

Dasa Adaskova¹, Tetyana Zubro²

STRATEGIC AND ECONOMIC ASPECTS OF A MILITARY NUCLEAR PROGRAMME

The aim of this paper is to assess strategic and economic aspects of a military nuclear programme in theory and practice and to identify their interconnection. The research is applied on the sophisticated US military nuclear programme. The paper comes to the conclusion that strategic importance of the US nuclear arsenal in current US security and defence policy prevails over extremely inefficient nuclear spending.

Keywords: military nuclear programme; nuclear weapons; the United States; military spending.

JEL: F50; F52; H56.

Даша Адашкова, Тетяна Зубро

СТРАТЕГІЧНІ ТА ЕКОНОМІЧНІ АСПЕКТИ ВІЙСЬКОВОЇ ЯДЕРНОЇ ПРОГРАМИ

У статті оцінено стратегічні та економічні аспекти військової ядерної програми в теорії і на практиці, а також визначено їх взаємозв'язок. Уважно вивчено американську військову ядерну програму. Зроблено висновки, що в політиці безпеки та оборони на даний момент стратегічне значення ядерного арсеналу США переважає над неефективністю витрат на ядерну програму.

Ключові слова: військова ядерна програма; ядерна зброя; США; військові витрати.

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Даша Адашкова, Татьяна Зубро

СТРАТЕГИЧЕСКИЕ И ЭКОНОМИЧЕСКИЕ АСПЕКТЫ ВОЕННОЙ ЯДЕРНОЙ ПРОГРАММЫ

В статье оценены стратегические и экономические аспекты военной ядерной программы в теории и на практике, а также определена их взаимосвязь. Детально изучена американская военная ядерная программа. Сделаны выводы, что в политике безопасности и обороны на данный момент стратегическое значение ядерного арсенала США преобладает над неэффективностью расходов на ядерную программу.

Ключевые слова: военная ядерная программа; ядерное оружие; США; военные расходы.

Introduction. Nuclear weapons are currently the most powerful and destructive weapons ever constructed by human beings. They belong to the weapons of mass destruction as they were constructed to cause enormous casualties and huge material damages in a short time. Due to their indiscriminate destructive power, the proliferation of nuclear weapons is one of the current most significant security threats.

Nuclear weapons present the supreme security guarantee for states in international relations. During the Cold War the proliferation of nuclear weapons influenced the dynamics of international relations for decades. The nuclear war between the two superpowers – the United States and the Soviet Union, was considered as the most serious security threat (Skvrnda, 2014: 28). The rivalry between two antagonistic blocs led to the accumulation of vast nuclear arsenals that pose security challenges for international relations until present time, as with the existence of nuclear weapons there is always a chance of their use.

¹ University of Economics in Bratislava, Slovak Republic.

² University of Economics in Bratislava, Slovak Republic.

Besides the influence on national security, development of military nuclear programs has a significant impact on national economic systems, as well. On the one hand, a sophisticated nuclear program means progress in the economy of a nuclear state and is the evidence of technological development of a nation. On the other, the proliferation of nuclear weapons has a significant impact on the economic system of the state as the development and maintenance of a military nuclear program is connected with huge long-term costs. Due to enormous costs of military nuclear programmes, the contribution of nuclear weapons to national security is being often assessed critically.

The main aim of the paper is to define strategic and economic aspects of a military nuclear programme and to define the nexus between them. The theoretical aspects are subsequently implemented on the US military nuclear programme. Firstly, the strategic importance of the US nuclear arsenal in the security and defence policy is assessed. Secondly, main costs associated with the development, maintenance, modernization and related activities of the US military nuclear programme are characterized. The conclusion presents the results of the nexus between strategic and economic aspects of the US military nuclear programme.

Literature review. There is a number of studies analyzing different aspects of nuclear proliferation. Within the research of the topic we focused mainly on scientific monographs, journals and scientific articles analyzing the impact of nuclear weapons on international relations and their role in national security and defence policy of nuclear states.

From the theoretical perspective, political realism and neo-realism focus on the role of nuclear weapons in international relations. Although they are not able to explain the complex dynamics of nuclear proliferation, they can explain the causes for nuclear proliferation and motivations of states to acquire nuclear weapons. K. Waltz (1981) is one of the main proponents of positive effects of nuclear weapons as an instrument of foreign and security policy and of positive impact on international relations caused by rational deterrence. The realist and neo-realist approach to nuclear proliferation has been elaborated and further developed by other theorists such as Z.S. Davis, R.K. Betts, J. Mearsheimer. A complex approach to nuclear proliferation from the perspective of international relations theories presents T. Ogilvie-White (1996).

A complex analysis of a military nuclear programme costs is elaborated by S. Willet (2003). The author focuses on the analysis of total costs and benefits of nuclear arms control, disarmament and non-proliferation of nuclear weapons and compares them with costs and benefits of a nuclear arms race. S.I. Schwartz and D. Choubey (2009) examine and assess costs on the US military nuclear programme and provide recommendations for an effective oversight of the US government. A critical analysis of a nuclear military spending is elaborated by J. Page and R. Thakur (2013).

As sources for statistic data served the information provided by H.M. Kristensen and R.S. Norris (2015) who monitor the dynamics and the structure of nuclear arsenals of all nuclear weapons states. The reports of non-governmental organisations such as James Martin Center for Nonproliferation Studies, Nuclear Threat Initiative and Arms Control Association served also as the sources of quantitative and qualitative information about the US military nuclear programme.

Problem statement and research objective. The strategic role of nuclear weapons and importance for national security can be explained especially within the frameworks of political realism and neorealism. From the realist perspective, nuclear weapons are the supreme guarantee of national security due to their destructive power and psychological effects of anticipated destruction. Their role in state's security and defence policy corresponds with the realist approach to international relations.

The basic assumption of classical realism in explaining international politics is the assumption that the global political system is characterized by the existence of independent unitary sovereign states that are threatened, as in the system there is no supranational authority to supervise and limit their activities. It is thus an anarchic system in which one of the major implications is uncertainty. The result is always the possibility of war between actors who want to ensure their security and survival (Morgenthau, 1978). Under these circumstances states must help themselves and provide for their own security. States are therefore actors seeking to maximize their power to ensure their survival internationally. The attempts to acquire nuclear weapons must then be perceived as a rational way to protect national interests. State's efforts to acquire nuclear weapons must then be understood as a rational choice to ensure survival, to counter threats to national security, to increase the capacity to achieve political aims in international relations, or to increase regional or global prestige and influence (Ogilvie-White, 1996).

According to K. Waltz (1981) nuclear weapons can be used for defence or for deterrence. The likelihood of war is decreased when deterrent and defensive capabilities are increased. Especially the deterrence ability of nuclear weapons has positive consequence on international relations as it can prevent conflicts between states. Nuclear deterrence is achieved through the ability to punish. To deter means to prevent someone from doing something by frightening him that the reaction of the attacked will result in a severe punishment of an attacker. The rational nuclear deterrence is promoted especially by the second-strike nuclear forces as expected costs of war are so high that war becomes unlikely because of mutually assured destruction (MAD). This strategy can be traced on relations between the United States and the Soviet Union during the Cold War and on explanation of the ability to prevent any direct full-scale conflict between superpowers and of the non-use of nuclear weapons (Kazansky, 2013).

As a result, the realist assumption is that nuclear weapons can deter an enemy so the possession of nuclear weapons lowers the chance, frequency and intensity of war among nuclear states. From the strategic perspective, a military nuclear programme is a rational choice to pursue national interests in international relations for states as no rational actor would ever attack a nuclear state. Therefore, the realist perspective on nuclear weapons is often used to justify a state's need to acquire nuclear weapons.

However, is the development and maintenance of a military nuclear programme also a rational choice from the economic perspective? After the beginning of a nuclear arms race between during the Cold War, there was an international opinion that nuclear weapons represent exponentially greater explosive power for fewer costs as compared to conventional explosive power systems (James Martin Center for Nonproliferation Studies, 2015). According to the advocates of nuclear weapons, the research and development of nuclear weapons meant significant benefits not only for national security, but also for national economy and technological progress.

Later it turned out that military nuclear programme does not cover only R&D and nuclear weapons production. However, the maintenance of an active military nuclear programme and mitigation of negative effects of the programme also bring additional costs, which have significant impact on the total outlays on nuclear programme and represent burden for the state economic system (Schwartz and Choubey, 2009).

From the economic point of view, capital outlays on nuclear production can be characterised as unproductive investments in military programme in general. Moreover, they represent long-term sunk or non-recoverable costs in absolute terms (Willet, 2003). The input costs of a military nuclear programme represent the costs on the whole process of research and development of nuclear weapons. Nuclear weapons are sophisticated devices consisting of nuclear and non-nuclear components and for their construction specific technologies, equipment and know-how are required. Therefore, the construction process includes, besides scientific research, also nuclear testing, production of nuclear warheads, research, testing and construction of delivery systems. Finally, there is the quantity production of nuclear warheads and delivery systems and their stockpiling.

In the long-term perspective, the maintenance of an active military nuclear programme and nuclear arsenals results in the demand for more resources and expenditures in the form of long-term recurrent costs. They have to be allocated first of all on maintaining and servicing of a complete nuclear arsenal and its modernization. When nuclear weapons are retired, additional costs must be allocated on dismantling and the storage of radioactive materials after dismantling. In addition to that, nuclear materials are specific as they have enduring life-cycle and must be stored safely and properly safeguarded (Willet, 2003). This means that the resources allocated on the complex nuclear weapons production process and the maintenance of an active military nuclear programme increase the initial budgetary outlays in the long-term.

Besides the input costs and long-term recurrent costs there are costs for the elimination or mitigation of negative effects of a nuclear programme. The production of nuclear weapons affects the health of military personnel and inhabitants nearby negatively and means also certain loss of workforce (Willet, 2003). Moreover, development and production of nuclear weapons affects also the environment negatively and means the loss of usable territories (Cernota, 2012). The elimination of these negative effects leads to other long-term hidden costs.

Key results. The United States is the first country in the history that has developed, constructed and tested a nuclear weapon and the only state which used a nuclear weapon in combat. During the Cold War from 1945 to 1992, the United States tested 1,032 nuclear weapons, and produced more than 66,500 nuclear warheads (CTBTO Preparatory Commission, 2015; Kristensen and Norris, 2013). The top of the US nuclear weapons proliferation was in 1967, when the national nuclear stockpile reached 31,000 operational nuclear warheads and bombs (James Martin Center for Nonproliferation Studies, 2015). This development corresponds with the changing US nuclear doctrine. The role of US nuclear arsenal has gradually evolved from offensive forces to defensive forces and the US strategic thinking has shifted from destruction to deterrence. Since the end of the Cold War the role of nuclear weapons has gradually decreased and due to the involvement of the United States in international arms control, the US strategic arsenal has been reduced significantly.

Specifically, more than 59,000 nuclear warheads were dismantled in total; more than 13,000 of them were dismantled after 1990 (James Martin Center for Nonproliferation Studies, 2015).

In order to develop and sustain the robust nuclear arsenal during the Cold War, the United States invested around 5,821 bln USD in the military nuclear programme development during 1940–1996. From the estimated total amount around 7% (409 bln USD) was spent on developing, testing and constructing nuclear warheads or bombs. The most expensive part of the total military nuclear programme was deploying nuclear warheads and bombs on delivery means as this phase consumed around 56% (3,241 bln USD) of expenditures. Around 14% (831 bln USD) of the total expenditures were allocated on command, control and communication systems. The rest of the expenditures were spent on various programmes such as defence against a nuclear attack (937 bln USD), dismantling of nuclear weapons (31 bln USD), nuclear waste management (365 bln USD), programmes on compensation for victims (2.1 bln USD) etc. (Schwartz, 2008). The overall estimated costs on the US military nuclear programme are presented in Figure 1.

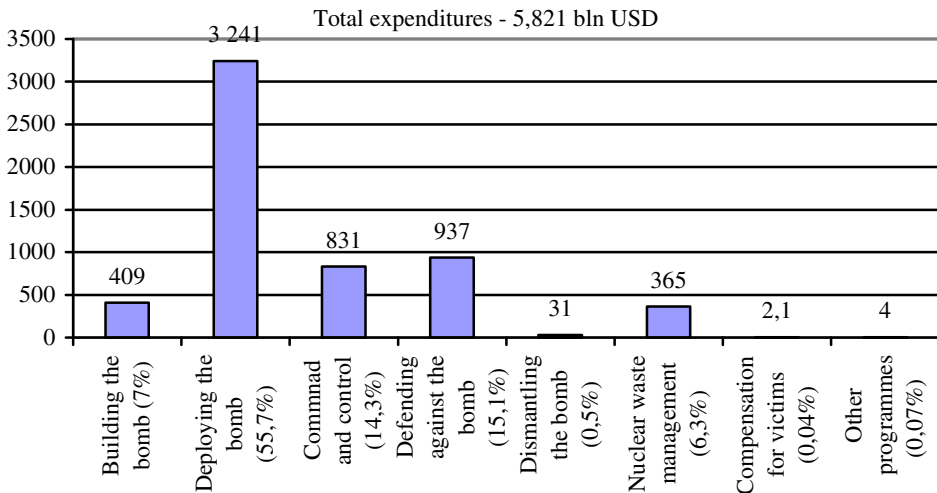


Figure 1. Estimated minimum costs of the US military nuclear programme, 1940–1996 (Schwartz, 2008)

The current administration of the US president Barack Obama decreases gradually the role of nuclear weapons in national security and defence policy. This was stated in the National Security Strategy in 2010 (Kucharcik, 2010). Specifically the role of nuclear forces in the US security and defence policy is stated in the nuclear strategy introduced in Nuclear Posture Review in 2010. It was reviewed by the Nuclear Weapons Employment Strategy in 2013. According to the strategy, nuclear forces still remain a credible deterrent preventing attack against the United States. Their use is possible only as a response to a nuclear attack or in extreme situations to defend vital interests of the United States and their allies (The White House, 2013). It is obvious from the strategy that besides conventional capabilities the US nuclear arsenal will still play an important role in the security and defence policy and therefore must be sustained and modernized.

Currently, it is estimated that the United States has about 7,100 nuclear warheads and bombs and disposes of sophisticated delivery systems such as intercontinental ballistic missiles, ballistic missiles on submarines and strategic bombers, which form the so-called nuclear triad. The US nuclear arsenal is thus the second largest after the nuclear arsenal of the Russian Federation (Kristensen and Norris, 2015). The total US nuclear arsenal consists of about 2,080 nuclear warheads ready for immediate deployment. Around 1,900 of the deployed nuclear warheads are strategic warheads deployed on ballistic missiles and at bomber bases in the United States. The nuclear arsenal encompasses also around 180 warheads, which are intended for tactical use and are located in Europe to guarantee the security of the NATO Allies. Besides deployed and ready-to-use nuclear warheads and bombs, there are additional 2,680 warheads located in reserves and maintained for potential use in the event of a technical failure of deployed weapons. In addition to that, about 2,340 nuclear warheads are awaiting dismantlement (Kristensen and Norris, 2015). Current US nuclear arsenal is presented in Table 1.

Table 1. The US Nuclear Arsenal, 2015 (Kristensen and Norris, 2015)

TYPE OF DELIVERY SYSTEMS	NUMBER OF WARHEADS
Strategic nuclear weapons	
Intercontinental Ballistic Missiles (LGM-30G Minuteman III, Mk-12A, Mk-21/SERV)	450
Submarine-Launched Ballistic Missiles (UGM-133A Trident II D5, Mk-4, Mk-4A, Mk-5)	1,152
Bombers (B-52H Stratofortress, B-2A Spirit)	300
Nonstrategic Forces (B61-3, -4 bombs)	180
Total Deployed Nuclear Weapons	~2,080
Nuclear Weapons in Reserves	~2,680
Nuclear Weapons for Dismantlement	~2,340
Total Stockpile of Nuclear Weapons	~7,100

The current US nuclear arsenal will be reduced in subsequent years according to the commitment under the New Strategic Arms Reduction Treaty (New START) which came into force in 2011. Although, the total number of nuclear warheads in the US arsenal is decreasing, the United States continues to modify and modernize the existing nuclear warheads to extend their lifetime and plans to produce interoperable designs of nuclear warheads, which are not included in the current arsenal (James Martin Center for Nonproliferation Studies, 2015). The modernization of the whole nuclear arsenal suggests that the United States will still rely on nuclear forces in its security and defence policy that poses a serious challenge for the US national budget in the following years.

At the beginning of 2015 the Congressional Budget Office released a report "Projected Costs of U.S. Nuclear Forces, 2015 to 2024". According to the report it is estimated that the total expenditures on maintaining and modernizing the US nuclear military programme over the period 2015–2024 will be 348 bln USD. About 35 bln USD will be spent every year. The proposed budget includes direct costs on maintaining and modernizing strategic nuclear weapons and delivery systems, tactical nuclear weapons and their delivery systems, of supporting activities, facilities and

infrastructure, command and control, communications and early warning systems (Congressional Budget Office, 2015).

The projected costs of the US military nuclear programme over the period 2015–2024 are presented in Figure 2.

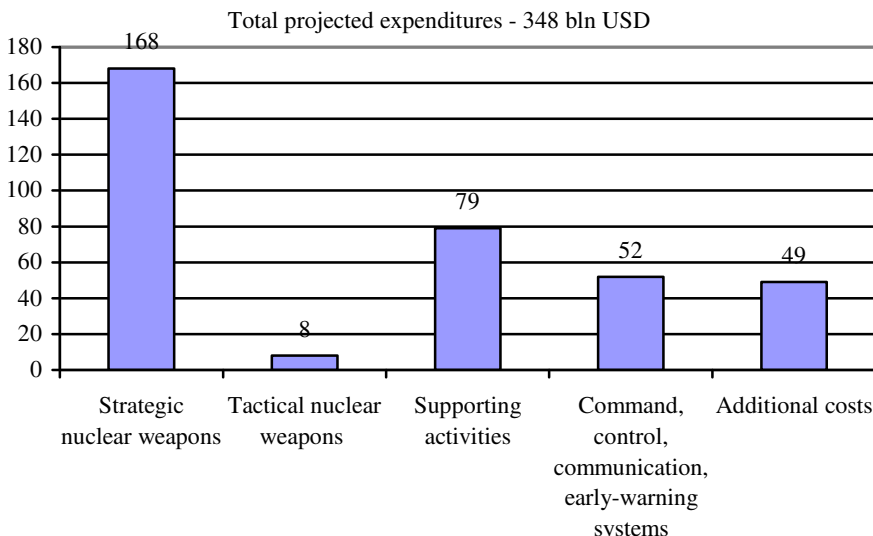


Figure 2. Projected Costs of US Nuclear Forces, 2015–2024 (Congressional Budget Office, 2015)

However the projected costs on nuclear forces of the United States are not complete. The report does not include all recurrent and hidden costs on the related activities. These are costs to dismantle retired nuclear weapons and their delivery systems, cleanup activities of contaminated environment at nuclear facilities, programmes to reduce nuclear threats posed by state and non-state actors, programmes to prevent nuclear proliferation, support for former military personal engaged in the military nuclear programme etc.

In addition to that, according to predictions, the costs on maintaining the US military nuclear programme are likely to grow as specific components of the nuclear arsenal need to be modernised or completely replaced by new systems. All parts of the US strategic arsenal undergo constant maintenance and extensive modernization. This is particularly the maintenance and modernization of nuclear warheads, missiles and bombers. Maintenance and modernization are associated with the supply of equipment and research and development of the individual components of the existing military nuclear programme, as well as new innovative technologies. Most of the costs associated with the expected research and development and supplies of the necessary components for bombers, missiles and submarines are planned after 2018 (James Martin Center for Nonproliferation Studies, 2013). The data in Figure 2 therefore represent only part of the costs on maintaining the US nuclear arsenal during the next decade.

Additional costs may be difficult to define precisely. These are particularly the costs associated with the command and control mechanisms, and especially communication and intelligence technology that are important "to prevent hackers' attacks,

abuse of information by foreign intelligence and/or leaks of information outside the given office" (Mattos, 2015: 24). It is estimated that the costs will rise annually over tens bln USD (James Martin Center for Nonproliferation Studies, 2013).

Another serious problem in maintaining the US nuclear arsenal is the removal of environmental problems and human resources caused by the maintenance of a military nuclear programme. It is estimated that for their elimination would be necessary to allocate additional 260 bln USD during the next 10 years (James Martin Center for Nonproliferation Studies, 2013).

Conclusions. From the strategic point of view, nuclear weapons still represent an important instrument in ensuring the security of the United States, despite their role being decreased in recent years. The evidence for that presents the current nuclear strategy according to which the US nuclear forces are mainly instruments for deterrence of any potential attack against the United States. Their use is possible only as a response to a nuclear attack or in extreme situations when vital interests of the United States and their allies are threatened. This means that US nuclear forces cannot be used as a substitute for conventional forces to achieve national interests of the United States in international relations.

From the economic perspective, the maintenance of the active US military nuclear programme entails major challenges in the form of both long-term recurring and hidden costs. They cover the expenditures on the maintenance and servicing of nuclear weapons, their means of delivery and storage of radioactive materials. In addition to these costs, the United States must also calculate the costs to mitigate the negative effects of the military nuclear programme on the environment and human resources as nuclear weapons production has a significant impact on the health of military personnel, local population and the environment, and causes the loss of usable areas. In addition to that, it is likely that costs associated with the programme will grow over the next years, because the outdated nuclear technology and weapons systems will have to be modernized.

Apart from the strategic benefits of the US military nuclear programme in terms of ensuring national security, in economic terms the programme presents a huge burden for the national budget of the United States and therefore a complete nuclear disarmament seems to be a rational choice.

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