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Economic Volatility Stress Tests for Trade Shocks Under the Pressure of Anti-Globalisation

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Abstract: Within the background of anti-globalisation, the ramifications of external disturbances on economic stability have garnered heightened scrutiny, emerging as a pivotal concern. Among these disturbances, trade shocks stand out as the most immediate and palpable representation of external perturbations, playing a crucial role in inducing output volatility in economies with a strong external orientation. This research employs a dynamic Leontief model, grounded in industrial linkage theory, and integrates empirical data from 42 predominant industrial sectors within China. The objective is to elucidate the transmission dynamics of import and export trade shocks on economic oscillations via industrial interconnections, utilizing numerical simulation techniques. The findings indicate that export trade shocks introduce volatility into the economy through both a direct pull effect and an indirect combination of pull and push effects, which are further magnified by inter-sectoral linkages. Conversely, import trade shocks can potentially counteract economic expansion by fostering the growth of import-substitution industries.

Keywords: Anti-Globalisation, Trade Shocks, Industrial Linkages, Economic Fluctuations, Transmission Mechanisms

1. Introduction

From the 2008 global economic crisis to the global spread of the covid-19 pandemic, as well as a succession of black swans and grey rhinoceros' events, the chain reaction triggered by external shocks has plunged the global economy into a prolonged downturn [1], accelerating the evolution of the "great change not seen in a hundred years". In this evolutionary trend, the development process of globalisation has been subject to great resistance, and has even moved towards divergence and closure, with the emergence of the trend of anti-globalisation. The trend of anti-globalisation, which started in 2016 with the UK's departure from the European Union and the US election, has become more and more intense with the increase in uncertainty in the global economy, and the implementation of the policy of "re-industrialisation" by major developed countries in Europe and America has resulted in the "reindustrialization" of the world's economy. Reindustrialization policy of major developed countries in Europe and the United States has led to a decline in the level of the international division of labor, and even caused a break in the global industrial chain, so that the system of global intra-product division of labor, which had been established in the past few decades, is facing a collapse and collapse. China is an important participant, builder and beneficiary of economic globalisation, so the shrinkage of external demand and supply caused by the change of anti-globalisation has constrained China's stable economic growth, and structural imbalance has appeared in the economic operation. The evolution of each change will deepen the society's awareness of the importance of smooth economic operation, and what causes the pressure of economic fluctuation and how it is transmitted has become an important requirement and an urgent task, and therefore has become the focus of increasing attention in the academic and political circles.

The manifestation of the effects of external shocks varies across geographic regions, with lagged effects that continue to widen. This widening of differences is the result of changes in the structure of the global economy that develop over a longer period of time after being exposed to external shocks. This structural change is amplified by differences in the degree of openness and policy preferences across countries. China's export-led economic development strategy,

while achieving great success, has also sharply increased the degree of external dependence of China's economic development. Therefore, it is important to study the transmission mechanism and impact of international trade shocks on economic fluctuations to maintain macroeconomic stability under open conditions. This paper constructs a dynamic Leontief model based on industrial linkage theory and explores the relationship between trade and economic fluctuations. The analysis focuses on the following questions: firstly, how do trade shocks affect economic fluctuations under the pressure of anti-globalisation; secondly, what is the pressure transmission mechanism of trade shocks on economic fluctuations, i. e., through which industries does trade transmit shocks to the whole economic system, and thus exert pressure on economic fluctuations; and thirdly, what are the key nodes in the industrial correlation of shock transmission? Related studies provide a good research basis for answering these questions, and an increasing number of studies have examined the drivers of economic stability both theoretically and empirically. Especially after the economic crisis of 2008, most empirical studies have shown the impact of industrial linkages, such as the specialized division in an industry, vertical industrial relatedness [2], or the industrial mix of related and unrelated varieties [3] of industrial association effects. With regard to the economic impact of trade shocks, the more representative traditional view is that export trade shocks affect domestic demand through the income effect and price signaling effect and trigger economic fluctuations [4]. Cantor & Mark examined the phenomenon that economic fluctuations in one country or more countries are transmitted through international trade, causing coordinated fluctuations in the economies of other countries [5], and proposed the phenomenon of economic cycle transmission. Canova & Dellas found that the interdependence between trading partners is the reason for the transmission of trade shocks to the domestic economic system [6], and Ambler, S. et al. [7] argued that intra-industry trade under the conditions of the international division of labor is the main transmission channel of economic fluctuations between different countries. Burstein et al. construct a two-country economic model based on verticalized production factors and find that substitutability differences between domestic and foreign intermediate inputs are the channel through which external demand shocks are transmitted domestically and lead to fluctuations in aggregate output [8]. An empirical study by Giovanni & Levchenko (2011) finds that the division of labor based on comparative advantage will exacerbate the macroeconomic disturbances caused by external shocks [9], and Hove et al. (2012) study the relationship between monetary policy regimes and trade shocks in emerging market countries, and find that inflation targeting by the monetary authority effectively reduces the impact of trade shocks on the economic volatility [10]. Domestic scholars have used different models to derive the transmission of the impact of US monetary policy on China's economy, especially on the export impact effect of trade frictions under the premise of uncertainty in the globalised environment.

Scholars have conducted in-depth research on the economic impacts under trade shocks, and many scholars have also noticed that trade shocks not only directly affect the final value output of the macroeconomy through the volume of imports and exports, but also indirectly affect the intermediate value output of the production chain through the correlation effect between trade and non-trade industries, which ultimately exacerbates macroeconomic fluctuations. When discussing economic responses under the effect of external environmental pressures, there is usually a greater bias towards examining the adaptability and volatility of the economic system [11], the stability of the macroeconomy or the efficiency of the market [12], as well as the role of industrial structure [13, 14]. Due to the increased uncertainty in the global economic environment, long- and short-term shocks have intensified the problem of uneven development between and within countries [15] and that external shocks to economies act first on the structure of the externally oriented economy, affecting the structure of the economy through the magnitude, persistence, and intensity of shocks, which in turn affects the government's supportive policies and measures, and ultimately on a new post-crisis path of development [13]. Therefore, the change of globalisation trend, as an external shock with the superposition of long-term and short-term factors, should be examined from the trade perspective of the impact of industrial linkages on economic fluctuations. In fact, the Leontief model based on industrial linkage theory is an effective method to study the output fluctuations of macroeconomic systems caused by individual industrial shocks, but there is not much literature on its use to study the transmission mechanism of trade shocks on economic fluctuations, and also, the traditional Leontief model has the limitation of not being able to analyze the dynamic transmission of industrial shocks.

This paper constructs a dynamic Leontief model with an adjustment mechanism for output fluctuations, and designs trade demand and supply shock scenarios, using numerical simulation to deduce the transmission mechanism of economic fluctuations caused by industrial shocks and their impacts. Forecasting the future based on the available historical data, the simulation predicts the shock output and tests the economic pressure under the shock, and then generalizes the corresponding policy implications. The possible policy contribution of this paper lies in exploring how China's economy with sufficient potential, strong resilience and large room for maneuver can be brought into play under the double-cycle development pattern against the backdrop of the wave of globalisation stepping into the stage of deeper adjustment, so as to promote China's open economy to a higher level of development.

2. Theory Basis

2.1. Direct Pull Effects of Trade Shocks

According to the theory of national economic accounting,

the accounting method of the national economy is divided into three categories (income, expenditure, production method), the expenditure method of accounting for the national economy is from the point of view of the use of the final product of the Gross National Product (Y) for a four-part decomposition, respectively, including consumption (C), investment (I), government procurement (G), exports (X) and imports (M), and the existence of the following constant equation:

$$Y = C + I + G + X - M \tag{1}$$

Without involving government purchases and consumption, the elasticity of the direct pull effect of trade shocks on the economy on the basis of equation (1) can be expressed as the transformed equation (2):

$$\frac{\Delta Y}{Y} = \frac{X}{Y} \times \frac{\Delta X}{X} \tag{2}$$

$$\frac{\Delta Y}{Y} = -\frac{M}{Y} \times \frac{\Delta M}{M} \tag{3}$$

Where, $\frac{X}{Y}$ denotes the elasticity of the direct pull effect of export trade on the economy, and $-\frac{M}{Y}$ denotes the elasticity of the direct pull effect of import trade on the economy. Accordingly, the following hypothesis can be obtained:

H1: Trade shocks have a direct pull effect on economic fluctuations.

2.2. Indirect Pull and Push Effects

The theory of industrial linkage believes that the industries in the macroeconomic system generate social production links by establishing the supply and demand relationship of each factor (products, services, and technologies) [16], and the interpretation of the industrial linkage theory on the economic fluctuations can be expressed as the consumption of products between different industries in the production process, specifically, industry 1 consumes the products and services of industry 2 in the production to form the industry 1's Gross output value, after deducting the intermediate consumption (products, services) of industry 1 to get the final output value, that is, the part of industry 1 in economic growth. In this case, the pull effect of industry 1 on industry 2, or the push effect of industry 2 on industry 1, is reflected in the demand for industry 2's total output value per unit of increase in industry 1's final output value. In the view of the industrial factor flows of the whole macroeconomic system, through the pull and push effects between industries, the initial shock will continuously evolve into changes in the total and final output value of multiple industrial sectors, and then economic fluctuations will occur. This economic fluctuation is an indirect effect of industrial transmission, which leads to the following hypothesis:

H2: Trade shocks have indirect pull and push effects on economic fluctuations through inter-industry supply and demand correlations.

3. Data and Methodology

Based on the theory of national economic accounting and the theory of industrial linkage, this paper designs an empirical analysis framework based on econometric modelling to measure the direct and indirect pull and push effects of trade shocks on economic fluctuations, so as to measure the pressure under trade shocks.

3.1. Measurement of Direct and Indirect Effects

On the basis of the research hypotheses put forward in the previous article, a dynamic Leontief model is constructed to portray the input-output relationship of 42 major industries in the national economic system; according to the structure of China's imported and exported commodities, we decompose the initial industries involved in the two types of trade shocks, namely, demand and supply, and carry out the design of trade shock scenarios, so as to lay a foundation for empirical analyses in the subsequent article. The dynamic Leontief model constructed in this paper is based on the following theoretical assumptions, including: first, the industry has a single factor input structure and the same production process; second, the price of the products produced by each industry is established (demand is established), and the production decision is only to consider the production decision; third, the production function of each industry is linear, and the input-output ratio of different industries is unchanged; fourth, there is no substitution between the factors; fifth, there is no substitution between factors; and fifth, there is no substitution between factors; and fifth, there is no substitution between factors. Fourthly, there is no substitutability between production factors; and fifthly, there is an adjustment mechanism within industries when they interact with each other.

3.1.1. Matrix of Direct and Full Consumption Factors

The Leontief model consists of two key elements, the direct and full consumption coefficient matrices, of which the direct consumption coefficient matrix is an indicator system for measuring the backward direct inter-industry correlation, reflecting the direct demand matrix of the output value of any industry to the output value of all the industries in the economic system, which is expressed as equation (4):

$$A = \begin{bmatrix} \alpha_{11} & \alpha_{12} & \cdots & \alpha_{1n} \\ \alpha_{21} & \alpha_{22} & \cdots & \alpha_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \alpha_{n1} & \alpha_{n2} & \cdots & \alpha_{nn} \end{bmatrix} \quad \alpha_{ij} = \frac{x_{ij}}{x_j} \quad i, j = 1, 2, \cdots, n \tag{4}$$

Where, denotes the direct consumption of industry j to industry j, denotes the total output value of industry j, and denotes the direct consumption coefficient of industry j to industry j, i. e. the backward direct correlation. The direct consumption coefficient of industry j to industry j is the backward direct correlation. The direct consumption coefficient only takes into account the direct demand relationship between industries and ignores the indirect demand relationship, which makes the measurement of the degree of industrial linkage inaccurate. Leontief distinguished

between the column vector of gross output value and the column vector of final output value of each industry, and derived the full consumption coefficient matrix reflecting the relationship between the two, see equation (5):

$$X=BY \quad B=\left(I-A\right)^{-1}-I \tag{5}$$

Where I represents the unit array of the same order as A, and B is the complete demand matrix reflecting the final output value of any industry to the total output value of all industries, i e. the complete consumption coefficient matrix. The element b_{ij} in B represents the complete consumption coefficient of industry i to industry j, which reflects the backward complete correlation degree of industry j to industry i on the one hand, i e., the demand correlation degree is also known as pull effect; on the other hand, it reflects the forward complete correlation degree of industry j to industry i, i e., the supply correlation degree is also known as the push effect. the larger the value of bij indicates that the production of a unit of final output value of industry j has a higher degree of demand for total output value of industry i. The larger value of b_{ij} indicates both the higher degree of demand for one unit of final output value produced by industry j to industry i, and the higher degree of supply of one unit of total output value produced by industry i to industry j's final output value.

3.1.2. Leontief Model Dynamic Design

The traditional Leontief model can only reflect the static relationship between final output and gross output among industries, but cannot portray the dynamic transmission mechanism of fluctuations in one industry across all industries. As a matter of fact, production inertia and market adjustment mechanism exist in many industries, with the former manifested in the short-term viscosity of production factor inputs leading to the continuous effect of gross output value over time, and the latter manifested in the dynamic adjustment mechanism of production by enterprises according to the market demand and supply situation. Thus, the transmission model of the fluctuation of total output value of each industry over time is designed, as shown in equation (6):

$$\Delta X_t=P\Delta X_{t-1} \quad P=\begin{pmatrix} \rho_1 & 0 & \cdots & 0 \\ 0 & \rho_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \rho_n \end{pmatrix} \tag{6}$$

where ΔX_t denotes the column vector of the volatility of the total output value of each industry in period t, and P denotes the matrix of the transmission coefficients of the volatility of the total output value of each industry over time. Combined with equation (6), the transmission mechanism of the volatility of total output value and final output value of each industry over time is shown in equation (7):

$$\Delta Y_t=B^{-1}P^t\Delta X_0 \tag{7}$$

where ΔX_0 denotes the column vector of the initial volatility of gross output by industry and ΔY_t denotes the column vector of the volatility of final output by industry in the period. In the empirical analysis, if we determine the initial shock formation ΔX_0 it is possible to simulate the response mechanism of the volatility of final output of each industry to the transmission of the initial shock in each period.

3.2. Stress Testing Under Trade Shock Scenarios

In the context of reverse globalisation, changes in trade can ultimately put pressure on the economy through inter-industry interactions. Setting the change value for the final output of the industry and measuring the overall impact of the change on the economy, we can measure the pressure of the whole economic system under the trade shock. Since there are two types of trade in international trade: import and export, the trade shock is divided into two types of shock modes: import and export, and according to the structure of China's import and export products, we analyze the industries involved in the initial shock of export or import trade. Since the export trade shock on economic fluctuations mainly manifests as the pull effect between industries, and the import trade shock manifests as the push effect between industries, therefore, it is set that the final output value of the industries involved in the initial shock of export trade decreases by 1%, and the total output value of the industries involved in the initial shock of import trade decreases by 1%.

3.3. Data Sources

In this paper, the model is simulated and estimated using the latest input-output tables published by the Office for National Statistics (ONS). This input-output table provides a matrix of inputs and outputs including 42 industrial sectors. The reason why the data selected for this paper measure the sample with 2016 as a time split point is firstly due to the trend of anti-globalisation, which was intensified after the Trump administration (2016) and the trade shocks have since manifested themselves, and secondly due to the fact that, limited to the availability of data, the latest input-output table currently available is the 2017 input-output table.

In the choice of industrial data, because the main industrial sector of the initial trade shock is an export-oriented industrial sector with a high proportion of exports, and the impact on the industry will gradually diminish as the upstream and downstream industrial chain lengthens and the number of industrial nodes increases, therefore, this paper analyses the impact of the shock in accordance with the trade share of the industrial screening. It should be noted in particular that, because the trade structure is relatively fixed over time, especially the key industry sectors are relatively stable, which is the basis for industrial selection, but also the reason why trade shocks do not choose to change over time.

4. Results

4.1. Estimation of Transmission Coefficients

Since the input-output table is not published annually, in

this paper, when calculating the transmission coefficient of industrial fluctuations, the 42 sectors in the input-output table are categorized into the 17 major industries under China's national economic accounting method, and the 42 major industries in the macroeconomic system are sequentially numbered as X1~42. The gross output value of the 17 industries in the period of 2010-2017, which was published by the National Bureau of Statistics, was used to data to establish a dynamic panel data model, i e., equation (6), and use the generalized moment estimation (GMM) method to estimate the value of each element ρ_i the matrix P, and the estimation results are shown in Table 1:

Table 1. *Estimated results of transmission coefficients of industry fluctuations.*

ρ_1	ρ_2	ρ_3	ρ_4	ρ_5	ρ_6	ρ_7	ρ_8	ρ_9
0.937***	0.340	0.854***	0.648***	0.537***	0.2890	1.083***	0.902***	0.540***
ρ_{10}	ρ_{11}	ρ_{12}	ρ_{13}	ρ_{14}	ρ_{15}	ρ_{16}	ρ_{17}	—
1.267***	0.755***	0.849***	0.820***	0.901***	0.808***	0.909***	0.930***	—

* Notes: *, **, *** represent at 1%, 5%, and 10% significance levels, respectively

4.2. Industrial Choices Involved in Import and Export Trade Shocks

Based on the product structure of China's import and export trade in the 2015 and 2017 input-output tables published by the National Bureau of Statistics (NBS) and the 2018 trade data published by the NBS, the main industries involved in the initial trade shock are identified. Among them, export trade is mainly considered as a percentage of the total amount of exports, as shown in Table 2, based on the export data decomposed into 42 sectors in the three years before and after 2016 (2015, 2017 and 2018), textile, clothing, shoes, hats, leather, down and their products (X8), chemical products (X12), electrical machinery and equipment (X19), communication equipment, computers and other electronic equipment (X20), wholesale and retail (X28) ranked in the top five in terms of export share, together accounting for more than 50 per cent of total exports. Therefore, export trade shocks will be transmitted from the above industries to other industries through the pull effect. In import trade, oil and gas mining products (X3), metal ore mining products (X4), chemical products (X12), metal smelting and rolling processed products (X14), and communication equipment, computers and other electronic equipment (X20) accounted for about 50 per cent of the total import value. Therefore, import trade shocks will be transmitted from the above industries to other industries through the push effect. At the same time, as seen in Table 2, China's trade structure is relatively stable, and the trade shock scenarios are set with a certain degree of rationality.

Table 2. *Proportional structure of China's import and export product transactions and choice of industrial sector (%).*

Industry		Export share			Import share		
		2015	2017	2018	2015	2017	2018
Oil & Gas Mining Products	X3				6.90%	8.01%	12.57%
Metal Mining Products	X4				4.75%	6.13%	
Textile, Clothing, Shoes, Hats, Leather, Down and their Products	X8	7.55%	7.50%	6.95%			
Chemical products	X12	7.21%	7.36%	7.65%	9.67%	11.22%	10.26%
Metal smelting and rolling products	X14				6.96%	5.36%	10.87%
Electrical machinery and equipment	X19	8.52%	8.19%	8.11%			
Communication equipment, computers and other electronic equipment	X20	21.00%	22.37%	21.71%	20.72%	19.38%	22.28%
Wholesale and retail	X28	11.66%	8.32%	8.86%			
Total Percentage		55.93%	53.74%	53.28%	49.00%	50.10%	55.98%

4.3. Industry Transmission of Trade Shocks to Economic Fluctuations and Stress Tests

According to the complete consumption coefficient data of final products of 42 sectors published by the National Bureau of Statistics in 2017, the complete consumption coefficient matrix of the main industries of the macroeconomic system, i. e., matrix B in equation (5), is constructed, and numerical simulation analyses of the transmission mechanism of import and export trade shocks on economic fluctuations are carried out respectively by combining the dynamic Leontief model designed in the previous section as well as the trade shock scenarios and the transmission industry is determined according to the strength of the correlation between the initial shock industry in the matrix of direct consumption coefficients and the other industries.

4.3.1. Test Results Under Export Shock Scenarios

Figure 1 show that the demand-side shock of reduced export trade adversely affects final output (GDP) in all industries through the pull effect. In terms of the inter-industry transmission effects of export trade shocks, a 1% reduction in X8, X12, X19, X20, and X28 final output through the inter-industry pull effect will result in 27, 26, 15, 30+, and 18 waves of shock transmission, respectively; leading to a maximum single-wave loss of 0.62%, 0.36%, 0.09%, 1.70%, and 0.11% of GDP, respectively; and leading to a cumulative GDP losses of 4.54%, 3.13%, 0.61%, 12.52%, and 0.97%. Therefore, the strong and weak order of export trade shocks on the pressure of economic fluctuations through the inter-industry transmission mechanism is in the

order of X20>X8>X12>X28>X19, and the export trade shocks transmitted through X20, X8, and X12 have a multiplier effect on the economic fluctuations with a factor of 12.5, 4.54, and 3.13 times. In terms of the transmission paths of export trade shocks across industries, there are differences in the shock transmission paths of X20, X8, X12, X28, and X19, but they share the common core transmission nodes X12, X28, and X29.

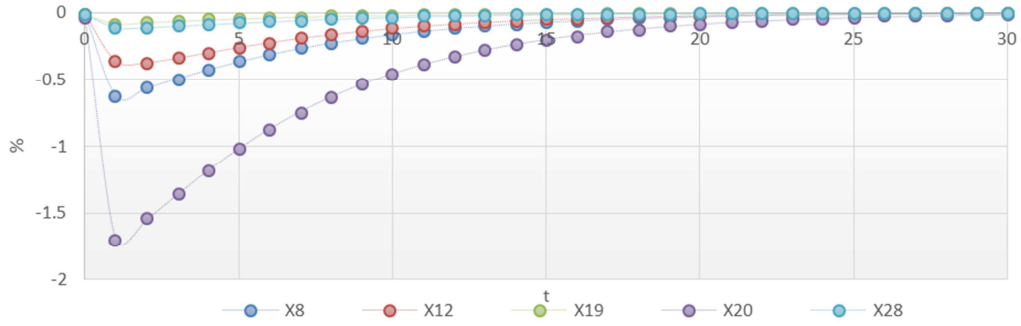

Figure 1. *Export Trade Shock.*

The above results suggest that in the macroeconomic system, export trade amplifies the impact on the economy through shocks to the industries of communications equipment, computers and other electronic equipment, chemical products, and textiles, clothing, footwear, hats, leather, down, and their products, which are then transmitted broadly to other industries through the three industries of chemical products, wholesale and retail trade, and transport, storage and postal services. Supporting the research hypotheses H1 and H2, trade shocks have a direct pull effect on economic fluctuations and an indirect pull-push effect through inter-industry linkages, thus putting pressure on the economic system. The multiplier effect in the transmission process, which responds to the stress test level, indicates that trade shocks amplify the pressure on economic fluctuations by a multiplier through the above effects.

It can be seen that, in addition to the traditional textile, clothing, shoes, hats, leather, down and their products, communication equipment, computers and other electronic equipment and chemical products have become industries with comparative advantages, China's export product structure is constantly optimized, industrial upgrading is in the process of continuing. In the process of pressure transmission, the chemical products industry supports the production of other industries through the provision of raw materials, semi-finished products, auxiliary materials and other products; with the vigorous development of e-commerce, the wholesale and retail industry has a strong industry-driven role; and the transport, warehousing and postal services, as an important logistics industry through the coordination of the operation of the other industries in the production, supply, sales, and other industries in close contact with the other industries, and become an important node of the Industry. China's upstream and downstream industrial chain and supply chain are becoming more and more perfect, which on the one hand promotes the development of export trade, and on the other hand, some industrial sectors are bound to emerge, based on their important position in the industrial chain and supply chain, and become the key node industries that are susceptible to shocks, which in turn affects the smooth operation of the whole economy.

4.3.2. Test Results for Import Shock Scenarios

From Figure 2, the supply-side shock of import trade reduction does not adversely affect the final output (GDP) of all industries, but, on the contrary, it also pulls the increase in the output of import trade substitution industries from the demand side and pulls the expansion of the total output (GDP) through the wider backward linkage among industries; and accordingly, it also illustrates that China's industries have not overly relied on the import trade for the provision of factors of production for the domestic industries, the Import substitution contributes to economic growth.

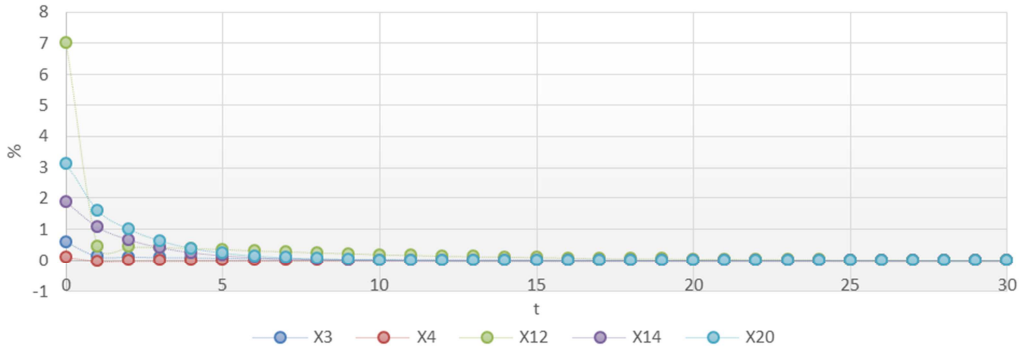

Figure 2. *Import Trade Shock.*

Import trade shocks in the inter-industry transmission effect, X3, X4, X12, X14, X20 total output decreased by 1% through the inter-industry push effect will be formed 22, 2, 30 +, 11, 12 waves of shock transmission, respectively; led to the maximum fluctuation of GDP single wave 0.14%, -0.01%, 0.45%, 1.08%, 1.61%; led to the maximum fluctuations of GDP, respectively by 1.71%, 0.08%, 11.62%, 4.70%, and 7.43%, respectively. Therefore, the import trade shock has a demand-side pull effect on import-substituting industries in the order of strength X12>X20>X14>X3>X4. The import trade shock linked through X12, X20, X14, and X3 industries has a multiplier effect on economic growth of 11.62, 7.43, 4.70, and 1.71 times, respectively.

From the perspective of the transmission path of import trade shocks between industries, there is no obvious transmission industry node. Import trade shocks are manifested as an initial shock that does not lead to economic fluctuations through extensive inter-industry transmission after the initial shock directly affects the economy, and the pressure for economic fluctuations comes mainly from export trade shocks. Import trade shocks affect the economy through four types of industries: chemical products, communications equipment, computers and other electronic equipment, metal smelting and rolling processed products, and oil and gas extraction products. The basic expectation is that the initial shock of import trade will lead to economic growth, but that it will affect other related industries due to shortages of raw materials, which in turn will cause economic fluctuations. For example, the communications equipment, computers and other electronic equipment industry through the supply of machinery and equipment, equipment parts, consumables, etc. to support the production of other products with higher technological content, chemical products, oil and gas development products, metal ore mining products, metal smelting and rolling processed products through the provision of raw materials, energy, production of auxiliary raw materials, etc. to support the production of other industries. It is therefore assumed that these raw material-demanding industries will be affected by the import shock. However, from the results of data simulation, the impact of import shocks on economic fluctuations continue to be positive, indicating that the domestic alternative industries offset the negative impact. In recent years, from the national strategy to industrial policy to the accumulation of enterprise technology, the domestic import substitution industry has developed and significantly reduced the dependence on foreign imports.

Taken together, export-side shocks exert downward pressure on the macroeconomy with industry chain transmission effects, while import-side shocks contribute to economic growth instead. And the trend of anti-globalisation is likely to push back China's rise in new materials, communication technology, computers and other strategic emerging industries, which will further consolidate China's position in the world industrial system. In the process of export trade shock transmission, chemical products, wholesale and retail, and transport, warehousing and postal three types of industries are the key nodes of the shock transmission industry, which affect the economy through the extensive pull and push effect with other industries. Among the industries with initial shocks to import and export trade, the chemical products sector and communications equipment, computers and other electronic equipment, which are both export- and import-initial shock industries, are particularly important in terms of their impact on macroeconomic stability. Therefore, special attention needs to be paid to the development of these industries.

5. Conclusion

This paper constructs a dynamic Leontief model based on the theory of industrial linkage, empirically analyses the transmission of import and export trade shocks on economic fluctuations through inter-industry supply and demand linkages using numerical simulation methods and carries out a stress test, which shows that: (1) the export trade shocks cause economic fluctuations through the direct pull effect and the indirect pull and push effect, and the trade shocks pressure on the economy through the inter-industry linkages and expanded, and the export dependence of some industries is still very high. (2) Export trade shocks are widely transmitted between industries mainly through the pull and push effects of the three types of industries, namely, chemical products, wholesale and retail, and transport, storage and postal services, on other industries, and are an important pressure-transmitting sector. (3) The initial shock of import trade did promote economic growth, but unlike what was expected, the supply-side shock of import trade in the long term still did not cause negative pressure on the economy, but rather through the development of import-substituting industries to pull economic growth. It shows that China's industrial structure has been continuously optimised, the resilience of the industry has been increasing, and the "internal cycle" has been gradually unimpeded, and has facilitated the formation of a "double cycle" pattern.

References

[1] Gunay, S., and Can, G., 2022, “The Source of Financial Contagion and Spillovers: An Evaluation of the Covid-19 Pandemic and the Global Financial Crisis,” PLOS ONE, 17 (1), p. e0261835.

[2] Rocha, H., and Audretsch, D. B., 2022, “Entrepreneurial Ecosystems, Regional Clusters, and Industrial Districts: Historical Transformations or Rhetorical Devices?,” J. Technol. Transf.

[3] Baumgartinger-Seiringer, S., Fuenfschilling, L., Miörner, J., and Trippl, M., 2022, “Reconsidering Regional Structural Conditions for Industrial Renewal,” Reg. Stud., 56 (4), pp. 579–591.

[4] He, Y., 2022, “Heterogeneous Stock Traders, Endogenous Bubbles, and Economic Fluctuations,” Finance Res. Lett., 47, p. 102607. Kletzer, K., and Bardhan, P., 1987, “Credit Markets and Patterns of International Trade,” J. Dev. Econ., 27 (1), pp. 57–70.

[5] Canova, F., and Dellas, H., 1993, "Trade Interdependence and the International Business Cycle," J. Int. Econ., 34 (1), pp. 23–47.

[6] Ambler, S., Cardia, E., and Zimmermann, C., 2002, "International Transmission of the Business Cycle in a Multi-Sector Model," Eur. Econ. Rev., 46 (2), pp. 273–300.

[7] Burstein, A., Kurz, C., and Tesar, L., 2008, "Trade, Production Sharing, and the International Transmission of Business Cycles," J. Monet. Econ., 55 (4), pp. 775–795.

[8] di Giovanni, J., and Levchenko, A. A., 2012, "Country Size, International Trade, and Aggregate Fluctuations in Granular Economies," J. Polit. Econ., 120 (6), pp. 1083–1132.

[9] Hove, S., Touna Mama, A., and Tchana Tchana, F., 2015, "Monetary Policy and Commodity Terms of Trade Shocks in Emerging Market Economies," Econ. Model., 49, pp. 53–71.

[10] Hu, X., and Hassink, R., 2017, "Exploring Adaptation and Adaptability in Uneven Economic Resilience: A Tale of Two Chinese Mining Regions," Camb. J. Reg. Econ. Soc., 10 (3), pp. 527–541.

[11] Agyabeng-Mensah, Y., Afum, E., Baah, C., and Essel, D., 2022, "Exploring the Role of External Pressure, Environmental Sustainability Commitment, Engagement, Alliance and Circular Supply Chain Capability in Circular Economy Performance," Int. J. Phys. Distrib. Logist. Manag., 52 (5/6), pp. 431–455.

[12] Yadegaridehkordi, E., Foroughi, B., Iranmanesh, M., Nilashi, M., and Ghobakhloo, M., 2023, "Determinants of Environmental, Financial, and Social Sustainable Performance of Manufacturing SMEs in Malaysia," Sustain. Prod. Consum., 35, pp. 129–140.

[13] Chen, L., Li, W., Yuan, K., and Zhang, X., 2022, "Can Informal Environmental Regulation Promote Industrial Structure Upgrading? Evidence from China," Appl. Econ., 54 (19), pp. 2161–2180.

[14] Zhu, J., and Lin, B., 2022, "Economic Growth Pressure and Energy Efficiency Improvement: Empirical Evidence from Chinese Cities," Appl. Energy, 307, p. 118275.

[15] Hickel, J., Dorninger, C., Wieland, H., and Suwandi, I., 2022, "Imperialist Appropriation in the World Economy: Drain from the Global South through Unequal Exchange, 1990–2015," Glob. Environ. Change, 73, p. 102467. Leontief, W., 1986, Input-Output Economics, Oxford University Press.

[16] Leontief, W., 1986, Input-Output Economics, Oxford University Press.