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ON THE BENEFICIARIES OF THE TECHNOLOGY ADVANCES

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Abstract: the study considers and compares the research and development drivers in the USSR and modern Russia. It is shown that the competition for the global military and economic leadership shaped the need to develop advanced military and civil technologies in the USSR. The paper lists the USSR technology achievements in a number of key industries, and the educational technologies behind them. We identified significant differences between the Russian business practices and the socialist ones, and the negative impact of such differences on the research and technology advancement in Russia.

Keywords: research and technology advancement, digital economy.

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О ВЫГОДОПРИОБРЕТАТЕЛЯХ НАУЧНО-ТЕХНИЧЕСКОГО ПРОГРЕССА

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Аннотация: рассматриваются и сопоставляются движущие силы научно-технического прогресса в СССР и России. Показано, как конкуренция за достижение военного и экономического лидерства в мире определяла необходимость создания в СССР передовых военных и гражданских технологий. Приводятся научно-технические достижения СССР по ряду ключевых отраслей и прослеживается взаимосвязь с образовательными технологиями. Отмечаются существенные отличительные особенности российского коммерческого бизнеса по сравнению с принципами социалистического производства, пагубное влияние этих особенностей на развитие научно-технического прогресса в России.

Ключевые слова: научно-технический прогресс, цифровая экономика.

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On the Driving Forces of the Technological Progress and its Beneficiaries in the USSR

In the second half of the twentieth century, the main driving force of scientific and technological progress in the USSR was competition with the United States to achieve first military and then economic leadership in the world. Achieving military superiority or parity with the United States in creating new weapons systems required, first of all, advanced development of military nuclear, rocket-space and aviation industrial technologies. The need to create in the USSR such military serial technologies and serial weapons systems on their basis was dictated by the fact that in the early 50's the USA had developed and mass-produced thermonuclear bombs Mk-19 and Mk-24 with TNT equivalent of 10–15 Mt. Aircraft B-36, each of which could deliver two such bombs to a distance of up to 16,000 kilometers, were developed and serially produced in the United States. The B-36 bombers, each of which could deliver two such bombs to a distance of up to 16,000 kilometers, were developed and serially produced in the United States. By 1954 the United States had an arsenal of 305 Mk-17 and Mk-24 bombs and 385 B-36 aircraft, which all together were a real threat to the destruction of the USSR and most of its population [1] since at that time the USSR had no such weapons or means of their delivery.

This threat was countered by the postwar technological and industrial breakthrough of the USSR, which resulted in the creation of military, and later civilian, nuclear, rocket-space, and new aviation (jet aviation) industries. By the end of the 1950s, these new industries ensured the development and mass production of megaton-class thermonuclear charges [1], as well as their carriers, Tu-95 bombers, and R-7

ballistic missiles, which could deliver these charges up to 12,000 kilometers away [2]. As part of the new aviation industry, based on the Tu-95 and Tu-16 bombers were developed and mass-produced civilian long-range Tu-114 and long-range Tu-104. Until 1990 every fourth civilian long-haul aircraft in the world was produced in the USSR on average of 80 airliners annually [4]. In the nuclear industry, based on the diversification of military technologies, the development and construction of nuclear power plants, as well as nuclear power plants for the icebreaker fleet, were ensured. It is essential that within the framework of the implementation of these large-scale nuclear, rocket-space and aviation projects, the state, by consolidating the efforts of industrial and scientific enterprises, created new industries and modified existing ones and created millions of new well-paid jobs in these industries, in science and education as well. For example, in 1990 in the USSR the headcount of the nuclear industry was 1.1 million people [2], the headcount of the aviation industry was 1.5 million [4], and the headcount of the science and science services industry was 2 million 804 thousand [5]. On the whole, the number of industrial-production personnel in the RSFSR in 1990 was 23.1 million people. That is, the entire population of the USSR was the beneficiary of scientific and technological progress in both military and civilian industrial technologies, since this progress ensured, in particular, the prevention of a nuclear strike on the USSR and the destruction of most of its population, as well as the creation of millions of high-paying jobs for the country's population. Overall, the scientific and technological progress initiated by the USSR's competition with the United States ensured a twentyfold increase in industrial production in the RSFSR alone over the 35 years from 1945 to 1980 [3].

It is essential that scientific and technological progress in the USSR was fundamentally based on a "cult of knowledge", especially in the exact sciences, which the state, as a result of a targeted policy, managed to form and maintain in the public consciousness almost until 1991. The ability to solve complex scientific and technical problems based on fundamental knowledge opened to a member of society one of the ways to state and public recognition, material well-being, access to power structures, and, no less importantly, to large-scale technical creativity. The natural-science component of the mass educational system of the USSR, which provided training for the nuclear, aviation, and rocket-space industries, including applied research institutes and the Academy of Sciences, was aimed at acquiring these skills and knowledge.

On the Driving Forces of the Technological Progress and its Beneficiaries in Russia

Our business is to make money for shareholders [7]

However, after the collapse of the USSR in 1991, the new Russia abandoned the economic and political course of the USSR, including the competition with the United States to achieve military and economic leadership in the world, and, consequently, the driving force behind the scientific and technological progress of the USSR. The basis of Russia's economic policy and the driving force behind scientific and technological progress were the interests of the shareholders of commercial organizations, whose main goal, according to Article 50 of the Civil Code, is profit. Of course, the maximum and, of course, for a minimum amount of time, and with minimum risks. The most common forms of joint-stock companies and limited liability companies are also commercial. That is why in the interview "Poverty is not our concern" Peter Aven, President, Alfa-Bank (Argumenty i Facty newspaper) [7] to the reporter's question "Besides profit you are interested in something else?", answers: "In business – only it! We only do what is profitable for us – financial operations, oil, mobile communications, television, the Perekrestok retail chain . . . ". And then, in the same interview, he formulates one of the key tenets of Russian commercial business: "Our job is to make money for shareholders and customers within the limits of the law. We have no other duties" [7].

That is, in fact, according to the Civil Code of the Russian Federation, it is not the responsibility of this Russian business to develop new technologies for oil production, production of mobile communications and television equipment, because this requires long-term, large financial investments and, consequently, a decrease in the profits of shareholders, and is also associated with significant risks of returning the investments, that is, with the possibility of even greater losses for shareholders. That is, it is not profitable for the Russian commercial business, which is only interested in profit, to engage in the development or production of industrial products, or the technology of their development and production in Russia.

But it is profitable to purchase industrial products of large foreign companies and the provision of services on their basis [6]. For example, the provision based on foreign computing and communications equipment remote banking services, mobile communications services or television broadcasting.

The essence of the economic reforms carried out in Russia was the creation of such a commercial

business, making money for shareholders based on the technology and equipment of foreign companies. Such domestic commercial business does not need both the science, education and industry, inherited from the USSR, which was aimed at creating and manufacturing industrial products and millions of high-paying jobs for the country's population, created in the industry, science and education of the USSR before 1991. It is for this reason, for example, that the number of workers in the aviation industry in Russia had decreased threefold by 2004 compared to 1990, and of the 96 mainline aircraft purchased by domestic carriers in 2002-2005, 76 were foreign-made [4]. Annual sales in the civilian segment of the industry became negligible – about $70 million. Sales in the military segment of the industry were almost entirely determined by export orders and did not exceed $2-$4 billion a year. For comparison, Boeing sales in 2006 were $61.5 billion [4].

Overall, the number of industrial personnel in the new Russia declined from 23.1 million in 1990 to 12.8 million in 2004, nearly halving it [3], even though, according to Vyacheslav Bobkov, director of the All-Russian Center for Living Standards, "salaries in Russia are so low that it is impossible to live on them" [7]. However, at the same time, the rich in Russia were buying yachts worth up to $10 million [7]. The rich are the beneficiaries of scientific and technological progress in new Russia, the driving force of which is profit. That is, the rich are the beneficiaries of private business profits, which are only its shareholders, but not the hired workers of this business, whose salaries are such that "it is impossible to live on them", i.e. "the poor". Among these "poor" employees are "normal honest toilers who have stable earnings" [7].

And this is a direct consequence of the Civil Code of the Russian Federation, which legally guaranteed and now guarantees the owner of the company the right to profit in any amount. At the same time, he bears no responsibility for the preservation of jobs, social support, and indexation of the wages of hired workers, as long as the wages are not lower than the minimum wage established by law. That is, the current Civil Code of the Russian Federation, in fact, legislatively states the supremacy of the owner-employer rights over the rights of employees, including the right to a decent life and human development. More precisely, it asserts the supremacy of the owner's interests in Russia, rather than the supremacy of the interests of society and the country's economy.

We pay taxes and don't owe anyone anything else [7]

This is the first key postulate of Russian commercial business, directly following from the current Civil Code of the Russian Federation. Since private business "pays taxes and owes nothing to anyone else", the fight against poverty in the new Russia is a matter for the state [7]. Therefore, even fifteen years from now, in 2020, the problem of poverty remains more than urgent in Russia. Indeed, according to the newspaper Moskovsky Komsomolets [8], in 2019 the number of people with incomes below the subsistence level rose to 20.9 million. The poverty rate rose to 14.3% compared to 13.9% in 2018. At the same time, the 20 richest people in our country – the shareholders, the beneficiaries of private business, for the last seven months together got rich by $36 billion, or 2.34 trillion rubles, it is quite natural, since the main purpose of this business, as well as 15 years ago in 2004. is to make money for shareholders [7]. Indeed, the owner of 84% of shares of PJSC Novolipetsk Steel is also one of these shareholders and 20 richest people in our country [9], whose Development Strategy until 2022 (hereinafter referred to as Strategy) declares that this company has the largest stake in Novolipetsk Metal Works. (hereinafter the Strategy) declares: "As part of Strategy 2022, we will continue our work to maximize returns to shareholders" [10]. The main tool to maximize profitability – increasing operational efficiency, which may well lead to a reduction in the number of jobs in the company and the income of employees. Especially since the Strategy only plans to "reduce the level of injuries" and "a high level of motivation and involvement" concerning personnel, i.e. hired employees [10], and in an interview with Vedomosti, NLMK's president talks about the intention, as part of his proposed Strategy and plan, to "close part of the production chain", which "is being discussed with trade unions and employees" [9]. That is, there are no guarantees even to maintain the existing number of employees and their remuneration level, which, according to IFRS reports, amounted to 58,300 in 2018. 58.3 thousand people and 60.8 thousand rubles, respectively. Another tool to maximize returns in the Strategy is to invest in growth projects, with the implementation of a "highly competitive dividend policy" [10], in other words, investing only in what has synergies with the core business [9] and does not lead to a reduction in shareholders' dividends, that is, "smart growth production" [9]. For example, in the production of steel for electric motors [9], but not in the production of electric motors themselves, let alone electric

cars based on them, because this would require long-term financial investments with high risks and could lead to a reduction in shareholder income. In other words, the criterion for choosing the direction and pace of scientific and technological progress at NLMK, whose net profit in 2018 was $2.2 billion, is the growth of income for its shareholders, but not the growth of the country's economy and the income and employment levels of its population. That is, not the growth of Russian aircraft manufacturing, machine building, machine tools, automobile manufacturing, etc. That is why the "assets of the Russian metallurgy inherited from the USSR produce twice as much steel as is consumed within the country", and "in Russia, 60–70% of steel consumption is construction" and, according to NLMK President, "in the same segment ... the main deferred demand" [9]. Therefore, it is quite natural that the president of NLMK is not a graduate of a technical university, but a graduate of the Finance Academy under the Government of Russia, a specialist in financial and management consulting, who "realized that steel production is a manageable system. And I became interested in the optimization of this system" [9]. Since the goal of optimization of this managed system, as follows from the Strategy, is to increase the profit of shareholders, growth projects should be based only on proven technical solutions with minimal risks, and the main criteria for selecting the optimal technical solution should be only financial. That is, in the new Russia for the last twenty-five years it is no longer the "cult of knowledge" in the field of exact sciences, but the "cult of knowledge" in the field of financial and management consulting opens the way for a member of society to state and public recognition, material well-being and entry into power structures. For example, in 2018, the average remuneration of NLMK Group Management Board members was 4 million 138 thousand rubles per month.

We only do what is profitable for us [7]

This is the second key tenet of Russian commercial business, which "benefits" anything that leads, according to the Russian Civil Code, to an increase in shareholder profits. It is "profitable" to increase operational efficiency, which is achieved, among other things, by reducing jobs and employee compensation levels. "Profitable" is the implementation of growth projects that do not reduce shareholder profits and maintain financial stability, i.e. the use in growth projects of only globally proven (i.e. foreign) technical and technological solutions with minimal risks.

"It is not profitable" to use domestic technical and technological solutions that have not been tested on the world market. "It is not profitable" to diversify oil, gas, steel, aluminium, etc. large Russian businesses to develop and mass-produce high-tech industrial products. Moreover, in fact, according to the Civil Code of the Russian Federation, any business based on the production of industrial products created by human hands, including microelectronics, loses to business based on products created by nature. Oil, gas, coal, iron and non-ferrous ores, timber, fish, drinking water are things that "grow by themselves". And can be sold with minimal risk on both the global and domestic markets. At the cost of extraction and preparation for sale, providing a high level of profit for shareholders. This is convincingly evidenced by the Bloomberg index, regarding the basis of the business of Russian billions.

This means that under the current Civil Code of the Russian Federation, Russia was, is and will be on the raw material needle and no economic methods, including both progressive taxation and regulation of interest rates, will change this situation. Neither will national projects that will build houses, highways, airports, create a strong information and communication infrastructure, etc. But they will not recreate industries similar to those that were in the USSR with millions of high-paying jobs. Such as the microelectronic and radio-electronic industries, for example. Even based on borrowed technology and equipment from foreign companies, commercial microelectronics is unprofitable for Russian shareholders since it requires billions of dollars in investments in production, technology and development of microelectronic products with high risks of failure on the global semiconductor market. For example, in 2009 the average cost of a semiconductor plant was from $1.6 to $3 billion and the cost of technology development was about $0.6 billion. Although the creation of both these and machine-building industries and jobs in Russia would provide a solution to the problem of poverty, the problem of getting the country's economy out of the "stagnant hole", and Russia's inclusion in the top five economies of the world. And, of course, a solution to the demographic problem, because young people would be provided with stable jobs and earnings. And not just targeted help from the state.

However, under the current Civil Code of the Russian Federation, the production of industrial products, and especially high-tech ones, such as microelectronics, is unprofitable for shareholders of commercial

companies. That is, in other words, in these conditions Russian commercial business is not and cannot be a driving force for scientific and technological progress aimed at solving the problems of Russian society and the Russian economy. Indeed, for example, today Russian commercial business is the driving force behind the use of foreign, but not the creation of its own massively cheap digital technologies. But solely and only to increase the profits of business shareholders by increasing the rate of capital turnover, i.e. increasing the funds invested in the business and reducing the time of their return. Business desires to increase the rate of capital turnover that was and is the main driving force of scientific and technological progress, first in microelectronics and consumer electronics, and then in household appliances, including cars. This is the essence of the processes called the "new technological revolution" [18], and, in the terminology of UNCTAD, the phenomenon of "digital economy", for which, however, according to the authors of the Digital Economy Report 2019, there is not enough understanding [11].

Lack of Sufficient Understanding of the Digital Economy

This is explicitly declared in Section B What is the Digital Economy? Digital Economy Report 2019 (hereinafter – the Report), prepared within the framework of the UN Conference on Trade and Development (UNCTAD) [11]. It is also argued that the lack of a definition of the term is "a consequence of the novelty and lack of sufficient understanding and clarity of the phenomenon in question". In this regard, the Report introduces "a working definition of the term digital economy, which serves as the basis for the analysis carried out in this report" [11]. However, this analysis made in the Report has not resulted in understanding and clarity of the phenomenon in question. Indeed, in the "Conclusion" section, which is entitled "The Digital Economy for the Many, Not the Few," there are no specific political, economic, or technical recommendations to ensure that the benefits of digitalization are equitably distributed. The main content of this section is a general argument that digital technologies can both help and hinder the goal of sustainable development, depending on the policy decisions made. A few simple solutions are mentioned, but even fewer have been tried and tested. Moreover, it is stated that "there is a general lack of reliable factual and statistical evidence for (or against) a particular policy that would ensure that the potential benefits of digitalization are effectively distributed in the first place".

Nevertheless, despite the lack of sufficient understanding and clarity of the phenomenon addressed in the Report, as well as ways to ensure equitable distribution of the benefits of digitalization, the Report concludes by inviting the development community to "explore new ways to support countries that lag in their readiness to participate in and benefit from the digital economy", and to provide assistance aimed at "bridging the digital divide, strengthening the enabling environment for value creation in the digital economy" [11].

Moreover, in the face of this uncertainty, the Report recommends establishing an alliance of donor agencies and encouraging practices in donor support for the digital economy in **developing countries**, with a particular focus on **digital accessibility**. The governing and policymaking body of developing countries are recommended as: "the adoption and implementation of national strategies and programs for digital development", "the integration of donor support for the digital economy into local resource mobilization and allocation systems, including... **public financial management**".

In other words, the Report asks developing countries to fund, with their own and borrowed resources, costly experiments (e.g., "regulatory sandboxes") to understand what the digital economy is and how to ensure that the benefits of participation in it are equitably distributed.

According to UNCTAD (2017a), the elements of the emerging digital economy that can be financed include robotics, artificial intelligence, the Internet of Things, cloud computing, big data and 3D printers, as well as digital platforms, including e-commerce. For this particular case of the digital economy as a collection of the elements listed in UNCTAD (2017a), we can identify the relevant beneficiaries and the benefit-sharing system they have created, in which Russia has no place.

The U.S. semiconductor industry is the most significant beneficiary of the U.S. Internet of Things project

Over the past 20 years, the key factor in the growth of profitability and production of semiconductors was the reduction in the cost per transistor by switching to lower design standards. By now the model of development of the leading U.S. semiconductor industry, which is based on reducing the cost of a transistor

by switching to lower design standards, has practically exhausted itself [12].

The concept of a new model of development of the U.S. semiconductor industry as a catalyst for the growth of the entire national economy was formulated in 2015 in the U.S. Senate's decision to accelerate the development and implementation of the Internet of Things. The initiators and most active participants in the discussion of this problem were representatives of INTEL and Samsung, as well as the U.S. Semiconductor Industry Association. The Internet of Things bill was approved by the Senate in 2017 and sent to the House of Representatives for consideration. The preamble to this law predicts that more than 50 billion devices will be connected to the Internet by 2020, which could generate trillions of dollars in turnover in new economic activity around the world [6].

The basis of this new economic activity will be the production by U.S. companies of hundreds of billions of semiconductors and tens of billions of digital control systems for these devices. It is these companies that will be among the main beneficiaries of the trillions of dollars, that is, the main beneficiaries of the U.S. Internet of Things.

Russia does not possess the technology and does not have the facilities capable of producing such quantities of semiconductors and digital control systems based on them. Products that fall into both the consumer and industrial categories of the U.S. Internet of Things, Russia merely imports or assembles from imported components. So do servers, computing and communications equipment, and mobile devices needed for cloud computing and artificial intelligence, big data, robotics, digital platforms and e-commerce. That is, the beneficiaries of these elements of the emerging digital economy in Russia will primarily be the semiconductor and radio-electronic companies in the United States, but not Russian companies and the state.

Mass-Market Cheap Short-Lived Services based on Mass-Market Cheap Digital Technologies

The formation of this model of service provision is directly linked to the creation in the late 1980s and early 1990s of separate segments of the Internet (the Network hereinafter) and digital technology for the transmission of text messages (e-mail). The cost of text messaging services was determined by the cost of data transmission equipment, including computing and communication equipment of the Network. In turn, the cost of this equipment was determined by the cost of semiconductors, based on which it is made. That is, the cheapening of the cost of semiconductors following the strategy of "double reduction" eventually led to a reduction in the cost of transmission of text and then graphics and video messages on the Network. According to Dr Peering. net, the cost of transmitting a 1 Mbyte message on the Web fell by an average of 61% per year from 1998 to 2010, from more than $1,000 to a few cents. The obvious consequence of this was the intensive cheapening of digital technologies and services based on them. At the same time, the profitability of this non-material "information consumer goods" turned out to be much higher than that of semiconductor. First of all, because of the huge number of services rendered daily (many hundreds of millions of messages transmitted), and also because for an intangible service there are no development and production costs, and its lifetime is determined by the time of message passage in the Network. The high profitability of these services is evidenced by the economic performance of Facebook, Google, Amazon and Apple, which specialize in delivering information and mass-market goods to the consumer. Indeed, the combined value of "The Four" is $2.8 trillion. Facebook and Google invested $29 billion in development in 2017, and Apple held $250 billion in overseas accounts that year, while Facebook capitalized $448 billion in 2018 and Intel only $165 billion. Every day, 1.2 billion users spend an average of 50 minutes on Facebook. A Facebook conversion is one in six minutes on the Internet and one in five minutes on mobile [16]. The strategic task of both this company and the whole "Four" is to increase the number of appeals, both by offering new services, and by increasing the number of its user community, or at least by maintaining this number. The prerequisite for solving this problem is to know how to analyze large amounts of data from users, and based on this analysis to form new types of services that will increase both the number of hits and the number of users. In other words, the companies of the "Four", or rather the shareholders of these companies, are the main beneficiaries of scientific and technological progress in the field of mass cheap digital technology, and such elements of the digital economy as big data and artificial intelligence, which are for the "Four" the key tools to increase the profitability of non-material "information consumer goods". These are tools of soft enslavement of people by the abundance of offered convenient and attractive services, depriving them at the end of essential skills and abilities for an independent and independent life from these companies. Such as, for example, the ability to memorize and analyze large volumes of data, building long

chains of inferences, present the results of the analysis in writing, read and understand complex texts, etc. A person deprived of such skills and abilities is an ideal consumer of all the new services provided by each of the "Four" companies because he trusts them almost unconditionally and is enslaved by them.

As noted in the book *The Four* by New York University Business School professor Scott Galloway [16], the intense cheapening of digital technologies and the high profitability of replacing employees with these technologies have led to the accelerated destruction of jobs and the devastation of related sectors of the economy. For the first time since the Great Depression, thirty-year-old Americans are living worse than their parents did at the same age [16]. The Four companies are creating high-paying jobs, but in tiny numbers, that is, substantially less than they are destroying. They are building an America of 3 million masters and 350 million serfs [16]. That is, the payment for the use of convenient and attractive services of The Four is the destruction of jobs and lowering the standard of living of the American population, which is not the beneficiary of scientific and technological progress in the mass cheap digital technology and technologies of big data and artificial intelligence.

An example of plans for the accelerated destruction of jobs and the enslavement of users in Russia is the planned reduction of half of the 330,000 employees of Sberbank by 2025. Of course, by actively transferring bank services to the digital sphere [7], as well as building personal work with each client and increasing the loyalty of its users, that is their entrenchment based on big data technology and artificial intelligence.

In five years, 80% of decisions will be made by artificial intelligence. The Supervisory Board of Sberbank approved the transformation of this credit institution, which will go far beyond banking services. The consequence of this transformation will be the closure of physical branches and thereby reducing the number of employees [7]. That is, in fact, as a result of this transformation based on PJSC Sberbank will be created a company similar to the "Four", which will create high-paying jobs, but in a tiny amount, that is significantly less than destroys and build Russia, which will have 1.4 million owners and 140 million serfs. Of course, the main beneficiaries of the planned transformation of Sberbank will be its shareholders, 45% of whom are foreigners.

However, the world is already ruled by a new economy of non-material "information consumerism", in which the winner takes all. The leader of this new economy is the "Four" – Amazon, Google, Facebook and Apple, whose entire economic power is aimed at destroying competition. "The Four" either absorbs competitors or strangles them, repeating the functions of the competing product, that is, in the foreseeable future, it is likely that the transformed Sberbank, and the Russian companies Yandex and Ozon, many times inferior in financial power to the "Four", will either be bought by it or destroyed.

This casts great doubt on G. Gref's assertion that the creation of a digital economy is extremely necessary for our country's economy because it is a global trend [17]. Especially since twenty-five years of blindly and thoughtlessly following various global trends have ultimately led to the need to solve the problems of taking the country's economy out of the "serious stagnation hole", defeating poverty and making Russia one of the world's top five economies.

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