

DOI: 10.32703/2415-7422-2023-13-2-311-333

UDC 94:629.78:327

Liudmyla Zhuravlova

Mykhailo Drahomanov Ukrainian State University

9, Pyrogovala Street, Kyiv, Ukraine, 01601

E-mail: zhuravleva1998@gmail.com

<https://orcid.org/0000-0003-1668-2774>

Evolution of techno-nationalism: The role of the space factor

Abstract. *Technological changes of the last four decades (1980s – 2020s) encourage scientists of various fields to assess the impact of technologies on the transformation of the system of international relations and national strategies of states. In particular, the main focus of many studies is devoted to the system of relations between countries with conflicting technological interests. Therefore, in the presented article, let's focus on the theoretical understanding of the evolution of the concept of techno-nationalism. Consideration of techno-nationalism through the prism of space policy, in particular US-China relations, is appropriate from the point of view of determining the relevance of the obtained research results. In view of this, the research methodology is based on an interdisciplinary approach, which made it possible to look at the problem through the perspective of historical, economic, political sciences and the theory of international relations. The analysis of publications on this issue shows that the development of techno-nationalism took place in a dichotomous relationship with techno-globalism. In the context of the end of the Cold War, techno-nationalism was used to refer to the protectionist policies of states that opposed the free exchange of technology. Space technology, which is an indicator of leadership and has a dual purpose, has become an important element of interstate communication in the post-bipolar era. Changes in this system led to an attempt by the United States to balance the interests of national security and commercial benefits from the use of space. However, these efforts led to a further strengthening of the export control regime from the second half of the 1990s. These restrictions were mainly based on concerns about the transfer of space technology to China, which was showing signs of military modernization. Thus, the leadership challenge facing the US and China in the space industry continued to strengthen the techno-nationalist elements of innovation systems throughout the 2000s and 2010s. Based on the views of the studied scientists, the author of the article provides his own definition of techno-nationalism as a state policy, scientific approach and ideology where national factors play a key role. The results of the study showed that the components of technological systems can be affected by the process of globalization to varying degrees. And therefore, techno-globalism and techno-nationalism are components of these systems and demonstrate*



interdependence. In this light, such categories as digital nationalism, digital identity, and techno-authoritarianism need further development.

Keywords: *techno-nationalism; techno-globalism; space policy; American-Chinese relations; scientific diplomacy; techno-diplomacy; export control*

Introduction.

Globalization and globalism today are almost the most used terms in assessments of the modern world order. And techno-globalism, as its important component, became the subject of study by many scientists in the 1990s – early 2000s (Mothe & Dufour, 1995; Montresor, 1998; Montresor, 2001; Tonelson, 1995; Tonelson, 1997). But, at the same time, the world scientific community relentlessly continues to focus on the opposite phenomenon of techno-globalism – techno-nationalism. Interest in which has only been growing in recent years. Attention to this phenomenon was drawn by the economic conflict between the administration of D. Trump and Beijing, which intensified in 2018. These events demonstrated that the world economic space is as much global as it is local. In particular, A. Capri, a well-known specialist in the field of international economic relations, claims that the change in the technological landscape has led to the emergence of a new hybrid war. This issue is particularly acute in relation to US-China relations, which, according to Capri, are on the threshold of a technological race similar to the space race between the USA and the USSR (Capri, 2021).

Researchers of space policy and technology naturally focus on the problem of interaction between the so-called "members of the space club", on the one hand, and the relations of these countries with states that have not yet joined it, on the other (Paikowsky, 2017). D. Krige, a brilliant historian of science and technology and space technologies, reveals these relations through the concept of "techno-diplomacy" (Krige, 2020).

The concept of "techno-diplomacy" was discussed in scientific circles as early as the late 1980s (Schweitzer, 1989) and certainly became a reflection of the transformational processes of the end of the Cold War. Therefore, the decisive place was assigned to the military-technological competition between the two strongest members of the space club – the USA and the USSR. With the destruction of the old system of international relations, techno-diplomacy aimed to steer relations towards improved cooperation (Salzman, 2017), which was indeed the case after 1991. Cooperation in the field of space activities was considered by the USA in the post-bipolar world as a tool of "soft power" capable of ensuring a new level of stability in the system of international relations (Eisenhower, 2004). The example of the International Space Station (ISS), as one of the most productive results of this cooperation, gives reason to optimistically evaluate the possibilities of this channel for the exchange of technologies and data (Stewart & Dittmer, 2023).

As a historiographic direction, the problem of techno-diplomacy continues to develop in the context of the broad scientific discourse of "scientific diplomacy" – the use of scientific cooperation between countries to solve common problems and build a constructive international partnership (Turchetti, Adamson, Rispoli, Olsakova, &

Robinson, 2020). The result of activities in this area was the creation in 2017 of the Historical Commission on Science, Technology and Diplomacy. This commission was formed on the initiative of the Department of History of Science and Technology of the International Union of History and Philosophy of Science and Technology. Since then, the organization's primary mission has been to promote and coordinate interdisciplinary historical research on the relationships between science, technology, and diplomacy (Turchetti, Adamson, Rispoli, Olsakova, & Robinson, 2020).

However, the concept of techno-diplomacy as a way of interaction does not exclude the desire of states to ensure national interests. It connects technology and national security, seeks to secure geo-economic interests in an integrated global market for state-building processes (Park, 2022, p. 1). At the same time, the topic of regulating the leakage of knowledge and technologies is definitely connected with the security system. Thus, the problem of the functioning of the system of export control of knowledge and the latest technologies, as the main manifestation of techno-nationalism, is being brought up to date again by modern historians (Daniels & Krige, 2022). Under such conditions, special attention is paid to the space industry, as it is directly related to the defense capability of states and political blocs, as well as to the functioning of economic systems.

It is worth noting that modern Ukrainian historical science, although actively discussing the problems of American-Chinese relations (Horodnya, 2014; Ishchuk & Ivanytska, 2018; Levytska-Doba, 2021; Taran, 2017; Shevchuk, 2010) and the economic effect of techno-globalism (Kozachenko, 2014; Chernyavska, 2010), but the problem of techno-nationalism is practically unexplored. Ukrainian political scientists (Petrenko & Oleshchuk, 2021) and economists (Koshova, Britchenko, & Bezpartochnyi, 2022) devoted their research to the potential of Ukraine in the space industry. However, they do not touch on the topic of techno-nationalism and its effect on the Ukrainian space program. Therefore, the security challenges faced by Ukraine under the conditions of Russian aggression determine the urgent need to study the role of the scientific and technical factor in the national strategies of the countries of the world.

The main aim of this article is to trace the evolution of the concept of techno-nationalism in the conditions of the end of the Cold War and in the post-bipolar period. Also, the aim of the article is to improve the understanding of the role of the space factor in the formation of the problem of techno-nationalism in the scientific discourse. The author tries to determine further research prospects in this direction.

Research Methods.

The research methodology is based on the principle of historicism, which made it possible to provide an unbiased interpretation of the concept of techno-nationalism through a critical understanding of the sources. In the article, we also used the problem-chronological method to follow how the scientific awareness of the problem developed at different historical stages.

The need to determine the impact of space policy on the formation of the problem of techno-nationalism led to the use of an interdisciplinary approach. Thus, political

and legal analysis helped to better understand the relationship and mutual influence of security and commercial interests in the national technological strategies of states. The work used approaches developed within the framework of the theory of international relations, in particular, the concepts of "Cold War", post-bipolarity and unipolarity.

Where to look for sources of techno-nationalism?

The very concept of techno-nationalism is not something new today. On the contrary, it is quite used both in scientific literature and in politics. And in a broad sense, the desire of states to develop national technologies does not raise questions. However, the process of formation of techno-nationalism itself and its simultaneous theoretical understanding by scientists has its own historical stages and features.

This concept was introduced into scientific circulation in 1987 by Harvard University professor and political activist R. Reich (Reich, 1987). He then applied this definition to characterize American-Japanese economic relations and, in particular, the problem of their competing values in these relations. When formulating his vision of this phenomenon, R. Reich proceeded from the inverse concept of "techno-globalism", giving arguments that America was already, in the 1980s, turning towards techno-nationalism precisely because of the realization of the impossibility of simultaneous and balanced development of technologies in the USA and Japan and the growing threats to American economic and political leadership (Reich, 1987).

It can be agreed that it was Japan's positive experience in combining the public and private sectors in the development of new technologies that became the driving force behind the paradigm shift in the US towards financing technologies for non-military purposes. In the same 1987, the American government, together with the private sector, founded the company "Sematech" (SEMATECH - SEMiconductor MANufacturing TECHnology), which became the first project in the history of the USA financed by public-private efforts for the research and development of commercial technologies (Yamada, 2000).

R. Reich himself gives a vivid example from the state of development of the space industry. The researcher states that "most of the memory chips in the world, including almost all the electronics required for the Star Wars program, were manufactured in Japan at the time" (Reich, 1987, p. 65). Why does the author give this particular example? After all, researchers today agree that the "Strategic Defense Initiative" (the official name of the program) was more of a political decision to involve the Soviet Union in the pursuit of weapons than a real prospect. In the same 1987, the American Physical Society (American Physical Society) concluded that if such a system were to be created, it would not be in the coming decades (Bloembergen et al., 1987).

Obviously, R. Reich did not analyze the question of whether the creation of this space initiative was possible and relied on the real state of affairs in the electronics market. He cites this particular example, because space policy in the 1980s was a hotly contested area in the Cold War, and therefore was one of the highest geostrategic tasks. At the same time, R. Reich does not give a concrete definition of techno-nationalism or techno-globalism. However, explaining techno-nationalism, he says that the main features of this principle are "the national direction of the development of new

technologies, the purpose of which is to preserve technological knowledge here" (Reich, 1987, p. 66), that is, on the spot. In other words, the researcher talks about limiting the leakage of technologies and knowledge that help these technologies develop.

It is possible to agree that the space chase was a kind of techno-nationalist policy of the Cold War period. But if technological prowess was an indicator of power during the Cold War, why did techno-nationalism not only retain its importance but also intensify after it ended? But can techno-nationalism be reduced to state support of commercial companies operating in the USA? Will techno-nationalism develop if the same companies are involved in international cooperation? These and other questions became even more acute in the late 1980s.

Space diplomacy in the conditions of the end of the Cold War.

One of the historical forms of techno-nationalism was the space pursuit of the Cold War period. The technological systems of the leaders of this pursuit depended on pendulum swings towards the cooling of international relations or their warming. Periods of warming brought with them excellent results of technological cooperation: the Apollo-Soyuz joint manned flight program, the international satellite search and rescue system "Cospas-Sarsat". However, one can agree with D. Krige that "technological leadership, which was the leitmotif of the US national strategy in the postwar period, was embedded in the support network of "hard" power structures" (Krige, 2016, p. 158). And therefore, the problem of non-proliferation of nuclear weapons and space technologies, as dual-use technologies, was a key component of the American strategy in technological policy.

However, the geopolitical and technological changes of the late 1980s and early 1990s required a serious reassessment of the goals and scope of export controls over dual-use technologies. National security could no longer be considered only from a military point of view. And military superiority was no longer sufficient to ensure America's global dominance. Economic security and industrial competitiveness is becoming a vital element of US technology policy (Daniels, Mario, & Krige, 2022, p. 231).

One of the powerful changes that forced American politicians to reconsider the system of export control and techno-diplomacy was the disaster of the space shuttle "Challenger" in 1986, which completely suspended the American space program for two years (Eisenhower, 2004, p. 34). The complete revision of the US space policy, which followed this event, called into question the expediency of implementing one of the most odious technological projects of the 20th century. reusable transport space shuttles "Space-Shuttle". By the end of the 1980s, all funding and efforts were invested in the shuttle program. And the fulfillment of obligations to launch payloads into space, which was undertaken by NASA, had to be fulfilled. The solution could be to provide support to the private sector. The creation of a targeted state policy on the development of the commercial space launch industry began (Logsdon & Reed, 1999, p. 415).

If to analyze the presidential directives of the USA in the field of space from the end of the 1980s until today (National Space Policy (NSP), 1988; NSP, 1989; NSP,

1996; NSP, 2006; NSP, 2010; NSP, 2020) then it becomes obvious that the commercialization was aimed at supporting, first of all, national American companies in the field of space activities. Already in the goals of the 1989 space policy, the following wording is indicative: "The United States will carry out international joint space activities that are expected to provide sufficient scientific, political, economic, or security benefits to the nation" (NSP, 1989). All subsequent directives have a similar meaning and reiterate that the main goal is American leadership in space industry and technology. In fact, the commercialization of space activities, which has become a key element of the American space program since the late 1980s, contained techno-nationalist elements. But securing the claimed technological leadership over the next decade was not easy.

Techno-globalism and techno-nationalism – the search for a balance.

The need to construct a new system of international relations, Japan's ever-increasing technological competition, and a severe crisis in the space industry are the main problems faced by the administrations of G. H. W. Bush and B. Clinton. At the same time, this is the period of the digital revolution and the emergence of the global Internet network, which brought the use of technology to a new level.

The administration of B. Clinton began to actively push for the creation of a comprehensive technological policy of the United States (Kyrychenko, 2011). In Clinton-Gore's Technology Policy of 1992 (A Techn. Policy for America, 1992), it is possible to see, at the same time, the desire to protect the American private sector from excessive control in the field of technology, and to ensure national security with the help of the same export controls. Proponents of techno-globalism in the US Congress have targeted many government programs to promote the commercialization of new technologies, "subject to the participation of foreign participants in these programs, as well as the numerous export promotion programs that flow from these interventionist impulses" (Tonelson, 1995, p. 31).

This has led researchers to argue that the rise of techno-nationalism during the 1980s was replaced by its decline during the 1990s. The diminishing role of military procurement led American governments to encourage technological progress in more direct ways. By closing their markets to imports, countries encouraged foreign firms to open branches within their borders. Through a policy of buying nationals or supporting only national firms, governments have listed firms by location and alliance (Ostry & Nelson, 1995, p. 61). Therefore, it gave reason to consider techno-globalism as a policy of internationalization of private technologies, and techno-nationalism as a technological policy of the public sector with an orientation towards the predominance of the national nature of technologies (Ostry & Nelson, 1995, p. 2–10). Techno-nationalism in this sense assumes that the initiative in directing technological progress belongs not to the market, but to the government, which, at the same time, provides support exclusively to national companies.

In this regard, US-Chinese relations in the space industry are indicative. Starting with the "Agreement between the Government of the United States and the People's Republic of China on cooperation in the field of science and technology" in 1979

(China-US science and technology agreement, 1979), China received considerable dividends from this cooperation (in the form of consultations and exchange of experience). Already on January 23, 1989, China and the USA officially signed the "Memorandum on the agreement on commercial launch services in international trade" (China-US Agreements, 1989).

This allowed the United States to establish the rules of trade early on while it still held the lead in the market for payload launch services. The deal also allowed American satellite manufacturers to sell satellites to China in exchange for contracts to launch them on Chinese launch vehicles. Despite protests from Western launch service providers, the terms of the deal were recognized as the best approach to avoid market destabilization by China and the expansion of the United States' markets (Reed, 1999, pp. 165–166). And although during the first half of the 1990s there were a number of launches of American satellites by Chinese rockets, "from 1989 to 1993, China was subjected to numerous sanctions regarding the export of satellites" (Reed, 1999, p. 167). Each such launch went through a series of procedures of an individual nature, which were considered separately in each specific case. Therefore, cooperation in the market of launching payloads into space demonstrates the simultaneous functioning of both techno-globalist and techno-nationalist elements.

Here it is worth noting that since the non-proliferation of nuclear weapons was an important issue for American policy in the 1990s, the issue of exporting space technologies was on the agenda. The interests of the powerful commercial satellite industry were opposed by national security advocates concerned about the threat of China's military modernization. But, as before, the latter argued that China's promotion of civil space cooperation creates leverage for achieving the non-proliferation goals sought by the United States (Zhang & Seely, 2019, p. 15–16). This is precisely the dualism of the nature of techno-globalism and techno-nationalism. Finding a balance between national security and economic benefits has always been and remains the main strategic task of states. Depending on the international situation and the state of the economy, technological systems respond to these circumstances by changing the balance with the involvement of certain elements of techno-globalism and techno-nationalism.

A shift towards techno-nationalism?

In the case of China, since the mid-1990s, techno-nationalist tendencies have clearly begun to dominate. This was due to the fact that the US governments sought cooperation in space primarily to achieve political goals. Techno-nationalism in this light appears as a political tool for stimulating the development of technology and an indicator of geostrategic power (Johnson-Freese, 2014).

In addition, in the mid-1990s, China experienced a series of fatal space launch pad disasters (Zhang & Seely, 2019, p. 42). The investigation into the causes of the failed rocket launches led to a review by the US government of the rules for the transfer of sensitive technology and confidential information related to the launch of spacecraft. As a conclusion, the "Cox Commission Report" asserted that "the PRC has stolen or otherwise illegally obtained US missile and space technology that enhances the PRC's

military and intelligence capabilities" (Report, 1999). Under these circumstances, private American companies that were already integrated into the process of development and use of space and involved in the transfer of space technology to China suffered (Pooley, 1998).

The strengthening of export controls against China was intended to counter the leakage of space technology through commercial international partnerships to ensure the national security of the United States. As the US export control regime strengthened, so did Asian technological nationalism.

However, tighter export controls from the United States were not the only reason for China's techno-nationalist policy. This is rather an additional incentive. Which pushed China during the 1990s – 2000s to develop its own information and technological space, and later - its own space program. Its sources were China's ambitions for regional leadership in Asia, and its real opportunities to achieve this status. In the 1990s, China moved from an ally to a competitor of the US, primarily due to rapid economic growth (Zhang & Seely, 2019).

At the same time, the 1990s was a period of extensive international cooperation in the space industry. After all, almost all modern achievements in space technologies, such as the ISS, the James Webb Space Telescope, etc., were created thanks to international cooperation. It is also possible to observe the deepening of the commercialization of space activities during the 1990s – 2000s (Zhuravliova, 2017). This begs the question – can techno-nationalism as a government policy apply only to selected international actors?

So, if to look more closely at the list of countries in these large international projects, it is possible to see that there is always cooperation with European countries and almost never with Asian countries (the exception is Japan in the ISS project). Apart from general bilateral agreements on cooperation in space (Embassy of India, Washington DC, USA, 2005), the United States has a clearly protectionist technology policy towards the East. Therefore, it can be argued that when issues of national security prevail over pragmatism, which is undoubtedly the main motive that pushes governments to cooperate in space, techno-nationalism relegates internationalism to second place. J. Freese calls this phenomenon "leadership challenge" (Johnson-Freese, 2014, p. 12). That is, it is not about economic benefits, but political dividends from space exploration. In the end, the national factor is decisive in technological space policy as well.

However, in space activities, which contain many risks, not all countries can show techno-nationalism. Because at a certain stage of the development of the space program, cooperation with other countries is necessary. Those states that seek to acquire new technologies will always insist on the exchange of experience. Cooperation in the field of space technology was enjoyed at one time by Japan and India, which became full members of the space club in 1970 and 1980, respectively (Johnson-Freese, 2014). And although the efforts in the field of space exploration of these countries are less outstanding than those of the USA and China, the very belonging to this club has put them on the highest level in the system of world order. And gradually they also began to move to the politics of techno-nationalism (Cheng,

1994). In other words, the formation of techno-nationalism requires really challenging conditions. In the process, the respective national states receive certain benefits.

Techno-nationalism can be defined as the idea that technological prowess is a valid determinant of national power in a fiercely competitive world that shapes both Chinese and American perceptions of China's space development. Then, "such a perspective elevates all space activities—manned, unmanned, military, and scientific – to the strategic level" (Johnson-Freese & Erickson, 2006, p. 12). Thus, techno-nationalism, and in the space sphere in particular, always includes an aspiration for leadership. In addition, in the field of space activities, this level of leadership reaches another level. After all, space exploration is, without exaggeration, the most risky technological activity. Using space technology and being a space state are different things.

Thus, after the collapse of the Soviet Union, Ukraine inherited almost a third of its missile and space potential. "By 1992, the Ukrainian space industry produced more than 10,000 ballistic launch vehicles, about 300 spacecraft and more than 400 artificial satellites for military and civilian purposes" (Petrenko & Oleshchuk, 2021, p. 85). But the erected political barriers between the republics of the former USSR with their internal completely uncompetitive currency destroyed a complex system of economic relations, which hit the space industry especially hard (Eisenhower, 2004). Having a powerful potential in the field of development and use of outer space, Ukraine was never able to turn into a strong space state. The reliance on cooperation with Russia in space activities, the difficult economic situation and, at the same time, the high capital intensity and long payback periods of the space industry (Koshova, Britchenko, & Bezpartochnyi, 2022), did not create the conditions for this "leadership challenge" for Ukraine.

The American leadership in relations with the former Soviet republic was mainly interested in the problem of non-proliferation. Through the implementation of the "Nunn-Lugar" program, US President B. Clinton managed to take control of the process of nuclear disarmament, including reducing the number of intercontinental ballistic missiles. The Ukrainian side was also persuaded to terminate the contract with Iran for the construction of a nuclear reactor in Bushehr. In the future, the USA never compensated the Kharkiv plant for the damages caused as a result of this refusal (Zaborsky, 1999). Already in 1995, Russia agreed with Iran to complete the construction of this reactor in Iran. Therefore, at the beginning of the 1990s, the USA was interested in Ukraine not so much in the possibility of using the potential of space technology of the Ukrainian SSR, but rather in the presence of a significant arsenal of nuclear weapons on Ukrainian lands (Zhuravliova, 2016a, pp. 64–65).

The administration of B. Clinton was guided by the same goal of deterrence when initiating the joint American-Russian project "Shuttle-Mir" in the mid-1990s (Stewart & Dittmer, 2023). The many tools of techno-diplomacy that were created during the Cold War to counter the Soviet threat have been reimagined and strengthened to meet the new challenges of the proliferation of ballistic missiles and nuclear weapons among rogue states in this club, as well as the emergence of China as

a technological rival, an economic competitor and a military threat (Krige, 2020, p. 115).

Therefore, the exceptional position in the international arena of the countries that are part of the space club really has its advantages. Membership in this club directly affects the international status of the state. And technological progress is the key to national well-being. States' perceptions of power and the means of achieving it are shaped by international norms and conventions, as well as by specific national features, goals, and internal needs. The domestic policy of the state modifies these ideas and turns them into real preferences, priorities and programs that correspond to the principles of techno-nationalism. Therefore, the very structure of national-state clubs makes it possible to integrate international factors and domestic political discourse into one structure (Paikowsky, 2017).

Therefore, international relations in the space industry are based on international interaction. The starting point of this interaction is the national interests of governments, for the benefit of which, wherever possible, international cooperation is involved. To talk about the weakening of techno-nationalism during the 1990s based on the development of research and industrial cooperation (Mothe & Dufour, 1995, p. 228–229) means to ignore geopolitical factors. Therefore, the differentiation of actors in relation to which the levers of techno-globalism or techno-nationalism act are really necessary for state policy.

Scientific ideas about the dichotomy of techno-globalism – techno-nationalism.

Simultaneously with the process of changes in the technological policies of the states in the 1990s, the theoretical understanding of these categories in the scientific environment is taking place.

L. Cheng, from the beginning, emphasizes that techno-nationalism and techno-globalism are two different approaches to determining the role of technology in the formation of international relations and the key factors that influence these relations. In addition, the phenomenon of techno-nationalism is specific to East Asia and tends to strengthen there (Cheng, 1994). In his opinion, "techno-nationalism focuses attention on the competitiveness of national states as a result of scientific and technological development. Technological power is seen, in this approach, as one of the determinants of the growth or decline of state power" (Cheng, 1994, p. 2).

In general, by 2000, although there was no single accepted definition of this concept, the concept of techno-nationalism had already crystallized among Japanese researchers. By which they understood the state policy whose main goal is to increase the competitiveness of national technologies through financial support, export-import policy, public procurement system and so on (Yamada, 2000). In addition, A. Yamada points to the transformation of "pure" techno-nationalism, where support is provided only to national technology companies. By involving foreign organizations, in one way or another, in the creation and distribution of new technologies, the state does so on certain conditions for these partners. This tendency to mix national and international can be labeled as neo-techno-nationalism (Yamada, 2000).

Thus, a dichotomous view of the globalization choice (either free trade or protectionism) significantly primitives the understanding of techno-globalism and techno-nationalism. Like any large-scale trend with far-reaching and profound consequences, globalization is very complex. This term describes an unfathomable number of relationships and arrangements that are inevitably subject to strategic, political, social and cultural – as well as purely economic – influences (Tonelson, 1997). A closer economic analysis shows that techno-globalism can develop to different extents and at different speeds (Archibugi & Michie, 1997, p. 124–126).

Applying the economic and political taxonomy to these categories in the late 1990s, the Italian economist S. Montresor structured the components of the global and local levels of development of innovation systems. "Based on the fact that the globalization process causes tension between national, supranational and subnational forces, he distinguishes the following dimensions of techno-globalization: techno-territoriality, techno-sovereignty, techno-citizenship, techno-nationality" (Montresor, 1998, p. 21). Each of these four components contains both global and national specificities to varying degrees. At the same time, the first three points actually acquired a global specification, but without the complete loss of national or even more local characteristics. Regarding techno-nationality, since a certain commonality of language and culture within a country, as well as its historically shaped institutional environment, contribute to different technological styles and outcomes, techno-national systems of innovation thus still retain an important meaning (Montresor, 1998, p. 1).

In further developments, S. Montresor points out that the globalization process encompasses complex technological systems, the components of which are affected by the process itself in different ways. Therefore, it is difficult to establish a certain general balance between techno-nationalism and techno-globalism (Montresor, 2001, p. 400). The researcher emphasizes that although the term "techno-nationality" is very similar to "techno-nationalism", it is used in a more specific sense – to indicate the technological relevance of socio-cultural elements, which are usually national, but also sub-national. That is, "the main question is whether common nationality or other similar, less formal elements of cohesion between innovative agents (for example, common knowledge, culture and ideology) retain a certain role in the formation of technological change?" (Montresor, 2001, p. 407).

Such a multi-level system actually allows for a better understanding of the co-existence of techno-globalism and techno-nationalism and how they relate to each other. Isolating different components of technological systems can provide more accurate conclusions about global processes and their consequences for national economies.

During the 2000s, a deep understanding of techno-nationalism in historical retrospect takes place. Thus, known for his research in the history of science, technology and medicine, the British historian D. Edgerton in 2007 made an attempt to define "techno-nationalism and techno-globalism as two opposite approaches, ideologies, to the study of technology and society in their relationship "connection"

(Edgerton, 2007, p. 1). That is, he saw these concepts from a research point of view, and not as some specific national policy.

Taking the nation as the starting unit of analysis in the study of technology, techno-nationalists, at the same time, resort to an innovation-centric understanding in the study of national histories of technology, just like techno-globalists. This would mean that there should be a direct connection between national innovations and the economic progress of a particular country. However, D. Edgerton convincingly proves that the connection between innovations and the use of technology is far from direct, and national innovations were not the main source of the development of national technology (Edgerton, 2007). That is, the main thesis that the development of technologies had a direct impact on the economic and social well-being of nations does not look so convincing. And therefore, the academic understanding of the categories of techno-nationalism and techno-globalism is incomplete, just like the understanding of its historical forms.

A new technological pursuit.

The beginning of the 2000s again brings new challenges for the global world, and for American-Chinese relations, in particular. The terrorist acts of September 11, 2001 powerfully updated the security tools of the US foreign policy. In 2003, another tragedy occurred – the disaster of the shuttle "Columbia" (Zhang & Seely, 2019, p. 28). In the same year, the People's Republic of China made its first human flight into space. China becomes the third country in the world with its own manned cosmonautics, which effectively includes it in the elite status of the "chosen among the chosen" in the space club. This further pushes the US government to strengthen the system of export regulation in the field of space technologies (Zhuravliova, 2016b).

A modern researcher of international economic relations A. Capri insists that the reason for the escalation of the new technological cold war between the USA and China should be sought in the further development of techno-nationalism. By which the researcher understands "a model of behavior similar to mercantilism that directly links technological innovation and entrepreneurship to national security, economic prosperity and social stability of the nation" (Capri, 2020b, p. 5).

So, let's return again to the "challenge of leadership" as one of the important components of techno-nationalism. It manifests itself most obviously in the space industry. After all, a leader can be clearly defined by the specific achievements of states or private companies. And, naturally, from a geopolitical point of view, the main task of this leader is to preserve his status. And those states that claim world, or at least regional, leadership will always proceed from pragmatism.

The concept of techno-diplomacy does not exclude this factor in interstate relations. However, techno-diplomacy does not limit the place of technology in interstate relations only to the number of weapons and does not draw a sharp line between intangible "knowledge" and material "technology" (Krige, 2020, p. 102). In this context, technological knowledge acts as a component of techno-diplomacy and techno-nationalism. It all depends on how to use them. They can be used selectively to form or restrain the technological potential of another state.

However, controlling knowledge in a global world is a very difficult task for governments. Strict restrictions on the space industry not only did not lead to the desired effect for the United States, but on the contrary, worsened the position of American business in this high-tech industry. Since 2005, European aerospace companies have begun to actively reject American-made parts for satellite technologies. They began to build a whole market for "ITAR-free technologies" (for U.S. International Traffic in Arms Regulations (ITAR)) (Abbey & Lane, 2009, pp. 4–5). That is, those that would not fall under the restrictions of the International Arms Trade Regulations, which determine the conditions for the export and temporary import of defense products and services over which the jurisdiction of the US State Department extends.

Naturally, the US policy of prohibiting China from launching satellites with American components forced China to seek customers among second-tier operators in Asia, Africa, and South America (Abbey & Lane, 2009, p. 5). As a result, by 2008 China had become the world's second largest economy, and China-USA strategic competition between China and the USA was growing. In 2008, the administration of G. Bush Jr. vetoed NASA's proposal to develop space cooperation with China (Zhang & Seely, 2019, p. 29). Thus, the American government views national politics as a confrontation between the United States (and its allies) on the one hand, and China and Russia on the other. The national space policy aims to separate competitors and reduce their role in the development of outer space (Petrenko & Oleshchuk, 2021).

Another aspect of this policy is to encourage the commercialization of space activities. The growing role of non-governmental actors in key state space programs also introduces new structural elements both to the system of international relations and to techno-nationalism as part of these relations. First, as the USA-China technological rivalry intensifies, the largest technology firms will increasingly engage in techno-nationalism. Second, new tensions will emerge between these public and private actors. This tension will emerge from the opposing narratives between market-oriented preferences on the one hand and aggressive state activism on the other (Capri, 2020b, p. 20). And therefore, techno-nationalism includes rivalry not only at the level of national economies, but also between governmental and non-governmental participants in relations in the field of development and use of technology. Therefore, the technological pursuit really leads to the formation of what S. Montresor called techno-nationality (Montresor, 2001).

Latest research and promising directions.

Such complexity of techno-globalism and techno-nationalism continues to generate lively discussions in the scientific discourse regarding the relationship of various elements of these phenomena, their essence and impact on the political and socio-economic life of mankind.

However, to reduce techno-nationalism only to political or economic benefits, from a historical point of view, means to narrow this phenomenon to domestic political and geopolitical tools. In particular, the Peruvian researcher P. Gayozo focuses on the ideological aspect. Comparing techno-nationalism with digital nationalism, the author

of the article concludes that "techno-nationalism is a type of digital nationalism that necessarily derives from ideological nationalism that is adapted to the fourth industrial revolution" (Gayozzo, 2022, p. 215–216). Thus, for P. Gayoso, techno-nationalism is one of the types of classical nationalism. "Both digital nationalism and techno-nationalism are directly related, not only because they are modern forms of nationalism, but also because they require information technology advances to exist" (Gayozzo, 2022, p. 214). Thus, techno-nationalism is a complex phenomenon that is not limited solely to the superiority or geopolitical influence of one country over others through technology companies (political techno-nationalism). "Techno-nationalism is the construction, defense, and promotion of a nation in cyberspace based on arbitrary values and criteria deemed typical of the nation that develops them" (Gayozzo, 2022, p. 217).

Therefore, P. Gayozo does not agree with J. Freeze's point of view on techno-nationalism as a geopolitical project opposed to techno-globalism. He believes that "techno-nationalism is a digital nationalism that seeks to: 1) extend national identity to the virtual world to build a digital identity; 2) extension of state sovereignty to the digital sphere and its protection through the implementation of the technological territorialization project; 3) protection of culture and interaction of citizens on the Internet. At the same time, digital identity refers to the state's presence in cyberspace. That is, what are the limits of its autonomy, how much it can control national resources and how its digital platforms help in nation-building" (Gayozzo, 2022, p. 219).

Thus, based on the point of view of this researcher, techno-nationalism is the result of the adaptation of classical nationalism to the fourth industrial revolution. But the concept of the fourth industrial revolution was formed only in the 2010s (Philbeck & Davis, 2019). It is possible to note that tying this concept to the fourth industrial revolution significantly narrows its content, especially in historical retrospect.

Regarding the issue of digital nationalism, it is possible to agree with researchers from the United Kingdom S. Miguel and S. Martinez that the current wave of nationalism is not new. After all, "nationalism in its banal form never disappeared from communication, but was simply "updated" to meet the specific possibilities of the digital communication environment" (Mihelj & Jiménez-Martínez, 2020, p. 332).

The modern understanding of techno-nationalism, as a certain concept, is increasingly moving in the direction of understanding the nature of the connections between state national interests and the private sector's desire to increase profits. In a review article on techno-nationalism, the Japanese researcher E. Park points out the need to include business interests in the strategic additions of the state as a critical criterion of techno-nationalism. In addition, techno-nationalism is a narrowly defined concept that includes state actors dealing with national security issues and high-tech business actors (Park, 2022). Therefore, the integration of business interests into the strategic agenda of the state really becomes a component of the techno-nationalist policy of today. This is how scientists are developing the concept of "democratization of space." Which, according to them, presupposes "that commercial interests play a leading role, or at least that the resources of governments and commercial enterprises

must be combined to improve efficiency in this field" (Koshova, Britchenko, & Bezpartochnyi, 2022, p. 94).

There is also a tendency to consider techno-nationalism as a geopolitical strategy. A. Capri claims that the rapid spread of Beijing's techno-authoritarian model caused countermeasures from liberalized world markets and democracies (Capri, 2021). That is, techno-nationalism continues to be understood as the technological policy of states with the aim of maintaining or aspiring to leadership on the international arena and world market. As a result, the phenomenon of "techno-authoritarianism" is emerging – "in which the state relies on heavy technology, digital platforms and data from Chinese technology companies to censor, monitor and control citizens" (Capri, 2020a, p. 13).

However, the dynamics of global competition for technological superiority and high interdependence with the global production complex have changed the mode of promotion and the nature of techno-nationalism. As states grapple with escalating high-tech pursuits, they are increasingly using their high-tech capabilities for geopolitical purposes, attracting domestic high-tech firms. Thus, the contemporary paradigm of techno-nationalism argues that state power is derived from domestic market power in high technology, using potential technological asymmetry to advance state power in international politics (Park, 2023, p. 8).

Thus, the future potential of techno-nationalism research is: firstly, in the need to use an interdisciplinary approach to develop a historical taxonomy of techno-diplomacy and clarify the sources of Chinese techno-authoritarianism; secondly, in the need to use new methodological methods of studying history, which are currently being developed by the world community. Thus, in the latest magazine "New Technical and Humanities", the American historian J. Owens tries to answer the question "what is important today in the study of world history, how to identify places where knowledge is produced and transmitted, how to emphasize the importance of narratives as answers to interpretative challenges" (Owens, 2023, p. 6) He proposes to apply a new methodology to the study of global history through its visualization on a complex landscape model. The researcher believes that this visual metaphor will significantly improve researchers' understanding of the processes most important for world history (Owens, 2023, p. 13).

For Ukraine, the study of the historical forms of functioning of the International Traffic in Arms Regulations (ITAR) remains particularly relevant. As space technologies and artificial intelligence become increasingly involved in post-cold war conflicts, it is worth deepening the understanding of the historical retrospective of these phenomena.

Conclusions.

Today, there is no single understanding of the concept of techno-nationalism, just like techno-globalism. The idea of techno-nationalism had its historical stages, which was connected with the very technological changes and transformations of the system of international relations.

The formation of the problem of techno-nationalism initially took place in the context of the American-Japanese competition in the technological sphere during the 1980s. In the conditions of the post-industrial society and the end of the Cold War, technical innovation became the equivalent of national power in the global world. Therefore, the understanding of the phenomenon of techno-nationalism began with the opposition to techno-globalism. This dichotomy arose from the understanding that the balance between international cooperation and national interests will always tip one way or the other. Therefore, techno-nationalism is in circulation as a protectionist model of the state's behavior to ensure its geopolitical interests by increasing the competitiveness of national technologies.

In the conditions of the construction of a new system of international relations, space policy became an indicator of leadership and the main component of techno-diplomacy in the early 1990s. At the same time, the need to form a comprehensive technological policy of the United States, which remained the undisputed leader in space exploration at the time, led to a reassessment of the goals and the scope of export control over dual-use technologies. Attempts by American administrations to improve the functioning of the system of export control of knowledge and the latest technologies have become a key tool for finding a balance between national security priorities and global economic and political benefits.

However, this balance could not be found. This is evidenced by the strengthening of techno-nationalist elements in the space policy of both the United States itself and the formation of Asian technological nationalism since the mid-1990s. Despite the comprehensive support of the United States for the commercialization of space activities, American business in this risky area has not received the desired freedom of action. on international markets. Thus, where the political dividends outweigh the economic benefits, national governments will always adhere to protectionism.

At the same time, there was a theoretical understanding of the concept of techno-globalism and techno-nationalism among the scientific community. Applying an interdisciplinary approach to this problem, it can be argued that the dichotomous view of techno-globalism and techno-nationalism reduced the understanding of these concepts to components of the global and local levels of development of innovation systems. Both of these approaches are characterized by an innovation-centric orientation. But if for techno-nationalists, the nation acts as the initial unit of analysis in the study of technology. Techno-globalists focus on the study of world economic and political systems.

The application of economic and political taxonomy to these categories indicates that the components of technological systems (techno-territoriality, techno-sovereignty, techno-citizenship, techno-nationality) are affected by the process of globalization to varying degrees. And therefore, techno-globalism and techno-nationalism can develop at different speeds in each of them. Techno-nationalism will develop faster in those areas where geopolitical interests exceed the benefits of international cooperation.

An analysis of US space policy and its relationship with China in the 2000s demonstrates that globalization has increased the importance of national technological

aspects. Technologies as an indicator of geostrategic power form a leadership challenge, which undoubtedly becomes an incentive to strengthen techno-nationalism. This gives reason to talk about the beginning of a new technological race between the USA and China.

At the same time, technological advances in space activities create competition, both among participants in international relations and among private actors. In these conditions, techno-nationalism involves rivalry not only at the level of national economies, but also between governmental and non-governmental actors. Because between them there will always be a conflict between national security and profit.

The author of the article herself came to the conclusion that techno-nationalism is 1) a state policy of creating a nationally oriented technological market in order to ensure national interests, where the technological power of individual nations is a guarantee of their geostrategic power; 2) a scientific approach to understanding the relationship between technology development and society, where national factors play a key role; 3) an ideology that determines that states strive to establish a connection between national and digital identity and, in the process, technological sovereignty is formed.

Recent studies show that the view of techno-nationalism as a geopolitical strategy is complemented by an ideological component. These scholarly pursuits link techno-nationalism to digital nationalism and digital identity. Being components of techno-nationalism, these two concepts reflect that part of the activity of the state and private actors that ensures the maintenance of national identity through digital technologies. It is these components of techno-nationalism that require further study to clarify the sources of Chinese techno-authoritarianism and how they relate to techno-diplomacy. The methodology of research in this field also requires significant refinement through the use of new technological methodologies, such as computational methods, data visualization.

Funding.

This research received no funding.

Conflicts of interest.

The author declare no conflict of interest.

References

- A Technology Policy for America Six Broad Initiatives by Bill Clinton. (1992). *A Publication of the Electronic Frontier Foundation*. Retrieved from <https://www.eff.org/effector/3/8>
- Abbey, G., & Lane, N. (2009). *United States Space Policy: Challenges and Opportunities Gone Astray*. Cambridge: American Academy of Arts and Sciences. Retrieved from <https://www.amacad.org/sites/default/files/publication/downloads/spaceUS.pdf>
- Agreement between the Government of the United States of America and the Government of the People's Republic of China on Cooperation in Science and Technology.

- (1979). *China-U.S. science and technology agreement*. Retrieved from <https://www.energy.gov/node/4812404>
- Archibugi, D., & Michie, J. (1997). Technological globalisation or national systems of innovation? *Futures*, 29(2), 121–137. [https://doi.org/10.1016/s0016-3287\(96\)00072-9](https://doi.org/10.1016/s0016-3287(96)00072-9)
- Bloembergen, N., Patel, C. K., Avizonis, P., Clem, R. G., Hertzberg, A., Johnson, T. H., ... & York, H. (1987). Report to The American Physical Society of the study group on science and technology of directed energy weapons. *Reviews of Modern Physics*, 59(3), 1–200. <https://doi.org/10.1103/RevModPhys.59.S1>
- Capri, A. (2020a). Techno-nationalism and diplomacy: The US-China race to reshape alliances, institutions and standards. *Hinrich Foundation Report*. Retrieved from <https://www.hinrichfoundation.com/research/wp/tech/techno-nationalism-and-diplomacy/>
- Capri, A. (2020b). Techno-nationalism: The US-China tech innovation race: New challenges for markets, business and academia. *Hinrich Foundation Report*. Retrieved from <https://s3.iois.me/Hinrich-Foundation-Techno-nationalism-and-the-US-China-tech-innovation-race-August-2020.pdf>
- Capri, A. (2021). Techno-Nationalism via Semiconductors: Can chip manufacturing return to America? *Hinrich Foundation Report*. Retrieved from <https://www.wita.org/wp-content/uploads/2021/06/Techno-nationalism-via-semiconductors-Hinrich-Foundation-white-paper-Alex-Capri-June-2021.pdf>
- Cheng, L. (1994). Techno-Nationalism vs. Techno-globalism: East Asia in Search of a New Vision for the 21st Century. *Newsletter The Yin and Yang of East Asia*. Retrieved from <http://www.icwa.org/wp-content/uploads/2015/09/CL-12.pdf>
- Cherniavska, O. I. (2010). *Ekonomichni faktory stanovlennia ta rozvytku tekhnoglobalizmu [Economic factors of formation and development of technoglobalizm]* (Extended abstract of candidate's thesis). Kyiv: Vadym Hetman Kyiv National Economic University [in Ukrainian].
- China-United States: Agreements regarding Commercial Satellite Launches. (1989). *International Legal Materials*, 28(3), 596–610. <https://doi.org/10.1017/S0020782900021835>
- Daniels, M., & Krige J. (2022). *Knowledge Regulation and National Security in Postwar America*. Chicago: University of Chicago Press. <https://doi.org/10.7208/chicago/9780226817521.001.0001>
- Edgerton, D. E. H. (2007). The contradictions of techno-nationalism and techno-globalism: A historical perspective. *New Global Studies*, 1(1), 1–32. <https://doi.org/10.2202/1940-0004.1013>
- Eisenhower, S. (2004). *Partners in Space: US-Russian Cooperation After the Cold War*. Gettysburg: The Eisenhower Institute.
- Embassy of India, Washington DC, USA (2005, July 14). India–U.S. Joint Working Group on Civil Space Cooperation Joint Statement. *Embassy of India, Washington DC, USA*. Retrieved from <https://www.indianembassyusa.gov.in/ArchivesDetails?id=571>

- Gayozzo, P. (2022). Tecno-nacionalismo y nacionalismo digital en la cuarta revolución industrial. *Teknokultura. Revista de Cultura Digital y Movimientos Sociales*, 19(2), 95–102. <https://doi.org/10.5209/tekn.80449> [in Spanish].
- Horodnia, N. D. (2014). *Skhidna Aziia u zovnishnii politytsi SShA (1989–2013 rr.) [East Asia in US foreign policy (1989–2013)]*. Kyiv: «Print-Servis» [in Ukrainian].
- Ishchuk, M. O., & Ivanytska, O. P. (2018). Rozvytok amerykano-kytayskykh vidnosyn za prezydenstva Dzh. Busha-molodshoho [The Development of US-China Relations under the Presidency of George W. Bush]. *Visnyk studentskoho naukovohto tovarystva Donetskoho natsionalnoho universytetu imeni Vasylia Stusa – Bulletin of the Student Scientific Society of Vasyl' Stus Donetsk National University*, 1(10), 45–49. [in Ukrainian].
- Johnson-Freese, J. (2014). The Geostrategic, Techno-Nationalist Push Into Space. *Oasis*, 20, 9–22. Retrieved from <https://revistas.uexternado.edu.co/index.php/oasis/article/view/4006>
- Johnson-Freese, J., & Erickson, A. S. (2006). The emerging China–EU space partnership: A geotechnological balancer. *Space Policy*, 22(1), 12–22. <https://doi.org/10.1016/j.spacepol.2005.11.001>
- Koshova, S., Britchenko, I., & Bezpartochnyi, M. (2022). Investment in the Space Industry: a Comparative Analysis of Ukraine and the EU. *Baltic Journal of Economic Studies*, 8(3), 92–100. <https://doi.org/10.30525/2256-0742/2022-8-3-92-100>
- Kozachenko, R. P. (2014). Hlobalizatsiini chynnyky v konteksti ekzohennykh faktoriv konkurentnoho rozvytku krain v umovakh tekhnno-hlobalizmu [Globalization Factors in the Context of Exogenous Factors of Competitive Countries Development in the Era of Technological Globalization]. *Naukovyi visnyk Khersonskoho derzhavnoho universytetu: naukove periodychne vydannia – Scientific Bulletin of Kherson State University: scientific periodical*, (9-1), Part 2, 18–21. Retrieved from http://www.ej.kherson.ua/journal/economic_09-1/58.pdf [in Ukrainian].
- Krige, J. (2016). *Sharing Knowledge, Shaping Europe: U.S. Technological Collaboration and Nonproliferation*. Cambridge, MA: MIT Press. <https://doi.org/10.7551/mitpress/10861.001.0001>
- Krige, J. (2020). Technodiplomacy: A Concept and its Application to U.S. – France Nuclear Cooperation in the Nixon-Kissinger Era. *Federal Register*, 12, 99–116. Retrieved from <https://shfg.wildapricot.org/resources/Documents/8-Technodiplomacy%20web.pdf>
- Kyrychenko, I. (2011). Stratehichni imperatyvy natsionalnoi informatsiinoi bezpeky administratsii B. Klintony [Strategic imperatives of the national information security of the administration of B. Clinton Administration]. *Aktualni problemy mizhnarodnykh vidnosyn – Current Issues in International Relations*, 103(1), 165–171. Retrieved from <http://apir.iir.edu.ua/index.php/apmv/article/view/691> [in Ukrainian].
- Levytska-Doba, Ye. O. (2021). *Polityka SShA ta KNR v Aziisko-Tykhookeanskomu rehioni [The USA and China's Policy in the Asia-Pacific Region]*. (Extended

- abstract of candidate's thesis). Chernivtsi: Yuriy Fedkovych Chernivtsi National University [in Ukrainian].
- Logsdon, J., & Reed, C. (1999). Commercializing Space Transportation. In J. Logsdon (Ed.), *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program* (pp. 405–422). Retrieved from <https://history.nasa.gov/SP-4407/vol4/cover.pdf>
- Mihelj, S., & Jiménez-Martínez, C. (2020). Digital nationalism: Understanding the role of digital media in the rise of 'new' nationalism. *Nations and Nationalism*, 27(2), 331–346. <https://doi.org/10.1111/nana.12685>
- Montresor, S. (1998). Techno-Globalism and Techno-Nationalism: an Interpretative Framework. *Quaderni – Working Paper DSE*, 330, 1–34. Retrieved from <https://ideas.repec.org/p/bol/bodewp/330.html>
- Montresor, S. (2001). Techno-globalism, techno-nationalism and technological systems: organizing the evidence. *Technovation*, 21(7), 399–412. [https://doi.org/10.1016/s0166-4972\(00\)00061-4](https://doi.org/10.1016/s0166-4972(00)00061-4)
- Mothe, J., & Dufour, P. R. (1995). Techno-Globalism and the Challenges to Science and Technology Policy. *Daedalus*, 124(3), 219–235. Retrieved from <http://www.jstor.org/stable/20027317>
- National Space Policy (2020). *National Space Policy of the United States of America*. (released December 9, 2020). Retrieved from <https://history.nasa.gov/NationalSpacePolicy12-9-20.pdf>
- National Space Policy №293. (1988). *Presidential Directive on National Space Policy*. (released February 11, 1988). Retrieved from <https://spp.fas.org/military/docops/national/policy88.htm>
- National Space Policy №30. (1989). *Presidential Directive on National Space Policy*. (released November 2, 1989). Retrieved from <https://spp.fas.org/military/docops/national/nsdp1.htm>
- National Space Policy №4. (2010). *National Space Policy of the United States of America*. (released June 29, 2010). Retrieved from https://history.nasa.gov/national_space_policy_6-28-10.pdf
- National Space Policy №49. (1996). *Presidential Decision Directive National Space Policy*. (released September 19, 1996). Retrieved from <https://irp.fas.org/offdocs/pdd/index.html>
- National Space Policy №49. (2006). *National Security Presidential Directive National Space Policy*. (released August 31, 2006). Retrieved from: <https://irp.fas.org/offdocs/nsdp/space.html>
- Ostry, S., & Nelson, R. (1995). *Techno-Nationalism and Techno-Globalism: Conflict and Cooperation*. Washington D.C.: The Brookings Institution.
- Owens, J. (2023). A complex-systems landscape: Recognizing what is important in world history. *New Techno Humanities*, 3(1), 6–14. <https://doi.org/10.1016/j.techum.2023.05.003>
- Paikowsky, D. (2017). *The Power of the Space Club*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/9781108159883>

- Park, S. (2022). *The Review Article on Technonationalism. Preprints*, 1, 2022. <https://doi.org/10.20944/preprints202211.0131.v1>
- Park, S. (2023). Semiconductors at the Intersection of Geoeconomics, Technonationalism, and Global Value Chains. *Social Sciences*, 12(8), 466. <https://doi.org/10.3390/socsci12080466>
- Petrenko, I. & Oleshchuk, P. (2021). National Space Policy of Ukraine: Changing Challenges and Threats. *Philosophy and Cosmology*, 27, 83–93. <https://doi.org/10.29202/phil-cosm/27/6>
- Philbeck, T., & Davis, N. (2019). The Fourth Industrial Revolution: Shaping a New Era. *Journal of International Affairs*, 72(1), 17–22. Retrieved from <https://www.jstor.org/stable/26588339>
- Pooley, E. (1998, June 1). Red Face Over China: Did a Chinese plot persuade Clinton to let a U.S. company give China its rocket science? No. Politics (and policy) did. *Time*. Retrieved from <https://edition.cnn.com/ALLPOLITICS/1998/05/25/time/china.missles.html>
- Reich, R. B. (1987). The rise of techno-nationalism. *The Atlantic Monthly*, 259(5), 63–69. Retrieved from <https://www.theatlantic.com/magazine/archive/1987/05/the-rise-of-techno-nationalism/665772/>
- Salzman, R. (2017). «Techno-Diplomacy» for the Twenty-First Century: Lessons of U.S.-Soviet Space Cooperation for U.S.-Russian Cooperation in the Arctic. (Research Paper No. 6, pp. 1–32). US: 2015–2016 Hurford Next Generation Fellowship Research Papers. Retrieved from <https://www.europeanleadershipnetwork.org/wp-content/uploads/2017/10/Techno-Diplomacy-for-the-Twenty-First-Century-Rachel-Salzman.pdf>
- Schweitzer, G. (1989). *Techno-Diplomacy: US-Soviet Confrontations in Science and Technology*. New York: Plenum Press. <https://doi.org/10.1007/978-1-4899-6046-7>
- Shevchuk, O. V. (2010). Kytai u zovnishnopolitychnii stratehii SShA (1990-ti – 2000-ni rr.) [China in the US Foreign Policy Strategy (1990s – 2000s)]. *Naukovi pratsi Chornomorskoho derzhavnoho universytetu imeni Petra Mohyly – Scientific works of Petro Mohyla Black Sea State University, Political Science series*, 131(118), 157–162 [in Ukrainian].
- Stewart, W., & Dittmer, J. (2023). More-than-Human Space Diplomacy: Assembling Internationalism in Orbit. *The Hague Journal of Diplomacy*, 18(2–3), 219–252. <https://doi.org/10.1163/1871191x-bja10149>
- Taran, M. A. (2017). Kytajska initsiatyva «Odyn poias–Odyn shliakh» ta stratehichni vyklyky dlia SShA [China's «One Belt – One Road» Initiative and Strategic Challenges to The USA]. *Amerykanska istoriia ta polityka – American History & Politics*, 4, 139–151. Retrieved from <http://www.americanstudies.history.knu.ua/wp-content/uploads/2018/05/13-Taran.pdf> [in Ukrainian].
- Tonelson, A. (1995). The Perils of Techno-Globalism. *Issues in Science and Technology*, 11(4), 31–38. Retrieved from <http://www.jstor.org/stable/43311451>
- Tonelson, A. (1997). Globalization: The Great American Non-Debate. *Current History*, 96(613), 353–359. Retrieved from <https://www.jstor.org/stable/45317737>

- Turchetti, S., Adamson, M., Rispoli, G., Olsakova, D., & Robinson, S. (2020). Introduction: Just Needham to Nixon? On Writing the History of «Science Diplomacy». *Historical Studies in the Natural Sciences*, 50(4), 323–339. <https://doi.org/10.1525/hsns.2020.50.4.323>
- U.S. National Security and Military/Commercial Concerns with the People's Republic of China. (1999). *Report of The Select Committee on U.S. National Security And Military/Commercial Concerns With The People's Republic of China*. Retrieved from <https://www.congress.gov/105/crpt/hrpt851/CRPT-105hrpt851.pdf>
- United States Space Priorities Framework. (2021). *Framework for space policy*. (released December 1, 2021). Retrieved from <https://www.whitehouse.gov/wp-content/uploads/2021/12/united-states-space-priorities-framework--december-1-2021.pdf>
- Yamada, A. (2000). Neo-techno-nationalism: How and why it grows. *Paper presented to the international studies association conference, 14–18 March, 2000, Los Angeles*. Retrieved from <https://ciaotest.cc.columbia.edu/isa/yaa01/>
- Zaborsky, V. (1999). US-Ukrainian nuclear cooperation: Is Kyiv ready for it? *The Nonproliferation Review*, 6(3), 131–139. <https://doi.org/10.1080/10736709908436772>
- Zhang, Z., & Seely, B. (2019). A Historical Review of China–U.S. Cooperation in Space: Launching Commercial Satellites and Technology Transfer, 1978–2000. *Space Policy*, 50, 101333. <https://doi.org/10.1016/j.spacepol.2019.08.003>
- Zhuravlova, L. V. (2016a). Amerykano-ukrainski vidnosyny u sferi kosmichnoi diialnosti(komertsiiinyi aspekt) [US–Ukraine Relations in Space Activities (Commercial Aspect)]. *Amerykanska istoriia ta polityka: naukovyi zhurnal – American history and politics*, (1), 63–72. Retrieved from http://nbuv.gov.ua/UJRN/ahp_2016_1_10 [in Ukrainian].
- Zhuravlova, L. V. (2016b). Problema eksportnoho kontroliu ta polityka SShA shchodo komertsializatsii kosmichnoi diialnosti u 1990-ti – 2010-ti roky. [Export control problem and US policy toward commercialization of space activity in the 1990 – 2010-ies]. *Voienno-istorychnyi visnyk: Zbirnyk naukovykh prats Natsionalnoho universytetu oborony Ukrainy – Military Historical Bulletin: Collection of scientific papers of the National Defense University of Ukraine*, 3(21), 34–40 [in Ukrainian].
- Zhuravlova, L. V. (2017). *Polityka SShA shchodo komertsializatsii kosmichnoi diialnosti (1989 – 2012 rr.) [US policy on commercialization of space activities]* (Candidate's thesis). Kyiv: National Pedagogical University named after M. P. Dragomanov [in Ukrainian].

Людмила Журавльова

Український державний університет імені Михайла Драгоманова, Україна

Еволюція техно-націоналізму: Роль космічного чинника

Анотація. Технологічні зміни останніх чотирьох десятиліть (1980-ті – 2020-ті рр.) спонукають науковців різних галузей оцінювати вплив технологій на

трансформацію системи міжнародних відносин та національних стратегій держав. Зокрема головна увага багатьох досліджень присвячена системі відносин між країнами з конфліктними технологічними інтересами. Тому у представленій статті ми зосереджуємося на теоретичному осмисленні еволюції концепції техно-націоналізму. Розгляд техно-націоналізму через призму космічної політики, зокрема американо-китайських відносин, є доцільним з точки зору визначення релевантності отриманих результатів дослідження. З огляду на це методологія дослідження побудована на міждисциплінарному підході, який дав можливість поглянути на проблему через перспективу історичної, економічної, політичної наук та теорії міжнародних відносин. Аналіз публікацій з цього питання показує що розвиток техно-націоналізму відбувався у дихотомічному зв'язку із техно-глобалізмом. В умовах завершення холодної війни техно-націоналізм використовувався для позначення протекціоністської політики держав, яка протиставлялася вільному обміну технологій. Космічні технології, які є показником лідерства й мають подвійне призначення стали важливим елементом міждержавних зносин у постбіполярну епоху. Зміни у цій системі призвели до спроби Сполученими Штатами збалансувати інтереси національної безпеки та комерційних вигод від використання космосу. Однак ці намагання призвели до подальшого посилення режиму експортного контролю з другої половини 1990-х рр. Переважно ці обмеження ґрунтувалися на занепокоєнні з приводу передачі космічних технологій Китаю, який демонстрував ознаки військової модернізації. Таким чином виклик лідерства, який постав перед США та Китаєм у космічній галузі, продовжив зміцнювати техно-націоналістичні елементи інноваційних систем протягом 2000-х й 2010-х рр. Спираючись на погляди досліджених науковців, автор статті надає власне визначення техно-націоналізму, як державної політики, наукового підходу та ідеології де ключову роль відіграють національні чинники. Результати дослідження показали що компоненти технологічних систем можуть бути різною мірою зачеплені процесом глобалізації. А отже техно-глобалізм й техно-націоналізм є складовими цих систем і демонструють взаємозалежність. У цьому світлі подальшої розробки потребують такі категорії, як цифровий націоналізм, цифрова ідентичність, техно-авторитаризм.

Ключові слова: техно-націоналізм; техно-глобалізм; космічна політика; американо-китайські відносини; наукова дипломатія; техно-дипломатія; експортний контроль

Received 09.06.2023

Received in revised form 27.10.2023

Accepted 07.11.2023