Наукові записки НаУКМА
Економічні науки, 9(1) (2024), 24–31

Scientific Papers NaUKMA
Economics, 9(1) (2024), 24–31

СТАТТІ **ARTICLES**

DOI: 10.18523/2519-4739.2024.9.1.24-31
UDC 336.582.748.14

Hennadii Hryhoriev
https://orcid.org/0000-0003-2349-3875

DEBT-DEFLATION THEORY AND MIDDLE-INCOME TRAP: SYSTEM DYNAMICS APPROACH

Abstract

The article analyzes the theoretical and practical aspects of the theory of the relationship between national debt and deflationary processes using the example of the impact of the economic recession in China on the decline in global economic growth, and determines the systemic effects of the national economy falling into the middle income debt trap and exiting it. With the help of simulation models, which are based on the methodology of system dynamics, the interrelationship of economic processes of global and national economies is presented. It was found that deflation leads to an increase in the price of the existing external and internal debt and inhibits economic growth and economic development of the national economy and is one of the forms of the country's middle income trap. The use of the scenario approach made it possible to identify the basic options for the development of the world economy under the influence of negative economic phenomena at the national level and to develop appropriate recommendations for middle-income countries to achieve the goals of macroeconomic and financial stabilization with the appropriate access to the trajectory of new economic development.

The study found that the factors of education, social and innovative development are of decisive importance in the country's achievement of the goal of leaving the middle income trap. The economies of such countries as China are unable to independently overcome this trap without further involvement in global integration and trade processes, and at the same time they themselves form deflationary processes at the global level. In addition, the policy of economic and political semi-isolation leads to the destabilization of the existing world economic and financial systems.

Keywords: debt-free economy, middle income trap, system dynamics, economic growth, debt-deflation, business cycle theory.

JEL classification: G51

Introduction and research problem. The dilemma of choosing between inflationary and deflationary trends, which accompany economic growth and development, has become extremely relevant in the last decade after the emergence of China (chosen as an object of study) as a new superpowerful global economic player with the ability to influence world macroeconomic and financial policy, in particular in the matter of the negative deflationary impact on global economic processes.

Deflation occurs as a result of excessive internal and external debt (created mainly by private firms) relative to the GDP of both high- and middle-income countries and has a non-linear dependence with the effect of a bell-shaped curve, which, when the maximum point is reached, signals the onset of economic depression. Depression can be avoided by implementing an effective countercyclical government policy and a mixed form of economy. Quite often, the deflation of a large country has an export-like character.

The issue of the interaction of national and global subjects based on a system-dynamic approach is insufficiently researched in the scientific literature. Preference is given to econometric research methods using complex economic forecasting tools.

The appearance of new powerful economic players on the world market erodes the existing established game rules in the multipolar world, which requires the use of new tools of economic analysis. The problem is not in the fact "that we don't know that deflation and high debt level of some countries (China in our case) is a threat to the global economy", but rather "Why the deflation and high debt level still exists in China?"

Recent research and publications analysis. The analysis of the main drivers of the debt-deflation spiral was developed and studied by White (2023), Nasir and Huynh (2024) and others.

This study is based on the methodology of (Fisher, 1933), who for the first time in his work [Fisher] formulated the impact of excessive indebtedness with the mutual manifestation of deflation on the business cycle and economic depression. I. Fisher found that debts and prices are usually not in equilibrium, and excessive indebtedness (due to the emergence of innovations and technological improvements) and deflation are the root causes of economic shocks, including economic booms and depressions. The most famous theory of debt deflation development, as is known, are H. Minsky (hypothesis of financial instability) (Minsky, 1982) and B. Bernanke (violation of the stability of the functioning of the credit market as a result of debt deflation and a series of bankruptcies) (Bernanke, 1983). Reinhart and Rogoff (2009) confirmed the hypothesis of I. Fischer regarding the unbalanced state of debt on the example of a long-term study of middle-income economies, unlike developed ones, suffer from various types of crises – inflationary, currency, banking and public debt crisis.

Scientific studies related to the problem of the middle-income trap are deeply studied by scientists from different countries. Among them, we can single out works that see the main problem in a wide range of incomes and the impossibility of solving the problem of the income trap exclusively in the sphere of economic growth (Yao, 2015). The solution to the problem, according to the authors, consists in "preventing financial liberalization and regulation of corporate debt" and avoiding financial risks and banking-financial crises (Yao, 2015). Getting out of the middle income trap is possible only through the implementation of technological renewal and innovation (Yao, 2015; Zhuang et al., 2012), as well as reforming not the economic and social system (Zheng, 2020) and the introduction of other innovative variables, in particular, "the use of the Internet and articles in scientific journals" (Cm et al., 2024).

As a result of such implementation, it is possible to go beyond the budgetary capabilities of the country and move to a higher level of consumption and income. Without the introduction of innovative technologies, the national economy is threatened by a rapid increase in public debt (primarily foreign), which is accompanied by a sharp reduction in employment in key industries. Thus, a country with an average level of income is not only deprived of the chance to reach a new level of economic well-being, but also loses the existing one with the acquisition of the effect of deindustrialization (Caraballo-Cueto et al., 2018), which is also confirmed in (Zheng, 2020) in the study of the debt crisis of Latin American countries. An exogenous shock to the start of a fiscal crisis and a sovereign debt crisis can be a change in the percentage of leading countries in the world (Sundaram, 2023).

Scientific works that relate to the identification of the relationship between debt, GDP and inflation using the methods of system dynamics are currently insufficiently represented. Among the scientific publications, we should highlight (Yamaguchi, 2010, 2011), where the use of simulation modelling led to similar conclusions as (Fisher) regarding the deterioration of the economic condition in the national economy during the liquidation of the public debt, which leads to "deepening of the recession and growth of unemployment" (Yamaguchi, 2011).

Modern scientific research also attaches great importance to the relationship between the development of the global economy and deflation. Despite the prevailing scientific view of a return of inflation in 2024 (Eichengreen, 2024), there are alternative concepts that argue that deflation in China will significantly reduce inflationary pressures in the developed world and diffuse global deflationary risks through a devaluation of the renminbi and a rise in the "inventories/sales" ratio in China (Smith, 2023). The exit from the closed spiral "debt-inflation" involves "increased consumption and expansion of the global trade cycle" (Ahya, 2023).

Unsolved part of the problem. Scientific and empirical studies indicate that the national economy may feel the risk of a deflationary shock in the form of a sharp reduction in aggregate demand, which leads to a fall not only in prices, but also in aggregate output and income. The negative situation is developing in a spiral of increasing feedback, as the growth of debt intensifies deflationary processes, which, in turn, deepens the debt burden on the country's economy. In the scientific literature, there are conflicting views on the empirical vision of the problem: the negative forecasts of the Chinese

economy of Western analysts do not always coincide with the optimistic ones of the official national publications of this country. There is an attempt to identify a systemic problem that will become the basis for conducting similar studies in the event of the phenomenon of the deflationary debt trap in other countries of the world. We are trying to go beyond the issue of a single country, because in the scientific publications on China, the emphasis of the problem is focused on the level of local debts only.

Research goal and questions. The purpose of this research is to explore the falling into the middle income trap of the respective countries, highlighting the key phenomenon "debt-deflation" and its impact on the economic development and growth of the country, identifying the place and role of such a phenomenon in the behaviour of the business cycle, as well as the adaptation of the macroeconomic strategy of the national economy to avoid or get out of the medium debt trap.

Main findings. The study was conducted using the PHAPI methodology developed by (Moxnes, 2009), which, accordingly, involves the following algorithm of actions: P – Problem; H – Hypothesis; A – Analysis; P – Policy; I – Implementation.

Debt-deflation is defined as economic downturn, caused by interrelated factors: debt overhang and price level decrease. The reference mode for two indicators is presented below (Fig. 1).

This reference mode reflects the problem statement. The following literature analysis reflects some hypothesis which we need to accept or reject. Current value is influenced by the price-to-earnings ratio as well as future price expectations. The future price influences the current value and the price-to-earnings ratio. To equilibrate the future price with the current one we need to increase our government spending. At the same time, it means the increase of budget deficit and inflation in the national economy and the possible correction of investment expectations, which also depends on the level of the wage ratio to GDP. The Net Present Value should also be corrected to level of current debt over national income level (Minsky, 1977, 1982).

This hypothesis assumes that excess debt is one of the main reasons for a sharp drop in price after increase of the debt level. In the scientific literature, starting from I. Fisher, we suppose that the main reason why debt-inflation phenomenon happens is because of the time gap (delay) between

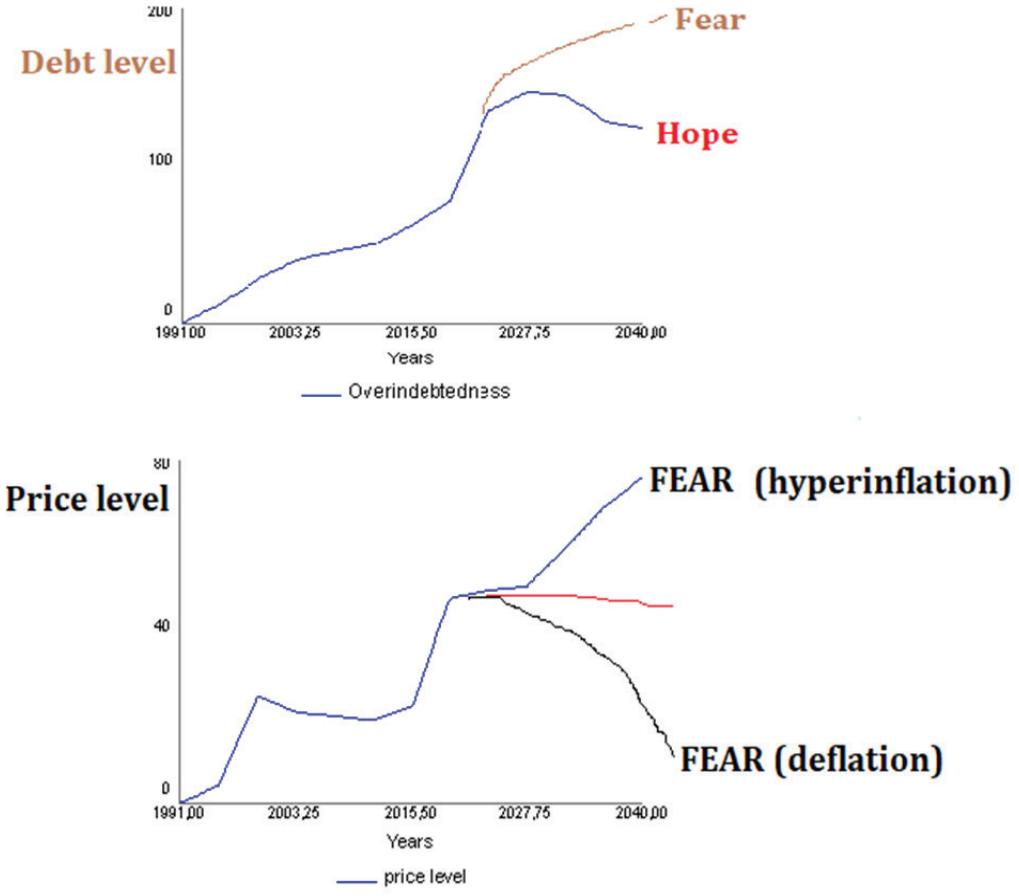

Fig. 1. Reference mode for debt-deflation

investment–savings and liquidity-money functions in the standard IS–LM model (Palley, 2008). If such delay exists, money supply cannot react instantly to investment mood change, but debt level continues to increase. Therefore, debt level remains high for a longer period, than is acceptable to be fine – tuned to price level. As a result, the market distortion arises with the over-hyped stock of debt level to GDP, even though the physical volume of it may fall. The aftermath of debt-deflation is falling into the middle-income trap. The burden of debt accelerated by deflation can't allow middle income and emerging markets to reach the higher level of welfare.

The revised hypothesis of debt-deflation is well-known in economic literature (Palley, 2008; Ahya, 2023). One of the contemporary well-known models is the hypothesis of (Zheng, 2020) about "prevention of deflation, encouraging economic expansion and demand increase". In this and any other known for us model there is no available information about connection between debt-deflation concept and middle-income trap of the country. The above-mentioned explanations have some ambiguities (Mashayekhi, 2012) with our hypothesis.

Ambiguity – statements: "Does the debt-deflation mechanism create the prerequisites for the economic slowdown effect to occur in middle-income countries and economic lagging behind the developed economies? What is the level of debt-deflation significance for economic growth and development?"

To develop the problem statement, mentioned above, we create the 3-stocks model for debt-deflation middle income countries (Fig. 2).

The major components of the model are: 1. National deflation. 2. Deflated total debt. 3. Global debt-deflation stock.

National deflation is derived by price-determined mechanisms. This mechanism is well described in economic literature (Ahya, 2023; Fisher, 1933; Minsky, 1977; Palley, 2008). Deflation is determined as the level of Consumer Price Index (CPI), or price level in our case. We also correct the national deflation on the level of the pessimism, which prevails in the economy for nowadays.

Deflated total debt is derived as the difference between debt inflow and outflow plus the debt liquidation. Since we have the impact of distress selling on it, we need to correct it on the volume of

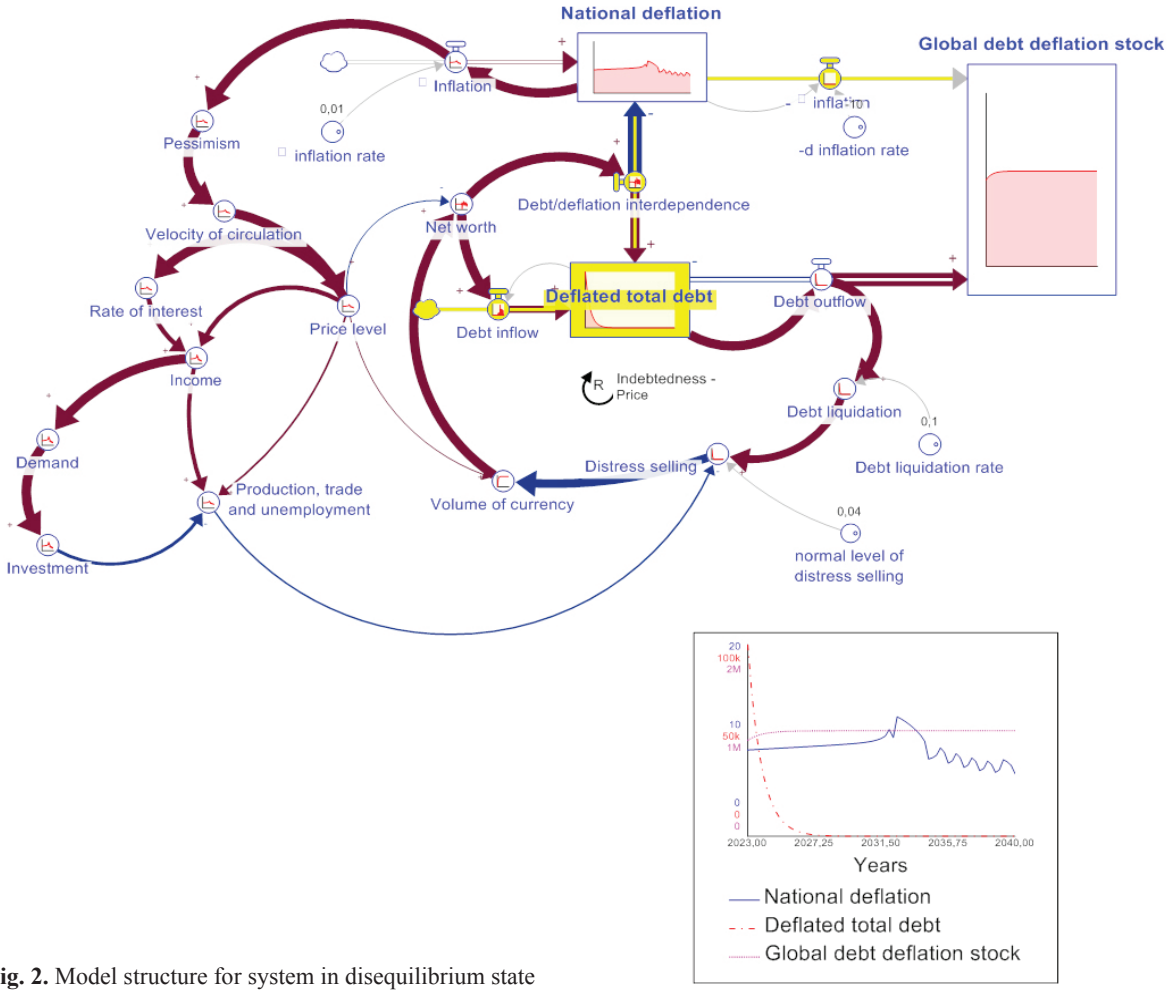

Fig. 2. Model structure for system in disequilibrium state

currency (influenced by velocity of circulation) corrected on the net worth in the economy. At the same time price level is the trigger for interest rate change. The system is rather more complicated, and we add into it the "real sector" feedback loop, consisting of income, real demand, investment and production, trade, and unemployment. "Real sector" feedback loop is triggered by interest rate change. The bi-flow between deflation and deflated total debt is driven by interdependence of two stocks (Fisher, 1933, p. 344).

Global debt-deflation stock is derived as the sum of two previous stocks – national deflation and deflated total debt. We assume that one large middle-income country largely determines the volume of global debt and deflation, as it can influence changes in the pace of global economic growth. Thus, we consider that global debt deflation stock is a relative indicator of world GDP, and not an absolute one. The system could be more comprehensive if an indicator of world economic growth were added to it. However, this requires additional scientific research.

Causal loop analysis

Debt liquidation. As the real estate crisis worsened, conglomerates (for example, Zhongzhi Enterprise Group) found themselves unable to service their debts. The company concentrates the hoard of individuals and corporations and provides loans for investment in real estate, securities, bonds and commodities to be able to finance property developers. It becomes more difficult for non-state enterprises to use traditional banks. Shadow banking is very important in China's economic growth over the last 15 years since 2008.

Investment in Chinese infrastructure served as an engine for its fast-economic growth in 2013-2023. Local Government Financing Vehicles (LGFV) used to borrow money from banks to finance the local economic development. The amount of borrowing was about 1/2 of China's GDP in 2023. The economic system of China provides very cheap access to public infrastructure. On the other hand, it created huge financial problems for LGFV, because debts are considered as a part of Chinese banks wealth. LGFV were able to pay their interest rate due to the help from their local government owners. The local policy was to waive the debt for some period. The termination of the support for LGFVs debt policy from the national government of China exacerbated by the economic slowdown, caused the LGFV interest payment crisis and triggered a chain reaction of the banking crisis threat and a shock to China's national financial system. The Chinese national government has a generally negative view of supporting LCFVs engaged in so-called "wasteful borrowing" and generating negative signals for the economy. The result of the further reduction of local investments in infrastructure is an increase in the risks of bond payments. As a result, the economic growth of not only China, but also the world economy is decreasing.

Distress selling on the property market in China will increase suddenly in 2022-2023. Despite the stressful situation and severe capital restrictions rules, there is still high investment demand. At the beginning of 2023 "around 45 % of Chinese property companies were at risk of debt distress" (Wong, 2023). At the end of 2023 China's property market was at the edge of total collapse.

To understand "distress selling", it is necessary to understand the specific global economic trends of 2021-2022:

– China's slow economic growth.

– High global interest rates.

– The high exchange rate of the US dollar, which significantly affected world prices.

The turbulence of world markets under the influence of Russian aggression in Ukraine was more noticeable in the markets of developing countries. Nevertheless, the level of vulnerability of those markets was quite small, as well as a resilience to external economic shocks was quite high. The main macroeconomic and financial risks for China with appropriate spillovers to the global economy in 2024 are for the real estate market and local government debt, which may negatively affect investors' expectations regarding default forecasting and "distress selling" on the securities market. Despite the quite low average debt/ GDP level in China from 1995 until 2022 (37 %), it is quite high in 2022 on the level of 77 % (Trading Economics, 2022). Strict regulation might make it harder for distressed properties to get credit, which would make the current issues in that industry worse. The absence of liquidity control is the unique issue with shadow banking. Fiscal programs aimed at regulating the shadow banking industry are belated. Restructuring puts pressure on state-owned businesses, which could impede economic expansion. There might be other unintended consequences.

Volume of currency

The Chinese currency has lost value relative to the US dollar in 2023, which limits substantially the scope of monetary easing policy.

Macroeconomic indicators

We see the challenge in the medium term for China. The highest achievable level of economic growth is not more than 5 % in 2024, because the investors' expectations are inflated from the economy on the stage of the recession. There needs to be fiscal reforms to rent the fiscal revenues.

Construction of the model structure allows it to reveal its behaviour via simulation process for the first ambiguity to be answered.

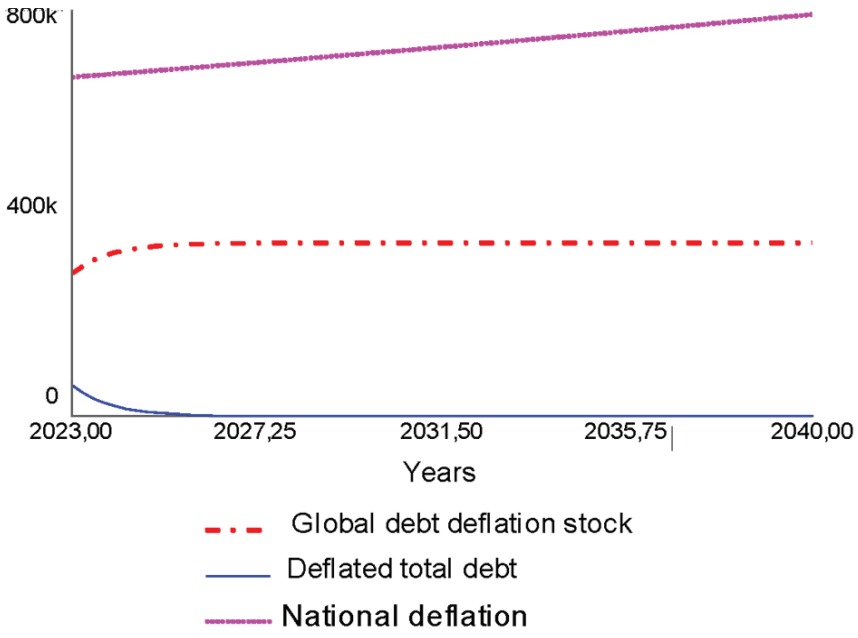

Fig. 3. Model structure for system in relative equilibrium state

System in equilibrium state

After obtaining an unbalanced model, it is necessary to return it to a state of balanced equilibrium. To do this, we will carry out certain algebraic transformations in the presented model and to test the model. The parts of our model partially deviate from reference mode, having the oscillation part. After model constructing, which behaves moderately well, we are to implement different scenarios to reveal some undesirable parts of the system behaviour and to obtain the optimal trend of behaviour.

National deflation rate – 9 %. Deflated total debt – USD $10000*10^9$. Global debt deflation – USD $10000*10^{12}$.

Let ND = National deflation; DD = Deflated total debt; GDD – Global debt deflation. The rate of deflated total debt – 0.4, the rate of global debt deflation – 0.1, and the rate of national debt deflation – 1.

DD + GDD / ND = USD $1011110*10^9$

The flows must equal: GDD * 0.1 = DD * 0.04 = = NDD * 1. We omit the interim analysis and present the result of the dynamic equilibrium.

DD = USD $61279{,}4*10^9$;

GDD = USD $280863{,}1*10^{12}$;

ND = USD $61279{,}4*10^9$

DD + GDD + ND = USD $668966{,}7*10^{12}$

The computation results, which are displayed on Figure 3, are being added to our stock.

Conclusions and proposal for further research

● Deflation is one of the ways that the average income of the nation is trapped, since it raises the cost of the nation's current foreign and internal debt and prevents the national economy from growing and developing.

● Middle income trap is inevitable for countries with high level of deflation, which might negatively influence on global economy economic growth. Due to its ability to affect fluctuations in the rate of global economic growth, one sizable middle-income nation has a significant influence over the amount of global debt and deflation.

● The oscillation of deflated total debt via national deflation might have take place during the period of economic instability, which leads to national and global economic and financial crisis spiral unwinding.

● To prevent the crisis, the policy instruments for changing the structure of economic system are needed as a combination of monetary, fiscal, and external trade policy. New Keynesian methods of consumption stimulation are appropriate. The transformation of social policy towards increasing social security costs is needed including spending on innovation development and education.

● After exiting the recession, the economic system (national economy) will return to a state of equilibrium, since external geopolitical and geo-economics forces of a certain type will cease to act on it.

The outcome of the research can be used in science and in practice for determining the strategy of behaviour of the national economy with an average level of income and a significant amount of foreign debt.

References

Ahya, C. (2023). China faces the risk of a debt-deflation loop. https://www.ft.com/content/925e1ab5-dbf9-4c38-adaf-f4ffa44998c9

Bernanke, B. S. (1983). Nonmonetary effects of the financial crisis in the propagation of the Great Depression. *American Economic Review*, *American Economic Association, 73*(3), 257–276, June.

Caraballo-Cueto, J., & Lara, J. (2018). Deindustrialization and unsustainable debt in middle-income countries: the case of Puerto Rico. *Journal of Globalization and Development*, *8*(2), 1–11, December.

Cm, J., Hoang, N. T., & Yarram, S. R. (2024). The transition from middle-income trap: role of innovation and economic globalisation. *Applied Economics, 56*(1), 1–21. https://doi.org/10.1080/00036846.2023.2267821

Eichengreen, B. (2024). The Return of Inflation. *Current History, 123*(849), 9–13.

Fisher, I. (1933). The debt-deflation theory of Great Depressions. *Econometrica: Journal of the Econometric Society*, 337–357, October.

Mashayekhi, A. N., & Ghili, S. (2012). System dynamics problem definition as an evolutionary process using the concept of ambiguity. *System Dynamics Review*, *28*(2), 182–198.

Minsky, H. P. (1977). The financial instability hypothesis: An interpretation of Keynes and an alternative to "standard" theory. *Challenge*, *20*(1), 20–27.

Minsky, H. (2015). Debt deflation processes in today's institutional environment. *PSL Quarterly Review*, *35*(143). https://doi.org/10.13133/2037-3643/13136

Moxnes, E. (2009). Diffusion of system dynamics. *System Dynamics Newsletter*, *22*(4).

Nasir, M. A., & Huynh, T. L. D. (2024). Nexus between inflation and inflation expectations at the zero lower bound: A tiger by the tail. *Economic Modelling*, *131*, 106601.

Palley, T. I. (2008). Keynesian models of deflation and depression revisited. *Journal of Economic Behavior & Organization*, *68*(1), 167–177.

Reinhart, C. M., & Rogoff, K. S. (2009). *This time is different: Eight centuries of financial folly*. Princeton University Press.

Smith, E. (2023). China's deflation could spill over into a global concern, economists say. https://www.cnbc.com/2023/08/24/chinas-deflation-could-spill-over-into-a-global-concern-economists-say.html

Sundaram, J. K. (2023). Middle-income country trap? https://www.globalissues.org/news/2023/11/22/35362

Trading economics. (2022). China government Debt to GDP. https://tradingeconomics.com/china/government-debt-to-gdp

White, W. (2023). What Next for the Post Covid Global Economy: Could Negative Supply Shocks Disrupt Other Fragile Systems? *Institute for New Economic Thinking Working Paper Series*, (199).

Wong, S. L., & Ji, K. (2023). China can contain its property market troubles. https://asia.nikkei.com/Opinion/China-can-contain-its-property-market-troubles

Yamaguchi, K. (2010). On the liquidation of Government debt under a debt-free money system. Modelling the American Monetary Act. Doshiha University.

Yamaguchi, K. (2011). Workings of a public money system of open macroeconomies. In *Modelling the American monetary act completed. Paper at the 29th international conference of the system dynamics society.* Washington, DC.

Yao, Z. (2015). How Can China Avoid the Middle-income Trap? *China & World Economy*, *23*(5), 26–42.

Zheng, Z. (2020). *Middle-Income Trap: An Analysis Based on Economic Transformations and Social Governance*. Palgrave Macmillan.

Zhuang, J., Vandenberg, P., & Huang, Y. (2012). *Growing beyond the low-cost advantage: How the People's Republic of China can avoid the middle-income trap*. Asian Development Bank.

Григор'єв Г. С.

ТЕОРІЯ БОРГОВОЇ ДЕФЛЯЦІЇ ТА ПАСТКА СЕРЕДНЬОГО ДОХОДУ: СИСТЕМНО-ДИНАМІЧНИЙ ПІДХІД

Метою статті є аналіз теоретичних і практичних аспектів теорії взаємозв'язку державного боргу та дефляційних процесів на прикладі впливу економічної рецесії в Китаї на зниження світового економічного зростання та визначення системних наслідків падіння національної економіки шляхом потрапляння в боргову пастку середнього доходу та виходу з неї.

Методи дослідження. За допомогою імітаційних моделей, які базуються на методології системної динаміки, показано взаємозв'язок економічних процесів світової та національної економік. Використання сценарного підходу дало змогу визначити основні варіанти розвитку світової економіки під впливом негативних економічних явищ на національному рівні та розробити відповідні рекомендації для країн із середнім рівнем доходу щодо досягнення цілей макроекономічної та фінансової економіки, стабілізації з відповідним виходом на траєкторію нового економічного розвитку.

Результати дослідження. Встановлено, що дефляція призводить до збільшення зовнішнього і внутрішнього боргу, гальмує економічне зростання та економічний розвиток національної економіки та є однією з форм пастки середнього доходу країни.

Дослідження показало, що чинники освіти, соціального та інноваційного розвитку мають вирішальне значення для виходу країни з пастки середнього доходу. Економіки таких країн, як Китай, не можуть самостійно подолати цю пастку без подальшого залучення до глобальних інтеграційних і торговельних процесів, до того ж самі формують дефляційні процеси на глобальному рівні. Крім того, політика економічної та політичної напівізоляції призводить до дестабілізації світових економічних і фінансових систем.

Можливе застосування результатів дослідження. Результати дослідження можуть бути використані з науково-дослідницькою метою та на практиці для визначення стратегії поведінки національної економіки із середнім рівнем доходу та значним обсягом зовнішнього боргу.

Висновки. У статті доведено, що дефляційні процеси призводять до потрапляння національної економіки в пастку середнього доходу, гальмують економічне зростання та розвиток.

Пастка середнього доходу неминуча для країн із високим рівнем дефляції, що може негативно вплинути на економічне зростання світової економіки. Завдяки своїй здатності впливати на коливання темпів глобального економічного зростання одна велика країна із середнім рівнем доходу має значний вплив на динаміку світового боргу та дефляцію.

Коливання дефльованого загального боргу через національну дефляцію можуть виникати в період економічної нестабільності, що призводить до розкручування національної та глобальної спіралі фінансової та економічної кризи.

Щоб запобігти кризі, потрібні політичні інструменти для зміни структури економічної системи як поєднання монетарної, фіскальної та зовнішньоторговельної політик. Доцільно застосувати нові кейнсіанські методи стимулювання споживання. Потрібно трансформувати соціальну політику в бік збільшення витрат на соціальне забезпечення, включно з витратами на розвиток інновацій та освіту.

Після виходу з рецесії економічна система (національна економіка) повернеться в стан рівноваги, оскільки на неї перестануть діяти зовнішні геополітичні та геоекономічні сили певного типу.

Ключові слова: пастка середнього доходу, системна динаміка, економічне зростання, боргова дефляція, теорія ділового циклу.

Матеріал надійшов 18.05.2024

Григор'єв Геннадій Степанович – доктор економічних наук,
доцент кафедри економічної теорії Національного університету
«Києво-Могилянська академія»

Hryhoriev Hennadii – Doctor of Economics,
Associate Professor of the Economics Department,
National University of Kyiv-Mohyla Academy

https://orcid.org/0000-0003-2349-3875

gennadyi.grygoriev@ukma.edu.ua