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Адрес редакции:
125993, Москва, ГСП-3,
Ленинградский пр-т,
53, к. 5.4
Тел.: **8 (499) 943-94-53**
E-mail: **vestnikfinu@mail.ru**
Сайт: **financetp.fa.ru**

Оформление подписки
в редакции
по тел.: **8 (499) 943-94-31**
e-mail: **MMKorigova@fa.ru**
Коригова М.М.

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Editorial address:
53, Leningradsky prospekt, office 5.4
Moscow, 125993
tel.: **+7 (499) 943-94-53**
E-mail: **vestnikfinu@mail.ru**
Site: **financetp.fa.ru**

Subscription in editorial office
tel: **8 (499) 943-94-31**
e-mail: **MMKorigova@fa.ru**
Korigova M.M.

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Key Challenges Facing Modern Finance: Making the Financial Sector Serve Society

J.E. Stiglitz
Columbia University, New York, United States
https://orcid.org/0000-0001-6149-046X

ABSTRACT

The purpose of this paper is to discuss the broad issue of how to make the financial sector serve society, at least serve it better than it has until now. Finance has been the centre of attention, for better or for worse, for more than a quarter-century, partly because of its increasing share of GDP, and partly because of the negative behaviour and activities of its professionals. The paper is divided into six parts. The first section concerns the necessity of stopping adverse behaviours (activities). Section II presents some measures aimed at encouraging positive activities and promoting positive behaviour. Section III discusses a crucial issue concerning the urgent need to curb rent-seeking. Section IV discusses taxation in the context of the corrosive effect of tax competition. Section V, using analysis provided, presents measures to enhance the role of government in restoring the public's eroded trust in financial institutions. Finally, Section VI discusses questions about how we can restore trust.

Keywords: regulation; financial crises; boom-busts; Dodd-Frank Act; Great Depression; Great Recession; housing boom; banking; inequality

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PRELIMINARY CRITICAL REMARKS

I want to begin by first emphasising that the financial sector is vital for the functioning of any economy. No country has been successful economically without a well-functioning financial sector. On the other hand, a malfunctioning financial sector can lead, as it did in 2008, to an economic crisis. In fact, there were a large number of crises around the world before, but the 2008 crisis was the worst after the end of WWII. It was because of deregulation of the financial market, which began in 1980. And most of these crises we can attribute to misbehaviour or misjudgements of the financial sector.

The experience of the crisis should have led us to change our economic models, our economic priorities, and our regulations of the financial sector. We have identified the problems that gave rise to the financial crisis, but our solutions to those problems have been highly incomplete — and are yet at risk of being undone[1].

The big question always centres on systemic risk: To what extent does the collapse of an institution imperil the financial system as a whole? America's financial system failed in its two crucial responsibilities: managing risk and allocating capital. Moreover, many of the worst elements of the US financial system, for example toxic mortgages and the practices that led to them, were exported to the rest of the world. It was all done in the name of innovation, and any regulatory initiative was fought off with claims that it would suppress that innovation. However, we do not overlook political forces that shape regulations over

[1] The Dodd-Frank Wall Street Reform and Consumer Protection Act whose long title is "An Act to promote the financial stability of the United States by improving accountability and transparency in the financial system, to end 'too big to fail', to protect the American taxpayer by ending bailouts, to protect consumers from abusive financial services practices, and for other purposes." (Effective July 21, 2010). Regarding the Republican-led rollback of some provisions of Dodd-Frank in 2018, this move from increased regulation after a crisis to deregulation during an economic boom has been a recurrent feature in the United States. See, for example, Dagher JC. Regulatory Cycles: Revisiting the Political Economy of Financial Crises. November 27, 2017. Available at SSRN: https://ssrn.com/abstract=2772373 or http://dx.doi.org/10.2139/ssrn.2772373. See also, for example, "What Does the Partial Rollback of Dodd-Frank Mean for the Largest U.S. Banks?" at https://www.forbes.com/sites/greatspeculations/2018/05/29/what-does-the-partial-rollback-of-dodd-frank-mean-for-the-largest-u-s-banks/#21ce13892f19 or "Congress Approves First Big Dodd-Frank Rollback" at https://www.nytimes.com/2018/05/22/business/congress-passes-dodd-frank-rollback-for-smaller-banks.html.

time. There is a widespread view that financial innovations are much ahead of regulators.

The financial crisis of 2007–2008 was partly determined by a catastrophic collapse in confidence. Financial markets hinge on trust, and that trust has eroded. Moreover, the crisis in trust extends beyond banks. However, before we treat our economy, we first need to determine what is sick [1, 2].

A malfunctioning financial sector can lead to slow growth because of:

- A failure to provide resources necessary to create new businesses and expand existing businesses and therefore to allocate capital well;
- A failure to develop good instruments for risk-sharing;
- Predation draining energy from the vitality of the economy;
- Greater inequality;
- Being the major source of rent-seeking in modern society.

A malfunctioning financial sector can lead to erosion of trust in other institutions:

- Especially in response to flawed response;
- It seemed to reflect capture, revolving door between finance and regulators, lobbying, monster campaign contributions. All tarnished the view that there was "good governance" and enhanced the view that the system was rigged.

The 2008 crisis spawned the "Occupy" movement worldwide and gave rise to the Tea Party.

In recent years, the financial sector of advanced countries has failed in all of these dimensions:

- Reduced flow of funds to small- and medium-sized enterprises;
- Excessive flow of funds to socially harmful sectors — coal, cigarettes;
- Insufficient flow of funds to areas of great social need — green investments (The Green New Deal).

The long list of "misbehaviours":

- Predatory lending;
- Market manipulation;
- Insider trading;
- Abusive credit card practices;
- Exploiting market power (e.g. in credit cards);
- Facilitating tax avoidance/evasion and other nefarious activities;
- Front running (including its modern version, High-Frequency Trading).

All these failures have very broad implications. I argue that the American system of capitalism has fallen down and needs government help to get back up. And I think that Friedmanite self-regulation is an oxymoron. I see an essential role for government in regulation and more active lending. And I stress in my latest book, *People, Power, and Profits: Progressive Capitalism for an Age of Discontent,* that "The view that government is the problem, not the solution, is simply wrong. To the contrary, many if not most of our society's problems, from the excesses of pollution to financial instability and economic inequality, have been created by markets." The true sources of wealth and increases in standards of living were based on education, advances in science and technology, and the rule of law. Therefore, the assault by free- market fundamentalists on the judiciary, in universities, and in the media undermines the very institutions that have long been the foundation of America's economic well-being, and its democracy [3, 4]. It may not be too late to create a ***progressive capitalism*** that will recreate shared prosperity. Too many have made their wealth through the exploitation of others rather than through wealth creation. From this follows the broad agenda:

- Stop adverse activities;
- Encourage positive activities;
- Curb rent-seeking activity;
- Make tax avoidance and tax heavens impossible;
- Rebuild a positive role for government;
- Restore trust in state institutes and democratic values.

I'm going to discuss six areas within this broad agenda of trying to make sure that the financial sector can serve society. And in each of these areas, I'm going to try to illustrate how advances in theoretical work and the analytics, and empirical research, explain these failures and what the government, what society, can do to address those failures.

What I'm going to do is highlight the nature of the pervasive imperfections in the markets and the kinds of potential remedies to these failures.

1. STOPPING ADVERSE BEHAVIOURS

The U.S. finance, insurance and real estate (FIRE) sector accounted in the middle of 2019 for about 7.4 per cent of GDP. It increased from 2.5 per cent of US GDP after the end of WWII to about 8 per cent before the financial crisis. Moreover, those in the financial sector earned very

high incomes. But there was a big mistake made in many countries. They thought that the high incomes meant that the sector was highly productive, that it was promoting the economy's growth and its stability. And that the bankers were being rewarded for their societal contributions in line with standard principles of economics, neoclassical economics. And these are perspectives that dominated the economics profession since Adam Smith.

But researchers provided a different interpretation of what was going on; in fact, the data showed that as the percentage of GDP that went to finance increased, growth was slower. The economy was more unstable. The process of financialisation was more related to the growth of inequality. And it was not just correlation, it was causation. And the causation was actually related not only to the growth of inequality but to the slowing down of the economy [5]. And it is related to a concept that economists referred to as ***rent-seeking***.

Experience showed us then the market participants were engaging in behaviour with excessive risk-taking, which can put the financial system on the brink of collapse. This excessive risk-taking is a "Mother of all Moral Hazards" because, usually, a moral hazard exists when an entity engages in risk-taking behaviour based on a set of expected outcomes in which another entity bears the costs in the event of an unfavourable outcome. However, among the set of expected outcomes can also be the state's promise of bailouts or any other indemnity guarantee. Further, extreme risk-taking behaviour is exacerbated by the expected promise of a bail-out. It creates one-sided bets and lowers the cost of funding (no bankruptcy risk premium) for "too big to fail" banks, distorting the financial sector, exacerbating unhealthy risk-taking and the size of eventual bailouts[2].

Such excessive risk-taking can take on many forms, including the excessively rapid expansion of credit (by any institution, of any type of credit), which is a strong predictor of troubles down the line. But to be "too big to fail" is only one side of the story. Many economists were devoting their research to getting around standards and regulations designed to ensure the efficiency of the economy and the safety of the banking system. Unfortunately, they were far too successful. They paid particular attention to the structure of the financial system. Another aspect is the existence, and growing share, of shadow banking systems. Shadow banking primarily represents a risk because of the lack of stability of the source of funding and government oversight.

It is not just the problem of being a "too big to fail" bank but, first of all, of being "too interconnected (too intertwined) to fail" and "too correlated to fail." Interlinked banks can lead to a systemic crisis (e.g. in the aftermath of the failure of Lehman Brothers). Interlinkages and connectedness are associated with the so-called *domino effect*, chain reactions caused by something unexpected in one node of the network. Dense networks can absorb small shocks but amplify big shocks, and make it difficult to organise an efficient "bail-in" — where other banks contribute to preventing bankruptcy cascade.

Greenwald and Stiglitz [3] developed formal models of debt deflation and a theory of monetary policy focusing on the role of credit. In this book, we explain the other factors that affect lending — among which is the risk, which has only grown worse as the economy's woes have deepened. With Gallegati and other co-authors, we explored the credit interlinkages that have played such an essential role in this crisis. These models explore the possibility of bankruptcy cascades. They explain how global financial integration may serve not only to share risk but also to facilitate contagion, as a failure in one part of the economic system — in this case, the US — spreads around the world [6–8].

There are two ways of becoming wealthy. One is to increase the size of the national pie. That is called wealth-creation. And the other is to steal a bigger share of the pie for yourself. And that is called rent-seeking or rent-grabbing. And much of the income in the financial sector was associated with this kind of rent-seeking activity, wealth-grabbing — exploitation of one kind or another.

Research in basic economics and finance has helped to see more clearly what is going on. We have come to understand better what a well-functioning financial market looks like. Ideas like the Modigliani-Miller Theorem [9][3], informationally efficient markets, capital asset pric-

[2] In 2009 the Financial Stability Board (FSB) started to develop a method to identify systemically important banks to which a set of stricter requirements would apply. **SIB** is the abbreviation for Systemically Important Bank. The term **SIFI** is the abbreviation for Systemically Important Financial Institution, which in addition to banks also includes insurance companies and financial market infrastructure providers deemed systemically crucial by regulators. There are separate lists of global systemically important banks, **G-SIBs**, domestic systemically important banks **D-SIBs (**known in Europe as "national SIFIs") and regional systemically important banks **R-SIBs.**

[3] Franco Modigliani was awarded the 1985 Nobel Prize in Economics for this and other contributions. Merton Miller was awarded the 1990 Nobel Prize in Economics (along with Harry

ing, Arrow-Debreu securities — all these clarify what a perfect market *would theoretically* look like. And what we know now is that the market that we see is very imperfect. While I was still a graduate student at MIT, I began to suspect that something was wrong with the Modigliani-Miller theorem [10, 11].

In my paper "Modigliani, the Modigliani-Miller Theorem, and Macroeconomics", presented to a conference, "Franco Modigliani and the Keynesian Legacy," at The New School from April 14 and 15, 2005, I analysed the Modigliani-Miller theorem in retrospect. I wanted to focus on the *indirect* contribution that Modigliani exerted on macroeconomics through his pioneering work with Merton Miller on corporate finance.

The most important conclusion of Modigliani and Miller was that corporate financial policy makes no difference to how the firm actually finances its investment. It means that the value of the firm is independent of how it was financed. Therefore, an immediate corollary is that the cost of capital does not depend on how the firm was financed. Besides theoretical aspects, for thousands of people working on Wall Street in corporate finance, Modigliani had shown that they did not know what they were doing.

And much of the research I am going to describe here is an attempt to understand why the market looks so different from a world depicted by the perfect market, perfect information, perfect competition etc.

But to give you just one example of how different the standard theory and the actual practice are, let me refer to some of the discussion that occurred in the years before the 2008 crisis.

A standard view of financial markets that is taught all over the world says that if you diversify your risk, you will become more stable. And unfortunately, many of our policymakers in Washington and at the IMF up until now believe what they were taught in the universities. They believe that a more diversified financial market is more stable. Hence, there were profound implications for how they responded to the crisis as it began to develop.

So, for instance, after the real-estate bubble broke in the United States in 2006, the crisis started to get even worse in 2007[4] and then finally it fell apart in 2008 when Ben Bernanke was the Chairman of the Federal Reserve[5]. Was he worried about the collapse of the housing market? He said, "No". He wasn't worried because we had a very highly diversified financial system! He was obviously wrong. We did have a crisis. And because he felt so relaxed, he didn't do what he should have done to prevent the economy from the worst major downturn since the Great Depression that began in 1929.

So, in the last 25–35 years, all the ideas that underlie a perfect market and a perfect financial market have been questioned. Let's take once more as an example the Modigliani-Miller theorem that says that the financial structure of a corporation does not matter. But the question is when and why it does not matter.

To me, it was so amusing that so many business schools taught the Modigliani-Miller theorem and took it seriously because half of New York's Wall Street is concerned with figuring out the optimum financial structure. And none of those people believes that the financial structure doesn't matter. So, we were teaching our students that according to the most important theorem in finance — the Modigliani-Miller theorem — financial structure doesn't matter. Yet it was evident that it did matter!

Another example is the research of Robert Shiller[6], who also gave a talk here in the same series. He got his Nobel Prize for showing that financial markets are not informationally efficient. Shiller is the co-creator of the widely followed Case-Shiller home price index, which quantifies shifts in U.S. housing prices. In the early 2000s, housing prices in the United States and several other nations rose to levels far above traditional valuations relative to rents. As Shiller's work predicted, this was driven by *excessive optimism* about future prices: about people getting rich by flipping houses, which contributed to a belief that house

Markowitz and William F. Sharpe) specifically for "fundamental contributions to the theory of corporate finance".

[4] When on April 2007 New Century, an American real estate investment trust specialising in sub-prime mortgages, filed for Chapter 11 bankruptcy protection.

[5] Ben Shalom Bernanke was 23rd Chairman of the Council of Economic Advisers (June 21, 2005 — January 31, 2006), Member of the Board of Governors of the Federal Reserve (July 31, 2002 — January 31, 2014), 14th Chair of the Federal Reserve (February 1, 2006 — January 31, 2014). On February 20, 2004, Bernanke gave a speech in which he postulated that we are in a new era called the Great Moderation, aka the Bernanke Doctrine. It was also the time when the Fed initiated Quantitative Easing, creating $1.3 trillion from November 2008 to June 2010 and using the created money to buy financial assets from banks and the government. In 2005, Bernanke coined his another famous term 'saving glut'.

[6] He presents results of his last research in Shiller Robert J. Narrative Economics: How Stories Go Viral and Drive Major Economic Events. Princeton, NJ: Princeton University Press; 2019.

prices would always go up. He names these stories *narratives*, which spread economic uncertainty, discouraging consumer spending and business investment. So, financial markets do not efficiently reflect available information, contrary to the Efficient Markets Hypothesis (the position of Eugene Fama).

Also, I would like to mention my work with Sanford (Sandy) Grossman decades ago, beginning in 1976 and continuing into the 1980s, where we showed that in reality markets *could not* be informationally efficient [12–15].

If markets were informationally efficient, nobody would have any incentive to gather any information, and so the market would not be informative at all.

So, what I want to try to explain is the need to understand why financial markets differ from the way they are theoretically characterised, and that assumptions of perfect markets, perfect information, the perfect competition, really do make a difference. And I hope it is understandable why the financial sector has not performed the functions it was thought it would perform and why the financial sector hasn't served society.

Besides, a malfunctioning financial sector can lead to slow growth. The reason for this is again easy to understand. The economy always needs to provide the resources necessary for creating new businesses and extending existing businesses. For example, some critical problems are facing small businesses, and lack of funding was at least one of them. The failure to allocate capital wealth will limit growth; the failure to develop instruments for sharing risk will limit growth as well. So, predation and exploitation sap energy from the vitality of the economy.

It is also the case that a malfunctioning financial sector can lead to the creation of inequality. As I mentioned above, it's a major source of rent-seeking. A malfunctioning financial sector not only affects the economy, but it also affects society more generally because it can lead to erosion of trust in other institutions. The way the US government responded to the financial crisis meant that a lot of people developed a lack of trust in government. They said the government had failed to regulate the banks adequately, but then when we had a crisis, the bankers cut off the money and undermined trust in society.

Maybe I should tell a little story of how I was on a small conference call with Barack Obama right after Lehman Brothers filed for Chapter 11 bankruptcy protection on September 15, 2008, after the Federal Reserve declined to guarantee its loans and prior to the beginning of the financial crisis. The question was, "President Bush had proposed a 700 billion dollar bailout of the banks." And I do not know if you know, 700 billion dollars is a lot of money. But the first questions in this conference call were mostly from the bankers. The first question of the bankers was, "Why only 700 billion dollars?" And the political answer was, "Don't worry, if you need more money there'll be some more, but we thought that a trillion dollars sounded too big". So, it was a political answer, not an economic answer[7].

Unfettered and under-regulated financial markets do not work, and the current regulation and regulatory institutions failed — partly because one is not likely to get effective regulation when there are regulators who do not believe in regulation.

The response to the crisis seems to reflect the captured government by the financial sector exhibiting a revolving door between finance and the regulators, with the Secretary of Treasury coming from Goldman Sachs or some other large bank over and over again.

It reflected the lobbying, the huge campaign contributions, which all tarnished the view that there was good governance and hence the view that the system was great. It gave rise to the Occupy movement worldwide. And it gave rise to the Tea Party movement and then, in turn, gave rise to the extreme politics that we are now experiencing — populism and nationalism as well. So, these failures have consequences not just for the economy but for our politics and for our society.

There is also an excessive flow of funds to socially harmful sectors like coal and cigarettes, and a reduced flow of funds to small- and medium-sized enterprises; there is an insufficient flow of funds to areas of greater social need such as green investments; there is a long list of misbehaviours like predatory lending, market manipulation, insider trading, abusive credit card practices, exploiting market power, facilitating tax avoidance, front-running, and its modern form — high-frequency trading.

[7] The Emergency Economic Stabilization Act of 2008, often called the "bank bailout of 2008," was signed into law by President George W. Bush. The act became law as part of Public Law 110–343 on October 3, 2008. The law created the Troubled Asset Relief Program (TARP) to purchase distressed assets from financial institutions with the $700 billion funds to purchase toxic assets from banks. Estimates for the total cost of the bailout to the government are as much as $29 trillion [3]. See Felkerson J. $29,000,000,000,000: A Detailed Look at the Fed's Bailout by Funding Facility and Recipient. *The Levy Economics Institute Working Paper No. 698;* December 2011. URL: http://www.levyinstitute.org/pubs/wp_698.pdf.

And, taken together, what this implies is that there's an important role for government. But of course, if the government is going to perform this role, there have to be good public institutions. That means that if your financial sector is going to work, you have to have a good regulatory sector as well.

The implication is very clear that unfettered and underregulated financial markets do not work and can be very corrosive to the economy and society, so that means you have to have an effective way of regulating them. Moreover, the current regulation and regulatory institutions have failed — partly because one is not likely to get effective regulation when there are regulators who do not believe in regulation.

In the aftermath of the 2008 crisis, most of the discussion focused on the excessive risk-taking that contributed to the 2008 crisis and what were some of the reasons behind that excessive risk-taking. One of the things that was pointed out was that when you have banks that are too big to fail there is a one-sided bet: If they undertake risk and it works out, they walk off with a lot of profits, but if things don't work out, well, the government will endeavour to bail them out.

So obviously, if you have a one-sided bet you take a big bet. When things turned out well, the bankers did very well. But when they didn't turn out well, as in 2006–2008, society pays an enormously high price.

In many ways, 2008 was a particular example, where the banks were in one particular area, in mortgages, but if you look around the world at different crises, one of the forms they can take is excessive lending, the excessive rapid expansion of credit.

And the evidence is pretty clear that the rapid expansion of credit by any institution, of any type of credit, is the wrong predictor of trouble down the line.

The issue of "too big to fail" banks now gets a lot of attention, but it's not the only problem. There's also a problem with the shadow banking system, but also of "too interconnected" or "too intertwined to fail" financial systems and "too correlated to fail" financial systems. An example of "too intertwined to fail" is what happened, when Lehman Brothers collapsed. The collapse of one bank leads to the collapse of financial institutions all around the world.

This is an example of what economists refer to as "an externality," where one bank, one firm, one financial institution does have big consequences for others. The failure of one bank leads other banks to fail and then eventually leads the whole economy to fail.

And there are inherent reasons why it's very difficult to price these externalities, to take these externalities into account, to make the individuals fully respond to these externalities.

I was the chief economist of the World Bank during the East Asia Crisis. In that period in Indonesia and Korea and Thailand, there were systemic bankruptcies, and in a couple of these countries almost 50 per cent of the companies in the country were not able to pay what was owed, and in the others, it was 70 per cent. That meant one had to think about how the bankruptcy of one enterprise or one bank leads to the bankruptcy of others.

And that lead to some research that I did with my colleague Bruce Greenwald and another group of researchers headed by Franklin Allen and Douglas Gale at Wharton Business School at the University of Pennsylvania examining networks of financial institutions and how, if you depended on the structure of the network, they were interlinked among themselves and interlinked with firms, how robust the financial system would be [16–18].

So these studies were done in 2001, 2003 and the early part of the decade well before the financial crisis. We wrote that everybody really has to pay a lot of attention to the nature of the financial structure. Unfortunately, the central banks, with one exception, paid no attention. The only central bank that paid any attention to this research was the Bank of England, and it was only their research department. Andrew G. (Andy) Haldane[8], who was a director of the research department at the Bank of England, understood what was at stake here. Well, the consequences of not paying attention to this were very, very severe.

Many of the macroeconomic models used by the central bankers did not even have banks in them. It was quite remarkable because if you did not have banks, you wouldn't have central banks. So there was a kind of cognitive dissonance: How could you have a model that didn't recognise the importance of banks? But even when they had banks, they used the concept of a *representative bank,* as if all banks could be aggregated into a single bank [19]. But we argued that that was wrong, that you needed to look at the nature of the financial structure, of how they

[8] A. G. Haldane is now the Chief Economist and Executive Director, Monetary Analysis & Statistics at the Bank of England.

were linked, whether they were what we call *sparse linkages* or *dense linkages*.

And we argued that some of the changes that were going on were helping the system to absorb small shocks. However, if you got a big shock, the whole system would collapse.

I asked people at the New York Federal Reserve whether they knew that when Lehman Brothers went down, or it could have been any other bank, what the consequence for the whole financial system would be. And the answer was, "No." It was really quite remarkable because during the period from the breaking of the real estate bubble through 2007, beginning of 2008, everybody in New York City knew that there would be a failure of a major bank. We had a debate about which of the banks would fail, but we felt very confident that one of the banks would fail. And we thought it was very important for people at the New York Federal Reserve to know if that happened, what the consequences would be for our entire financial system. Moreover, they never bothered to research it to figure this out.

So the important point is that financial structure does matter and this itself has become an important subject for many researchers. Today, there is a vast literature that has now developed trying to understand what are good, robust financial structures, structures that have financial stability versus those that do not [20–23].

There is a broader question that had to be asked: The banks behaved badly, but why was that? How do we explain their behaviour? And there are two sets of problems. One is the incentives at the institutional level. I mentioned one of those problems, that is, too big to fail, or too intertwined to fail, where the bank did not feel the consequences of undertaking too much risk because the government absorbed the downside risk.

But there was another problem — the individuals who make the decisions at the bank. The executives, the bankers, they themselves did not bear the full consequences of their decisions. It is a problem that is now referred to as the problem of corporate governance — the problem of the misalignment of incentives of individuals with those of the organisation and more broadly those of society.

It was a problem that my research in the economics of information helped expose, because what I pointed out was that in the presence of imperfect and asymmetric information, you have to delegate.

If you are the owner of the firm, you cannot make all the decisions. You delegate it to somebody below you, to the managers. But there you have a problem: If you delegate, you have to make sure that their behaviour is in line with your interest. And the basic theory was with imperfect information you could never do that perfectly. And the question was how imperfect was the alignment.

After the crisis, we had hearings in Congress. Alan Greenspan had been the chairman of the Federal Reserve at the time when a lot of the bad lending practices occurred. Alan Greenspan said he was surprised that the bankers had not managed the risk better. But I was surprised that he was surprised. Because, if he had looked for a minute at the incentive structures facing the bankers, he would have expected them to undertake excessive risk.

There are stock options, which meant that when things went up they did very well, and when things went down, they did not pay any price. So, just as the banks got only the upside risk, the bankers got only the upside risk of the bank. It was a doubling of mis-structuring of incentives. They encouraged short-sighted behaviour — an excessive risk-taking. So, it is not a surprise, given both the institutional incentives and the managerial incentives, that here was excessive risk-taking.

And, as a broader issue that I will come back to a little bit later, is the difficulty of aligning the incentives of the bankers and management more broadly with the interest of society for long-term economic growth. The fact that managerial incentive schemes are excessively short-term in focus means that it is very hard to sustain long-term economic growth.

There were other aspects of adverse behaviour besides the excessive risk-taking that I have just described. The financial sector is often in a position to exploit market power, to exploit asymmetries of information and individual vulnerabilities. Information asymmetries mean that somebody knows something that others do not know. The business of the financial sector is to know, is to gather information, so they often have a lot more information than other people. It is not only according to the principle Know Your Customer (alternatively known as know your client) or simply KYC.

Modern behavioural economics, which has been a subject of two of the recent Nobel prizes[9], has identified the importance of irrationalities and individual vulnerabilities.

One of the things that concerns me a great deal these days is that AI and big data may enhance these potentials

[9] Richard Thaler in 2017 and Robert Shiller in 2013.

because it means that they can gather a lot more information and use that information to exploit individual vulnerabilities. And that is why there have to be strong regulations to prevent these abuses.

A list of abuses, which I mentioned earlier, include market manipulation, incentive trading, predatory lending. Some of these we were not aware of until after the crisis, like the foreign exchange manipulation that many banks were engaged in.

So it was predictable, and it was actually predicted, that deregulation would lead to a wide range of abuses. What was remarkable was that for 40 years after the Great Depression we had no financial crises. From around 1930 until the 1980s, almost a half-century, we had no major crisis. And the reason, I think, was that we had good regulation.

But then people made the wrong inference. They said, because we have had no financial crisis we do not need regulation. Of course, if you have good regulation you don't see the kinds of excesses that lead you to need regulation, and so they stripped them away.

And it was when we began a deregulation process that we began to see a whole variety of abuses including the financial crisis, but also those kind of abuses that I described before.

2. PROMOTING POSITIVE BEHAVIOUR

Much of the discussion in the years after the 2008 crisis focused on how we stop this kind of bad behaviour, like excessive risk-taking. The interesting thing is that there been a lot of good discussion on how we actually get the financial sector to do what it is supposed to do. That is to say, if the financial sector does nothing but exploit people than why have it at all? There is a reason we have a financial sector. As I said, no country has been successful without a well-functioning financial sector, and I described what it is the well-functioning financial sectors are supposed to do. The question is, how we can get the financial sector to actually do what it is supposed to do?

The hope was that somehow, by curtailing the profitable anti-social activities, we would encourage them to return to more other traditional activities. We could have done a lot more to encourage positive behaviour. For instance, we could have or should have made providing lending to small businesses a condition for the borrowing of funds or access to the central bank 'window'. Instead, even though the IMF and the World Bank put conditions on all the loans and the US Treasury always makes a set of conditions when the IMF and the World Bank make a loan, no conditions were put on the money, that 700 billion dollars that I mentioned, that we gave to the banks.

And what did they use that money for? To pay out dividends and bonuses, but not lend to small businesses. And that was one of the reasons the economic crisis was so severe.

An exciting aspect of the structure of America's financial system is that there is one part of our financial system that actually works well.

An exciting aspect of the structure of America's financial system is that there is one part of our financial system that actually works well. And that is cooperative banks. We shall call them credit unions. The credit unions did not engage in predatory behaviour because they are owned by the people who put their money in. They are owned and managed by their members, all of whom have accounts at the bank. It is why they never engage in excessive risk-taking, and after the crisis credit unions were the only part of the financial system that continued to lend and increase their lending in fact to small businesses. There are thousands of credit unions in the United States holding assets ranging from over 10 billion dollars to under 1 million dollars. Credit unions may be chartered under state or federal law. Credit unions are not-for-profit organisations to serve their members rather than to maximise corporate profits.

However, there is a broader problem in lending that I want to draw attention to. After the financial crisis Ben Bernanke — I don't mean to pick on him in particular, but being the Chairman of the Federal Reserve gives you a position of saying quotes that people remember — he said that the world faced a *savings glut*. He said the problem was that there were too much savings.

Having been a chief economist of the World Bank, I could not understand that because when I looked around the world, I saw a shortage of savings. We needed money for investment in infrastructure, we needed it for investment in education, and health, and technology — every area I could see — we needed more investment funds. So

how could he say we had a surplus of savings? It seems absurd.

Well, there really is a problem. Many of society's major problems require long-term investments. Long-term investments are needed to retrofit the economy for climate change, for infrastructure, and much of the world's funds are long-term: the sovereign wealth funds, the pension funds. However, between the long-term savers and long-term investors' needs exist short-term financial markets, with benchmarks and incentives focused on the short term. So, by putting these short-term financial institutions between the long-term savers and long-term investors, you get a kind of paralysis. You have got a savings glut.

And what we need now is to encourage more long-term thinking in the financial markets. And part of this is a need for more public financial institutions. It brings me to the role of development or infrastructure of green banks. Frankly speaking, the attitude of economists, of official institutions actually towards development banks, has changed very dramatically in the last twenty-five years.

It used to be that the World Bank and IMF always criticised development banks (aka *development finance institution* (DFI) or *development finance company* (DFC)). It was a curious criticism because they were development banks, but they said they had a monopoly on being a good development bank, and other development banks were not going to be good. Well, now as we look around the world, there are a large number of very successful development banks. And it is not just limited to developing countries. Many developed countries have successful development finance institution (banks). However, let me make a point here: There are problems sometimes because it is not an automatic recipe — you have to do it well.

The largest development bank is the European Investment Bank, which had several decades of good investment. And now, several new development banks are being founded with a particular focus on climate change. Russia was one of the founders of the New Development Bank, which is called the BRICS Bank, which is flourishing now. During the sixth BRICS Summit in Fortaleza (2014), the leaders signed an agreement establishing the New Development Bank (NDB). The inaugural meeting of the Board of Governors of the NDB was chaired by Russia and held on the eve of the Ufa Summit on 7 July 2015, when the Bank formally came into existence as a legal entity.

Following that, the Asian Infrastructure Investment Bank (AIIB), headquartered in Beijing, was founded and began operations in January 2016. It has now grown to 102 approved members worldwide. It is a multilateral development bank with a mission to improve social and economic outcomes in Asia.

But even my state, New York State, has founded a new development bank focusing on climate change, which has proven to be very successful. NY Green Bank is an agent for greater private-sector investment in sustainable infrastructure with the mission to accelerate clean energy deployment in New York State by working in collaboration with the private sector to transform financing markets.

Summing up, all these new banks can take advantage of new instruments, broader mandates, new governing principles, and play a pivotal role in putting together new projects. This perspective of the positive role that development banks can play in mobilising funds for important social needs really contrasts with what's been happening in the private financial sector.

Now I will talk more about the United States and some of the Western European countries.

Traditionally, many of the textbooks that you probably used talked about banks as "intermediating." They take funds from households (entities) that have a surplus of funds and give them to those enterprises that need the funds to make investments to create jobs. Namely, that is called intermediation. Well, if you look at the data for the United States, the banks have been dis-intermediating. The flow of funds is going the opposite way. For the last twenty years, money has been going from the firms to the household sector.

So the money that was inside the firm, that could have been used for investment, for creating new jobs, instead has gone to rich individuals who own the firm and that has been one of the reasons why we have had weak aggregate demand and slow economic growth.

Just as an example, we had a tax bill in December 2017[10]. A Trump administration staffed by plutocrats — most of who gained their wealth from rent-seeking activities rather than from productive entrepreneurship — have

[10] The *Act to provide for reconciliation pursuant to titles II and V of the concurrent resolution on the budget for fiscal year 2018,* Pub.L. 115–97, is a congressional revenue act of the United States originally introduced in Congress as the Tax Cuts and Jobs Act (TCJA), that amended the Internal Revenue Code of 1986. Signed into law by President Donald Trump on December 22, 2017. Four winners of the Nobel Prize in Economics have spoken out against the legislation: Joseph Stiglitz, Paul Krugman, Richard Thaler, and Angus Deaton.

rewarded themselves. It was a big gift to corporations and the ultra-rich. It lowered the taxes on billionaires and corporations. It was a very peculiar tax bill because the problem facing the United States is huge inequality. It raised taxes on the majority of people in the second, third and fourth quintiles, the broad middle class, and lowered taxes on billionaires and rich corporations. If inequality were a problem before, enacting the tax reform will make it much worse [24].

Moreover, the promise was that it was going to lead to more investments. It didn't. A little bit. Most of the money was used to have share buybacks. Share buybacks are just a way of distributing money from the company to shareholders in a manner that is subjected to less taxation. Last year, a trillion dollars went to share buybacks. That is money that could have gone into investment but did not; could have gone into increased wages, but did not.

It has become such a big problem that there are now a number of proposals to regulate or even forbid share buybacks. The United States — and much of the world — confronts today four central problems: widening income inequality; growing job insecurity; climate change; and anaemic productivity growth. There is an important positive agenda that the financial sector could be encouraged to do. It has not been doing that; it has been doing a variety of excessive risk-taking, a variety of dis-intermediation instead.

Mark it well: America's large corporations are sitting on a couple of trillion dollars. And the lack of investment is not because profits, either before or after-tax, are too low; after-tax corporate profits as a share of GDP have almost tripled in the last 30 years.

3. CURBING RENT-SEEKING

I want to elaborate on two other negative aspects of the financial sector: the rent-seeking behaviour that I alluded to at the beginning and the role of the financial sector in tax avoidance.

Curbing rent-seeking is one of the themes of my new book. In this book, I focus attention on trying to explain why the United States' growth has slowed down, why inequality has grown. And a key part of that explanation is the growth of this rent-seeking behaviour. There is increasing empirical evidence supporting that view. The financial sector has excelled in this kind of risk-taking and rent-seeking, and one of the particularly adverse aspects of it is *market power*.

Banks have significant market power in many arenas, including, most importantly, the means of payments. Currency is a means of payment, but increasingly we use electronic mechanisms. If you think about it, you know that now most of the purchases are made with debit cards or credit cards or over your smartphone. If you think about how much it costs to move money electronically when you go to the store and want to buy something, how much it costs to transfer money from your bank account to the store's bank account, it costs a fraction of a penny. How much do banks charge a merchant? One, two, three per cent, sometimes even more than that — four per cent.

Banks have significant market power in many arenas, including, most importantly, the means of payments.

So, if you buy something, say, that costs five thousand dollars, you have to pay 'transaction costs'. The merchant may have to pay several hundred dollars for something that costs a fraction of a penny. Therefore, the banks in the United States alone make tens of billions of dollars in monopoly profits from this every year. That is an example of market power, which transfers money from ordinary citizens to the banks.

And that increases inequality because transaction costs interfere with the efficiency of the economy; it is a waste of resources. The result is high profits, low innovation, and almost no entry for strangers.

However, there are alternatives; for instance, in Australia, they have actually prohibited the anti-competitive contracts that underlie the maintenance of this monopoly power. In the United States, we regulated the fees for debit cards, but not for credit cards; and even when we regulated the fees for the debit cards, we allowed the Federal Reserve to set those fees, and they set them much too high, and the judge said it, it was much too high, but they went ahead and did it anyway[11].

[11] The Durbin Amendment to the 2010 Dodd-Frank financial-reform legislation curbs the excessive fees charged for debit cards only to a very limited extent, and it did nothing about the much bigger problem of excessive fees associated with credit cards.

But the most interesting example is what's going on in India. India realised that the costs of these transactions are essentially zero, so they said, "Why don't we make them zero?" Together the banks created a cooperative framework providing payment mechanisms for free. That should be a basic public function in one way or another.

If you are selling a financial product, you have to put the buyer's interest first.

The second example of banks' rent-seeking is their benefiting from the power of issuing money, sometimes called "seigniorage". It's a major source of profits and it rests on the trust in government and its ability to build up banks in trouble. The question is: How can we get the government to appropriate these rents for public purpose?

One way of doing that is auctioning off the right to issue credit. It could be easily implemented through a system of digital currency, and this is particularly true, as some countries, for example, Sweden, have gone to an almost totally digital system of payments. But I should emphasise that there's been a lot of discussions recently about cryptocurrencies — in particular, Libra that Facebook has been trying to promote — that I think should not be allowed [25]. The last thing we need is a new vehicle for nurturing illicit activities and laundering the proceeds, which another cryptocurrency would almost certainly turn out to be.

The entire thrust of the regulation of the financial sector is to promote *transparency*. Transparency is essential for a well-functioning competitive market, for preventing nefarious activities and for macroeconomic regulation. And the idea that you could have a cryptocurrency (which means 'secret' or 'anonymous') that is transparent is obviously an oxymoron. So, that is not the answer; the real answer is the approach that India has taken.

There are a couple of references here [26, 27], of recent works that have tried to highlight the ability to use digital currencies as an alternative, if we can break the monopoly power of the banks.

4. TAXATION

Another negative role that the financial sector has performed in recent years is tax avoidance. A modern society needs a strong tax base for a wide range of public expenditures, from basic research and technologies to the other elements that I mentioned before — infrastructure, education, health, and social protection.

But the corporate tax base has been eroded, and the financial sector has played a considerable role.

They have figured out how to take advantage of globalisation to avoid taxation. Apple is an example; it uses the same cleverness that is also used to produce the telephones that so many of you enjoy; it uses that same cleverness to avoid paying taxes. They use the same tricks that allow some of the world's largest companies to pay minuscule taxes, in some cases far less than 5 per cent of their profits, giving them an unfair advantage over small local businesses. And in Ireland, they got their tax rate down to something like point two or lower per cent of their profits. And they took all of their profits out of the rest of Europe and moved to Ireland. And when that got questioned, they moved it to Jersey. So, they are dedicated to not paying the fair share of taxes, and they work very hard on it.

But Apple is not alone. Many of the major corporations (among others, Google, Facebook, Microsoft, Amazon, Caterpillar) have used globalisation to avoid paying taxes. Some of you may know that there is a considerable effort by the OECD/G20 project to limit the extent of tax avoidance, but it has only scratched the surface. It is called "The Base Erosion and Profit Shifting" (BEPS) Project, where the corporations shift their profits around to a low-tax jurisdiction. The project aims to mitigate tax-code loopholes and country-to-country inconsistencies. So corporations cannot shift profits from a country with a high corporate tax rate to countries with a low tax rate[12].

Capital income should be taxed. We will review certain theoretical results — in particular, those of Atkinson and Stiglitz [28], Chamley [29], and Judd [30] — implying no capital income taxes and argue that these findings are not robust enough to be policy-relevant. The taxation of very high earners is a central aspect of the tax policy debate not only for equity reasons but also for state revenue raising.

But the fundamental problem is they also transfer a price system that has been employed now for almost 100 years, and what is needed is far more fundamental reform. The problem is that tax competition has resulted in a race to the bottom, which has been especially damaging to developing countries. There is a widespread misunder-

[12] See also Financial Secrecy Index, 2018 at https://en.wikipedia.org/wiki/Financial_Secrecy_Index.

standing of the incidence of corporate income tax and its effect, and that was evident in the discussion of the corporate tax cuts in the United States in 2017.

After the brief sugar high of the stimulus of the growth, the growth is already under 2 per cent (1,9 per cent), and it is expected to slow with negligible effects on wages, a small impact on investment, and it is actually predicted that GDP within a few years will be lower than it would have been without the tax cut.

So, this is a really good example of where badly designed tax bills, even tax cuts, can actually lead to lower GDP, lower economic growth. And the key flaw in the conventional analysis was the failure to recognise certain provisions of the Tax Code: the tax-deductibility of interests and depreciation allowance and write-off of investments. And the result of this is that with interest deductibility, the marginal cost of investments is reduced by the same amount as the marginal return on investments. So, there is actually no distortion in investment. The implication is the corporate income tax is close to a tax on pure profits and, in that sense, is not distortionary, but with positive distributive effects.

If we take it globally, there is no place for only piecemeal fixes. Indeed, the world is facing multiple crises — including climate change, inequality, slowing growth, and decaying infrastructure — none of which can be addressed without well-resourced governments. Unfortunately, the current proposals for reforming global taxation simply don't go far enough. And these are just some of the references that have discussed these points [31–34].

5. A DIRECT, POSITIVE ROLE FOR GOVERNMENT

Most of the discussions about the role of "Government" are focused, firstly, on preventing bad behaviour through well-designed regulations effectively enforced and, secondly, on encouraging good behaviour on the part of the private sector. But the government has an important, and more direct, positive role. Of course, everybody recognises the role in monetary policy, where it is the lender of last resort. I have already mentioned the role in the development and in the rebuilding of infrastructure through development banks. There is a further role, what is sometimes called "the public option", by providing more choice to consumers, increasing competition, innovation, lowering prices for financial services, growing returns on financial products. Now, obviously, for the government to perform these roles, it has to have good governance. It won't work in all countries, but in some countries, it has proven very effective.

For instance, one example is the student loan program in Australia — income-contingent loans. All the students in Australia get a government-provided student loan that is income-contingent. So, what they repay depends on how well they do. If they do very well, they pay back a lot. If they don't do so well, they do not. But that means that they can still go to university, and if they want to choose to go into a low-income profession like being a professor, they can do that. But if they are going to go into a high-income profession like a banker, they can do that, but they have to pay back more. And that has had a very positive role in increasing opportunities for everybody in Australia without taking a hit on the government budget for good tuition.

MORTGAGES

It seemed remarkable to me that we waited so long to do anything about the foreclosure problem, which, in a sense, was at the root of the financial sector's problem. In many cases, we have on our hands a social and human tragedy. For example, as of August 2014, the foreclosure rate was 33.7 per cent, 1.7 per cent up from the last year. The rise in foreclosure activity has been most significant in New York and New Jersey, the two most densely populated areas in the USA. The idea of a public option is now being discussed in the United States and concerns a number of different areas, particularly related to finance, and one these areas is mortgages. In my latest book, I also discuss the idea of a public mortgage financing system that could access an individual's I.R.S. (Internal Revenue Service) and Social Security data despite the current low-trust political environment. When you think about the mortgage, there are two pieces of critical information: income data and the value of the house. Both of these pieces of data are in the public domain, income tax data and housing transaction data.

An argument is that a conventional mortgage should be available, for instance, to anyone who has paid taxes regularly. There are economies of scope for the collection of the payments that can be done through the tax system. And this would mean that mortgages would be available to everybody at a much lower cost than they are today.

RETIREMENT

Somewhere an argument's being made for a public option in retirement. Indeed, the Social Security Admin-

istration is far more efficient at disbursing retirement benefits than private pensions. The problem is that retirement products are very complex. Individuals, when they are 20, 30, 40 and when they are thinking about retirement — 20, 30, 40 years from now — they don't always fully understand what the world might look like. That gives an opportunity to those who would take advantage of individual vulnerabilities and take advantage of them.

President Obama proposed that those selling financial products (retirement products) have to satisfy a *fiduciary standard* of financial responsibility. In other words, you cannot have conflicts of interests. If you are selling a financial product, you have to put the buyer's interest first. But, remarkably, the financial sector said, "We cannot make profits if we do not have conflicts of interest if we are honest." And they opposed this particular provision.

The public option could do well for those who want to have higher retirement benefits than are provided by the public program, to increase their contributions with benefits increased commensurately. And one could actually design a range of financial products with different risk profiles. And again, taking advantage of economies of scale and scope, and avoiding the potential for abuse.

And another example. When I was the chairman of the Council of Economic Advisors (under President Clinton), we proposed a product called inflation-indexed bonds, that would help people face inflation. However, the US Treasury and Wall Street opposed it. At first, I was surprised because our analysis said that not only would it make people have a more secure retirement, it would also actually reduce borrowing costs for the government. It was a win-win situation. But they opposed it because they discovered that if people have these products that protect them against inflation, they buy them and hold them until their retirement. They do not trade, and Wall Street does not make money by transaction costs from these trades.

6. RESTORING TRUST

Remember, at the beginning of this talk I said the way we responded to the financial crisis led not only to mistrust of the financial system but to mistrust of institutions more generally. Well, not a surprise, the bankers behaved in a morally reprehensible way, they took advantage of others and their positions of trust. Many of these bankers, when they were students of mine, seemed just like other people. And the question is — what happened? What turned these people who seemed to be ethical and nice into people who behaved so badly?

Well, this illustrates some of the dangers of the standard economic model. It assumes that individuals are rational and selfish; there is no room for altruism. However, much of modern behavioural economics, including behavioural finances, explains that humans are less rational than that model assumes. They are also less selfish. Based on these standard models, the IMF and U.S. Treasury promoted the diversification of risks. It would spread the risk widely, and that would make the system more stable. As a matter of fact, the risk was not distributed and spread, but it was propagated and amplified. There was not a diminution of risk through diversification, but rather an amplification through *contagion*. Like the domino effect, diversification simply turned what could have been contained cases of financial failure into a global pandemic.

A number of studies revealed two things: The longer people study economics, the more they become like the economic model assumes they would be. That is to say, the longer people study economics, the more selfish they become. And also, those who are more like the economic model assumed are more attracted to economics and finance, but bankers maybe even more than economists in general.

I am going to illustrate this by some recent research [35, 36] that was done in experimental behavioural economics. When bankers were reminded that they were bankers, they were more dishonest.

So, the experiment was a very simple one, done in Switzerland. I cannot tell you whether it would apply here or in the United States, but I think the suggestion is that it is actually more general. They went into a room, and they tossed a coin. And you tossed the coin ten times, and you reported how many heads or how many tails you got. And it was totally in secret; your pay-offs were related to the outcome of the tosses.

Now we know, on the basis of probability, what they should report. We know how many should report "1 heads-9 tails", "2 heads-8 tails" and so forth. So, we know what the probability distribution should look like; we also know what they would look like if they were totally dishonest because they would report the answer that gave them the highest returns.

The interesting thing about most people is they are not quite as honest, they are not fully honest, but they are not fully dishonest either. They don't take as much

money as they could, but they are not fully honest. We can test how honest they are, we can contrast what the probability distribution should be with what they report. And the interesting thing is if we contrast what probability distribution should be with what they report when you remind bankers that they are bankers, they turned out to be more dishonest.

So, the question is — why did the bankers' behaviour change?

The argument in experimental behavioural economics is that the norms of the industry may permit or encourage dishonesty. A behaviour shift may have happened even outside the bankers' awareness. When you reminded the banker who he was, what is called "cueing the banker's identity," it increased this dishonest behaviour, even in the novel setting of the experiment, since the priming question unconsciously calls up these perspectives and habits associated with the banking 'compartment' of the individual's life. In another experiment, with non-banker participants, it was shown that cues to banking have no influence on dishonest behaviour.

This is a kind of experiment that has been done over and over again and is replicable.

There are some broader insights from modern economic theory about how the pursuit of profits leads to societal well-being only when social and private costs and benefits are perfectly aligned. Whenever information is imperfect and asymmetric, they are not well-aligned, which is why the market economy is not in general Pareto efficient.

One of the most important ideas in economics is called "Adam Smith's invisible hand". An idea was that the pursuit of self-interest and profits leads the economy, as if by an invisible hand, to the well-being of society. And what my colleague Bruce Greenwald and I showed is that the reason the invisible hand often seems invisible is that it is not there. That is to say that when information is imperfect, risk markings are incomplete, competition is imperfect — all these conditions, which are true all the time,— markets are not in general efficient.

And this, of course, is a major change in thinking from the world that Adam Smith (presented) in the first welfare theorem. I began by emphasising the problems of corporate governance. The typical incentive pay systems are neither efficient nor effective. Those in the financial sector were actually counterproductive, leading to short-termism and excessive risk-taking. In a way, academic economists should be very sensitive to this point: non-material incentives, professional standards, are often far more effective. Most of us are not motivated most of the time by just material incentives. It is professional standards that really drive us.

Societies and economies in which norms are taken into account, as well as the impact on other externalities, perform better; likewise, societies and economies where there is less inequality also perform better. Inequality gives rise to negative externalities.

CONCLUDING REMARKS

The rules of the game matter. In the decades after 1980, the US and much of Europe changed the rules of the game in ways which led to a less well-performing financial sector, with more inequality, more instability and lower growth. Only the financial sector seemed to gain.

Societal norms and trust all matter. A change in norms of finance towards a more exploitative behaviour, far different from what it was 60 years ago, has helped undermine trust in the institutions. And the social contract has been broken. Bankers were given 'privileges' — limited liability, rights to create credit by government, control over the means of payments —and they abuse those privileges to serve themselves rather than society more generally, at great cost to our economy, our society and our democracy.

Underlining all this is a significant disparity between social and private returns and deregulation that gave them the ability to pursue the private returns at the expense of the rest of society. That is why, returning to the remarks I gave in the very beginning, in spite of the growth of the financial system in the last 40 years, economic performance deteriorated, growth slowed and inequality increased, and the world eventually faced the worst crisis since the Great Depression. The financial sector played a large role in these failures, both because of what it did and what it failed to do.

There are reforms in the economic and financial system that can make the financial sector perform better — better serve the roles that it needs to play. And what I have tried to do is outline some of the major reforms and to show how research in economics over the past 30 years has helped us understand both the limitations — the failures of other financial systems — and what we can do to make it work better.

Most importantly, restoring trust in the financial system is essential if it is going to perform the role that it should play in the economy and society. And that will require changes in laws, in regulations, governing setting standards, and in norms.

REFERENCES

1. Stiglitz J.E. The current economic crisis and lessons for economic theory. *Eastern Economic Journal*. 2009;35(3):281–296. DOI: 10.1057/eej.2009.24
2. Stiglitz J.E. Ten years later: Keynote address. Roosevelt Institute Working Paper. September 2018. URL: https://www8.gsb.columbia.edu/faculty/jstiglitz/sites/jstiglitz/files/Roosevelt%2010-Years-After-the-Financial-Crisis.pdf
3. Greenwald B., Stiglitz J.E. Towards a new paradigm in monetary economics. Cambridge, New York: Cambridge University Press; 2003. 328 p.
4. Stiglitz J.E. Moving beyond market fundamentalism to a more balanced economy. *Annals of Public and Cooperative Economics*. 2009;80:3:345–360. DOI: 10.1111/j.1467–8292.2009.00389.x
5. Stiglitz J.E. The price of inequality: How today's divided society endangers our future. New York: W.W. Norton & Co.; 2012. 560 p.
6. Battiston S., Delli Gatti D., Gallegati M., Greenwald B., Stiglitz J.E. Credit chains and bankruptcy propagation in production networks. *Journal of Economic Dynamics and Control*. 2007;31(6):2061–2084. DOI: 10.1016/j.jedc.2007.01.004
7. Delli Gatti D., Gallegati M., Greenwald B., Russo A., Stiglitz J.E. Business fluctuations and bankruptcy avalanches in an evolving network economy. *Journal of Economic Interaction and Coordination*. 2009;4(2):195–212. DOI: 10.1007/s11403–009–0054-x
8. Gallegati M., Richiardi M.G., Greenwald B., Stiglitz J.E. The asymmetric effect of diffusion processes: Risk sharing and contagion. *Global Economy Journal*. 2008;8(3). DOI: 10.2202/1524–5861.1365
9. Miller M.H., Modigliani F. The cost of capital, corporation finance and the theory of investment. *The American Economic Review*. 1958;48(3):261–297.
10. Stiglitz J.E. A re-examination of the Modigliani-Miller theorem. *The American Economic Review*. 1969;59(5):784–793.
11. Stiglitz J.E. On the irrelevance of corporate financial policy. *The American Economic Review*. 1974;64(6):851–866.
12. Grossman S.J., Stiglitz J.E. Information and competitive price systems. *The American Economic Review*. 1976;66(2):246–253.
13. Grossman S.J., Stiglitz J.E. On value maximization and alternative objectives of the firm information and competitive price systems. *The Journal of Finance*. 1977;32(2):389–402. DOI: 10.1111/j.1540–6261.1977.tb03278.x
14. Grossman S.J., Stiglitz J.E. On the impossibility of informationally efficient markets. *The American Economic Review*. 1980;70(3):393–408.
15. Grossman S.J., Stiglitz J.E. Stockholder unanimity in making production and financial decisions. *The Quarterly Journal of Economics*. 1980;94(3):543–566. DOI: 10.2307/1884584
16. Greenwald B., Stiglitz J.E. Pecuniary and market mediated externalities: Towards a general theory of the welfare economics of economies with imperfect information and incomplete markets. NBER Working Paper. 1984;(1304). URL: https://www.nber.org/papers/w1304.pdf
17. Allen F., Gale D. Financial contagion. *Journal of Political Economy*. 2000;108(1):1–33. DOI: 10.1086/262109
18. Allen F., Gale D. Understanding financial crises. Oxford, New York: Oxford University Press; 2007. 320 p.
19. Stiglitz J.E. Where modern macroeconomics went wrong. *Oxford Review of Economic Policy*. 2018;34(1–2):70–106. DOI: 10.1093/oxrep/grx057
20. Benjamin B., Capponi A., Stiglitz J.E. Bail-ins and bail-outs: Incentives, connectivity, and systemic stability. NBER Working Paper. 2017;(23747). URL: https://www.nber.org/papers/w23747.pdf
21. Battiston S., Caldarelli G., May R.M, Roukny T., Stiglitz J.E. The price of complexity in financial networks. *PNAS. Proceedings of the National Academy of Sciences of the United States of America*. 2016;113(36):10031–10036. DOI: 10.1073/pnas.1521573113

22. Roukny T., Battiston S., Stiglitz J.E. Interconnectedness as a source of uncertainty in systemic risk. *Journal of Financial Stability.* 2018;35:93–106. DOI: 10.1016/j.jfs.2016.12.003
23. Battiston S., Delli Gatti D., Gallegati M., Greenwald B., Stiglitz J.E. Liaisons dangereuses: Increasing connectivity, risk sharing, and systemic risk. *Journal of Economic Dynamics and Control.* 2012;36(8):1121–1141. DOI: 10.1016/j.jedc.2012.04.001
24. Stiglitz J.E. Déjà Voodoo. Project Syndicate. Oct. 4, 2017. URL: https://www.project-syndicate.org/commentary/republican-tax-reform-voodoo-economics-by-joseph-e — stiglitz-2017–10?barrier=accesspaylog
25. Stiglitz J.E. Thumbs down to Facebook's cryptocurrency. Project Syndicate. July 2, 2019. URL: https://www.project-syndicate.org/commentary/facebook-libra-facilitates-crime-money-laundering-by-joseph-e-stiglitz-2019–07?barrier=accesspaylog
26. Rogoff K. The curse of cash: How large-denomination bills aid crime and tax evasion and constrain monetary policy. Princeton, NJ, Woodstock: Princeton University Press; 2016. 296 p.
27. Stiglitz J.E. Macro-economic management in an electronic credit/financial system. NBER Working Paper. 2017;(23032). URL: https://www.nber.org/papers/w23032.pdf
28. Atkinson A.B., Stiglitz J.E. The design of tax structure: Direct versus indirect taxation. *Journal of Public Economics*. 1976;6(1–2):55–75. DOI: 10.1016/0047–2727(76)90041–4
29. Chamley C. Optimal taxation of capital income in general equilibrium with infinite lives. *Econometrica*. 1986;54(3):607–622. DOI: 10.2307/1911310
30. Judd K.L. Redistributive taxation in a simple perfect foresight model. *Journal of Public Economics*. 1985;28(1):59–83. DOI: 10.1016/0047–2727(85)90020–9
31. Stiglitz J.E. Taxation, corporate financial policy, and the cost of capital. *Journal of Public Economics*. 1973;2(1):1–34. DOI: 10.1016/0047–2727(73)90008-X
32. Stiglitz J.E. The corporation tax. *Journal of Public Economics.* 1976;5(3–4):303–311. DOI: 10.1016/0047–2727(76)90022–0
33. Korinek A., Stiglitz J.E. Dividend taxation and intertemporal tax arbitrage. *Journal of Public Economics*. 2009;93(1–2):142–159. DOI: 10.1016/j.jpubeco.2008.08.001
34. Stiglitz J.E. No more half-measures on corporate taxes. Project Syndicate. Oct. 7, 2019. URL: https://www.project-syndicate.org/commentary/oecd-proposal-multinational-tax-avoidance-by-joseph-e-stiglitz-2019–10?barrier=accesspaylog
35. Cohn A., Gesche T., Maréchal M. Honesty in the digital age. University of Zurich. Department of Economics. Working Paper. 2018;(280). URL: http://www.econ.uzh.ch/static/wp/econwp280.pdf
36. Cohn A., Fehr E., Maréchal M.A. Business culture and dishonesty in the banking industry. *Nature*. 2014;516:86–89. DOI: 10.1038/nature13977

ABOUT THE AUTHOR

Joseph E. Stiglitz — 2001 Winner of Nobel Memorial Prize in Economic Sciences, Professor, Columbia University, New York, United States

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Improving Project Finance Tools for the Spatial Development Strategy of Russia (Evidence from Priority Sectors)

I.A. Ezangina[a] ✉, **N.D. Zakharova**[b]
Volgograd State Technical University, Volgograd, Russia
[a] https://orcid.org/0000-0002-9441-4401; [b] https://orcid.org/0000-0002-1544-868X
✉ Corresponding author

ABSTRACT

The authors **study** total financial, organizational and management relations in implementing and developing project finance principles in priority sectors of the Russian economy. **The aim** of the work is to reveal the importance of the formation and further development of the project finance market to achieve the strategic objectives of the spatial development of Russia. The study employs the scientific **methods** and approaches of observation, comparison, analogy, analysis, generalization, system-structural approach to assessing the development of the research subject. The authors consider the basic provisions of the spatial development strategy of Russia from the perspective of the content of priority sectors of the economy. They update the list of priority sectors and assess their needs for financial support of competitive development in this context. The authors propose modern effective project finance tools to overcome the deficit of government sources in financing priority sectors, such as syndicated loans, concession bonds, bonds of the special-purpose vehicle in project finance (SPV), securitization, and risk management. The main barriers that hamper the development of the project finance institution in Russia are insufficient legal framework, imperfect bank reserve system for potential losses on loans, loan and equivalent debt, the lack of a comprehensive proposal for project finance, and the lack of a unified database of project finance transactions. As **a result**, the study made it possible to specify the areas for improving project finance tools. The authors highlight the role of the regulatory framework and the importance of its conceptual review to improve the conceptual framework, the formation of individual legislative acts related to project finance, not as a special form of lending, but as a separate funding institution. They **concluded** that a unified database of investment objects with project finance tools is necessary. Further study of the topic is associated with developing guidelines for structuring project finance transactions, using the proposed recommendations to improve project finance mechanism by development institutions, banking institutions, pension funds and insurance companies.

Keywords: project finance; spatial development strategy; priority sectors; concession agreement; public-private partnership

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INTRODUCTION

New methods of infrastructure and innovative development in various sectors of the economy and their financing methods are of particular relevance amid the current modernization of the Russian economy. Project finance is one of these promising methods. The aim of this study is to justify the formation and further development of the project finance market to achieve the strategic objectives of the country's spatial development. Russia has used this finance tool, however, there are problems associated with the imperfect legislation, insufficient financial resources, lack of a uniform understanding of the content of the project finance mechanism, including in the implementation of the spatial development strategy. Therefore, the research objectives are to analyze the spatial development strategy, to identify priority sectors in Russia, to disclose project finance tools, and to define a vector to improve project finance together with priority sectors in Russia.

SPATIAL DEVELOPMENT STRATEGY AND PRIORITY SECTORS IN THE RUSSIAN FEDERATION

The Government of the Russian Federation approved the spatial development strategy on February 13, 2019. It determined the long-term actions for developing priority sectors of Russian territories, spatial development targets and geostrategic regions of the country.

The strategy regulates the model of spatial development balance, focused on reducing interregional differences in the level and quality of life of the population, accelerating the pace of economic growth and technological development [1]. In the context of priority sectors, the Strategy sets the following key tasks:

- to eliminate federally significant infrastructural restrictions and to increase the availability and quality of the main transport, energy and information and telecommunication infrastructure;
- to reduce interregional differentiation in the socio-economic development of the constituent entities of the Russian Federation, as well as to decrease intra-regional socio-economic differences. This requires:
- to improve the territorial organization of providing services by social sectors;
- to form and develop mineral resource centers;
- to ensure geographic growth and acceleration of economic growth, scientific, technological and innovative development of the Russian Federation due to the socio-economic development of promising economic growth centers;
- to increase competitive capacities of the economies of the constituent entities of the Russian Federation by providing conditions for developing production of goods and services in the sectors of promising economic specializations of the constituent entities of the Russian Federation listed below (the list includes promising sectors for each constituent entity of the Russian Federation considering their competitive advantages)[1].

The role of the Strategy is not only to improve the socio-economic development of Russia, to create a spatial environment conducive to people's lives, but also to form and strengthen interregional relations [2]. Under the budget centralization, Russian regions sorely lack financial resources, and decisions on the creation of infrastructure facilities, especially important for regional development, are made by the government. At the same time, there is a trend in project finance, in particular, social and transport infrastructure. As a key factor in the development of peripheral regions of the country, project finance is an advanced tool in the implementation of the Russian Spatial Development Strategy.

In the face of an unfavorable political, economic and environmental situation in the

[1] Order of the Government of the Russian Federation of February 13, 2019 No 207-r (as amended on August 31, 2019) "On approval of the Spatial Development Strategy of the Russian Federation for the period until 2025". URL: http://www.consultant.ru/document/cons_doc_LAW_318094/006fb940f95ef67a1a3fa7973b5a39f78dac5681/ (accessed on 18.03.2020).

world, choosing priority sectors is the current problem for Russia.

Today, Russia gradually implements the measures planned in separate federal, regional, and municipal programs. However, they do not form a uniform understanding of priority sectors of economic development.

The project finance program identified the priority sectors of the economy as follows:

- agriculture (including services in this industry);
- manufacturing, including food production;
- chemical production;
- machine-building complex (aircraft, shipbuilding, automotive, etc.);
- housing construction;
- transport system, including air transport (airports, air carriers, transport infrastructure);
- communications and data transmission;
- production and distribution of electricity, gas, water and other resources[2].

The spatial development strategy also defines the main directions that can be recognized as priority by the content:

- transport and trunk infrastructure;
- energy industry;
- social infrastructure;
- information and telecommunication technologies[3].

At the same time, upcoming sectors of economic specialization are defined for each constituent entity of Russia, mediated by an advantageous combination of factors. This refers to natural resource potential, infrastructural security, and quality of human capital.

Being a state development institution, Vnesheconombank actively uses project finance tools, regulates its own List of priority sectors of the economy where it implements projects:

- manufacturing industry (mechanical engineering, automotive, shipbuilding, forestry, chemical, aviation, rocket and nuclear industries);
- infrastructure support for the spatial development of the economy and social sphere of the Russian Federation (railway, energy, transport, social, information infrastructure);
- construction, as well as reconstruction of industrial and engineering structures;
- healthcare;
- research and production complex;
- agriculture[4].

The Program for promoting lending to small and medium-sized businesses is also of interest. It provides the following list of priority sectors:

- manufacturing industry;
- agriculture;
- construction;
- tourism;
- transport and communication;
- public utilities;
- processing industry[5].

Due to the specifics of the Russian territory, i.e. the country's location in the European and Asian parts, large array of undeveloped areas, high domestic social and economic inequality, insufficient comfort of the urban environment, energy and food supply are assumed to be decisive in creating the foundation of the country's economic security. Moreover, considering the uneven distribution of the population, economic and natural resources, it is necessary to develop the com-

[2] Decree of the Government of the Russian Federation of 10.10.2014 No. 1044 "On approval of the Program for supporting investment projects implemented in the Russian Federation based on project finance". URL: http://www.consultant.ru/document/cons_doc_LAW_169755/db1e82e144e53e5cf32399e762914f0b25b95d9d/ (accessed on 18.03.2020).

[3] Order of the Government of the Russian Federation of February 13, 2019 No 207-r (as amended on August 31, 2019) "On approval of the Spatial Development Strategy of the Russian Federation for the period until 2025". URL: http://www.consultant.ru/document/cons_doc_LAW_318094/006fb940f95ef67a1a3fa7973b5a39f78dac5681/ (accessed on 18.03.2020).

[4] Priority sectors of the economy where Vnesheconombank implements its projects. URL: http://www.consultant.ru/document/cons_doc_LAW_303190/2e26fef8ac6989dbe3de7041cfcce5437ecf747e/ (accessed on 18.03.2020).

[5] The Program for promoting lending to small and medium-sized businesses. URL: https://corpmsp.ru/upload/iblock/1d2/Programma-stimulirovaniya-_red.-ot-30.09.19_.pdf (accessed on 18.03.2020).

munication and transport system. Agriculture seems to be a promising sector, largely due to its status as a priority sector for non-oil exports. There are also programs for the development of social sectors: healthcare, utilities, education, tourism, etc., which also mediates their priority.

Table 1 illustrates the infrastructure sectors and their need for public and private finance.

Thus, available funding for transport infrastructure from traditional sources falls far short of the investment needs [3, 4]. The funding needs are 950 billion roubles, while the planned budget expenditures are 627 billion roubles.

Healthcare, as a priority sector, also needs significant investments (100 billion roubles with expenditure budget commitments in 2019 in the amount of 44.7 billion roubles).

The draft spatial development strategy of the Russian Federation indicates the areas for development in the social sphere, in particular healthcare. The areas include founding and updating large multidisciplinary medical centers, including national medical research centers that carry out research and educational activities, developing and implementing innovative medical technologies, exporting medical services, high-tech medical care.

Thus, the defined priority sectors require support from both private business and the state. Project implementation in these sectors is of great importance, and therefore requires significant financial investments using various tools. Project finance is a main source of project implementation under the spatial development strategy.

PROJECT FINANCE TOOLS

Project finance is the financing of a project company established to create and subsequently operate a specific economic asset. At the same time, the lenders' recourse is thus limited primarily or entirely to the project's assets, and the prime source of funds to service the loan is the cash flow generated by this company [5]. Project finance, as well as the loan, corresponds to maturity, repayment, serviceability and proper use. Also, security, whose structure takes a special form: future cash flows from the project implementation, as well as future assets that will subsequently be related to the project, are assigned as security to guarantee the commitments in project finance transactions [6].

Nevertheless, project finance should not be considered as a form of lending. This finance mechanism includes a wide range of mechanisms, such as risk management, insurance, project evaluation, cost analysis, public-private partnerships, concession agreements, escrow accounts, project bonds and much more [7].

Project finance organization includes basic elements of financing, such as the entity and object, principles, types and project finance alternatives. They constitute the mechanism of financial relations between the subjects of the investment system for the implementation of various investment projects, namely to satisfy financial needs [8]. It is not only the entities able to invest financial resources in infrastructure projects are of interest, but also the amount of finance (*Table 2*).

Project finance is a complex structured mechanism associated with attracting a significant number of participants to the project and the variety of financial tools used [9]. *Table 3* presents the main project finance tools.

Thus, there are many project finance tools, but they are obscure for Russia, and therefore inapplicable.

The most important project finance tool at the stage of considering the project concept is cost analysis as a technology for determining and calculating costs of an investment project. Domestic companies currently only calculate the commercial effectiveness of the project in terms of the personal interests of the owners. This approach is not relevant, especially in the context of the implementation of infrastructure geostrategic projects.

Cost analysis allows defining indicators such as project cost and budget, project ef-

Table 1

Assessment of infrastructure gaps by industry

Industry	Budget expenditures in 2019, billion roubles	Uncovered demand in 2019, billion roubles	Coverage potential through public-private partnerships, billion roubles
Transport infrastructure	626.9	950.0	220 (23%)
Healthcare	44.7	100.0	30 (30%)
Utilities and energy infrastructure	41.1	300.0	120 (40%)
Agricultural infrastructure	35.0	50.0	10 (20%)
Education	24.3	40.0	20 (50%)
Physical training and sport	13.4	40.0	20 (50%)
Culture and tourism	12.9	20.0	15 (75%)
IT infrastructure	0.8	50.0	35 (70%)
Other industries	5.3	50.0	12.5 (25%)

Source: The draft national report on attracting private investment in infrastructure development and application of mechanisms of public-private partnership in the Russian Federation 2018. URL: https://pppcenter.ru/upload/iblock/90a/90acd5070ef93cfcf89e2377aa34328e.pdf (accessed on 18.03.2020).

Table 2

Infrastructure financing market entities

Entity	Available for infrastructure investment, billion roubles	Infrastructure investment forecast in 2019–2020, billion roubles	Market status
Largest state-owned banks	900–1170	300	Active participants
Russian direct investment fund	300–370 (including funds of foreign investors)	40	Periphery
Non-state pension funds that have already started to invest in infrastructure	160	60–65	Active participants
Asian Infrastructure Investment Bank (AIIB)	150	–	Periphery
Insurance companies	130–190	10	Trial
Private investors, including funds and repatriated capital	130–137	23	Active participants
Private banks	100–125	20	Trial
State second tier banks, state and interstate development institutions (excluding VEB, AIIB, NDB)	100–110	20	Trial / active participants
Non-state pension funds preparing to enter the infrastructure market	84–91	18–19	Trial
New Development Bank (BRICS)	70–80	20–30	Trial
Vnesheconombank	45–60	15–30	Periphery
Contractors	25	10	Trial
Total	2194–2668	536–567	

Source: Infrastructure investments: an analytical review 2019. URL: https://infraone.ru/sites/default/files/analitika/2019/investitsii_v_infrastrukturu_2019_infraone_research.pdf (accessed on 18.03.2020).

Table3

Project finance tools

Tool	Conditions	Russian practice
Credit / credit line	1. The maximum term is up to 15 years. 2. Interest rate — the key rate of the Central Bank (CB) + 2.5–3% (state-owned banks) / + 5–7% (private banks).	A common finance tool in Russia. Banks do not seek to provide credits / credit lines as project finance due to the lack of long-term financial resources and the lack of security. The maximum credit term is not sufficient to implement an infrastructure project
Syndicated loan	1. The maximum term is 10–12 years (state banks) / 3–5 years (private banks). 2. Interest rate — the key rate of the Central Bank + 2.5–3% (state-owned banks) / + 4–5% (private banks). Foreign banks — LIBOR / EURIBOR + 1–4.5%	At the end of 2018, banks issued $9.42 billion of investments through syndicated loans. The largest deal is the construction project of the central section of the Western High-Speed Diameter highway in St. Petersburg. The loan was $1.6 billion, or 52 billion roubles (of which 25 billion roubles were VEB funds, 10 billion roubles were EDB funds, and 8.5 billion roubles — those of VTB Capital and Gazprombank's)
Concession (or concessionary) bonds	1. Interest rate — the key rate of the Central Bank + 1–3%	Concession bonds are bonds issued by a party to a concession agreement in order to secure financing for the given agreement. The owner of the concession bond has the right to receive part of the profit in the concession project. The funds are usually distributed to develop road infrastructure and housing and utilities sector. 29 emissions of concession bonds amounting to 87 bn roubles have been in circulation as of the end of 2018
Bonds of the specialized society of project finance (SSPF or SPVs)	1. Interest rate — the key rate of the Central Bank + 1–3%	The Central Bank has registered the bonds program "SSPF Project Finance Factory" for up to 294 billion roubles with a maximum maturity until 2040, with up to 20 years payback period. Meanwhile, an issue of such bonds has not been registered yet
Green bonds	1. Interest rate — the key rate of the Central Bank + 1.5%	A single case of issuing bonds for new projects. In 2019, Russian Railways issued 8-year green bonds for 50 million euros. The state-owned company intends to use the funds of the bond for financing and refinancing the purchase of electric passenger trains "Lastochka". According to Russian Railways, European investors bought out 49% of the securities, and Russian — 26%
Bonds secured by future flows from a project	1. Interest rate — the key rate of the Central Bank + margin, depending on what the paper is linked to.	In Russia, they have not been applied yet. In mid-2017, TMH-Service initiated the issuance of bonds secured by the pledge of payments by Russian Railways under a 40-year service contract for locomotives. The float is 4.373 billion roubles, the maturity of the securities is 10 years with a coupon, which is determined by the formula for the rate of 10-year federal loan bond + 1%
Securitization	1. Interest rate — the key rate of the Central Bank + 2–2.5% rate on the federal loan bond + 1%	Securitization is a set of measures and legal institutions to increase the liquidity of requirements through the formation and maintenance of a special property complex and the issue of securities related to it in order to attract additional cash. Gazprombank issued 7-year bonds with a coupon rate of 9% for a pool of loans issued for social PPP projects in the regions. It was possible to attract 1.8 billion roubles
Subordinated debt	1. The minimum term is 5 years. 2. Interest rate — the key rate of the Central Bank + 5–10% / LIBOR + 6%	A subordinated debt is a loan mobilized for 5 or more years, which cannot be claimed by the lender until the contract expires (except if the contract is breached by the borrower). It limits credit opportunities due to the Central Bank regulations. Few cases in Russia

Source: National Infrastructure Projects Pipeline. URL: https://infraone.ru/sites/default/files/analitika/2019/nacionalnyj_perechen_perspektivnyh_proektov_infraone_research.pdf (accessed on 18.03.2020).

Table 4

Project finance risk management strategies

Strategy	Content
Risk acceptance by project finance participants	Internal risk control
Risk sharing with key participants in project finance	Distribution of functions by signing contracts (with contractors, suppliers, buyers). Legal agreements between the project company and sponsors, creditors, product buyers and other parties
Risk sharing between professional agents	Risk insurance, hedging

Source: Kharmat A.M. Modern methods and tools for managing the risks of project financing [14].

fects and risks in monetary terms, and explaining cost factors. Moreover, the assessment, monitoring and control of these factors should be significant throughout the project life cycle.

There are two methods to evaluate a project: net present value and rate of return. With the net present value method, the cost should express the feasibility of the project from a social position and consider all the income and expenses associated with the project implementation. From the perspective of this method, the net present value of the project should be evaluated. As the main indicator of investment analysis, NPV explores and shows the added economic value that can be generated during the project implementation, and determines the potential economic effect of the project in its economic sense.

Calculation and analysis of the project cost with the rate of return (ROR) method is carried out by accumulating costs at the pre-investment stage of the project, investments required for new assets, interest costs on loans during the construction period and expenses to pay consultants for attracting bond loans and credits [10].

Project finance is a high-risk form of financing. Besides the main risks inherent in any form of lending, project finance is characterized by specific risks [11].

Bank practices witness several types of project finance, depending on the accepted risk:

1. Non-recourse project finance is a risky type of financing for the lender due to their refusal of all requirements in relation to the initiators of the project. Since the lender expects compensation for the high risk, this type involves the high cost of debt.

2. Full-recourse project finance ensures the prompt mobilization of the necessary resources for the investment project. In fact, this type of project finance does not imply any project risks taken by the creditor bank; therefore, it has a rather low cost of attracted sources.

3. With limited recourse project finance, risks are distributed in such a way that participants (buyers, sponsors, consultants, etc.) could take on all the risks that depend on them. Within this type of finance, it is pos-

Table 5

Special-purpose vehicles in project finance in Russia as of 12.20.2018

Title	Region	Registration date	Shareholder
SSPF Ehs. Ai. Obligatsii LLC	Moscow	12.01.2016	Private actor
SSPF Svezhest'-365 JSC	Tula Region	27.12.2016	A group of private actors through Svezhest'-365 LLC
SSPF National Agency for Housing Management LLC	Moscow	27.05.2015	INPO Center for Information Strategies, All-Russian public organization "Institute for Development interaction between the state and society"
SSPF Project Finance Factory LLC	Moscow	01.02.2018	VEB
SSPF Gold Rock LLC	Moscow	31.05.2018	A group of private actors through Gold Rock LLC

Source: Bonds for infrastructure. URL: https://infraone.info/analitika/Bondy_dlya_infrastructury_2018_InfraONE_Research.pdf (accessed on 18.03.2020).

sible to provide other collateral than future cash flows, for example, guarantees for project participants [12]. This is the most common type of project finance and is the most beneficial for all participants interested in the project implementation [13].

Table 4 presents the major risk management strategies in project finance.

The problem of project finance in Russia is the lack of long-term financial resources. Infrastructure bonds as a long-term capital instrument allow attracting financial resources

Table 6

The largest concession bonds outstanding

Issuer	Project	Volume of issue, billion roubles	Date of public stock offering on the Moscow Exchange	Circulation period, years	Coupon formula	Coupon period
"Main Road"	Construction of a toll section of the M-3 highway, bypassing Odintsov near Moscow	8	22.11.2010	18	Consumer Price Index (CPI) + 0.5 GDP growth; (minimum 4%)	1 year
		8.17	12.12.2012	16		
		1.4	20.11.2012	17		
Transport Concession Company (Transportnaya kontsessionnaya kompaniya (TKK LLC)	Creation, reconstruction and operation of a tram network in the Krasnogvardeisky district of St. Petersburg	1.24	27.09.2016	17	Up to coupon 5: CPI + 3%; hereinafter — as determined by the issuer	1 year
		2	27.09.2016	30	Up to coupon 5: CPI + 3.5%; hereinafter — as determined by the issuer	
		3.533	09.11.2017	16		
		3.752	12.12.2018	15		
"The Highway of Two Capitals"	Creation of the M-11 Moscow-St. Petersburg highway on sections of the 543–646th km and 646–684th km	7.5	29.05.2015	15	1–11 coupons — 13.45%; 12–59 coupons — CPI + 3% (minimum 1%)	0.25
		5.5	08.07.2015		1–11 coupons — 13.25%; 12–59 coupons — CPI + 2.5%	
"North-West Concession Company"	Creation of the M-11 Moscow-St. Petersburg highway on sections of the 15–58th km	5	21.10.2011	20	CPI + 3% (range of coupon rates for the 2nd — 6th coupon periods: 6–11.5%, for the 7th — 14th coupon periods: 5–12.5%, for the 15th –20th coupon periods: 5–15%)	0.5
		5	21.10.2011			
"Waste Management"	System for the processing and disposal of solid waste in the Saratov region	2.8	07.11.2013	10.5	The larger of the two: CPI + 4%; Central Bank key rate + 1%	1
	System for the processing and disposal of solid waste in Chuvashia System for the processing and disposal of solid waste in the Saratov region	1.7	02.12.2014			1 (10th coupon for 273rd day)
	System for the processing and disposal of solid waste in the Murmansk region	1.85	01.06.2016	10 years and 10 months	Fixed rate — 4%	1
	System for the processing and disposal of solid waste in the Chelyabinsk region (Magnitogorsk cluster)	1.75	23.04.2018	12 years and 5 months	The larger of the two: CPI + 4%; Central Bank key rate + 2%	1

Source: Infrastructure investments: an analytical review 2019. URL: https://infraone.ru/analitika/Investitsii_v_infrastrukturu_2019_InfraONE_Research.pdf (accessed on 18.03.2020).

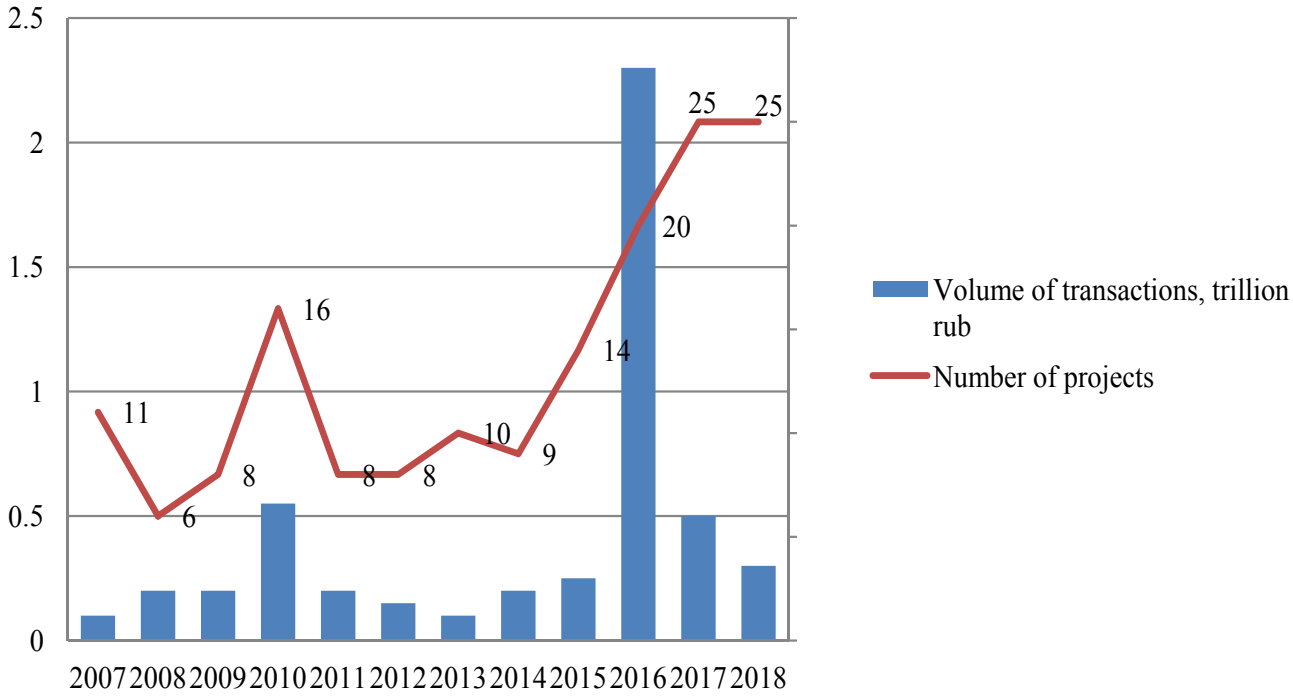

Fig. 1. **Dynamics of the project finance market in Russia from 2007 to 2018**

Source: Infrastructure investments: an analytical review 2019. URL: https://infraone.ru/sites/default/files/analitika/2019/nacionalnyj_perechen_perspektivnyh_proektov_infraone_research.pdf (accessed on 18.03.2020).

sufficient to implement large-scale investment projects [14]. Infrastructure bonds are long-term issue-grade securities, whose owner obtains the right to receive their nominal value and a percentage earnest [15].

Currently, in Russian legislation, it is possible to create a specialized society of project finance (SSPF), which carries out activities to acquire monetary requirements and issue project or infrastructure bonds secured by these requirements. In fact, the society is the Russian equivalent of the SPV-company. Within the SSPF, bondholders meet to make decisions, including on the voluntary liquidation or bankruptcy of the company, on the election of the board of directors, and on approval of transactions. The specialized society of project finance is secured from bankruptcy as much as possible, since the project property is separated from the property of the project initiator.

Table 5 presents SSPFs (SPVs in project finance) registered in Russia by December 20, 2018.

The SSPFs listed in the table have not yet issued any project or infrastructure bonds.

Thus, the infrastructure bond market in Russia is a new, developing field.

Concession bonds are a form of infrastructure bonds: 29 emissions of concession bonds amounting to 87 bn roubles have been in circulation as of 1 January 2019[6].

Table 6 illustrates the top five largest concession bonds by issue in circulation.

Securitization is a set of measures and legal institutions to increase the liquidity of requirements through the formation and maintenance of a special property complex and the issue of securities related to it in order to attract additional cash [16].

Classically, asset securitization is as follows. A banking institution or other entity pools necessary assets and sells them to an SPV company, which issues asset-backed securities and places them among investors.

[6] Infrastructure investments: an analytical review 2019. URL: https://infraone.ru/analitika/Investitsii_v_infrastruktu-ru_2019_InfraONE_Research.pdf (accessed on 18.03.2020)

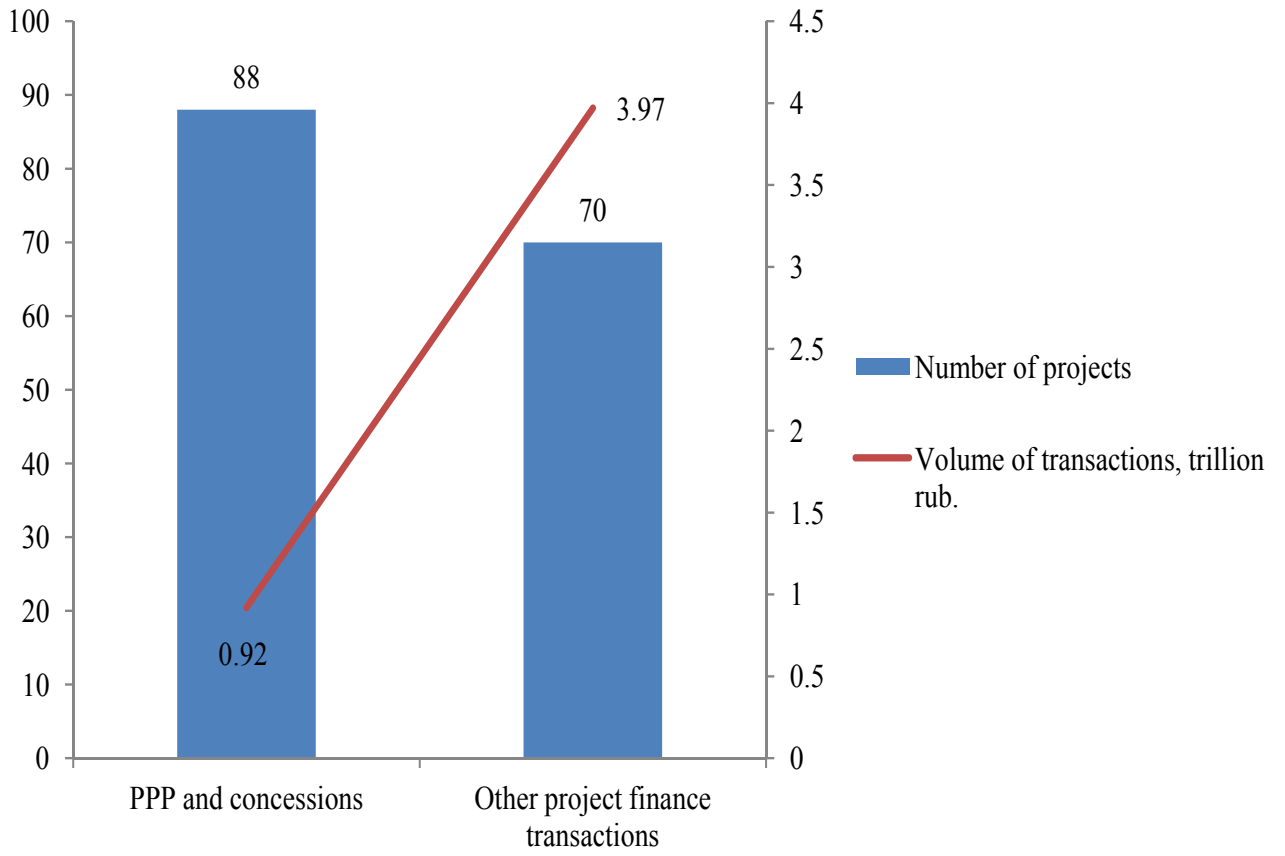

Fig. 2. **Share of PPPs and concessions in project finance in Russia for 2007–2018**

Source: National Infrastructure Projects Pipeline. URL: https://infraone.ru/sites/default/files/analitika/2019/nacionalnyj_perechen_perspektivnyh_proektov_infraone_research.pdf (accessed on 18.03.2020).

Funds received from the placement of securities come back to the original entity [17]. Classical securitization allows the bank to significantly reduce the burden on equity and increase the balance sheet liquidity.

Thus, we identified a variety of project finance tools used in Russian conditions. Using the project finance mechanism still has a number of restrictions. A set of appropriate measures would definitely improve this mechanism.

IMPROVING THE PROJECT FINANCE MECHANISM IN RUSSIA IN THE CONTEXT OF PRIORITY SECTORS

Despite the general instability of the project finance market in Russia, as well as other institutional problems (imperfect legislation, insufficient development of cost and project analysis tools, banks reluctant to invest due to high risks and restrictions, lack of longer term money), there is proven experience in implementing investment projects. Since 2007, about 160 investment projects have been implemented in Russia using project finance with an investment volume of 4.9 trillion roubles. *Fig. 1* shows the dynamics of the project finance market in Russia for the period from 2007 to the present.

Considering the dynamics of the project finance market, we note a significant increase in transactions since 2016. The increase was due to the Yamal LNG project — the construction of a liquefied natural gas plant, as well as transport infrastructure, including the seaport and airport[7].

[7] Yamal LNG project. URL: http://yamallng.ru/ (accessed on 18.03.2020).

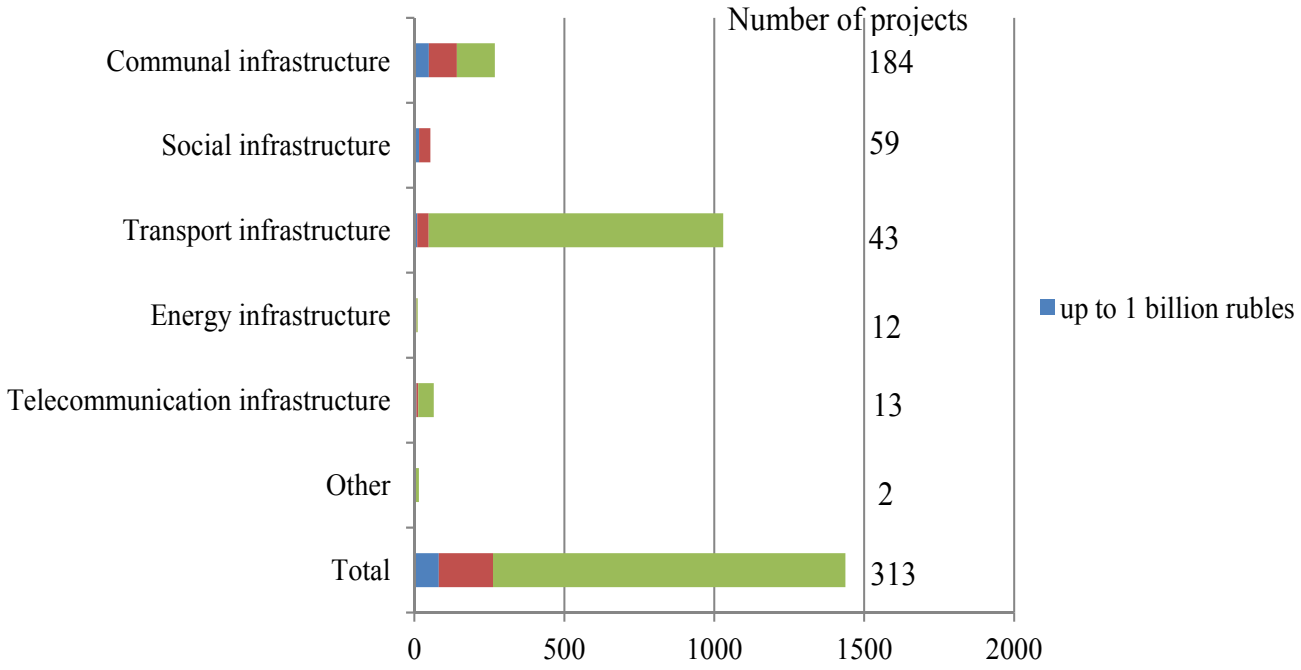

Fig. 3. **Distribution of concessions by industry for 2007–2018, billion rubles**

Source: National Infrastructure Projects Pipeline. URL: https://infraone.ru/sites/default/files/analitika/2019/nacionalnyj_perechen_perspektivnyh_proektov_infraone_research.pdf (accessed on 18.03.2020).

The majority of transactions over the considered period employed public-private partnerships and concession agreements rather than other forms of project finance [18]. For more details, see *Fig. 2*.

The role of public-private partnerships and concession agreements significantly increases in the framework of the spatial development strategy implementation. These very forms of interaction between the state and the private sector can have the greatest impact on infrastructure development, which is ultimately the goal of the Strategy [19].

Fig. 3 illustrates the distribution of concession projects by industry.

Thus, the transport infrastructure has the biggest number of transactions: 43 projects under concession agreements amounted to 1.03 trillion roubles, both in process and already implemented. The communal sector has a bigger number of projects: 184 projects amounted to 268.4 billion roubles.

One of the promising projects in the transport infrastructure is the Moscow-Kazan high-speed railway stretching from Zheleznodorozhnii to Gorokhovets that may be extended from Yekaterinburg to Beijing (China). The project has been discussed since 2013, but there is still no solution on the funding. The project cost is estimated at 621.8 billion roubles, including the extension of railways to Kazan — 1.7 trillion roubles[8].

Another project of the transport infrastructure is the Chelyabinsk — Yekaterinburg high-speed railway. The project is included in the spatial development strategy, and the financing scheme involves a public-private partnership with an investment of 365.9 billion roubles. The construction of the railway is planned for 2021, and the commissioning is scheduled for 2025[9].

[8] Investment projects of Russian Railways in accordance with the approved Comprehensive Plan for the Modernization and Expansion of Trunk Infrastructure. URL: http://www.rzd.ru/static/public/ru? STRUCTURE_ID=5245 (accessed on 18.03.2020).

[9] RDIF announced the construction timing for the Chelyabinsk — Yekaterinburg high-speed railway. URL: https://ria.ru/20190215/1550941823.html (accessed on 18.03.2020).

The projects by the Project Finance Factory remain important. In 2018, the Factory began financing a construction and operation project for producing of sulfuric acid "K" up to 140 thousand tons per year and an improved oleum up to 360 thousand tons per year by KuibyshevAzot JSC. The project provides environmental and industrial safety by resource-saving technologies. The total cost of the project is 6.3 billion roubles, of this VEB.RF invested 3.8 billion roubles.

Another project by the Factory in 2018 was the implementation of the third stage of a comprehensive program to increase methanol production at the industrial site of Shchekinoazot OJSC. With this program, Shchekinoazot OJSC will become the largest producer and exporter of methanol in the Russian Federation. The total project cost is 22 billion roubles, of this VEB.RF invested 4.5 billion roubles[10].

Syndicated lending, including through project finance, seems to be a relevant and promising tool. In early June 2019, it was announced that the Operator-CRPT company, implementing a PPP project in the field of marking goods, would receive a syndicated loan: Gazprombank will provide15.5 billion roubles, and VEB.RF — up to 8.7 billion roubles.

Another project to be financed by VEB.RF together with Sberbank refers to modernizing six airports. The loan will amount to 6.5 billion roubles.

To improve project finance tools within the framework of the spatial development strategy, it is necessary to take measures contributing to the healthy development of the Russian economy. These include government measures to support project finance, including improving the legislation. By now, some steps have been taken to improve the system, e.g., the requirements for creating project reserves of the Project Finance Factory have been eased, the possibility of creating SSPFs has been formed, the concept of syndicated lending has been introduced, etc. However, there are still barriers for the use of project finance [20].

Another area of improvement of financing instruments in terms of bank project finance is a conceptual review of the funds reservation system within Regulation No. 590-P "On the procedure for the formation of reserves by credit organizations for possible losses on loans, loan and equivalent debt". Bank reserves is an item that significantly reduces the funds of bank. This is the reason for banks reluctance to offer products with project finance mechanisms [21]. In particular, Regulation No. 590-P suggests creating an increased reserve for loans to borrowers using project finance, including due to the lack of creditworthiness (often a new project company has no significant credit history), as well as assets to adjust the reserve. To improve the system for assessing reserves, it is necessary to improve the methodology for assessing the creditworthiness of project companies.

The Central Bank has now eased reserve requirements only for the Project Financing Factory's projects. Meanwhile, there are many ongoing and potentially ready for implementation projects outside the Factory. Therefore, the need to ease the assessment of loans issued under project finance is obvious.

We suggest introducing a separate classification of loans with project finance and creating by the bank a separate portfolio for such loans. Such measures will allow banks not to lose capital and channel it to other purposes.

Offering a complex product within project finance will significantly strengthen its attractiveness. VEB Infrastructure JSC (InfraVEB) offers a similar product to its customers. The main activity of the joint stock company is projects for the development of social, transport, utilities and energy infrastructure, public administration infrastruc-

[10] VEB.RF Annual report 2018. URL: https://xn-90ab5f.xn — p1ai/investoram/otchetnost/godovyye-otchety/ (accessed on 18.03.2020).

ture, as well as projects for the integrated development of territories. Besides attracting investors and financing organizations, InfraVEB provides investment advisory services, analyzes the cost effectiveness of the project, builds a financial model, etc.

An advantage of project finance in foreign practice is a sufficient number of completed projects, and, consequently, an extensive database. Meanwhile, information transparency is not a priority for Russia. As a result, there are no data on the main economic indicators of the project. Therefore, a growth driver of the project finance attractiveness in Russia will be creating a project information database indicating the initiator, investors, key investment indicators and the stage of the life cycle. Information systematization will help investors compare various projects, which will contribute to informed decision-making on the investment of financial resources [22].

CONCLUSIONS

The following conclusions can be drawn from the present study.

The project finance market in Russia is in its infancy, which is largely due to the imperfect legislation, insufficient financial resources, lack of a uniform understanding of the content of the project finance mechanism. Adopted in 2019, the spatial development strategy is a document combining local development strategies and determining the directions for sustainable development of regions. The Strategy should facilitate transferring investments to peripheral territories, and determine their effective economic specialization.

Implementing the spatial development strategy triggers the question about the sources of financing. In this regard, the importance of project finance is emphasized, since its tools can provide substantial support and ensure priority sectors of the Russian economy with long-term financial resources. The advantages of project finance are the possibility of forming sources of financing with no assets, flexible terms of loan, and the universality of project finance tools.

Project finance is preferable for the state due to solving infrastructure problems, reducing budget costs and risks, associated with attracting a private partner, improving the quality of services, increasing budget revenues at various levels.

Updated in the paper, project finance tools prove the complexity of this investment mechanism, which even in the conditions of instability of the Russian economy will ensure necessary long-term resources for investment projects in priority sectors.

The study revealed many additional issues that require further resolution. In particular, a separate redundancy mechanism for potential loan losses within the implementation of project finance is necessary. Besides, issuing infrastructure and project bonds by specialized project finance societies require greater elaboration. Finally, banks should develop individual project finance products with providing related services such as insurance, guarantee, factoring and syndicated lending.

REFERENCES

1. Kuznetsova O.V. Structure of the economy in Russian regions and the level of their socio-economic development. *Nauchnye trudy: Institut narodnokhozyaistvennogo prognozirovaniya RAN = Scientific Articles: Institute of Economic Forecasting. Russian Academy of Sciences*. 2018;16:473–493. (In Russ.). DOI: 10.29003/m275.sp_ief_ras2018/473–493
2. Mitrofanova I.V., Selyutin V.V., Ivanov N.P. "Blind spots" of Russia's spatial development strategy: Discussion of the project. *Regional'naya ekonomika. Yug Rossii = Regional Economy. The South of Russia*. 2019;7(1):42–55. (In Russ.). DOI: 10.15688/re.volsu.2019.1.4
3. Khmel V., Zhao Sh. Arrangement of financing for highway infrastructure projects under the conditions of public-private partnership. *IATSS Research*. 2016;39(2):138–145. DOI: 10.1016/j.iatssr.2015.05.002

4. Pukhova E.V. A comprehensive plan for the modernization and expansion of the main infrastructure of Russia: Tasks, predicted results, sources of financing for transport infrastructure projects. *Transportnoe delo Rossii = Transport Business of Russia*. 2018;(6):37–38. (In Russ.).
5. Ezangina I.A., Zakharova N.D. The role of banking institutions in the implementing the organizational and functional model of project finance management in Russia. *Russian Journal of Management*. 2017;5(3):393–403. (In Russ.). DOI: 10.12737/article_59f5c4a134ff30.30298638
6. Nikonova I.A., Smirnov A.L. Project financing in Russia: Problems and directions of development. Moscow: Konsaltbankir; 2016. 216 p. (In Russ.).
7. Galak V.A., Kosogorova A.R. Methods of financing infrastructure projects. *Sinergiya Nauk = Synergy of Science*. 2019;(36):217–222. (In Russ.).
8. Lu Zh., Peña-Mora F., Wang X.R., Shen Ch.Q., Riaz Z. Social impact project finance: An innovative and sustainable infrastructure financing framework. *Procedia Engineering*. 2015;123:300–307. DOI: 10.1016/j.proeng.2015.10.094
9. Murtazaliev Sh.A. Key problems of project financing schemes implemented in Russia. *Ekonomika i biznes: teoriya i praktika = Economy and Business: Theory and Practice*. 2019;(1):171–173. (In Russ.). DOI: 10.24411/2411–0450–2018–10323
10. Nikonova I.A., Fedotova M.A. Valuation problems in project analysis and project financing. *Ekonomicheskij analiz: teoriya i praktika = Economic Analysis: Theory and Practice*. 2014;(42):2–10. (In Russ.).
11. Byoun S., Xu Z. Contracts, governance, and country risk in project finance: Theory and evidence. *Journal of Corporate Finance*. 2014;26:124–144. DOI: 10.1016/j.jcorpfin.2014.03.003
12. Müllner J. International project finance: Review and implications for international finance and international business. *Management Review Quarterly*. 2017;67(2):97–133. DOI: 10.1007/s11301–017–0125–3
13. Gorshkov R., Epifanov V. The mechanism of the project financing in the construction of underground structures. *Procedia Engineering*. 2016;165:1211–1215. DOI: 10.1016/j.proeng.2016.11.841
14. Kharmat A.M. Modern methods and tools for managing the risks of project financing. *Vestnik Finansovogo universiteta = Bulletin of the Financial University*. 2014;(5):137–143. (In Russ.).
15. Zakurskaya M. Yu. Features of the issue and circulation of infrastructure and concession bonds. *Znanie*. 2018;(2–2):45–48. (In Russ.).
16. Podlovila E. Prospects of infrastructure securitization in Russia. *Innovatsionnoe razvitie*. 2018;(4):115–116.
17. Nikiforenko A.S. Using the securitization mechanism in financing PPP projects. *Forum. Seriya: Gumanitarnye i ekonomicheskie nauki*. 2018;(3):292–295. (In Russ.).
18. Kutlukaeva A.N. A comparative analysis of the current state of project financing in developed and emerging markets (in Russia and abroad). *Molodoi uchenyi = Young Scientist*. 2017;(12):315–319.
19. Kolodiziev O., Tyschenko V., Azizova K. Project finance risk management for public-private partnership. *Investment Management and Financial Innovations*. 2017;14(4):171–180. DOI: 10.21511/imfi.14(4).2017.14
20. Sazonov S., Ezangina I., Makarova E., Gorshkova N., Vaysbeyn K. Alternative sources of business development: Mezzanine financing. *Scientific Papers of the University of Pardubice. Series D: Faculty of Economics and Administration*. 2016;23(37):143–155. URL: https://dk.upce.cz/bitstream/handle/10195/65648/SazonovSP_AlternativeSources_2016.pdf?sequence=1&isAllowed=y
21. Khmurova T.V., Ezangina I.A. Analysis of the features of the development of project financing in Russia. In: Generation of the future: A look of young scientists. Proc. 4th Int. youth sci. conf. (19–20 Nov., 2015). Kursk: Southwestern State University; 2015:372–375. URL: https://elibrary.ru/download/elibrary_24998604_51181924.pdf (accessed on 30.11.2019). (In Russ.).

22. Murtazaliev Sh. A. Evaluation of effectiveness and insurance of risks with project financing. *Mezhdunarodnyi zhurnal gumanitarnykh i estestvennykh nauk = International Journal of Humanities and Natural Sciences.* 2019;(1–2):72–74. (In Russ.). DOI: 10.24411/2500–1000–2018–10479

ABOUT THE AUTHORS

Irina A. Ezangina — Cand. Sci. (Econ.), Assoc. Prof., Department of management and finance of production systems, Volgograd State Technical University, Volgograd, Russia
ezangirina@rambler.ru

Natal'ya D. Zakharova — Master's student, Department of management and finance of production systems, Volgograd State Technical University, Volgograd, Russia
zndvstu@mail.ru

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Green Financing in Russia: Current Status and Development Prospects

N.N. Semenova[a] ✉, **O.I. Eremina**[b], **M.A. Skvortsova**[c]
[a, b] National Research Ogarev Mordovia State University, Saransk, Russia;
[c] Saransk Cooperative Institute (branch), ANOO VO Central Union of the Russian Federation "Russian University of Cooperation", Saransk, Russia
[a] https://orcid.org/0000-0002-2270-256X; [b] https://orcid.org/0000-0002-7712-519X;
[c] https://orcid.org/0000-0002-9840-4147
✉ Corresponding author

ABSTRACT

The **aim** of the work is to assess the current state of green financing in the Russian Federation and develop proposals to stimulate its further development. The methodological basis of the research was modern economic and mathematical **methods**: cluster analysis, building a regression model. This helped obtain **results** that possess both a certain scientific novelty and practical significance. The authors considered the evolution of scientific consensus about the concept of sustainable development and the formation of a green economy. They analyzed the current state of green financing in the Russian Federation for 2000–2018. Clustering the constituent entities of the Russian Federation by environmental investments and current environmental expenditures allowed for identifying the regions, leaders and outsiders in these processes, as well as revealing a high regional differentiation in financing green projects. The regression model helped prove that with increased investments in fixed assets aimed at environmental protection and rational use of natural resources by 1 million rubles, Russia's GDP will increase by 0.1 billion rubles. Increasing current environmental expenditures in organizations by 1 million rubles will raise Russia's GDP by 0.3 billion rubles. The authors **concluded** that to stimulate the development of green financing in Russia, it is necessary to implement policies providing for an appropriate regulatory framework; development and use of new tools for financing green projects; creation of a specialized banking institution.

Keywords: green financing; green finance; green economy; environmental investments; Russian Federation

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INTRODUCTION

In recent decades, the world community has been actively discussing an economic growth model based on the development, on the one hand, of its fundamental foundations (technological progress and modernization of production, human capital, infrastructure, macroeconomic stabilization), and on the other hand, on the growth initiation through the "green" component. Under rapid scientific and technological development of the global economy, the anthropogenic pressure on the environment has significantly increased, which resulted in the environmental depletion, ecosystem degradation, and the decrease in the biosphere's regenerative capacity.

Since the mid-1980s, humanity's footprint has been larger than the planet's carrying capacity and its ability to assimilate [1]. At present, humanity's total footprint (demand) exceeds the Earth's biocapacity (supply) by 50%. According to the calculations by the Global Footprint Network analytical center, in 2018, 1.7 global hectares per person were available worldwide. Russia is in the top ten countries with the largest biocapacity reserves (7.9% of all reserves) and the largest ecological footprint (4.0%).

In recent years, a growing number of countries have identified the concept of a green economy and the transition to green economic growth (OECD countries, Japan, South Korea, etc.) as a strategic development model of national economies. Russia is not an exception. In 2017, it adopted the Strategy for Ecological Safety of the Russian Federation for the period until 2025, which proves the direction for green economic growth. At the same time, it is impossible to achieve green sustainable economic growth, i.e. with no detriment to the environment and environmental depletion, without developing an effective green financing system.

GREEN ECONOMY AS A NEW PARADIGM OF ECONOMIC DEVELOPMENT

The interest to sustainable development in the context of global climate change and environmental deterioration has led to the development of a new paradigm in the scientific community — the green economy. With a variety of approaches to this problem, it seems appropriate to single out those that reveal interactions between economic growth and environment.

Studying the factors of economic growth, the winner of the 2018 Nobel Prize in Economics W. Nordhaus back in the 1970s recognized that the global climate and environment directly affect continuous economic development. Nordhaus actually combined models of economic growth and climate change into the Integrated Assessment Model [2]. The idea of the model was that the total use of natural resources corresponds to a certain amount of greenhouse gas emissions, which affect the average air temperature. In turn, air temperature determines the factor corresponding to environmental damage. As a result, the total productivity of production factors decreases due to environmental damage, which ultimately worsens the well-being of the population, inhibits economic growth and the development of human capital.

It is worth noting that W. Nordhaus's views on the relationship between economic development and environment were not new for the scientific community. In the 1960–1970s, supporters of environmental economics (H. Daly, J. Martinez-Alier, P. Hay, R. Costanza, etc) developed the issues of climate change and negative anthropogenic impact on the environment. Representatives of this school considered the economy as an integral part of the ecosystem and believed that to solve environmental problems it was necessary to limit the economic growth rate by setting taxes on the use of natural resources, i.e. environmental taxation.

In subsequent years, the ideas of an environmentally oriented economy developed rapidly. In particular, in 1987, the Report of the World Commission on Environment and Development "Our Common Future" noted that ensuring equal coexistence between society

and the world, where achieving environmental safety will be a crucial part of sustainable development, is a major priority of the global economy. The definition of "sustainable development" was interpreted as the development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" [3].

In 1992, the United Nations Conference on Environment and Development (UNCED) adopted Agenda 21, which presents the fundamental principles of sustainable development. The World Summit on Sustainable Development ("RIO +10"), held in 2002, developed an approach to sustainable development as the integration of economic, environmental and social decision-making. The World Summit participants approved a roadmap for protecting the ecology of the Earth. The next UN Conference on Sustainable Development (RIO + 20), held in 2012, outlined the emphasis on the transition to sustainable development, based on the formation of a green economy.

The well-known German politician and publicist R. Fücks argued that a green revolution is necessary, since humanity reached the stage when the costs of economic growth, leading to environmental depletion, significantly exceed the effect of material advancement [4].

Prepared by scientists at the London Environmental Economics Centre in 1989, "Blueprint for a Green Economy", for the first time, presented the term "green economy". This paper presented the economic rationale for the concept of sustainable economic growth [5].

At present, both in foreign and in domestic literature, the formation of a green economy model is a dominant trend in the development of national socio-economic systems [6–7]. The analysis of publications devoted to sustainable development and greening economic activity, as well as the concept of green economic growth, allows to define the following distinctive features of the green economy:

a) low emissions of carbon and hydrocarbons;

b) preventing deterioration of ecosystem services and biodiversity;

c) conservation and increase of natural resources;

d) resource and energy saving;

e) increase in the living standard and income of the population [8–11].

It is impossible to build a green economy without developing an effective green financing system [12–18]. Note that modern economic literature does not provide a universally accepted definition of "green financing". In a general sense, this term refers to the solution of environmental problems and resource management [19]. Currently, the term "green finance" is more frequent, referring to investment in environmental projects [20–22]. Green finance underlies the concept of green (low-carbon) economic growth, as it provides a link between financial institutions, environmental protection and economic growth.

O. V. Bogacheva and O. V. Smorodinova include here financial services provided to business entities for economic activities on improving the environment, mitigating the effects of global climate change, and more efficient resource use [23]. Green finance includes various branches of the financial sector and financial products [24].

According to foreign scientists, green finance is a market investment or credit programs that considers the environmental footprint when assessing risks or uses environmental incentives to make business decisions [25].

The analysis of the existing economic literature helps conclude that green finance is considered in three main aspects:

1) a set of various methods to finance technological processes and projects in the field of greening economic activity;

2) a set of financial institutions (banks, insurance companies, etc.) engaged in financing environmental programs and projects;

3) financial products and services (loans, bonds, etc.) with an environmental component.

Table 1

Dynamics of green financing in the Russian Federation for 2000–2018

Year	Investments in fixed assets aimed at environmental protection and rational use of natural resources, million roubles	Share of investments in fixed assets aimed at environmental protection and rational use of natural resources in the total investment, %	Current environmental expenditures, million roubles
2000	22 338.6	1.92	76 235.6
2001	27 710.0	1.84	76 832
2002	25 270.1	1.43	89 365
2003	35 407.0	1.62	110 705
2004	41 167.6	1.44	126 560
2005	58 738.0	1.63	142 655
2006	68 188.0	1.44	133 330
2007	76 884.0	1.14	148 157
2008	102 388.0	1.16	183 905
2009	81 914.0	1.03	183 655
2010	89 093.9	0.97	193 463
2011	95 662.0	0.86	222 599
2012	116 543.0	0.92	239 170
2013	123 807.0	0.92	254 377
2014	158 636.0	1.14	269 839
2015	151 788.0	1.09	290 890
2016	139 677.1	0.95	306 534
2017	154 042.3	0.96	320 947
2018	157 651.0	0.89	345 464.1

Source: compiled by the authors.

Table 2

Clustering Russian regions by fixed capital investments aimed at environmental protection and rational use of natural resources

Cluster number	Region
I	Moscow, St. Petersburg, Tyumen region, Yamalo-Nenets Autonomous Okrug, Krasnoyarsk Territory
II	Komi Republic, Volgograd Region, Republic of Bashkortostan, Republic of Tatarstan, Perm Territory, Sverdlovsk Region
III	Leningrad Region, Irkutsk Region, Omsk Region, Republic of Sakha (Yakutia)
IV	Belgorod Oblast, Lipetsk Oblast, Arkhangelsk Oblast, Vologda Oblast, Murmansk Oblast, Orenburg Oblast, Samara Oblast, Chelyabinsk Oblast, Kemerovo Oblast, Tomsk Oblast, Primorsky Krai, Khabarovsk Krai, Sakhalin Oblast
V	Vladimir region, Voronezh region, Ivanovo region, Kaluga region, Kostroma region, Kursk region, Moscow region, Oryol region, Ryazan region, Smolensk region, Tambov region, Tver region, Tula region, Yaroslavl region, Republic of Karelia, Kaliningrad region, Novgorod region, Pskov Region, Republic of Adygea, Republic of Kalmykia, Krasnodar Territory, Astrakhan Region, Rostov Region, Republic of Dagestan, Kabardino-Balkaria, Karacha-Cherkess R Republic of North Ossetia-Alania, Chechen Republic, Stavropol Territory, Republic of Mari El, Republic of Mordovia, Udmurt Republic, Chuvash Republic, Kirov Region, Nizhny Novgorod Region, Penza Region, Saratov Region, Ulyanovsk Region, Kurgan Region, Altai Republic, Republic of Buryatia, Republic of Tuva, Republic of Khakassia, Altai Territory, Novosibirsk Oblast, Transbaikal Territory, Kamchatka Territory, Amur Oblast, Magadan Oblast, Jewish Autonomous Oblast, Chukotka Autonomy th District

Source: compiled by the authors.

DEVELOPMENT OF GREEN FINANCING IN RUSSIA

Today, the most important imperative for the sustainable development of the Russian economy is the formation of a green economy and a green financing system. However, according to the data of the Federal State Statistics Service of the Russian Federation, the current green investments in our country are only 0.9% of the total investments in fixed assets and are insufficient for green development (*Table 1*). Moreover, in the last twenty years (2000–2018), the share of green investments in the total volume of investments in fixed assets decreased two-fold. At the same time, Russian companies tend to spend more

Table 3

Average values of investments in fixed assets aimed at environmental protection and rational use of natural resources and current environmental expenditures for the allocated clusters, million roubles

Year	Indicator value by clusters				
	I	II	III	IV	V
2000	1618.9	1100.7	263.6	294.3	65.3
2005	5222.2	1239.6	976.1	1024.0	171.8
2011	6107.9	2012.4	1302.1	2275.2	403.1
2015	9643.3	8382.3	2003.9	2357.9	392.3
2017	14 666.8	3927.4	6538.1	2184.9	390.0

Source: compiled by the authors.

Table 4

Clustering Russian regions by current environmental expenditures

Cluster number	Region
I	Murmansk Region, Tyumen Region, Krasnoyarsk Territory
II	Belgorod Oblast, Moscow Oblast, Moscow, Leningrad Oblast, Krasnodar Territory, Volgograd Oblast, Republic of Bashkortostan, Republic of Tatarstan, Perm Territory, Nizhny Novgorod Oblast, Orenburg Oblast, Samara Oblast, Sverdlovsk Oblast, Yamalo-Nenets Autonomous Okrug, Chelyabinsk Oblast, Irkutsk Oblast, Kemerovo region, Republic of Sakha (Yakutia)
III	Bryansk region, Vladimir region, Voronezh region, Ivanovo region, Kaluga region, Kostroma region, Kursk region, Lipetsk region, Oryol region, Ryazan region, Smolensk region, Tambov region, Tver region, Tula region, Yaroslavl region, Republic of Karelia, Komi Republic, Arkhangelsk region, Vologda region, Kaliningrad region, Novgorod region, Pskov region, St. Petersburg, Republic of Adygea, Republic of Kalmykia, Astrakhan region, Rostov region, R Republic of Dagestan, Republic of Ingushetia, Kabardino-Balkarian Republic, Karachay-Cherkess Republic, Republic of North Ossetia-Alania, Chechen Republic, Stavropol Territory, Republic of Mari El, Republic of Mordovia, Udmurt Republic, Chuvash Republic, Kirov Region, Penza Region, Saratov Region, Ulyanovsk Region, Kurgan Region, Altai Republic, Republic of Buryatia, Tuva Republic, Republic of Khakassia, Altai Territory, Novosibirsk Region, Omsk Region, Tomsk Region, Trans-Baikal Cr second, the Kamchatka Territory, Primorye, Khabarovsk Territory, the Amur Region, the Magadan Region, Sakhalin Region, the Jewish Autonomous Region, Chukotka Autonomous Okrug

Source: compiled by the authors.

Table 5

Average values of current environmental expenditures for the selected clusters, million roubles

Year	Indicator value by clusters		
	I	II	III
2000	4392.3	2266.2	383.7
2005	10736	3979.5	684.4
2011	16432.7	5955.2	1169.5
2015	42862.4	8085.2	1456.1
2017	21099	9256.2	1584.2
2018	20847.4	10143.3	1727.3

Source: compiled by the authors.

Table 6

Matching correlation coefficient matrix

Indicator	*X*1	*X*2	Y
*X*1	1.00	0.966	0.569
*X*2	0.466	1.00	0.993
Y	0.969	0.993	1.00

Source: compiled by the authors.

on environmental protection — more than 4.5 times.

Geographic distribution of green financing in our country is uneven. The cluster analysis of Russian regions by environmental investments helped identify five clusters (*Table 2*).

Moscow, St. Petersburg, the Tyumen Region, the Yamalo-Nenets Autonomous Okrug, and the Krasnoyarsk Territory (the first cluster) lead in green investments. The second cluster (Republic of Komi, Volgograd Region, Republic of Bashkortostan, Republic of Tatarstan, Perm Territory, and Sverdlovsk Region) also has an active policy in the study area and has significant investment in fixed assets aimed at protecting the environment and rational use of natural resources. The regions of the third and fourth clusters have just

started developing a green financing mechanism. However, the regions of the largest, fifth cluster reflect the overall situation in Russia. These regions are outsiders of green financing. There is a significant gap between the leading regions and the outsider regions: in the total environmental investments, the share of the leaders is about 25%, and the share of the outsiders is only 1%.

Table 3 presents the average values of green investments in the selected clusters.

Clustering Russian regions by current expenditures on environmental protection resulted in splitting them into three clusters (*Table 4*).

Table 5 presents the average values of the expenditures of companies on environmental protection for the selected clusters.

As noted above, amid implementing the green economy concept, green financing is one of the sources for ensuring sustainable economic growth. Therefore, the authors calculated a regression model on empirical data for 2000–2018 for the relationship between the level of green financing and the pace of economic development in the country. GDP (Y) was considered as an effective indicator, and the following indicators (factors) were determined as independent variables: X_1 — investments in fixed assets aimed at environmental protection and rational use of natural resources; X_2 — expenditures of organizations on environmental protection.

Matching correlation coefficients were calculated to assess the interdependence of these indicators (*Table 6*).

The matching correlation coefficient matrix allows us to conclude that the strongest correlation exists between Russia's GDP (Y) and current expenditures on environmental protection (X_2) — $r_{yx2} = 0.993$.

The regression equation is as follows:

$$Y = -22769.6 + 0.1x_1 + 0.3x_2.$$

The coefficient of determination indicates the accuracy and exactness of the model. It suggests that 63.3% of the effective feature variation (Y) is due to the influence of factors (X) in the model.

Coefficients of the multiple regression equation show the absolute influence of independent variables on the final effective indicator. In our case, if investments in fixed assets aimed at environmental protection and rational use of natural resources increase by 1 million roubles, Russia's GDP will increase by 0.1 billion roubles; if current expenditures of organizations on environmental protection increase by 1 million roubles, Russia's GDP will increase by 0.3 billion rubles.

CONCLUSIONS

The transition to green economic growth and the formation of a green economy are the global trend in the development of socio-economic systems. An important condition for sustainable economic growth in the green economy is the presence of a green financing mechanism to mobilize the necessary financial resources for greening and decarbonizing national economy. In our opinion, the following measures would stimulate the development of green financing in Russia:

- to develop a regulatory framework to handle the implementation of green financing;
- to develop a roadmap for green financing;
- to form a green bond market to finance environmental projects: green transport; renewable energy sources; water and forest management; reduction of carbon and environmental pollution; utilization and recycling; low hydrocarbon production. In December 2018, RSB KHMAO LLC issued first green bond with a nominal value of 1.1 billion roubles and the circulation period of up to 2031 to build a landfill for municipal solid waste disposal;
- to create a specialized banking institution, whose main activity will be lending to environmental protection projects;
- to ensure state support for environmental initiatives of private business through di-

rect budget financing (budgetary allocations; state guarantees; budget loans; subsidizing part of investors' loan charges) and to provide tax benefits and preferences (including to investors and issuers of green bonds).

Finally, we would note that the green financing mechanism in Russia is in its infancy. Today, green investments in our country are insufficient to ensure sustainable green development. Geographic distribution of green financing in the regions of the Russian Federation is uneven. For the further development of green financing in Russia, it is necessary: to form an appropriate regulatory framework; to develop and actively use new tools to finance green projects; to create a specialized banking institution.

REFERENCES

1. Stiglitz J.E., Sen A., Fitoussi J.-P. Mis-measuring our lives: Why GDP doesn't add up. The report by the Commission on the Measurement of Economic Performance and Social Progress. New York, London: The New Press; 2010. 176 p. (Russ. ed.: Stiglitz J.E., Sen A., Fitoussi J.-P. Neverno otsenivaya nashu zhizn': Pochemu VVP ne imeet smysla? Doklad Komissii po izmereniyu effektivnosti ekonomiki i sotsial'nogo progressa. Moscow: Gaidar Institute Publ.; 2015. 464 p.).
2. Nordhaus W.D. Economic growth and climate: The case of carbon dioxide. *The American Economic Review*. 1977;67(1):341–346.
3. Brundtland G.H. Our common future: Report of the World Commission on Environment and Development. Oxford, New York: Oxford University Press; 1987. 383 p.
4. Fücks R. Intelligent wachsen: Die grüne Revolution. München: Carl Hanser Verlag; 2013. 262 p.
5. Pearce D.W., Markandya A., Barbier E.R. Blueprint for a green economy. Abingdon, New York: Earthscan Publications; 1989. 192 p.
6. Bierman F., Kanie N., Kim R.E. Global governance by goal-setting: The novel approach of the UN sustainable development goals. *Current Opinion in Environmental Sustainability*. 2017;26–27:26–31. DOI: 10.1016/j.cosust.2017.01.010
7. Rinne J., Lyytimäki J., Kautto P. From sustainability to well-being: Lessons learned from the use of sustainable development indicators at national and EU level. *Ecological Indicators*. 2013;35:35–42. DOI: 10.1016/j.ecolind.2012.09.023
8. Yashalova N.N. "Green" economy: Theory and development issues. *Natsional'nye interesy: prioritety i bezopasnost'= National Interests: Priorities and Security*. 2013;9(11):33–40. (In Russ.).
9. Demirel P., Li Q.C., Rentocchini F. Tamvada J.P. Born to be green: New insights into the economics and management of green entrepreneurship. *Small Business Economics*. 2019;52(4):759–771. DOI: 10.1007/s11187–017–9933-z
10. D'Orazio P., Popoyan L. Fostering green investments and tackling climate-related financial risks: Which role for macroprudential policies? *Ecological Economics*. 2019;160:25–37. DOI: 10.1016/j.ecolecon.2019.01.029
11. Semenova N.N. "Green economy": New approaches to financing. *Finansovaya zhizn' = Financial Life*. 2019;(2):30–35 (In Russ.).
12. Banga J. The green bond market: A potential source of climate finance for developing countries. *Journal of Sustainable Finance and Investment*. 2019;9(1):17–32. DOI: 10.1080/20430795.2018.1498617
13. Zimmerman R., Brenner R., Abella J.L. Green infrastructure financing as an imperative to achieve green goals. *Climate*. 2019;7(3):39–52. DOI: 10.3390/cli7030039
14. Raberto M., Ozel B., Ponta L., Teglio A., Cincotti S. From financial instability to green finance: The role of banking and credit market regulation in the Eurace model. *Journal of Evolutionary Economics*. 2019;29(1):429–465. DOI: 10.1007/s00191–018–0568–2
15. Criscuolo C., Menon C. Environmental policies and risk finance in the green sector: Cross-country evidence. *Energy Policy*. 2015;(83):38–56. DOI: 10.1016/j.enpol.2015.03.023

16. Bezsmertnaya E. R. Issue of green bonds as an element of environmental protection system. *Ekonomika. Nalogi. Pravo. = Economics, Taxes & Law.* 2019;12(5):61–69. (In Russ.). DOI: 10.26794/1999–849X-2019–12–5–61–69
17. Rubtsov B. B., Guseva I. A., Il'inskii A.I., Lukashenko I. V., Panova S. A., Sadretdinova A. F., Alykova S. M. "Green finance" in the world and in Russia. Moscow: RuScience; 2018. 170 p. (In Russ.).
18. Dvoretskaya A. E. Green financing as a modern trend in the global economy. *Vestnik Akademii. Moskovskaya akademiya predprinimatel'stva pri Pravitel'stve Moskvy = Academy's Herald: Scientific Journal of Moscow Academy of Entrepreneurship under Government of Moscow*. 2017;(2):60–65. (In Russ.).
19. Porfir'ev B.N. "Green" trends in the global financial system. *Mirovaya ekonomika i mezhdunarodnye otnosheniya = World Economy and International Relations*. 2016;60(9):5–16 (In Russ.). DOI: 10.20542/0131–2227–2016–60–9–5–16
20. Cadman T. Climate finance in an age of uncertainty. *Journal of Sustainable Finance and Investment*. 2014;4(4):351–356. DOI: 10.1080/20430795.2014.971097
21. Khudyakova L. S. Reform of global finance in the context of sustainable development. *Mirovaya ekonomika i mezhdunarodnye otnosheniya = World Economy and International Relations*. 2018;62(7):38–47. (In Russ.). DOI: 10.20542/0131–2227–2018–62–7–38–47
22. Zhang D., Zhang Z., Managi S. A bibliometric analysis on green finance: Current status, development, and future directions. Finance Research Letters. 2019;29:425–430. DOI: 10.1016/j.frl.2019.02.003
23. Bogacheva O., Smorodinov O. Challenges to green finance in G20 countries. *Mirovaya ekonomika i mezhdunarodnye otnosheniya = World Economy and International Relations*. 2017;61(10):16–24. (In Russ.). DOI: 10.20542/0131–2227–2017–61–10–16–24
24. Bazhenov I. N. "Green" financing: Global trends and Russian practice. *Problemy natsional'noi strategii = National Strategy Issues*. 2018;5:172–186. (In Russ.).
25. Soundarrajan P., Vivek N. Green finance for sustainable green economic growth in India. *Agricultural Economics*. 2016;62(1):35–44. DOI: 10.17221/174/2014-AGRICECON

ABOUT THE AUTHORS

Nadezhda N. Semenova — Dr. Sci. (Econ.), Head of the Department of Finance and Credit, National Research Ogarev Mordovia State University, Saransk, Russia
nnsemenova@mail.ru

Olga I. Eremina — Cand. Sci. (Econ.), Assoc. Prof., Department of Finance and Credit, National Research Ogarev Mordovia State University, Saransk, Russia
o.i.eremina@mail.ru

Marina A. Skvortsova — Cand. Sci. (Econ.), Head of the Department of Economics, Saransk Cooperative Institute (branch), ANOO VO Central Union of the Russian Federation "Russian University of Cooperation", Saransk, Russia
skvorcova_ma@mail.ru

Authors' declared contribution:
Semenova N. N. — problem definition; analysis of existing publications on sustainable development issues, formation of a green economy and a green financial system; development of recommendations to stimulate the development of green financing in Russia.
Eremina O. I. — collection of analytical data and assessment of the current state and development trends of green financing in Russia.
Skvortsova M. A. — cluster analysis of the constituent entities of the Russian Federation by the level of green financing; building a regression model reflecting the relationship between the level of green financing and the pace of economic development in the country.

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Comparative Study of Discounted Cash Flow and Energy Return on Investment: Review of Oil and Gas Resource Economic Evaluation

J. Yan[a], L. Feng[b] ✉, A.N. Steblyanskaya[c], S. Fu[d]
[a, b] China University of Petroleum (Beijing), Beijing, China;
[c, d] Harbin Engineering University, Harbin, China
[a] https://orcid.org/0000-0002-2271-5387; [b] https://orcid.org/0000-0001-6077-8293;
[c] https://orcid.org/0000-0002-1995-4651; [d] https://orcid.org/0000-0001-8745-5291
✉ Corresponding author

ABSTRACT

The aim of the paper is to develop a methodology for evaluating oil and gas fields return on investments based on not only finance, but also environmental and social interrelations. The **subject** of the study is a comparison of methods for calculating return on investments on the example of China, Canada and Russia's oil and gas companies. The authors used a comparative **method** of calculations, as well as a case study – a comparison of return on investments methods on the example of oil and gas enterprises. In the paper, the authors analyze the next traditional methods of economic assessment: net present value, differential rent, reserve and multiple costs. The authors suggest using a new assessment method that determines the energy return on investment (EROI). This method does not rely on traditional analysis of net present value (NPV), internal rate of return (IRR), and financial sensitivity. It comprehensively takes into account the costs of energy production, environmental protection and energy efficiency. Based on the results of the study, the authors **conclude** that the advantages of various methods of economic assessment should be integrated in order to avoid disadvantages and create a new dynamic integrated system of economic assessment. Oil and gas companies may use the **results** of the study to implement the energy return on investment methodology concerning oil and gas fields' evaluation. **A promising direction** for further research may be to compare the energy return on investment at oil and gas enterprises in different countries as well as developing corporate reporting concerning energy return on investment improving efficiency.

Keywords: Economic evaluation; Net Present Value (NPV); Energy Return on Investments (EROI)

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INTRODUCTION

Resources shortage and environmental pollution are the results of industrialization and urbanization of human society. Resource constraints have become a significant obstacle to economic development. Oil and gas are essential strategic resources. Generally, the international oil and gas resources exploration market is increasingly fierce. From a global perspective, the Middle East, West Asia and North Africa are mainly conventional oil and gas resources areas with profound exploration and development costs. North America has a low population density but is rich in oil and gas resources. With the development of technology, the US shale gas revolution has arrived. China has a vast territory, abundant reserves of oil and gas resources and complicated geological conditions. The exploration of oil and gas resources is facing many uncertainties and risks, especially the development of unconventional oil and gas resources. The discounted cash flow method is widely used in conventional oil and gas evaluation methods, especially in the economic evaluation of unconventional energy.

China's shale gas-rich areas are mostly mountainous, with high drilling, fracturing and mining costs. Technology development is still immature.

The decline of shale gas wells is very fast, and environmental problems such as carbon emissions, water pollution, and air pollution during the mining process are apparent. The traditional method only evaluates from the perspective of "cash flow", and ignores the environmental factors. Therefore, it is urgent to establish economic evaluation methods and systems for unconventional oil and gas resources [1].

There are some crucial factors in the traditional economic evaluation process, such as the prediction of oil and gas resource reserves, technically recoverable reserves, recoverable economic reserves, the economic exploitation life and the depreciation lifetime. This paper establishes a dynamic economic evaluation system of energy, with emphasis on the EROI evaluation method. The new method no longer relies on traditional NPV, IRR and sensitivity analysis to judge the economic value of oil and gas resources, but comprehensively considers energy input and output, environmental impact and time value (*Fig. 1*).

THEORETICAL LITERATURE REVIEW OF ECONOMIC EVALUATION METHODS

Resource value assessment has three different methods such as income method, market method and cost method. The discounted cash flow method (DCF), especially the net present value (NPV) method, determines its value by estimating the present value of future expected returns of oil and gas resources. The parameters in the evaluation process are clear, the results are objective and easy to operate. However, the NPV economic evaluation index is too single, and small parameter changes make the results very different. If the oil prices are low, it is easy to make a lower economic evaluation result [2].

Energy return on investment (EROI) is the ratio of energy output to energy input. It is a physical method to measure resource scarcity. Energy input is generally considered as investment related to human activities. Usually, the calculation process of the economic evaluation of resource development does not include natural resources or primary energy input [3]. In EROI calculation process, primary energy and initial exploration investment are considered. Regarding the consideration of energy input, EROI has more comprehensively measured the input and output factors in resource development from the perspective of biophysical economics. EROI has is considered to be a valuable economic evaluation tool and method that can be widely applied, reflecting energy quality and benefits such as environmental, economic, and social benefits [4].

Therefore, it is necessary to establish a dynamic economic evaluation system for oil and gas resources exploration and to evaluate the input and output from a comprehensively perspective in order to make investment decisions more accurately.

Professor Charles Hall from The State University of New York, quantified the EROI value of energy exploration and found the relationship between EROI value and resource price and economy. He points out when EROI decreases, resource price rises. In other words, lower EROI value means higher resource input cost. Carey King, a researcher in the Energy Research Institute of Austin, Texas, studied the relationship between the net energy decline and economy of dynamic connection of development [4–7].

METHODOLOGY

Net present value method

The net present value method is one type of discounted cash flow (DCF) that is derived from Irving Fisher's capital value theory. In 1906, Fisher published "The Nature of Capital and Income", mentioned that capitalizing future income means discounting future income. In 1930, Fisher created a discounted model of future returns, so the net present value formula is as follows [8]:

$$NPV = \sum_{t=0}^{n} \frac{(CI - CO)_t}{(1+i)^t}, \quad (1)$$

among them:

NPV — Economic benefits of oil and gas resource target areas during the evaluation period;

CI — Cash inflows to developing oil and gas resources during the evaluation period;

CO — Cash outflow for developing oil and gas resources during the evaluation period;

T — Evaluation period, $t = 1, 2, \ldots, 30$ years;

I — Benchmark discount rate;

$(1+i)^{-t}$ — Discount factor in year *t*.

The NPV calculating is the necessary decision-making process for capital expenditures (outflows) in investment decisions. The quality of the economic evaluation is related to the choice of decision-making and implementation. The net present value of an investment in an oil and gas resource project is the difference between the present value of the investment project PV and the investment cost C, which is expressed as:

$$NPV = PV - C, \quad (2)$$

NPV — Economic Benefits of Oil and Gas Resource Target Areas During the Evaluation Period;

PV — Present value (target value) of oil and gas resources;

C — Cost of investment;

Further, refine the method:

$$NPV = -\sum_{t=0}^{n} \frac{C_t}{(1+i)^t} + \sum_{i-1}^{k+} \frac{C'_t}{(1+i)^t}, \quad (3)$$

C'_t — Expected cash flow for year t;

C_t — Investment cost in year t;

t — Investment payback period;

i — Discount coefficient.

If the NPV is positive, the project is accepted. Otherwise, the project is rejected. Oil and gas field investment is a large investment project, and it is necessary to estimate the capital investment of current and subsequent periods. In practice, it is complicated to estimate the cash flow of the project in each period of cash flow. Therefore, the average cash flow is generally used. The cash flow for each year is affected by the depreciation rate. The key issue is to determine the discount rate. The more significant the depreciation, the smaller the year-end profit, and leads to the higher the cash flow. Conversely, the smaller the depreciation, the higher the profit, and the smaller the cash flow. The internal discount rate is called the internal rate of return and refers to the discount rate when the net present value is equal to zero. Regarding the determination of the discount rate, it is believed that the discount rate for conventional oil and gas is 12%, and that for unconventional oil and gas is about 8%. Shale gas is as low as 3% to 4% [9].

NPV and rate of return are two critical indicators of the operating ability of oil and gas companies.

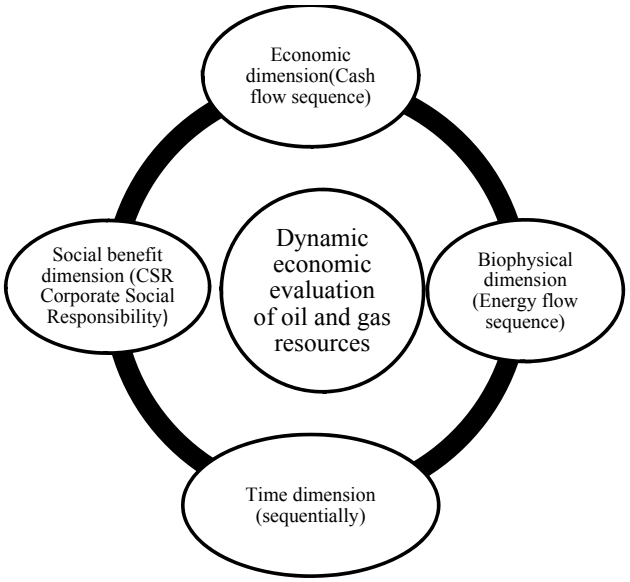

Fig. 1. **Framework for the economic evaluation of oil and gas resources**

Source: Authors' methodology.

The rate of return is the income obtained by the unit invested in capital, and is an essential indicator of corporate profitability. The internal rate of return, IRR, is the discount rate when NPV is equal to zero. In the oil and gas industry investment analysis, the internal rate of return is a vital indicator.

Evaluation of Net Present Value Method

The NPV is based on the present value, and it depends on the cash inflow and outflow of financial data to analyze the opportunity cost, which has absolute objectivity. NPV is addictive, intuitive and straightforward. The NPV method also has disadvantages: it is mainly difficult to estimate the discount rate in practice. The DCF model implicitly assumes that there is a static expected cash flow for the investment project, ignoring the value of growth opportunities. Hodder and Riggs summarized three shortcomings of DCF. First, the impact of inflation cannot be handled well, especially in long-term investment decisions. The second is that a single discount rate cannot reflect complex risk conditions. The third is that investment decisions are not only irreversible, but are flexible. Decision-makers can further modify the investment decision based on changes in the external environment and the uncertainty of investment projects to flexible investment to avoid losses [10].

In practice, many projects where the NPV is positive will be reversed during implementation. Taking the Canadian Oil Sands acquisition as an example, the economic evaluation results were made against the background of a high oil price economy, and the acquisition failed in failure. The root cause is a misprediction of cash flow. Therefore, the economic evaluation cannot be based on accepting the project as long as the NPV is greater than zero. Instead, it should look for the economic life of the oil and gas project. In the context of the global financial crisis, oil prices have continued to decline. Also, the evaluation method does not take into account the externalities generated in the production process, such as environmental issues, social benefits, employment.

Case study

The factors affecting the NPV include the impact of changes in oil prices and costs on the NPV of investment income. The influencing factors on economic evaluation of tight gas include natural gas price, cost, the life cycle of exploration and development, and discount rate (*Table 1, 2*). Taking tight gas fields in southern China as an example, the annual gas production is 200,000 cubic meters per year of every well, and the expected production period is twenty years.

According to *table 2*, the change of gas price has a great influence on NPV results. In daily practice, the influence of market factors and domestic and foreign political factors on the results of economic evaluation is very important.

Overview of the Energy Return Method EROI Method

Meaning of EROI

As early as 1955, Fred proposed the concept of energy surplus (net energy production), which became the earliest prototype of the energy return on investment (EROI). In 1973, American ecologist Odum first proposed the concept of net energy, which was recognized and cited in the Federal Non-Nuclear Energy Research and Development Act. In 1975, Gilliland published a paper in Science, pointing out the superiority of the EROI method and pointing out that it is one of the most suitable methods for evaluating net energy. In 1984, Science published Cleveland's article, which put forward the concept of EROI and explained the critical value and significance of EROI for social development and economic growth. However, there is no attention has been paid in the following twenty years [11]. Until 2000, with the outbreak of the financial crisis, sharp fluctuations in international oil prices, and constant changes in the international oil market, American scholar Charles A.S. Hall studied the EROI thresholds of oil and gas resources worldwide.

The EROI method focuses on the following issues: First, the boundary issues of the analysis; second, the correlation of energy quality; third, the mutual transformation of the energy economy; fourth, the EROI threshold database [6, 12]*.

The energy return on investment is the ratio of the output and input of energy development. The formula is shown in (4),

$$EROI = \frac{\sum_{i=1}^{n} E_i^O}{\sum_{i=1}^{n} E_i^I}. \quad (4)$$

Where E_i^O and E_i^I represent the output and input values of the *i*-th energy respectively.

The above formula shows that the energy cost of low EROI value is far greater than that of high EROI value.

Advantages and disadvantages of EROI evaluation methods

EROI is a new indicator for the economic evaluation of energy investment. With heat value as a unit of measurement, it can intuitively compare the value of different energy production values, effectively evaluate changes in energy quality, and objectively explain the relationship between energy exhaustion and technological progress. Traditional NPV evaluates from an economic perspective, paying attention to the production, cost, and quality of resources using cash flow and profit margins as the basis for evaluation, measuring economic value in terms of currency, and ignoring energy in the process of energy production and conversion consume. EROI method not only considers input and output, but focuses on energy

* CGMA. Global management accounting principles. No. May, 2014.

consumption and environmental indicators from the dynamic perspective of energy flow ("material flow"), effectively measures energy efficiency and quality, better evaluates the actual value of energy production, and can adequately explain impact of technological progress on energy output [4, 13, 14].

EROI considers the ecological environment and social impact in the process of energy conversion, and directly measures the level of energy costs. EROI method has not been applied on a large scale in practice, only the theoretical method is highly valued in academia. China Petroleum University (Beijing) Feng Lianyong Petroleum research team members reasonably calculated Canadian oil sand EROI value, the research results nominated for the French Eni Prize 2019 [15, 16]. There are also shortcomings such as there is no uniform international standard for the economic boundary of energy output. Considering the direct and indirect inputs in the process of energy conversion, it is not easy to obtain compared with financial data and requires acquisition. Implied material and energy flow is behind a more accurate amount of money. After EROI defines uniform standards and boundaries, it can provide large-scale databases for practical application for governments and industrialized and the public sectors.

Case study of Canadian Oil Sand EROI

Oil sands are unconventional petroleum resources. Because of the considerable pollution during mining and refining, it is also called "dirty oil". Most of the oil sands resources in the world are concentrated in Canada [16]. The global primary unconventional oil and gas resources currently include heavy oil, oil sands, tight oil, oil shale, shale gas, tight gas, coalbed methane, and so on. Oil sands and shale oil and gas production is currently concentrated only in North America. This research team uses the energy return evaluation method to analyze the value of Canadian Oil Sands resources at the company level from 2010 to 2015. The mined oil sands are transported to a processing plant for separation, and tailing pits are easily generated, and a large amount of fuel is required to separate from oil sands. It can be seen from the figure that Husky's EROI value is only maintained at about 1, and the investment risk of oil sands projects is very high (*Fig. 2*).

Table 1

The basic data sheet for tight gas development

No.	Parameter value and description	
	Basic Parameter	**values**
1	Number of wells	32
2	Time of gas production	20 years
3	Tax rate	8%
	Tax	
1	Value added tax rate	5%
2	Urban maintenance and construction fees	1% of value added tax
3	Additional education tax rate	5% of value added tax
4	Resource tax rate	4.8% of value added tax
	Cost	
1	Fixed cost	281 640 million yuan
2	Variable cost	689.77 yuan/10^3 m^3
	Income	
1	Gas price	1.5 yuan/m^3
2	Commodity rate	82.37%
	Production	
1	Production of Average annual gas	200 000 m^3
2	Production of Economic annual limit t annual output	4.96*10^8 m^3

Source: China National Offshore Oil Corporation (CNOOC) database. URL: https://www.cnooc.com.cn/ (accessed on 21.03.2020).

Table 2

Calculation results of NPV at different gas prices

Gas well grade	0.75 Yuan / m^3	1.5 Yuan / m^3
NPV	(10 585 619 971.43)	111 548 002 997.60
IRR	–1.73%	8.05%

Source: Authors' methodology.

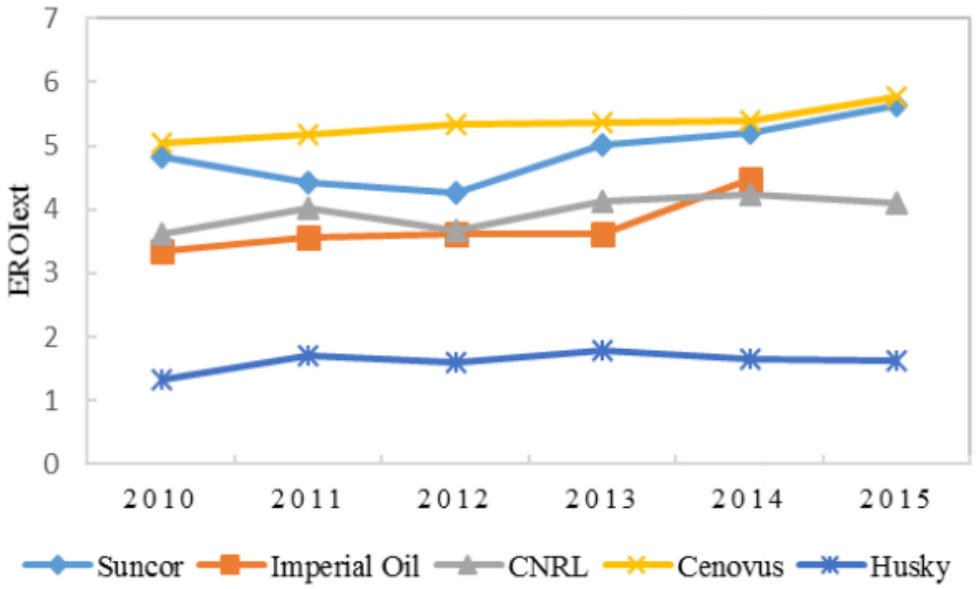

Fig. 2. **EROI value of Canadian oil sand company**

Source: Disclosing the Facts 2016 [EB/OL]. 2016;11–3. URL: http://disclosingthefacts.org/ (accessed on 21.03.2020).

Study of Russia's oil and gas potential supply and EROI

Russia is one of the largest energy resource suppliers in the world market. It occupies the leading positions in the world in gas reserves and gas production. According to the Energy Strategy of the Russian Federation until 2030, the country must appoint innovative ways to develop the gas industry and increase its leading position in global energy markets. Nowadays, Russia exports more than 40% of energy resources that obtain 16% in the world inter-regional trade by energy (*Fig. 3*). Gas share in Russia's fuel balance constitutes 62%. However, if we consider only the European part of the Russian Federation, it will reach 86%. The domestic gas industry provides about 10% of national GDP and up to 25% of the income in the country's budget. There are 755 gas fields in Russia; more than half are already developed or prepared for industrial development. Explored gas reserves across Russia average 15.5%. In the European part of the country it reaches 70%, and in Eastern Siberia — only about 1%. The exploration of potential Russian gas resources is only 24.5%. The gas resources and the sea shelves of the East Siberian and Far Eastern regions are characterized by insufficient indicators of the scale and exploration. This situation indicates excellent opportunities for further expansion and development of Russian gas industry.

Natural gas resources production in Russia is profitable, both economically and in terms of the energy produced. Russian oil and gas companies have improved energy saving and energy efficiency policies. Based on these data, EROI can be calculated. In 2013, the EROI for gas producing, transporting and processing was 79:1 for Public Joint Stock Company (PJSC) Gazprom; 76:1 — for PAO NOVATEK; 116:1 — only for producing — for JSC Yakut Fuel and Energy Company (YATEC). The average EROI of Russian natural gas is calculated as follows (*Fig. 4*). The growth of energy efficiency as the result of the transversal processes with financial resources affecting the Company's technical innovation state, ecological environment, and social responsibility.

The EROI for oil production in Russia varies in different companies. In 2012, it was in the range of 22–35:1. The EROI for light oil products in 2012 was in the range of 5–13:1. Underestimated cost of fossil fuels leads to distorted economic assessments and investor failure. Incorrect filling out of energy resource data sheets may lead to distortion and deterioration of energy, environmental and technological efficiency indicators, and ultimately to a decrease in internal and external competitiveness.

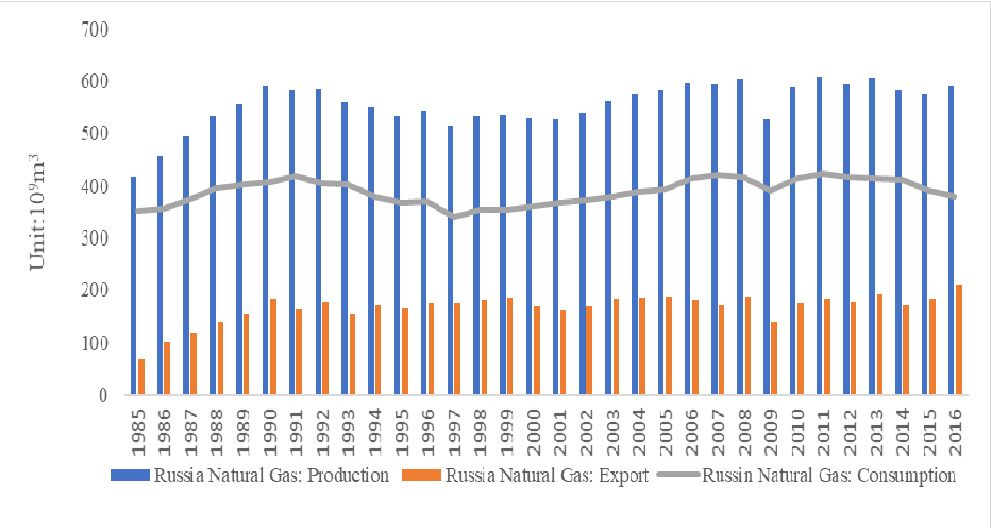

Fig. 3. **Russian oil and gas reserves, production and export**

Source: BP statistics.

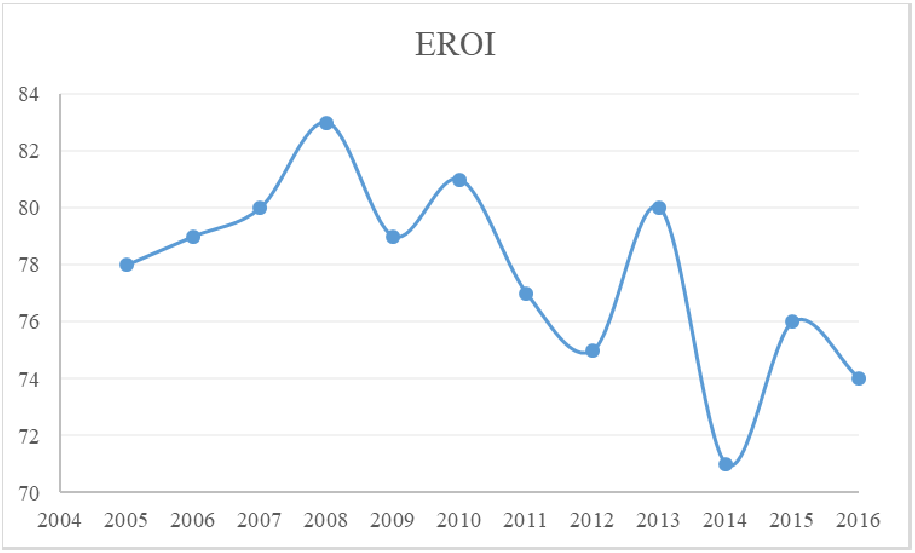

Fig. 4. **The average EROI of Russian natural gas**

Source: Russian Statistic Agency. URL: http://www.gks.ru/free_doc/new_site/business/prom/en_balans.htm Annual Report of PJSC Gazprom (accessed on 21.03.2020).

The relationship between EROI and NPV

The energy return on investment is expressed in units of heat, which is the ratio of energy generation to cost. NPV is a monetary unit that represents a certain value. They may not be necessarily related, but they both are useful indicators of resource economic evaluation (*Table 3*).

Table 3 shows various NPVs due to gas price volatility. Regardless of how the NPV results change, the EROI for a tight gas field is higher than the standard value.

CONCLUSION

The economic evaluation of oil and gas exploration and development includes many internal and external, objective and subjective factors. It is a complex process. The discounted cash flow method is generally regarded as an essential evaluation method, and other evaluation methods, such as a real options method and energy return on investment, are also scientific and practical.

Different assessment methods can make the assessment results very different. Therefore, to establish a scientific dynamic evaluation system it is

Table 3

Comprehensive method of economic evaluation

EROI	NPV	Feasibility of oil and gas project investment
EROI higher than reference	NPV > 0, Feasible	Feasible
EROI higher than reference	NPV < 0, Infeasible	Feasible
EROI less than reference	NPV > 0, Feasible	Infeasible
EROI less than reference	NPV < 0, Infeasible	Infeasible

Source: Authors' methodology.

necessary to comprehensively use different evaluation methods, and consider the exploration and development projects from multiple perspectives of economy, environment, and time. It is particularly essential and necessary to evaluate the exploration and development of resources in all aspects. In the traditional economic evaluation, the net present value method accounts for the perfect proportion and is easy to operate. This evaluation method is based on financial data and has a certain credibility. However, with the development of economy and society and the advancement of science and technology, the traditional single NPV method can no longer meet the needs of investment decisions. People pay more and more attention to the environment, climate change, health. Considering economic factors, this evaluation method will be contrary to objective reality and future expectations. Especially in the context of low oil prices, the evaluation of oil and gas development is often easily underestimated, causing erroneous investment decisions and even waste of resources. On the contrary, in the context of high oil prices, the net present value method will cause blind investment decisions and cause profit losses to the company's future operations. Oil and gas resources are facing challenges and dilemmas on a global scale. Traditional evaluation systems seek to maximize economic benefits and ignore environmental factors. EROI is a newly emerging method for evaluating net energy output in academia, and its focus is on energy output after deducting energy input. Research on EROI has received much attention in recent years.

There are several methods to evaluate oil and gas resource for investment decisions, a dynamic evaluation mechanism should be established to obtain comprehensive recommendations for investment decisions. Before the calculation of the net present value, the energy return on investment method (think of EROI before money) can be used to comprehensively consider energy costs, quality, and environment to establish a dynamic evaluation mechanism for oil and gas resource investment decisions.

Thus, NPV is a financial and static analysis indicator. Energy Return on investment (EROI) can be regarded from the energy perspective considering energy consumption. When making investment decisions on oil and gas resources, first the project's net present value should be calculated; then, the impact of market prices and cost changes on the economic evaluation results should be measured according to the sensitivity analysis method; then, the option value should be used to modify the net present value. Finally, the EROI value should be calculated and compared to the standard value to comprehensively consider the results of economic evaluation (*Table 4*).

Both methods have their advantages and disadvantages, and they will not replace each other. Considering these methods in a comprehensive evaluation of exploration and development projects, the results of the evaluation of unconventional projects in the field of oil and gas resources will be more scientific, accurate, and reasonable following the strategic value and significance. Specified non-financial criteria should be used by enterprise valuation evaluation. After the United States imposed sanctions on Russia in 2015, the international situation deteriorated sharply, credit rating went down and financial indicators jumped to the lowest point. Russia's production efficiency management became especially complicated. Quicker assessment of basic social and environmental responsibility requires developing

native methods to correct political bias in credit ratings and sustainability ratings. To evaluate the enterprise, we can use not only the net present value, but also sustainability indicators such as social responsibility indexes, environmental and energy ratings, comparative technologies and other tools. Russia's objective advantage in the viability of its natural environment was overlooked. The high cost of energy efficiency audits and environmental certifications (for medium-sized companies) aggravated the situation with the assessment of the main success criteria. However, government and companies can use a few tools to improve economic productivity. According to the paper, the main task is to develop tools to evaluate production energy efficiency by using biophysical economy tools. However, the economists do not pay attention to energy.

Table 4

Advantages of two methods

NPV	EROI
Simple and easy quantification of financial data	From the perspective of energy flow, input and output are considered comprehensively, which is more accurate

Source: compiled by the authors.

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REFERENCES

1. Yuan J., Luo D., Feng L. A review of the technical and economic evaluation techniques for shale gas development. *Applied Energy*. 2015;148:49–65. DOI: 10.1016/j.apenergy.2015.03.040
2. Huang Shengquan. Project evaluation index — expansion of net present value. *Technology Economics and Management Research*. 2001;6:29–31.
3. Hu Y., Feng L.Y., Qi C. et al. EROI and its application in China-Daqing oil field. *China Mining Magazine*. 2014;9:30–34. (In Chinese). DOI: 10.3969/j.issn.1004–4051.2014.09.009
4. Hall C.A.S., Lambert J.G., Balogh S.B. EROI of different fuels and the implications for society. *Energy Policy*. 2014;64:141–152. DOI: 10.1016/j.enpol.2013.05.049
5. Dale M., Krumdieck S., Bodger P. Global energy modelling — A biophysical approach (GEMBA). Part 1: An overview of biophysical economics. *Ecological Economics*. 2012;73:152–157. DOI: 10.1016/j.ecolecon.2011.10.014
6. Yan J., Feng L., Steblyanskaya A., Sokolov A., Iskritskaya N. Creating an energy analysis concept for oil and gas companies: The case of the Yakutiya company in Russia. *Energies*. 2019;12:2:268. DOI: 10.3390/en12020268
7. King C. An integrated biophysical and economic modeling framework for long-term sustainability analysis. *SSRN Electronic Journal*. 2019. DOI: 10.2139/ssrn.3334615
8. Freeman M.C., Groom B., Panopoulou E., Pantelidis T. Declining discount rates and the Fisher Effect: Inflated past, discounted future? *Journal of Environmental Economics and Management*. 2015;73:32–49. DOI: 10.1016/j.jeem.2015.06.003
9. Luo D. An analysis of indices for economic evaluation of petroleum exploration and development investment. *International Petroleum Economics*. 2002;(12):40–42. (In Chinese).
10. Hodder J.E., Riggs H.E. Pitfalls in evaluating risky projects. *Harvard Business Review*. 1985;(Jan.):128–135. URL: https://hbr.org/1985/01/pitfalls-in-evaluating-risky-projects
11. Hall C.A.S., Cleveland C.J. Petroleum drilling and production in the United States: Yield per effort and net energy analysis. *Science*. 1981;211(4482):576–579. DOI: 10.1126/science.211.4482.576
12. Yan J., Feng L., Steblyanskaya A., Kleiner G., Rybachuk M. Biophysical economics as a new economic paradigm. *International Journal of Public Administration*. 2019;42(15–16):1395–1407. DOI: 10.1080/01900692.2019.1645691
13. Lambert J.G., Hall C.A.S., Balogh S., Gupta A., Arnold M. Energy, EROI and quality of life. *Energy Policy*. 2014;64:153–167. DOI: 10.1016/j.enpol.2013.07.001

14. Hall C.A.S., Klitgaard K.A. Energy and the wealth of nations: Understanding the biophysical economy. New York, Dordrecht: Springer Science+Business Media; 2011. 407 p.
15. Wang K., Feng L., Wang J., Xiong Y., Tverberg G.E. An oil production forecast for China considering economic limits. *Energy*. 2016;113:586–596. DOI: 10.1016/j.energy.2016.07.051
16. Wang K., Vredenburg H., Wang T., Feng L. Financial return and energy return on investment analysis of oil sands, shale oil and shale gas operations. *Journal of Cleaner Production*. 2019;223:826–836. DOI: 10.1016/j.jclepro.2019.03.039

ABOUT THE AUTHORS

Yan Jun — PhD student, Institute of Economics and Management, China University of Petroleum (Beijing), Beijing, China

Lianyong Feng — PhD, Prof., Institute of Economics and Management, China University of Petroleum (Beijing), Beijing, China

Alina N. Steblyanskaya — PhD, Assoc. Prof., Institute of Economics and Management, Harbin Engineering University, Harbin, China

Shanna Fu — PhD, Lecturer, Institute of Economics and Management, Harbin Engineering University, Harbin, China

Authors' declared contribution:
Yan J.— theoretical base, methodological base.
Feng L.— general conclusions and recommendations.
Steblyanskaya A.N.— methodological support.
Fu S.— calculations.

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ORIGINAL PAPER

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Formation of Economically Sound Tax Consequences on Purchase and Sale of Foreign Goods (Case Study on Customs Procedure of Customs Warehouse)

E. Yu. Sidorova
Financial University, Moscow, Russia
https://orcid.org/0000-0002-4385-7173

ABSTRACT

The aim of the article is to develop a typology for purchase and sale of foreign goods under the customs procedure of the customs warehouse and to propose a mechanism for the formation of economically sound tax consequences of VAT based on this typology. **The subject** of the research is transactions with goods under the customs procedure of the customs warehouse and their taxation mechanism. **The methodological basis** was economic methods, a generalization method, and a comparison method to study the approaches in Russia and abroad to the formation of the institutional structure of the customs procedure of the customs warehouse. **The study results** are a typology of purchase and sale of foreign goods under the customs procedure of the customs warehouse, the base for economically sound tax consequences that comply with the principle of neutrality in determining the tax consequences of VAT. The author **concludes** that for taxpayers relied on economic rather than tax interests, it is necessary to create conditions in the tax and customs legislation of the Russian Federation that taxation was identical in identical operations. Thus, it is necessary to clarify the norms of Article 147 of the Tax Code of Russia, so that under the current regulation were no legal opportunities to reject Russian territory as a place of sale of goods located in the Russian customs warehouse when they undergo the customs procedure of the customs warehouse. **The directions for future research** are to develop a mechanism for introducing economically sound tax consequences that comply with the principle of neutrality in determining VAT for sale of foreign goods imported into the territory of the Russian Federation and placed under the customs procedure of the customs warehouse.

Keywords: customs procedure; customs warehouse; customs duties; contractual relationship models; purchase and sales transactions

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INTRODUCTION

The system for determining the tax consequences of foreign trade transactions is based on the economic category "customs procedure". In total, the Customs Code of the Eurasian Economic Union (EAEU) includes 17 customs procedures that can be applied to imported and exported goods. The concept of the "customs procedure" is considered from a few standpoints: as a tax regulation tool and as a mechanism of government regulation.

Moreover, the legal procedure is clearly defined for each customs procedure, which indicates the existence of a clear institutional form for implementing the mechanism of state regulation of international trade.

In the composition of tax payments for international trade may arise duties determined by the peculiarity of the customs procedure for these goods. By placing the goods under separate customs procedures, the declarant can conduct many business transactions with them, but they do not lead to tax consequences. However, similar transactions conducted with goods of the Eurasian Economic Union would result in tax consequences. Therefore, the difference in treatment of a product that has the status of a foreign one, when determining tax consequences, leads to unjustified tax accruals. This violates the principle of neutrality, which states: "Business decisions should be motivated by economic rather than tax considerations. Taxpayers in similar situations carrying out similar transactions should be subject to similar levels of taxation"[1].

For the purposes of this study, this is interpreted to determine the economically justified tax consequences in terms of VAT as follows: decisions on the transaction and its implementation should be economically beneficial to the organization, while the tax aspects are not considered when developing contractual relationship. This postulate looks obvious for market management, but in fact, this is not entirely true. Economists emphasize efficiency and effectiveness. Economic consequences are calculated for shareholders and government agencies, and their size may vary.

This is especially important for applying the customs procedure of the customs warehouse, since tax exemptions determine more favorable conditions for the taxpayer than under the release for domestic consumption customs procedure.

Thus, we can conclude that when determining the tax consequences, the status of the goods is important, as well as the chosen customs procedure.

The analysis of modern economic literature has led to the conclusion that few authors work on this issue: E. Yu. Sidorova [1–4], L. I. Goncharenko [5, 6], A. A. Artem'ev, M. R. Pinskaya [7, 8], Yu. V. Malkova [5] (scientific school of the Financial University), also certain aspects are present in the works by A. N. Kozyrina [9], M. V. Markina [10], I. E. Akopyan, O. V. Deryagin, V. N. Tovstonoshenko [11], S. S. Frolova, E. A. Khromova [12]. However, the authors do not consider the problem systematically and do not give practical recommendations for further use by state authorities.

SOLUTION

Within the framework of this study, we aim to solve two interrelated tasks:

First, to determine the typology of purchase and sales transactions of foreign goods placed under the customs procedure of the customs warehouse.

Second, to form economically sound tax consequences based on this typology.

We will consider a few economic aspects of the process under study, when purchase and sales transactions of foreign goods between different market entities can be conducted with the goods placed under the customs procedure of the customs warehouse. We will compose their typology (*Fig. 1*).

[1] Implementation Issues for Taxation of Electronic Commerce. URL: https://www.oecd.org/tax/consumption/5594899.pdf (accessed on 04.04.2020).

The main problem of this issue is that if selling goods when placing them under the customs warehouse procedure, provided that the procedure does not change, there is no obligation to pay VAT. This is stated in four letters of the Ministry of Finance of the Russian Federation[2].

We analyzed the letters of the Ministry of Finance of the Russian Federation and noted neither comprehensive understanding of complex contractual relationship models, nor consideration of the principle of neutrality of indirect taxation of international trade. Legally, the approach of the Ministry of Finance of the Russian Federation does not define the concept of "the beginning of shipment" used to determine the place of sale of goods (Clause 1, Article 147 of the Tax Code of Russia). Therefore, it can be formally assumed that, since the goods were originally shipped from a foreign state, the Russian Federation is not recognized as the place of sale of the foreign goods. However, the Ministry of Finance of the Russian Federation does not consider, first, that the customs warehouse is located on the territory of the Russian Federation, and second, that the customs procedure of the customs warehouse can be correlated not only with the release for domestic consumption customs procedure.

[2] Letter of the Ministry of Finance of Russia dated 01.17.2019 No. 03–07–08 / 1842 "On VAT-free trading of goods placed under the customs warehouse procedure". Computer-based legal research system "Consultant Plus". 2019. Questions and answers ("Finansist"). Letter of the Ministry of Finance of Russia dated 07.22.2011 No. 03–07–08 / 236 "On the application of VAT to sales transactions of foreign goods imported into Russia and placed under the customs warehouse procedure conducted by a foreign organization".Computer-based legal research system "Consultant Plus". 2019. Questions and answers ("Finansist"). Letter of the Ministry of Finance of Russia dated November 26, 2014 No. 03–07–08 / 60101 "On VAT taxation of sales transactions of goods from the customs warehouse until the completion of the customs warehouse procedure by placing goods under another customs procedure involving the import into the Russian Federation".Computer-based legal research system "Consultant Plus". 2019. Questions and answers ("Finansist"). Letter of the Ministry of Finance of Russia dated 06.30.2016 No. 03–07–08 / 38240 "On the application of VAT to the sale of foreign goods placed under the customs warehouse procedure".Computer-based legal research system "Consultant Plus". 2019. Questions and answers ("Finansist").

The above approach may look controversial, since it is necessary to assess the tax consequences of the investigated operations based on their economic meaning and the previously described principles of indirect taxation of international trade. To develop a comprehensive methodological approach for determining the tax consequences of purchase and sales transactions of goods within the customs procedure of the customs warehouse, it is necessary to study two most frequent models of relations in the sales of goods stored in customs warehouses, namely:

Model 1. Import of goods into the customs territory of the EAEU, their placement under the customs procedure of the customs warehouse and subsequent sale by a foreign organization (the goods retain the status of foreign ones) in the EAEU member state (e.g., a Russian organization).

Model 2. Import of goods into the customs territory of the EAEU, their placement under the customs procedure of the customs warehouse and subsequent sale by a foreign party.

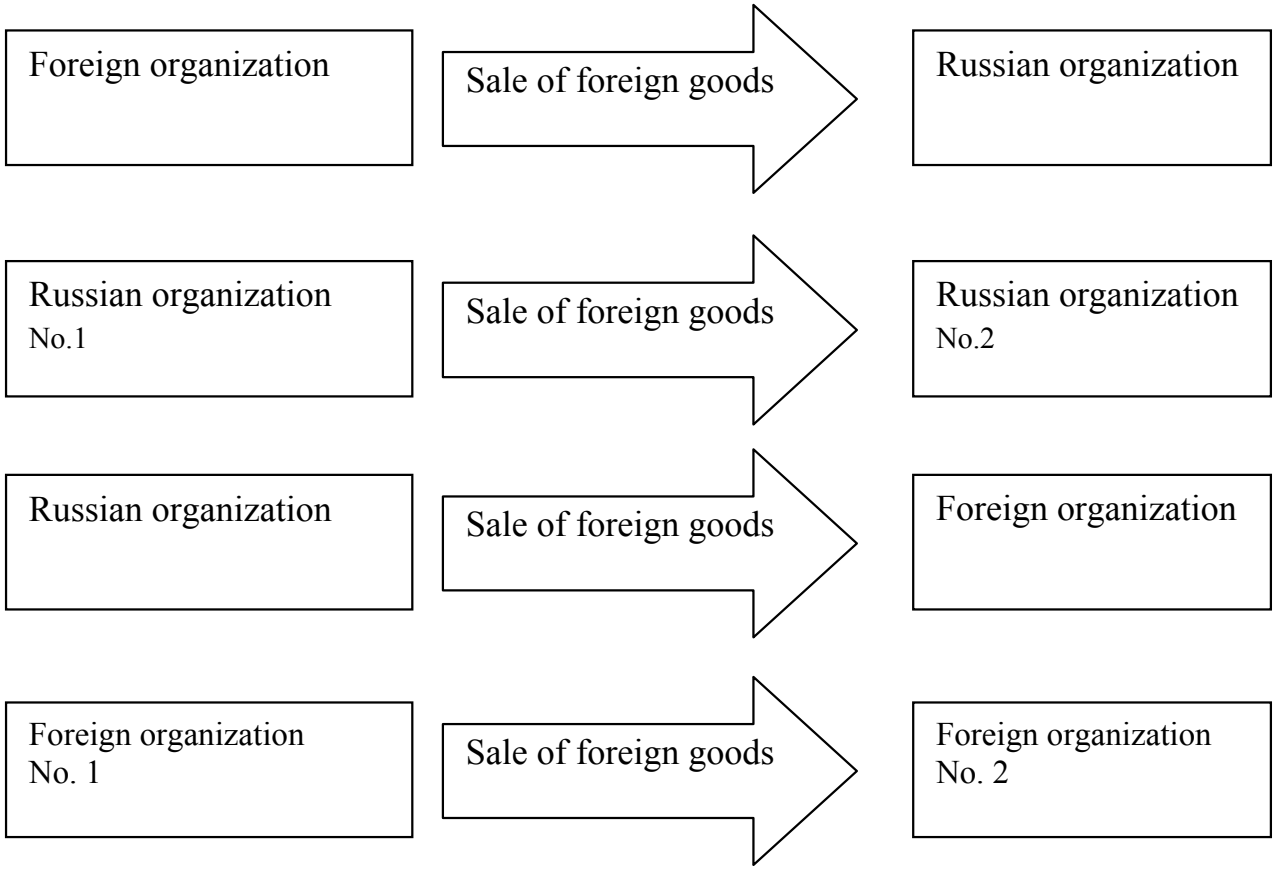
Let us have a closer look at the two models.

Model 1.

A foreign organization sells goods to a Russian organization under a purchase and sale contract or under an intermediary contract. Foreign goods are imported into the customs territory of the EAEU and then placed under the customs procedure of the customs warehouse. Moreover, goods can actually be placed in a warehouse that has the status of a warehouse. After the Russian organization the goods, it places them under the customs procedure of the customs warehouse, the importer starts looking for buyers and selling the goods. The goods can be sold in one lot or in several lots.

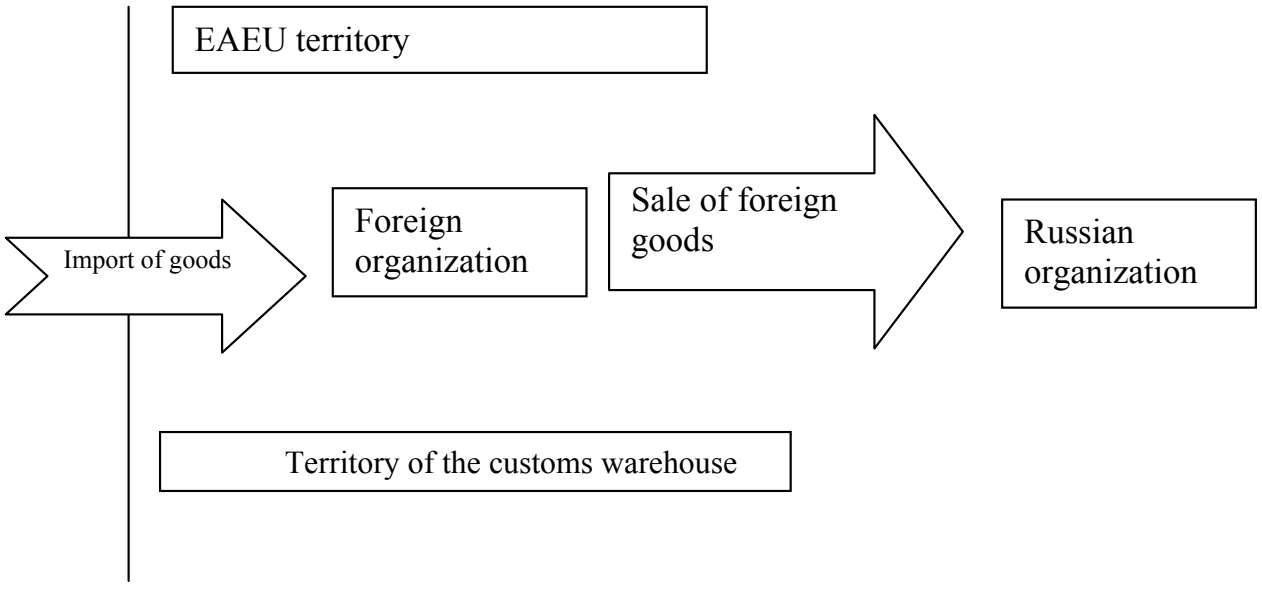
Judging by the letters of the Ministry of Finance of the Russian Federation, we can conclude that a Russian organization imports the goods, places them in the customs warehouse and then resales them. To place under the customs procedure, to release for domestic consumption is only a special case. However,

a) general concept of transactions:

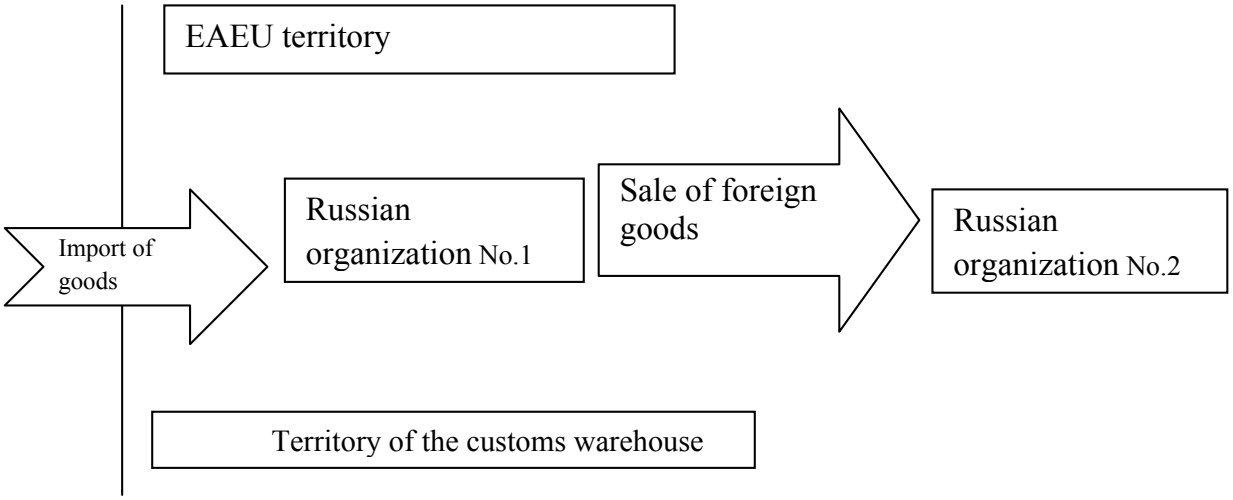


Note: the first three types of transactions are the most common.

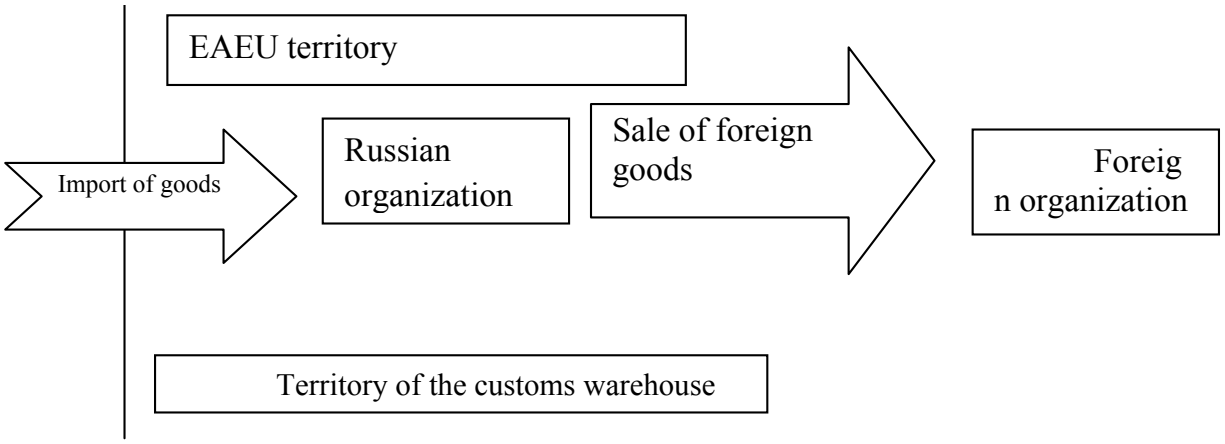
Explanation of transaction concepts:
b) sale of goods inside the customs warehouse
by a foreign organization to a Russian organization:



c) sale of goods inside the customs warehouse by Russian organization No. 1 to Russian organization No. 2:



d) sale of goods inside the customs warehouse by a Russian organization to a foreign organization:



e) sale of goods inside the customs warehouse by foreign organization No. 1 to foreign organization No. 2:

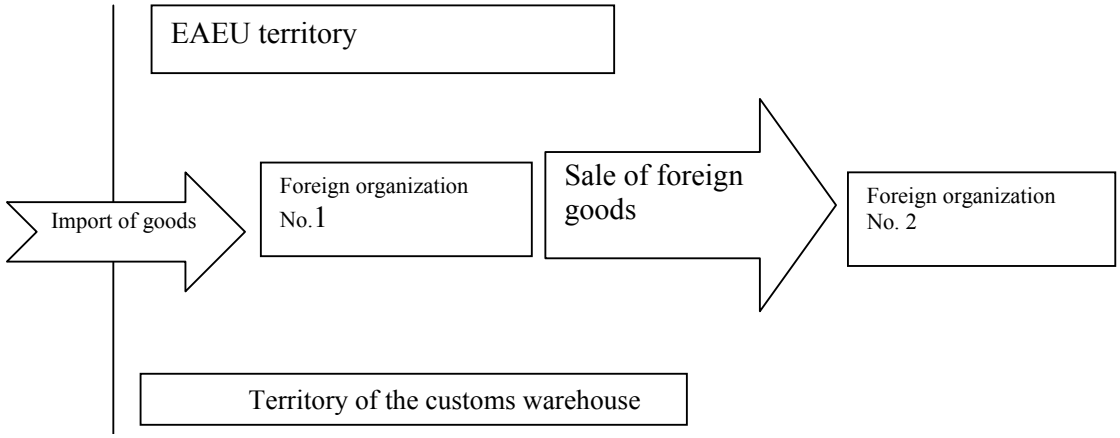


Fig. 1. **Typology of purchase and sale transactions of foreign goods under the customs procedure of the customs warehouse**

Source: compiled by the author.

the buyer can purchase the goods to import them into the EAEU territory and not change their status (the goods remain foreign), to sell the goods inside the warehouse without paying taxes and get economic benefits. Therefore, importing goods, a Russian organization can pursue two goals:

- to import goods to resell them inside the warehouse without being involved in a full-fledged economic turnover;
- to import goods to sale them and be involved in a full-fledged economic turnover.

It is important to understand that the customs warehouse is located on the territory of the Russian Federation, and the trade takes place on the territory of Russia. Despite the fact that the Russian organization or importer is actually an intermediary between the foreign organization and the real buyer (consumer of the goods), the real transaction took place when the goods had already been imported into the territory of the Russian Federation.

Thus, having examined the transaction mechanism in accordance with model 1, we can conclude that the conditions established by Article 147 of the Tax Code of Russia are met; the territory of the Russian Federation can be recognized as the place of sale of goods.

Model 2.

Foreign organization No. 1 purchases goods from foreign organization No. 2 (the transaction takes place on the territory of a foreign state) or moves its own goods outside any transaction to its own separate branch on the territory of the Russian Federation. Foreign organization No. 2 purchases the goods, then imports them into the EAEU territory, places them under the customs procedure of the customs warehouse and actually places them in the warehouse. After the organization finds buyers, the goods are sold inside the customs warehouse. Then, the buyer either resells the goods inside the warehouse, or releases them into real turnover (this is classified as placing the goods under the customs procedure and release for domestic consumption). Thus, the place of sale of goods is the territory of the Russian Federation.

Foreign organization No. 2 has the same goals as the Russian organization in model 1.

The key message of the sale transaction of foreign goods within the customs procedure of the customs warehouse to determine the economically sound tax consequences is the fact that the place of sale is the territory of the Russian Federation. At the same time, in model 2, as in model 1, the sale of goods takes place on the territory of the Russian Federation due to the fact that the goods are actually imported into its territory, the requirements established by Article 147 of the Tax Code of Russia are met. To determine indirect taxes, the territory of the Russian Federation can be recognized as the place of sale of goods.

The principle of neutrality of VAT taxation at selling goods in international trade transactions states that the tax consequences should be similar for the transactions of similar economic nature. If, as in our study, the purchase and sale of goods takes place in the territory of the Russian Federation, it is necessary to pay VAT, and if the goods are excisable, then to pay excise as well.

From an economic point of view, the above contractual relationship models are almost identical to standard internal purchase and sales transactions. These transactions suggest that:

- a foreign purchase and sales transaction takes place between foreign and Russian organizations;
- goods are imported into the customs territory of the EAEU, customs payments, including VAT, are paid, which involves placing goods under the customs procedure and release for domestic consumption, and acceptance by the Russian organization of the amount of VAT paid as part of customs payments for deduction;
- goods are sold in the domestic market and the amount of VAT presented by the buyer

for purchase and sales transactions is classified as tax deductions in the domestic market[3].

Model 1 implies that goods are imported by a Russian organization, while:

- a foreign purchase and sales transaction takes place between a foreign organization and a Russian organization;
- goods are imported into the customs territory of the EAEU, then they are placed under the customs procedure of the customs warehouse and are actually placed in the customs warehouse, while customs payments, including VAT, are not paid;
- goods are sold on the EAEU domestic market and the amounts of VAT presented to the buyer can be classified as VAT tax deductions on the EAEU domestic market[4];
- goods are exported from the territory of the customs warehouse, then the customs procedure of the customs warehouse is changed to the release for domestic consumption procedure, which involves the payment of customs payments, including VAT, the buyer's acceptance of VAT (customs payments) for deduction, then the goods are exported from territory of the customs warehouse.

Model 2 implies that the goods are imported by a foreign organization under the following conditions:

- a foreign organization has decided to import goods into the territory of the EAEU and transfer them to its separate branch in the territory of the Russian Federation;
- goods are imported into the customs territory of the EAEU, then they are placed under the customs procedure of the customs warehouse, the goods are actually placed in the customs warehouse, while customs payments, including VAT, are not paid;
- goods are sold on the domestic market of the Russian Federation and the amount of VAT presented to the buyer can be classified as VAT tax deductions on the domestic market of the country;[5]
- goods are exported from the territory of the customs warehouse, then the customs procedure of the customs warehouse is changed to the release for domestic consumption procedure, which involves the payment of customs payments, including VAT, the buyer's acceptance of VAT (customs payments) for deduction, then the goods are exported from territory of the customs warehouse.

We can conclude that in the two models similar actions are implemented in the same sequence, so the tax consequences should be the same. Thus, the work proved the need to observe the principle of neutrality in determining the tax consequences of indirect taxes.

Therefore, we can develop proposals aimed at the formation of economically sound tax consequences when conducting transactions with goods placed under the customs procedure of the customs warehouse.

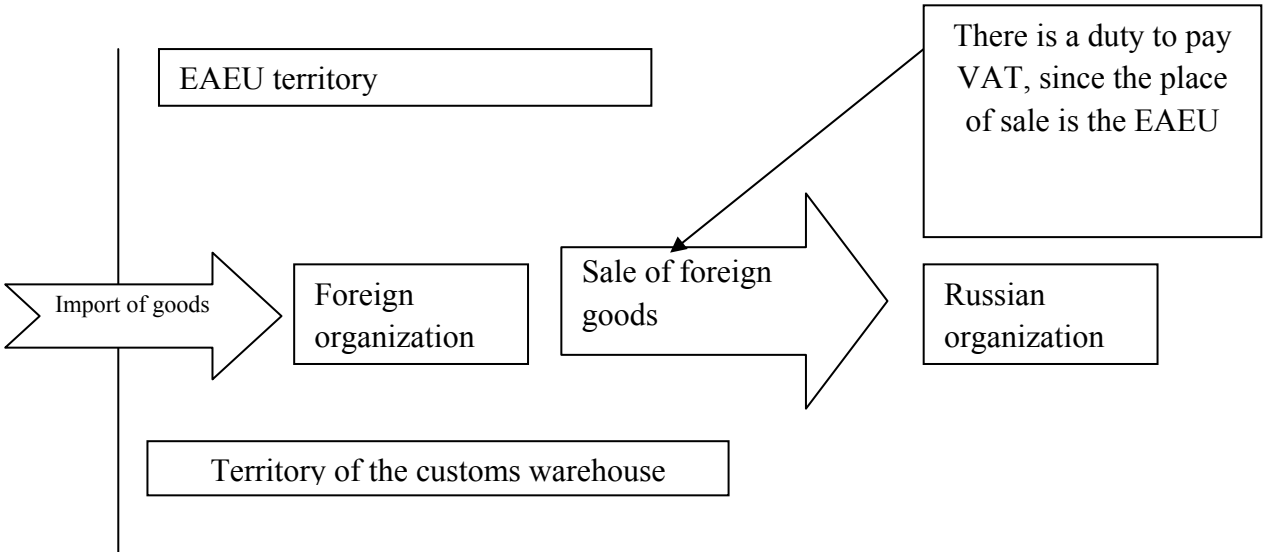
Based on the typology and the considered models of relations, most common for transactions with goods stored in customs warehouses and placed under the customs procedures of the customs warehouse, shown in *Fig. 1*, we will develop proposals aimed at the formation of economically sound tax consequences (*Fig. 2*).

We will now consider the above-mentioned transactions with goods placed under the customs procedure of the customs warehouse from the point of view of the formation of economically sound tax consequences.

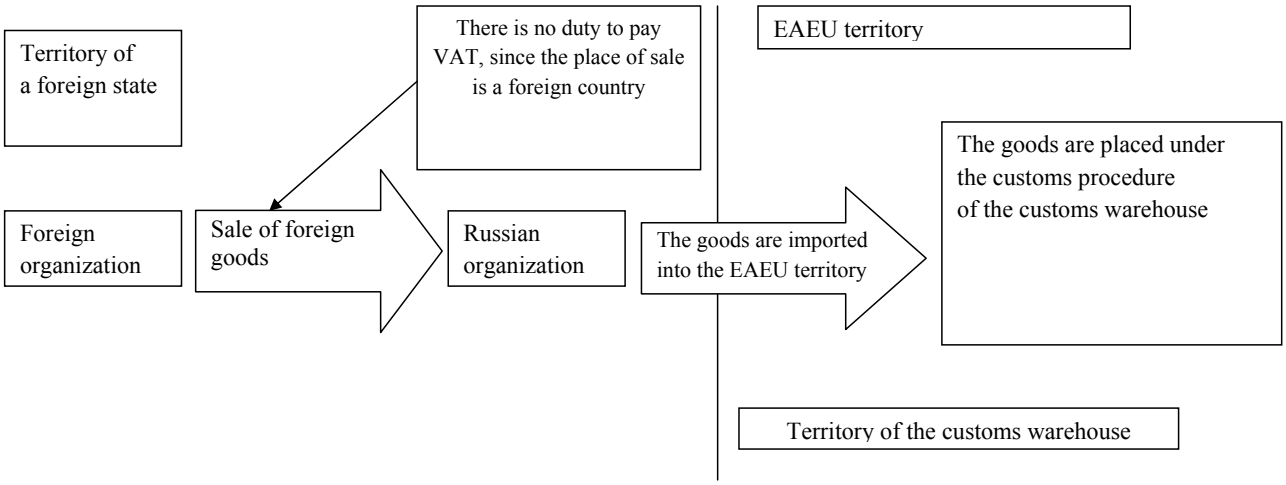
Fig. 2a presents a case when goods are imported into the EAEU territory by a foreign organization and are placed under the customs procedure of the customs warehouse. Then, the goods inside the warehouse are sold to a Russian organization. At the same time, VAT should be paid, since the place of sale is the EAEU territory. Below are the updates of the norms of Article 147 of the Tax Code of Russia. These updates exclude legal opportunities for non-recognition the territory of Russia as the place of sale of goods, since the actual sale of goods takes place when they are under the customs procedure of the customs warehouse

[3] Articles 171 and 172 of the Tax Code of Russia.
[4] The same.
[5] The same.

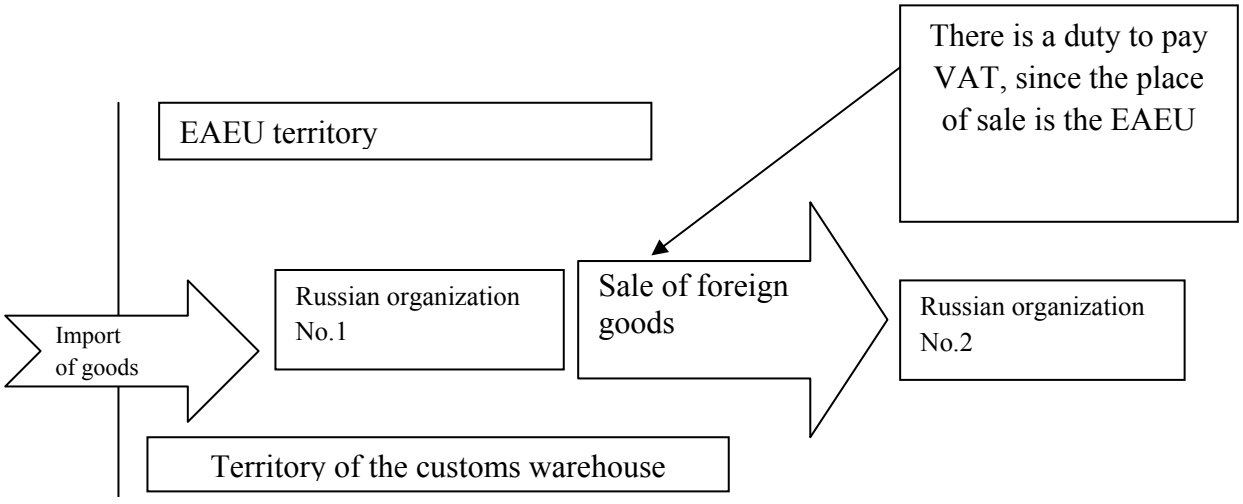
a) Situation 1. Sale of goods inside the customs warehouse by a foreign organization to a Russian organization:



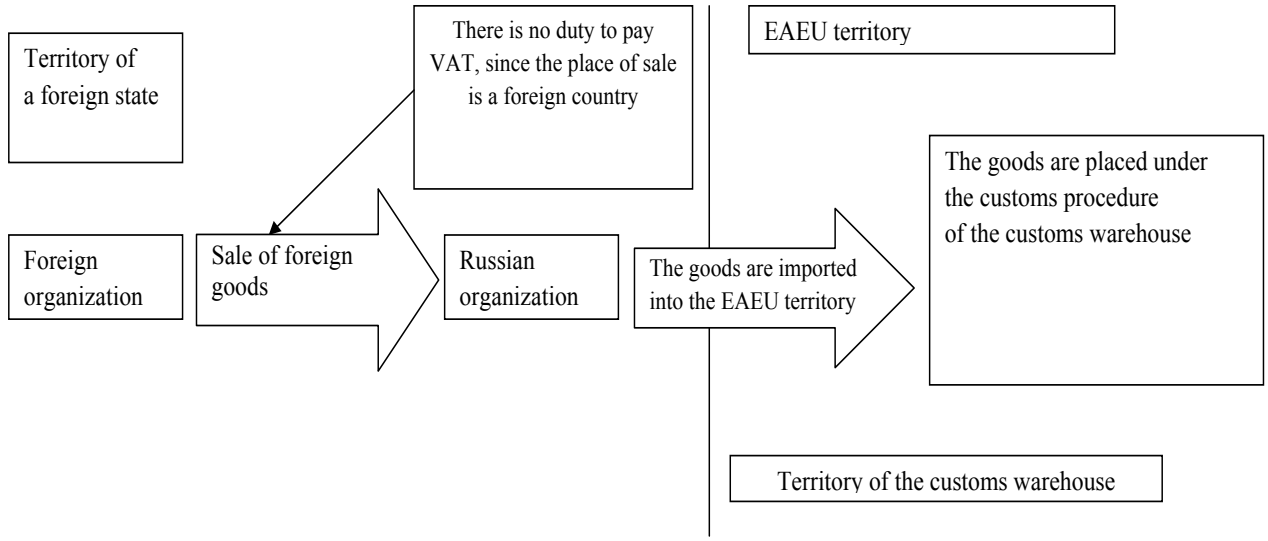
b) Situation 2. Sale of goods inside the customs warehouse by a foreign organization to a Russian organization:



c) sale of goods inside the customs warehouse of Russian organization No. 1 to Russian organization No. 2:



d) sale of goods inside the customs warehouse by a Russian organization to a foreign organization:



e) sale of goods inside the customs warehouse by foreign organization No. 1 to foreign organization No. 2:

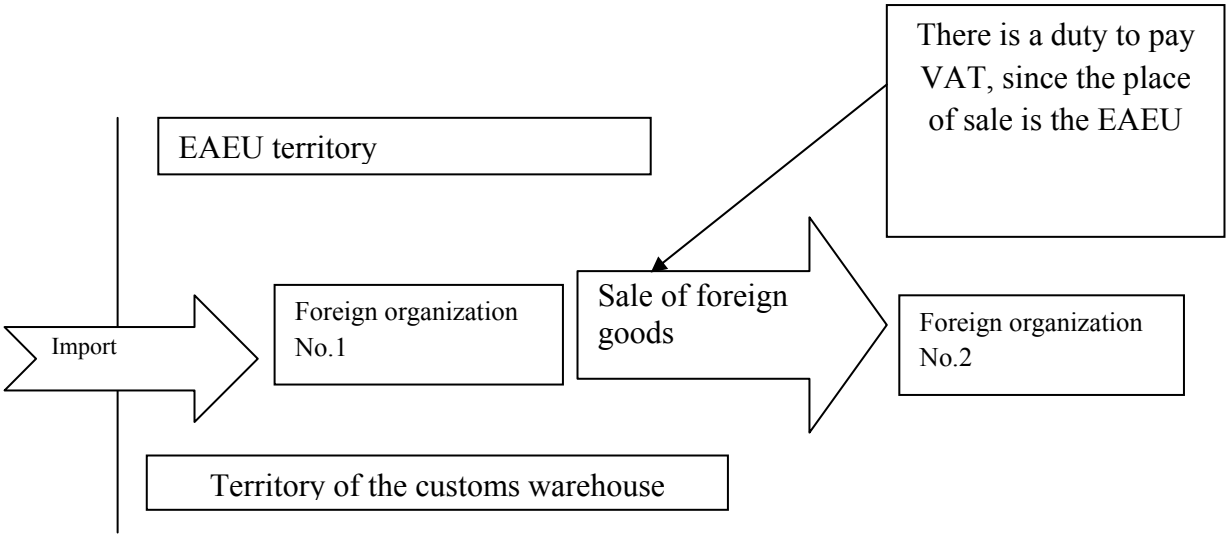


Fig. 2. **Economically sound tax consequences of purchase and sale of foreign goods under the customs procedure of the customs warehouse**

Source: compiled by the author.

and, accordingly, stored in the Russian customs warehouse.

Fig. 2b presents a similar, though a different case, since the place of sale is the territory of a foreign state. A foreign organization makes an agreement with a Russian organization, the sale takes place on the territory of a foreign state and the goods are imported into the EAEU territory and placed under the customs procedure of the customs warehouse. Therefore, to create economically justified tax consequences for transactions with goods placed under the customs procedure of the customs warehouse, it can be assumed that there is no duty to pay VAT on the EAEU territory, since the foreign state is by law the territory for the sale of these goods.

Fig. 1 presents a case when goods are imported into the EAEU territory by Russian organization No. 1 and are placed under the

customs procedure of the customs warehouse. Then, the goods inside the warehouse are sold to Russian organization No. 2, and VAT should be paid, since the place of sale is the EAEU territory.

Fig. 2d presents a case when goods are imported into the EAEU territory by a Russian organization and are placed under the customs procedure of the customs warehouse. Then, the goods inside the warehouse are sold to a foreign organization, while the buyer should pay VAT, since the place of sale is the EAEU territory.

Fig. 2e presents a case when goods are imported into the territory of foreign organization No. 1 and are placed under the customs procedure of the customs warehouse. Then, the goods inside the warehouse are sold to foreign organization No. 2. At the same time, VAT should be paid, since the place of sale is the EAEU territory.

In the case of several resales within the warehouse, tax consequences arise in each case, as does the right to a tax deduction.

STUDY RESULTS

The following developments represent a uniform system for the sale of goods within the customs procedure of the customs warehouse:

- a typology of transactions for purchase and sale of foreign goods placed under the customs procedure of the customs warehouse;
- a mechanism for determining economically justified tax consequences of purchase and sale of foreign goods placed under the customs procedure of the customs warehouse;
- updates of the tax legislation of the Russian Federation for the implementation of scientific developments.

As practical recommendations for improving the mechanism of indirect taxation regarding the application of the customs procedure of the customs warehouse, we propose to finalize the provisions of Article 147 Tax Code of Russia. In this case, we must consider that the customs procedure of the customs warehouse applied to complex contractual relationship models is used to optimize the supply chains of goods to foreign countries.

Determining the place of sale of goods has long been worked out in the current tax regulation, namely, in Article 147 Tax Code of Russia. Regarding tax consequences of standard purchase and sale transactions, the norms of Article 147 of the Tax Code of Russia, as a rule, make it possible to unambiguously determine the presence or absence of a place of sale and, accordingly, the object of VAT taxation in the Russian Federation. When the taxpayer uses more complex contractual relationship models in economic activities, in particular, import and storage of goods in a customs warehouse, placement under the appropriate customs procedure, further sale of goods inside the warehouse without changing the customs procedure, the problem to determine the place of sale of goods arises and it acquires special significance.

We find it necessary to note the lack of transparency in determining the place of sale of goods. Even if foreign goods cross the EAEU customs border in terms of international trade, and this fact is documented, it does not provide a clear understanding of the place of sale.

International documents on the indirect taxation methodology do not pay due attention to "place of sale of goods". This problem is typical of the tax legislation of the EAEU and the Russian Federation.

The Organization for Economic Cooperation and Development (OECD) on VAT taxation of international trade transactions do not consider this issue either [13][6]. At the same time, the chapter in this document[7], which deals specifically with the methodology for determining this category, is devoted to determining the place of sale for work, services and property rights.

[6] Guide on Customs Valuation and Transfer Pricing. URL: http://www.wcoomd.org/en/topics/key-issues/revenue-package/~/media/36DE1A4DC54B47109514FFCD0AAE6B0A.ashx (accessed on 04.04.2020).

[7] The same.

The analysis of tax legislation allows us to conclude that the methodology for determining the place of sale of goods is not sufficiently developed and does not consider all possible nuances in the sale of goods, including those noted above. All this, first of all, creates risks of negative impact on the amount of tax revenues on indirect taxes when taxing transactions with goods, as well as violations of the essential international principles of indirect taxation of international trade operations, including the principle of neutrality.

For taxpayers to rely on economic rather than tax interests, it is necessary to accommodate the tax and customs legislation of the Russian Federation so that the tax level is identical for similar transactions.

The norms of Article 147 of the Tax Code of Russia should be clarified so that under the current regulation were no legal opportunities to reject Russian territory as a place of sale of goods located and stored in the Russian customs warehouse when they undergo the customs procedure of the customs warehouse.

The suggested clarifications are as follows.

Article 147. The place of sale of goods[8]

For the purposes of this Chapter the place of sale of goods shall be deemed to be the territory of the Russian Federation if any one or more of the following circumstances exist: (by reference to specific features established by paragraph 2 of this article)[9]:

1) the goods are situated in the territory of the Russian Federation and other territories under its jurisdiction, including in the customs warehouse, have the appropriate status and placed under the customs procedure of the customs warehouse, and are not shipped or transported[10];

2) at the time of the commencement of shipment or transportation, the goods are situated in the territory of the Russian Federation and other territories under its jurisdiction, including in the customs warehouse, have the appropriate status and placed under the customs procedure of the customs warehouse[11].

An empirical basis for these updates can be the following. The principle of neutrality of indirect taxation is not considered when forming the tax consequences of purchase and sale transactions of foreign goods placed under the customs procedure of the customs warehouse. The OECD and then the states that ratified the Kyoto Convention made a systemic mistake that can be eliminated by changing the category "place of sale of goods" [14, 15].

With the customs procedure of the customs warehouse applied, the changes regarding the "place of sale of goods" category will create a mechanism for the formation of reasonable tax consequences for VAT, which will increase stability for the state (in terms of VAT receipts) and for the business unit (transparency of VAT calculation). It is the most effective way to solve this problem.

There is also another way — institutional changes in the customs procedure of the customs warehouse — which, however, will not help achieve the best efficiency.

According to famous economist I. Adizes [16, p. 124], decisions must be both effective and efficient, which is implied in the suggested solution.

We should also bear in mind the restrictions imposed by the ratification of the Kyoto Convention. Thus, in relation to the WTO, the system of national regulation must comply with the WTO requirements enshrined in the International Convention on the Simplification and Harmonization of Customs Procedures (Kyoto, 18.05.1973, revised — protocol of 26.06.1999 in Annex D — "customs warehouses and free zones"). The proposed changes do not violate this provision.

[8] Article 147 of the Tax Code of Russia.

[9] The same.

[10] The same.

[11] The same.

Within the application of the customs procedure of the customs warehouse, the proposed changes will have a positive impact on the state and business entities and increase their stability. This will help achieve:

The growth of tax revenues to the budget of the Russian Federation, which is associated with additional charges in terms of indirect taxes (VAT and excise).

Lower state expenditures on control measures in terms of indirect taxes.

Lower tax risk:

- for the state — evasion of indirect taxes to the budget of the Russian Federation;
- in terms of additional charges of indirect taxes as a result of control measures, as well as penalties and fines for violation of tax legislation, a more efficient scheme for reimbursing VAT tax deductions for the sale of goods, as well as the lack of verification of VAT reimbursement for international trade transactions.

Definitions of unambiguous tax consequences of a typical purchase and sale transaction and the application of the principle of neutrality in terms of indirect taxes.

CONCLUSIONS

Thus, in compliance with Article 158 p. 1 of the Customs Code of the EAEU, we proposed a typology of purchase and sale transactions of foreign goods placed under the customs procedure of the customs warehouse (*Fig. 1*). We also applied the generalization method to systematize scientific knowledge. We formed economically sound tax consequences (*Fig. 2*) (by the economic method), which comply with the principle of neutrality in determining the tax consequences of VAT.

The paper analyzes the approaches to the formation of the institutional structure of the customs procedure of the customs warehouse by comparing the studies in Russian and foreign practice.

As practical recommendations, we proposed to clarify the norms of Article 147 of the Tax Code of Russia, so that under the current regulation were no legal opportunities to reject Russian territory as a place of sale of goods located and stored in the Russian customs warehouse when they undergo the customs procedure of the customs warehouse.

REFERENCES

1. Sidorova E. Yu. Methodological provisions for determining the place of sale of goods in transactions of sale of imported goods placed under the customs procedure “customs warehouse”. *Mezhdunarodnyi bukhgalterskii uchet = International Accounting*. 2019;22(12):1392–1403. (In Russ.). DOI: 10.24891/ia.22.12.1392
2. Sidorova E., Tikhonova A. Assessment of the fiscal effect of the tax reform options until 2019: The case of Russia. *Економічний часопис-XXI = Economic Annals-XXI*. 2017;164(3–4):45–48. DOI: 10.21003/ea.V164–10
3. Sidorova E. Yu. Improving methods for assessing the effectiveness of the tax regulation mechanism of the Russian Federation. *Економічний часопис-XXI = Economic Annals-XXI*. 2015;115(11–12):47–51. URL: http://soskin.info/userfiles/file/Economic-Annals-pdf/S155–0010(10)047.pdf (In Russ.).
4. Sidorova E. Yu. Economic efficiency of the formation of reasonable tax consequences when applying the customs procedure “customs warehouse” in order to increase the stability of the state and business units. *Mezhdunarodnyi bukhgalterskii uchet = International Accounting*. 2020;23(1):30–44. (In Russ.). DOI: 10.24891/ia.23.1.30
5. Goncharenko L. I., Malkova Yu.V., Advokatova A. S. Actual problems of the tax system in the digital economy. *Ekonomika. Nalogi. Pravo = Economics, Taxes & Law*. 2018;11(2):166–172. (In Russ.).
6. Goncharenko L. I., Sidorova E. Yu., Artemev A. A., Nazarova N. A. Dividend-based and interest-based schemes of minimization of customs value of goods in deals between related parties: Russian practice. *Espacios*. 2018;39(16):42. URL: http://www.revistaespacios.com/a18v39n16/a18v39n16p42.pdf
7. Artem’ev A.A., Pinskaya M. R. Methodological problems of VAT taxation of operations with foreign goods in the EAEU. *Nalogovaya politika i praktika*. 2016;(10):64–68. (In Russ.).

8. Pinskaya M. R., Artem'ev A. A. Drawbacks of the indirect taxation mechanism in the EAEU and methods for their elimination. *Mezhdunarodnye otnosheniya = International Relations*. 2018;(4):104–111. (In Russ.). DOI: 10.7256/2454–0641.2018.4.28433
9. Kozyrin A. N. Customs procedure of customs warehouse under the legislation of the EAEU and the Russian Federation. *Reformy i pravo*. 2016;(2):8–15. (In Russ.).
10. Markin M. V., Pyrkova M. A. Features of the placement of goods under the procedure "customs warehouse". *Vestnik nauki.* 2019;4(6);202–204. (In Russ.).
11. Akopyan I. E., Deryagin O. V., Tovstonoshenko V. N. The role and importance of the customs warehouse in foreign economic activity. *Logisticheskie sistemy v global'noi ekonomike = Logistic Systems in Global Economics*. 2018;(8):58–60. (In Russ.).
12. Frolova S. S., Khromova E. A. The role of warehouses in customs logistics. *Logisticheskie sistemy v global'noi ekonomike = Logistic Systems in Global Economics*. 2017;(7):641–643. (In Russ.).
13. Baldwin R., Wyplosz Ch. The economics of European integration. New York: McGraw-Hill Higher Education; 2012. 654 p.
14. Aujean M. Tax competition and planning: What solution for the EU? *EC Tax Review*. 2014;23(2):62–63. URL: https://www.deepdyve.com/lp/kluwer-law-international/tax-competition-and-tax-planning-what-solution-for-the-eu-D5t4U3nWRO
15. Kireyeva E. F. Tax regulation in agriculture: Current trends, selection of a state support forms. *Journal of Tax Reform*. 2016;2(3):179–192. DOI: 10.15826/jtr.2016.2.3.023
16. Adizes I. Mastering change: The power of mutual trust and respect in personal life, family life, business and society. Carpinteria: Adizes Institute; 1992. 240 p. (Russ. ed.: Adizes I. Upravlyaya izmeneniyami: Kak effektivno upravlyat' izmeneniyami v obshchestve, biznese i lichnoy zhizni. Moscow: Mann, Ivanov and Ferber; 2014. 368 p.).

ABOUT THE AUTHOR

Elena Yu. Sidorova — Dr. Sci. (Econ.), Prof., Department of Tax Policy and Customs and Tariff Regulation, Financial University, Moscow, Russia
Ejsidorova@yandex.ru

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Grant as a Special Type of Budget Subsidies

S.V. Zapol'skii[a], **E.M. Andreeva**[b] ✉
[a] Institute of State and Law of the Russian Academy of Sciences, Moscow, Russia;
[b] Saint Petersburg State University of Economics, Saint Petersburg, Russia
[a] https://orcid.org/0000-0001-5906-893X; [b] https://orcid.org/0000-0001-5238-9984
✉ Corresponding author

ABSTRACT

The article provides the study of the Russian legislation on grants funded through the budget. **The relevance** of the research is due to the importance of grants in the development of human potential, stimulating innovative and other activities, as well as the lack of an overall estimate of budget legislation on grants by the scientific community. **The aim** of the article is to answer the following questions. First, whether state grant support in the Russian Federation is a special type of financing, or it is regulated by the general rules of budget or civil law. Second, whether the financial legislation on grants contributes to the economic and social development of Russia and to achieving grant objectives. Third, what proposals could increase the legal regulation of grant activities in the Russian Federation. The authors used the scientific **methods** of formal legal and comparative legal methods, generalization and modeling. They applied the method of comparative law to the legal regulation of grants in the European Union and to the attempt to transfer this positive experience to the Russian legal system. The modeling method helped the authors build a mocking mechanism for the legal regulation of grant activities in the Russian Federation. The formal logical method allowed for evaluating the current conceptual framework of grant support and making suggestions for improvement. Studying the regulatory legal acts and applying grant legislation by the authors resulted in the **conclusion** that the quality of legal support for grants in Russia is unsatisfactory. To improve the efficiency of legal regulation of grants, the authors propose to separate the concepts of "grants" and "budget subsidies"; to provide a separate chapter "Budget grants" in the Budget Code of the Russian Federation with the concept, procedure and grants funded through the budget. According to the authors, these proposals will be able to increase the effectiveness of state grant support in the Russian Federation.

Keywords: grants; budget; Budget Code of the Russian Federation; European Union; funding; subsidy; donation; public finance

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INTRODUCTION

According to D. I. Provalinskii, it was not until fairly recently that grants appeared in Russian law (approximately in the mid-90s of the 20th century). Major political, economic and social transformations initiated in the state at that time were showing the early results: a new basic legislative framework was outlined, free integration with foreign countries appeared in almost all spheres of life (science, culture, education, art, sports, etc.) [1].

Currently, grant activities are regulated by civil, financial and administrative law, depending on the source of funds. The authors aim to evaluate modern grant regulation and make suggestions for its improvement.

LEGAL NATURE OF GRANTS

The legal nature of grants was discussed by a number of researchers, however, their conclusions are ambiguous. A. A. Kumaritova concluded that grant agreements are donation agreements and, therefore, are civil by nature [2].

Belyavskii [3] notes that the role of the grant funding scheme for the development of fundamental science is ambiguously evaluated by foreign researchers [4–7].

Russian legislation that does not provide full-fledged legal regulation of grant activities encourages disputes about the place of grant standards in the Russian law system. The Civil Code of the Russian Federation does not use the word "grants". There is no universal concept of grants in Russian law. There are only a few different interpretations, adapted for specific purposes. For example, one of them is enshrined in Article 2 of the Federal Act of 08.23.1996 No. 127-FZ "On Science and State Scientific and Technical Policy". This document refers to grants as private money and other funds transferred free of charge and irrevocably by citizens and legal entities for the implementation of specific scientific and technical programs and projects, innovative projects, specific research (Article 2). At the same time, Article 16.2 of the aforementioned document states that grants are also acceptable as the state support for innovation.

Federal Act dated 11.08.1995 No. 135-FZ "On Charity and Volunteering (Volunteering)" refers to charitable grants as purpose-oriented donations provided by citizens and legal entities (Article 15). Currently in Russia, quite a number of grants are provided by private charitable foundations. The most famous foundations are Elena and Gennady Timchenko foundation and the Vladimir Potanin foundation[1]. Many grants are awarded by international organizations.

State support of various activities using this form of financing is actively provided in Russia. For example, total public funds allocated to research projects in the form of grants through the Federal Budget Institution "Russian Foundation for Basic Research" were 9.9 billion roubles in 2016, 10.0 billion roubles in 2017 and 19.1 billion roubles in 2018[2]. The total grants in various areas in the federal budget amounted to 18.0 billion roubles in 2016, 23.6 billion roubles in 2017, 38.6 billion roubles in 2018 and 30.6 billion roubles in 2019[3]. Therefore, it is reasonable to suppose that grants should be recognized as a full-fledged category of financial law.

In Russia, grants can be funded through the budget ("budget grants") or through private (non-public) funds ("private grants"). The authors studied the rules, procedures and tar-

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[1] Grants from Elena and Gennady Timchenko Foundation. URL: http://timchenkofoundation.org (accessed on 30.03.2020). Grands from the Vladimir Potanin Foundation. URL: https://www.fondpotanin.ru (accessed on 30.03.2020).

[2] Federal Budget Institution "Russian Foundation for Basic Research". RFBR reports on the results and use of the assigned federal property for 2016, 2017, 2018. URL: https://www.rfbr.ru/rffi/ru/news_events/o_2095203 (accessed on 12.08.2019).

[3] The authors summarize the analysis of federal budget for 2016–2020. Federal Laws of December 14, 2015 No. 359-FZ "On the federal budget for 2016"; dated December 19, 2016 No. 415-FZ "On the federal budget for 2017 and for the planning period of 2018 and 2019"; dated December 5, 2017 No. 362-FZ "On the federal budget for 2018 and for the planning period of 2019 and 2020"; dated November 29, 2018 No. 459-FZ "On the federal budget for 2019 and the planning period 2020–2021". The official website of legal information. URL: http://www.pravo.gov.ru (accessed on 30.01.2020).

gets for grants and concluded that private and budget grants are of different legal nature and should be regulated by different branches of law. If it comes to grants from private funds, their legal regime should be determined by civil law. If grants are funded through the budget of the Russian Federation, they should be regulated by financial law. However, both areas of law have significant gaps, if not a legal vacuum, in the regulation of grant relations.

BUDGET GRANTS. CONCEPT AND TARGETS

As part of this scientific study, we will look at the financial and legal component of grants. We will consider the Russian budget legislation on grants and try to answer the question whether the current situation contributes to the economic and social development of Russia and to human development.

The first problem that we faced was that there is no single normative act outlining the targets of state grant support. In contrast, the European Union Financial Regulation (Article 180) clearly states that grants may be awarded to finance an action intended to help achieve a Union policy objective or the functioning of a body which has an objective forming part of, and supporting, a Union policy. Establishing priorities in the use of public finance avoids the waste of budgetary resources and makes their use more efficient. Thus, we believe that the targets of budget support should be determined in the budget legislation of Russia. These are the priorities of socio-economic development of the Russian Federation, enshrined in the goal-setting documents in Article 11 of the Federal Regulation of June 28, 2014 No. 172-FZ "On Strategic Planning in the Russian Federation". These include the Annual Address to the Federal Assembly of the Russian Federation and the Concept for Long-term Socio-economic Development of the Russian Federation. Moreover, we consider regulatory restrictions are important limiting the state grant support to the spheres of culture, art, science and education. This conclusion follows from the Federal Act of 29.11.2018 No. 459-FZ "On federal budget for 2019 and for 2020 and 2021 planning period", which provides grants specifically for these purposes[4].

The Budget Code of the Russian Federation mentions the word "grants" five times; however, there is no definition of grants or basic legal regulation of the procedure for their provision and expenditure. In addition to the named source, grants are devoted to Act of the Government of the Russian Federation of March 27, 2019 No. 322 on general requirements to regulatory legal acts and municipal legal acts establishing the procedure for grants in the form of subsidies, including those provided on a competitive basis (hereinafter — Government's Act No. 322), as well as Order of the Ministry of Finance of the Russian Federation No. 280n of December 21, 2018 on the endorsement of the typical forms of agreements (contracts) on the grants in the form of subsidies provided from the federal budget in compliance with paragraph 7 of Article 78 and paragraph 4 of Article 78.1 of the Budget Code of the Russian Federation" (applied since 2019).

We will analyze the content of these legal acts and try to define the concept of grants in the budget law of Russia. It follows from Articles 78 and 78.1 of the Budget Code of the Russian Federation that **grants are a form of subsidy**. In these rather voluminous articles, grants are mentioned only in paragraph 7 of Article 78 and paragraph 4 of Article 78.1. According to these paragraphs, "a budgetary provision (grant expenses ... *in the forn of subsidies*) can be included in the federal budget). Therefore, grants are budget allocations in the form of subsidies.

The Budget Code of the Russian Federation provides for two types of subsidies, completely different by nature and regulation:

[4] However, it also provides grants to mass media, but such grants will contradict the principle of mass media independence.

- subsidies, which are a form of intergovernment transfers and allocated to budgets of a different level ("intergovernment subsidies" — *author's note*);
- subsidies provided to individuals and legal entities ("budget subsidies" — *author's note*).

This fact often confuses the application of the provisions of the Budget Code of the Russian Federation. This study shows that grants should be distinguished from budget subsidies. In fact, there are many more types of budget subsidies. Almost every paragraph of Articles 78 and 78.1 of the Budget Code refers to various types of budget subsidies and has special (rather than general) rules. For example, paragraphs 1–3 of Article 78 determine the legal regulation of subsidies to producers of goods, works, and services in order to reimburse lost income; paragraph 4.1 determines the legal regulation of subsidies to individuals for reimbursement of customs payments; paragraph 7 determines the legal regulation of subsidies in the form of grants; paragraphs 8–8.4 determine the legal regulation of subsidies for capital investments, etc.

Based on the above said, we suggest defining the concept of "budget grants" in the budget legislation as follows: "budget grants are free-of-charge, non-refundable, earmarked funds provided from the budgets of the budgetary system of the Russian Federation to individuals and legal entities to implement non-commercial projects corresponding to the goals of socio-economic development of Russia, enshrined in the strategic planning documents".

FEATURES OF BUDGET GRANTS

The analysis of the above regulatory documents indicates a few features of budget grants. They are as follows:

- **grant recipients** can be legal entities, individual entrepreneurs and individuals (except public institutions);
- legal regulation of grants provided to non-profit legal entities and other entities is concentrated in different Articles of the Budget Code of the Russian Federation and has some differences;
- the procedure for providing individual grants is determined by decisions of the President of the Russian Federation, the Government of the Russian Federation, the highest official of the constituent entity of the Russian Federation, the highest executive body of state power of the constituent entity of the Russian Federation, local administration;
- if such decisions do not provide for such an order, it shall be established accordingly by regulatory legal acts of the constituent entities specified in the previous paragraph. Moreover, these acts must comply with the general requirements established by the Government of the Russian Federation;
- grants can be provided both on a competitive basis and not.

Article 21 of the Budget Code of the Russian Federation defines a special subgroup of budget expenditures of classification code of the Russian Federation "Prizes and *Grants*", included in the group "Social Security and Other Payments to the *Population*". It can be seen that grants to legal entities do not have their own subgroup of expenditures and it is not clear what they relate to.

A systematic interpretation of the items of the Budget Code of the Russian Federation on budget subsidies allows us to add to the above the following essential elements of budget grants:

- grants to ***non-commercial*** legal entities are included in the budget allocation for the provision of state (municipal) services (work performance), while grants to other entities are included in the budget allocation for the provision of subsidies to legal entities [except subsidies to state (municipal) institutions], individual entrepreneurs, to individuals (Articles 69, 69.1 of the Budget Code of the Russian Federation), which, in our opinion, is illogical;
- grant recipients should not have overdue (unsettled) debts on monetary obligations to

the corresponding public legal entity (p. 17 of Article 241 of the Budget Code of the Russian Federation);

- applicants for grants cannot be foreign legal entities or Russian legal entities with the total share of offshore companies in their authorized (joint-stock) capital exceeding 50% (p.15 of Article 241 of the Budget Code of the Russian Federation);
- grant recipients must conclude an agreement, form of agreement is established by the relevant financial authority (for example, the standard form for grants provided from the federal budget is established by order of the Ministry of Finance of the Russian Federation);
- a precondition of this agreement is that the grant recipient should agree to financial control measures regarding compliance with the objectives and use conditions of the grant (Articles 78, 78.1 of the Budget Code of the Russian Federation);
- for grant recipients, an obligation to return funds used in violation of the order should be provided (for some reason, this obligation is not mentioned in relation to non-profit organizations — grant recipients). Moreover, the last rule is not mentioned anywhere, though it should be included in the procedure for the provision of individual grants.

If we evaluate the Articles of the Budget Code of the Russian Federation on grants from the point of view of technology of legal wriring, we will see that the provisions of Articles 78 and 78.1 on grants partially coincide (duplicate).

Government's Act No. 322, which establishes the requirements for normative legal acts for providing grants, supplements the characteristics of grants given in the Budget Code of the Russian Federation to a small extent. It leaves a lot of decisions to the discretion of certain provisions for specific grants. For example, this concerns such important issues as the procedure for calculating the size of grants, the deadlines for submitting and considering applications, the procedure for selecting grant recipients, the method of financing the grant recipient (advance payment or payments upon completion), the procedure and reporting forms, etc. Besides, Order No. 322 establishes only the "general requirements" to the normative legal acts on the provision of grants, and not to the grant activity or to budget funding procedure. The significance of this document is also mitigated by the fact that these general requirements do not apply to the procedure for grants in the form of subsidies from the federal budget, budgets of the constituent entities of the Russian Federation, local budgets, as determined by the decisions mentioned in sub-paragraph 1, paragraph 7 of Article 78 and sub-paragraph 1, paragraph 4 of Article 78.1 of the Budget Code of the Russian Federation. That is, if the rules for the provision of certain types of grants are established in specific decisions on the provision of these grants, these rules take precedence over the general requirements enshrined in Government's Order No. 322. Therefore, this Order is applied residually. This suggests that "local" legal regulation focuses on each grant, while there are no general requirements for grant funding.

We consider it is important to limit the state grant support within the spheres of culture, art, science and education.

Nevertheless, Government's Act No. 322 contains several important amendments about grants. In particular, it bans double funding of the same activity. According to paragraph 4, "in the current financial year or on a different date determined by the legal act, the applicant must not receive funds from the budget of the budgetary system of the Russian Federation planned for the grant provision, in accordance with other legal acts

for the purposes established by the legal act". The general requirements also indicate that the applicant, a legal entity, as of the date determined by the legal act should not be in the process of liquidation or bankruptcy, and the applicant, an individual entrepreneur, should not stop acting as an individual entrepreneur. Paragraph 5 of Government's Act No. 322 formulates the controversial provision that an additional requirement for an applicant — a budgetary or autonomous institution — is to provide consent from its founder to participate in the selection.

EVALUATION OF FINANCIAL AND LEGAL REGULATION OF GRANT ACTIVITY IN RUSSIA

The analysis shows that financial legislation pays little attention to grants. Meanwhile, even this superficial legal regulation of grant activities leads to the conclusion that grants as a form of budget funding (state support) for legal entities and individuals have a number of distinguishing features from budget subsidies, as well as from private grants.

First, subsidies involve **co-financing** of expenditures, while grants can cover the costs of their recipients all.

Second, most of the budget subsidies provided for in Articles 78 and 78.1 of the Budget Code of the Russian Federation, aimed at reimbursing the expenditures already incurred by the recipients, while grants are provided to finance any future activities.

Third, classifying budget grants into a separate category would help isolate them in the budgetary classification and eliminate confusion in the legislation on the type of budget allocation they relate to. Now, they belong to two types of budget allocations at the same time. Another difference between budget grants and private grants might be in limiting the targets for budget grants and in pursuing the state (public) interest in providing them. We emphasize the non-profit nature of grants. Frequent grants differ from budget ones by the fact that they are based on the principles of freedom of agreement and equality of parties to legal relations, which is not applicable to budget grants.

However, if the legislator learns about our view on the special nature of the "budget" grants, and if the grants remain a form of budget subsidies, the Russian grant regulation should be substantially modernized.

This view can be proved by the European Union's extensive practice. Grants should be considered an important component of the development of the European economy. They aim to stimulate the development and implementation of radically new ideas and solutions in priority industries for the European Union. Currently, there are about 20 programs in the European Union, which provide funding from the EU budget in the form of grants[5]. The analysis of EU legislation on grants testifies its high sophistication. The European legislator strives to regulate the smallest details of grant funding. There are no legal acts of the European Union devoted specifically to the procedure of budget funding through grants.

The legislation of the European Union, like the Russian one, is based on the general-to-specific principle and, therefore, establishes:

- general rules for spending the EU budget;
- forms of financing any activity from the EU budget (procurement, bonuses, contributions to trust funds, grants, loans, budget guarantees, etc.);
- features of the provision of grants;
- features of grant allocation for innovation and research, ecology, education, culture, etc.[6]

[5] Single Electronic Data Interchange Area (SEDIA). Funding & tender opportunities. URL: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home (accessed on 30.03.2020).

[6] Procurement and Grants for European Union external actions. A Practical Guide to financial and contractual procedures (Version 2018.0–2 August 2018). European Commission. URL: https://www.info-cooperazione.it/wp-content/uploads/2018/09/ePrag-en-2018.0–1.pdf (accessed on 30.03.2020).

Following the described procedure, the basic document governing grant activities in the EU is the Regulation (EU, Euratom) 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union (hereinafter referred to as the EU Regulation)[7]. This document can be referred to as the Budget Code of the European Union. It regulates the whole range of activities regarding adoption, execution and control over the implementation of the EU budget. What is especially important and has the edge over the Budget Code of Russia is that the EU Regulation has quite a few provisions devoted to grants. Besides the regulation of grant support, section VIII of the EU Regulation that consists of 4 chapters and 25 articles (Articles 180–205) is devoted to grants.

Article 2 of the EU Regulation provides a rather concise definition of the *grant* as a financial contribution by way of donation. Previous EU Regulation provided a more detailed definition, which established that grants are direct financial contributions by way of donations from the budget to finance actions aimed at achieving the EU policy objectives; functioning of bodies that pursue the EU common interest objective or have an objective that is part of or supports the policy of the European Union (Article 121). It is important to emphasize that the EU Regulation establishes special principles for grant support, namely:

- equal treatment;
- transparency;
- co-financing;
- non-cumulative award and no double financing;
- non-retroactivity (grants shall not be awarded retroactively for actions already completed);
- no-profit (grants shall not apply to actions the objective of which is the reinforcement of the financial capacity of a beneficiary).

A distinctive feature of the EU legislation is a large number of general regulations on grants of higher legal force (adopted by the Parliament of the European Union), as well as detailed regulation of grant activities. For example, in the European Union, grants are awarded by a general rule, only by calls for proposals (projects). Moreover, Article 195 of the EU Regulation provides an exhaustive list of exceptions to calls for proposals. For example, in the case of research and technological development, where the basic act expressly provides for the condition that the project does not fall under the scope of a call for proposals, and to bodies (not legal entities — *author's note*) for activities with specific characteristics that require a particular type of body on account of its technical competence, its high degree of specialization or its administrative powers.

Budget grants are free-of-charge, non-refundable, earmarked funds provided from the budgets of the budgetary system of the Russian Federation to individuals and legal entities to implement non-commercial projects corresponding to the goals of socio-economic development of Russia, enshrined in the strategic planning documents.

As already noted, the Russian budget legislation has no rule to hold a compulsory competitive selection of grant recipients. Meanwhile, the competitive selection of grant recipients is aimed at choosing the most interesting projects (works), helps increase competition and achieve the best results with the least costs. Thus, we propose to clearly

[7] EU, Euratom 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union. Official Journal of the European Union L 193/1. 30.07.2018.

define the list of cases that do not require a competition or another selection for grants in the Russian Federation.

Another shortfall of grant regulation in Russia is notification to potential applicants about the possibility of obtaining grants. Due to the lack of universal legal regulation, there are no general requirements for notifying interested parties. Here, the experience of the European Union also seems useful. According to the EU Regulation, information on any grant should be posted on a common official website dedicated only to grant support. This Single Electronic Data Interchange Area contains all information about all grants from the EU budget, the procedure for receiving them and immediately provides an option to apply for a grant[8].

CONCLUSIONS

The identified shortfalls of the grant legislation of the Russian Federation, the cited experience of the European Union on grant regulation, and the assessment of the impact of budget legislation on grants for achieving the objectives of Russia's socio-economic development led to the conclusion that it is possible and necessary to improve the legal component of grant support in Russia. Therefore, we propose to include a separate chapter "Budget grants" in the Budget Code of the Russian Federation. It should provide: the concept of budget grants, the distinguishing features of grants (non-profit basis, gratuitous, non-refundable nature), principles of grant support, targets of grants (science, culture, art, education), outline the range of grant recipients (individuals and non-profit organizations), define general rules for the provision and expenditure of grants, responsibility for their misconduct or inefficient use, other violations. The chapter should pay particular attention to notification to potential participants about the grants proposed for award, as well as the regulation of cases of competitive (non-competitive) receipt of budget grants.

This proposal solves several important problems at one time. Besides regulating grant relations, it will move the current rules on grants from the sub-legislative to legislative level. Moreover, detailed regulation of grant relations based on the Budget Code of the Russian Federation may also provide methodological assistance to regional and local authorities in awarding regional and local grants. Federal legislation should guide them and be an example for creating normative acts of the constituent entities of the Russian Federation and local communities.

[8] Single Electronic Data Interchange Area (SEDIA). Funding & tender opportunities. URL: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home (accessed on 12.01.2020).

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REFERENCES

1. Provalinskii D.I. Grants: Concept and features. *Voprosy rossiiskogo i mezhdunarodnogo prava = Matters of Russian and International Law.* 2016;6(12A):201–210. (In Russ.).
2. Kumaritova A.A. State and municipal grants: The emergence, formation and development prospects in Russian civil law. *Zhurnal rossiiskogo prava = Journal of Russian Law*. 2008;(7):88–99. (In Russ.).
3. Belyavskii O.V. Legal regime of the grant as an instrument of state funding of fundamental scientific research in the Russian Federation. Cand. legal sci. diss. Moscow: RAS Institute of State and Law; 2018. (In Russ.).

4. Goldsworthy J.D. Research grant mania. *Australian Universities Review*. 2008;50(2):17–24.
5. Jacob B.A., Lefgren L. The impact of research grant funding on scientific productivity. *Journal of Public Economics*. 2011;95(9–10):1168–1177. DOI: 10.1016/j.jpubeco.2011.05.005
6. De Figueiredo J.M., Silverman B.S. How does the government (want to) fund science? Politics, lobbying and academic earmarks. NBER Working Paper. 2007;(13459). URL: https://www.nber.org/papers/w13459.pdf
7. Shibayama S. Distribution of academic research funds: Case of Japanese national research grant. *Scientometrics*. 2011;88(1):43–60. DOI: 10.1007/s11192–011–0392-z

ABOUT THE AUTHORS

Sergei V. Zapol'skii — Dr. Sci. (Law), Chief Researcher, Sector of Administrative Law and Administrative Process, Institute of State and Law of the Russian Academy of Sciences, Honored Lawyer of the Russian Federation, Moscow, Russia
zpmoscow@mail.ru

Elena M. Andreeva — Dr. Sci. (Law), Assoc. Prof. at the Department of Financial Law, Saint Petersburg State University of Economics, Assoc. Prof., Saint Petersburg, Russia
Elenaandreeva09@mail.ru

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Performance Audit: Importance and Prospects within the Public Financial Control System

O.I. Lozitskaya[a] ✉, **N.L. Voronina**[b]
Financial University, Moscow, Russia
[a] https://orcid.org/0000-0001-7166-3213; [b] https://orcid.org/0000-0002-4769-5538
✉ Corresponding author

ABSTRACT

The article discusses the concept and application of performance audit in public administration integral to the modern public financial control system. **The aim** of the study is to analyze the public financial control system using modern approaches to audit performance and its development prospects in Russia. The authors use general scientific and special research **methods** (analysis, synthesis, induction, deduction), as well as methods of economic theory: positive analysis and scientific abstraction. The study analyzed basic approaches to defining the concept of "performance audit", its idea, the most important issues that it solves, and development prospects. The study proposed the concept of a two-level control system: the internal control bodies represented by the Federal Treasury of the Russian Federation should supplement the bodies conducting the performance audit. In the future, this will help build a full performance audit system of the use of public financial resources. As a **result**, the authors identified the problems of implementing the proposed concept. The key problem is the different statuses of the Federal Treasury of Russia and the Accounts Chamber of the Russian Federation, with different regulation of their activities. The authors named directions for the development of the public financial control system when it is impossible to implement the proposed system. In particular, they proposed to review and precisely regulate the activities of all public financial control bodies. The authors **concluded** that there is still no regulatory, legal and informational base necessary to switch to the proposed two-level performance audit system. Further studies may provide a deeper look at the possibilities and prospects of the integrated implementation of the performance audit system in the general government sector.

Keywords: performance audit; public financial control; public funds; internal control; financial resources; performance criteria

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INTRODUCTION

Today, the Russian economy requires a complete review of the public financial control, which meets the goals and objectives to improve the performance efficiency of the budget system mechanisms of the Russian Federation. The modern stage of transformations in the state economy and administrative reform must revise the concept of performance audit, which will allow for systematic monitoring of proper use of public expenditures, as well as forecasting potential losses or benefits from the use of public resources. Today, there is a tendency in reforming public financial control in a gradual transition from routine monitoring of legality, expediency and accuracy of the formation, distribution and use of public resources and means to control from the perspective of economical, productive and efficient spending of public funds [1].

The economic development of Russia today is due to permanent changes, development of new ambitious goals and the need to address serious social, economic and political problems and challenges. A necessary condition for ongoing economic development is creating a platform for effective reforms for the successful performance of the state. In this situation, developing performance audit is a natural process associated with transformations in the public finance management system and the development of public financial control [2].

Financial mechanism is a basic mechanism of public administration and influence on the economic setup, whose fundamental part is the budget. The distribution and use of public funds, as well as other financial and material resources by the state, determines the effectiveness and efficiency of its activities as a whole.

Article 157 of the Budget Code legislates that the controlling bodies are entitled to performance auditing aimed at determining the efficiency and efficient use of public funds. Moreover, among the principles of the budget system of Russia, Article 34 of the Budget Code names only the principle of effective use of budget funds[1]. However, in practice, a differentiated approach is used to understand the contents of performance audit [2]. Some scientists consider performance audit as a type of financial control, and others — as an instrument of public financial control [3].

Performance audit of state resources is a modern form of financial control [4]. It helps review the validity and rationality of the use of public funds. The problem of legislative consolidation of performance audit and its improvement is relevant to our country as never before. Public financial control varies from the traditional verification of accuracy, targeting, expediency and legality of the distribution of public financial resources to control from the standpoint of the effective, efficient and economical use of state resources in the form of performance audit [5, 6].

This approach is enshrined in the Lima Declaration of Guidelines. It notes that in addition to financial audit (verification of the proper use of funds and financial reporting), whose the importance is undeniable, there is also another type of control (it has a different task) — to determine efficient and economical use of public funds [7][2].

The public financial control system should include subsystems of state external and internal financial control [8].

According to the Budget Code, there are two types of control — internal and external — in the Russian Federation. The Federal Treasury of the Russian Federation is responsible for internal control, and the Accounts Chamber of the Russian Federation is responsible for external control; they should not duplicate each other's functions. Performance au-

[1] Budget Code of the Russian Federation dated July 31, 1998 No. 145-FZ (as amended on December 27, 2019).

[2] The Lima Declaration of Guidelines on Auditing Precepts was adopted in 1977 at the IX INTOSAI in Lima (Peru). It is the basic conceptual document of Supreme Audit Institutions (INTOSAI).

dit is conducted by the Accounts Chamber of the Russian Federation, which is reflected in the standard of the external state audit (control) of the Accounts Chamber — SGA 104 "Performance audit". The Federal Treasury of the Russian Federation is responsible for control over the accuracy and legality of disclosure and movement of budget funds in personal accounts.

According to SGA 104, performance audit is a type of external state audit[3]. That is, speaking of performance audit, we refer to the work of the Accounts Chamber of the Russian Federation and corporate social responsibility (CSR) entities. The importance of performance audit is to evaluate the performance of public spending. This is a complex and multifaceted evaluation system, which includes the following functions:

- control in order to determine the economic relevance, legality and proper use of public funds;
- analysis of the effectiveness of using public funds
- control over the activities of state bodies in the financial sector, etc.

PERFORMANCE AUDIT: ANALYSIS AND DEVELOPMENT PROSPECTS

In our opinion, there is now a number of imperfections in the definition and direct procedures for conducting performance audit, which reduce the quality of its implementation. As mentioned above, there is no single approach to the conceptual framework of this form of public financial control, which directly affects its consistency [9].

In international practice, performance audit is an integral part of external public financial control. The Office of the Auditor General of Canada (OAG) is vested with the responsibility for monitoring and reporting on the operations of the Government of Canada[4], which is a Member of Parliament. The OAG has a legislative basis in the Auditor General Act, the Financial Administration Act, and a number of other statutes. The Auditor General's powers and responsibilities are set forth in legislation passed by Parliament, including the procedure for applying for a position and other provisions. Besides, they work on strategic development documents that also address issues of public audit, for example, the Federal Sustainable Development Strategy [10].

In Canada, financial audits, performance audits and special surveys are carried out. The financial audit is applied in the form of follow-up control and consists in analyzing the financial statements of both the whole state and individual departments of the Canadian government. Quantitative indicators of the execution of federal budget expenditures are mainly analyzed within its framework. More than half of the OAG's work is to conduct financial audits. A special survey is a variety of thematic events that conducted on a regular basis in specific areas of activity [11].

Performance audit is an objective and systematic assessment of both the public finance management and the direct use of budget funds. The process of performance audit reveals effectiveness, efficiency and the external effect of directing budget funds to specific goals. Performance audit is considered the most time-consuming form of monitoring and expert analysis, and can take up to 18 months. This is due to the complexity of its organization and conduct. In this regard, the Office carefully selects objects and subjects of control and uses a risk-based approach to determine the most significant and relevant areas. Typically, performance audits are applied to public corporations.

In Finland, the supreme state audit institution is the National Audit Office of Finland

[3] The standard of external state audit (control) SGA 104 "Performance Audit" (approved by the Resolution of the Board of the Accounts Chamber of the Russian Federation dated November 30, 2016 No. 4 PK).

[4] Office of the Auditor General of Canada. URL: http://www.oag-bvg.gc.ca (accessed on 27.12.2019).

(NAOF). The NAOF performs its duties laid down in the Constitution through financial audit, compliance audit, performance audit and fiscal policy audit[5]. A performance audit reviews the purposefulness of central government finances, ensuring that state funds are used in an economical, efficient and influential manner. Performance audits are only conducted for activities in which significant amounts of state funds are used or which have a significant impact on the state's profit, expenditure or assets [12, 13].

The NAOF conducts 12–15 performance audits each year. Performance audits focus on determining the quality of financial management, and full and comprehensive assessment of the potential opportunities to increase productivity and efficiency within the control object. Thus, the subject of control can be organizational structure, financial system, operational planning and management, operational results and their impact on the environment, productivity and efficiency of operations.

International practices show that the purpose of performance audits should not only be to actually determine how efficiently federal and other resources are used by objects of control to achieve established goals, but to assess the real effect that society receives from using these resources. Achieving the planned goals often does not entail the qualitative change expected to be obtained as a result of certain measures [14].

For example, the goal of the department project "Development of railway transport infrastructure" of the state program "Development of the transport system"[6] is to accelerate commodity distribution and increase mobility of the population by building 1.8 thousand km of additional tracks and railway lines. However, not all of these lines are likely to be made in the areas with all the conditions and high demand from the population and organizations. There might be no accompanying infrastructure (for example, roads) or its deadlines might be violated. Technically, the goal indicator is accomplished, but the final goal is not achieved.

The two-level control system will allow not to duplicate the functions of the two subsystems, but will lead to more precise regulation of the scope of activities of a particular state financial control body.

Thus, the Accounts Chamber of the Russian Federation should conduct a performance audit not only based on performance evaluation in terms of achieving strategic goals, the economical use of federal budget funds and other resources. The socio-economic effect, the impact on a particular activity, plays the key role depending on the goals. This approach will help determine the expediency of measures implementation, department and other projects included in state programs, make the necessary changes on time, and conduct a comparative analysis.

An important problem in performance evaluation of budget funds is the complexity and lack of precise criteria for performance audit. SGA 104 "Performance audit"[7] establishes that performance includes three components: effectiveness, productivity and efficiency, which correlates with the above examples from international practices, but contradicts the provisions of the budget legislation of the Russian Federation. However,

[5] The National Audit Office of Finland. URL: https://www.vtv.fi/en/audit-and-evaluation/ (accessed on 27.12.2019).

[6] On approval of the state program of the Russian Federation "Development of the transport system": Decree of the Government of the Russian Federation of December 20, 2017 No. 1596. ATP Consultant-Plus.

[7] The standard of external state audit (control) SGA 104 "Performance Audit" (approved by the Resolution of the Board of the Accounts Chamber of the Russian Federation dated November 30, 2016 No. 4 PK).

the results of a specific event depend on the parameters set by the inspector at the preparatory stage in the relevant documents (program, plan and others), so they are partially subjective.

By releasing the Accounts Chamber from the first control stage, we increase its productivity in monitoring the effectiveness of spending public funds, and the cost of control measures is reduced by narrowing the scope of control.

Besides, this standard sets the direction for performance evaluation of the use of federal budget funds and other resources; one of them is the performance evaluation of budget expenditures, considering the features determined by the type of expenditure. The current valuation methodology of the Accounts Chamber[8] contains a number of general universal criteria for the performance evaluation of planning and utilization, based on which it is possible to write calculation formulas with approved indicators according to established criteria (*see Table*).

The presented calculation formulas of the approved indicators for the performance evaluation of planning and execution of both the individual budget of the budget system and specific types of budget expenditures can form the basis for the performance evaluation methodology of federal budget expenditures considering the specifics of a particular direction and type of expenditures.

[8] Criteria and methodology for performance evaluation of budget expenditures, considering the characteristics determined by the type of expenditure: approved by the co-chairs of the Working Group on the development of criteria and methods for performance evaluation of budget expenditures by Deputy Minister of Finance of the Russian Federation A. Lavrov and chief of staff of the Accounts Chamber of the Russian Federation Yu.V. Voronin. ATP Consultant-Plus.

It is necessary to improve the information exchange between the bodies of external and internal public financial control, in particular, to update competence and procedure for cooperation during the performance audit. The Federal Treasury cannot carry out a full performance evaluation of disbursing public funds. It should not do this, anyway. First, it would duplicate the functions of the Accounts Chamber of the Russian Federation. Second, it does not have evaluation standards; therefore, the evaluation would be subjective. However, the Federal Treasury could play an important role in preparing and planning activities for performance auditing by the Accounts Chamber of the Russian Federation.

We believe that the public financial control system regarding the performance audit should look as follows (see *Figure*).

Level 1 exercises control over the correct utilization of budget funds, in particular from the Federal Treasury in the field of verification of personal accounts. This level should separate those who have not violated formal requirements from those who have. Measures against violators are immediately taken at this level, and the Accounts Chamber of the Russian Federation is informed of the need for subsequent control measures at a particular object to determine the effectiveness of using budget funds.

If targeting and legality are fine, then external control comes into play — the Level 2 check with the internal control data. At this stage, the effectiveness of using public funds regarding all financial and economic activities of the control object is under consideration, since internal control has less authority to accurately determine the fulfillment of performance criteria (efficiency, effectiveness, productivity) [15, 16].

At present, the Accounts Chamber uses a risk-based approach in its activities, which implies certain procedures for planning and conducting control and expert analysis. The information received by the Federal Treasury will allow to identify objects of control with

Table

Criteria and calculation formulas for the performance evaluation of certain budget planning and utilization

Criteria	Calculation formula	Legend
Complete rationale for expenditures on achieving the desired results, including objectivity and reliability of indicators	$Ccre = \frac{\sum E_r}{\sum E_{rr}}$	$Ccre$ is the coefficient of complete rationale for expenditures; $\sum E_r$ is the amount of expenditures that the rationale is provided for; $\sum E_{rr}$ is the amount of expenditures requiring the rationale
Accurate and complete distribution of budget allocations	$C_{ba} = \frac{\sum BA_c}{\sum BA_{fl}}$	C_{ba} is the coefficient of budget allocations; $\sum BA_c$ is the amount of complete budget allocations; $\sum BA_{fl}$ is the amount of complete budget allocations provided for by the federal law on the federal budget
Complete rationale for unexpended balances of budget funds, if any	$Ccrb = \frac{\sum UBr}{\sum UB_{rr}}$	$Ccrb$ is the coefficient of complete rationale for unexpended balances; $\sum UBr$ is the amount of unexpended balances that the rationale is provided for; $\sum UB_{rr}$ is the amount of unexpended balances requiring the rationale
Compliance with the requirements for openness and transparency of information on the type of expenditures	$C_{cr} = \frac{\sum E_{cr}}{\sum E_{mcr}}$	C_{cr} is the coefficient of compliance with the requirements; $\sum E_{cr}$ is the amount of expenditures in compliance with the requirements for openness and transparency; $\sum E_{mcr}$ is the amount of expenditures that must be presented in accordance with the requirements
Budgetary violations identified during preliminary, subsequent and operational financial control	$C_{bv} = \frac{\sum V_1}{\sum V_0}$	C_{bv} is the coefficient of budgetary violations; $\sum V_1$ is the amount of violations detected in the reporting year; $\sum V_0$ is the amount of violations identified for the year preceding the reporting one

Source: compiled by the authors.

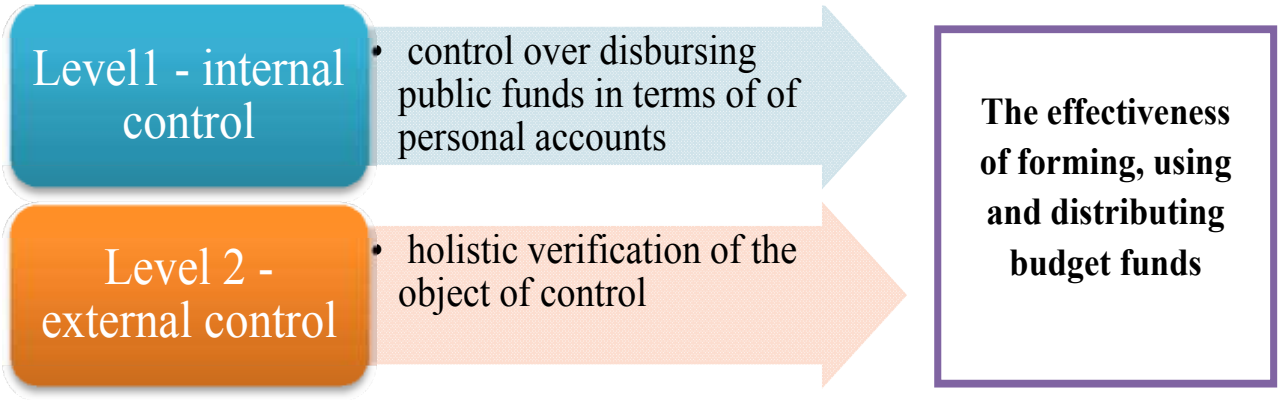

Fig. **Public financial control system at the performance audit**

Source: data visualization by the authors.

a high risk of inefficient using budget funds, other violations and shortfalls.

This approach does not imply that the scope of performance audit will exclude recipients of budget funds and non-participants in the budget process receiving funds from the corresponding budget of the budget system of the Russian Federation, in whose activities the Federal Treasury did not reveal violations or shortfalls after internal state financial control.

For example, when planning the activities of the Accounts Chamber for the next year, the reasons to include a control (expert and analytical) measure in the work plan, besides risks may be: the obligation to comply with the norms of the Federal Law "On the Accounts Chamber of the Russian Federation"[9], and other laws empowering the Accounts Chamber; instructions, appeals and requests of the chambers of the Federal Assembly, the President of the Russian Federation; lack of control (expert and analytical) measures at a specific control object over the past three years; proposals by structural divisions of the Accounts Chamber and others.

The two-level control system will allow not to duplicate the functions of the two subsystems, but will lead to more precise regulation of the scope of activities of a particular state financial control body. This will be an interaction between the two levels, which will allow more effective control of budget funds and will lead to closer cooperation between state financial control bodies. At the moment, conducting an audit of the control object, the Accounts Chamber of the Russian Federation should do a full audit cycle, which is a waste of time and resources [17][10]. While conducting control, the Federal Treasury can only indicate accuracy in terms of legality, but not efficiency [18].

In order to see prospects in performance audit of public financial control, we should first set up an effective system of state bodies. By releasing the Accounts Chamber from the first control stage, we increase its productivity in monitoring the effectiveness of spending public funds, and the cost of control measures is reduced by narrowing the scope of control.

However, there is a number of obstacles to the implementation of the proposed two-level system for performance audits. Since the Federal Treasury and the Accounts Chamber are two different types of state (municipal) financial control bodies, they have differ-

[9] Federal Law dated 05.04.2013 No. 41-FZ "On the Accounts Chamber of the Russian Federation". ATP Consultant-Plus.

[10] Golikova T. 2016. Speech at the plenary meeting of the State Duma of the Federal Assembly of the Russian Federation on bill No. 15455–7 "On the federal budget for 2017 and for the planning period of 2018 and 2019". URL: http://audit.gov.ru/news/tatyana-golikova-dohody-federalnogo-byudzheta-v-2017–2019-godah-budut-vyshe-zaplanirovannyh-28704 (accessed on 04.04.2020).

ent statuses and, therefore, their activities are regulated in different ways [19]. The Accounts Chamber of the Russian Federation is an independent body of public audit (control), accountable to the Federal Assembly. The Federal Treasury of the Russian Federation is directly subordinate to the Ministry of Finance. It does not have its own normative legal acts, except for the Budget Code and regulations (while the Accounts Chamber of the Russian Federation also relies on the Federal Law "On the Accounts Chamber of the Russian Federation" of 04.05.2013 No. 41-FZ, standards and other internal documents) [20].

CONCLUSIONS

Despite the advantages described above, it is now impossible to switch to the two-level system of performance audit (whose name should also be changed, since audit is the prerogative of the Accounts Chamber of the Russian Federation only) without revising and accurately regulating the activities of all public financial control bodies. The development of a unified information system, closer cooperation between internal and external control, the development of comprehensive standards and regulations for the public (municipal) control system as a whole will lead to increasing quality of activities of both the Accounts Chamber of the Russian Federation with regard to performance audits, and the Federal Treasury of the Russian Federation, necessary for support and more focused organization of performance audit by the Accounts Chamber of the Russian Federation. Even if it is impossible to implement our concept of adding internal control bodies represented by the Federal Treasury of the Russian Federation to the bodies conducting performance audit, in view of the obstacles described above, we consider it necessary to increase cooperation between them. The Federal Treasury of the Russian Federation will assist the Accounts Chamber of the Russian Federation, providing information on possible inefficient use of budget funds as a result of its control measures. For the Accounts Chamber of the Russian Federation, it is a signal to pay closer attention to certain objects dealing with budget funds. The coordination and cooperation that will not allow to worsen inefficient use of public resources, will identify and prevent violations at the early stages. All this will improve the process of performance audit, and will lead to a more rational use of public budget funds.

The process of legislative and methodological consolidation of fundamental concepts and procedures for the performance audit as an integral part of public financial control is not complete. The current methodology for performance evaluation of using federal budget funds and other resources does not have specific calculated indicators, which can lead to various approaches when carrying out specific control and expert analytical measures. Customization, improving information exchange, applying a risk-based approach, emphasis on analysis of organizing and functioning of financial management of control objects are quite controversial issues when setting the task to improve public financial control in the Russian Federation. Each of them requires further in-depth research.

REFERENCES

1. Samarukha V. I., Derevtsova I. V. Public financial control in the Russian Federation. Irkursk: Baikal State Univ. Publ.; 2018. 160 p. URL: http://sgal.bgu.ru/pub.aspx?id=23254 (accessed on 31.01.2020). (In Russ.).
2. Khabibullin T. R. Audit of efficiency in the system of public financial control. *Molodoi uchenyi = Young Scientist.* 2016;(11):1367–1371. (In Russ.).
3. Saunin A. N. Audit of the effectiveness of using public funds. Moscow: MSU Publ.; 2015. 336 p. (In Russ.).

4. Sutopo B., Wulandari T.R., Adiati A.K., Saputra D.A. E-government, audit opinion, and performance of local government administration in Indonesia. *Australasian Accounting, Business and Finance Journal*. 2017;11(4):6–22. DOI: 10.14453/aabfj.v11i4.2
5. Golikova T.A. The transition from financial audit to public audit is a qualitatively new stage in the development of public financial control in Russia. *Vestnik AKSOR*. 2014;(4):4–6. (In Russ.).
6. Tereshchenko D.S. Performance audit as a special form of public audit. *Publichno-pravovye issledovaniya*. 2017;(3):34–63. (In Russ.).
7. Karepina O.I. Development of the audit of public spending efficiency. *Mezhdunarodnyi bukhgalterskii uchet = International Accounting*. 2014;(30):42–51. (In Russ.).
8. Golikova T.A. The main directions of improving financial control. *Vestnik AKSOR*. 2013;(4):5–7. (In Russ.).
9. Kells S. The seven deadly sins of performance auditing: Implications for monitoring public audit institutions. *Australian Accounting Review*. 2011;21(4):383–396. DOI: 10.1111/j.1835–2561.2011.00150.x
10. Palmer L. An analysis of reports from the office of the Auditor General of Canada: How audit guidelines shape the documents that inform government and citizens. *Canadian Journal for Studies in Discourse and Writing/Rédactologie*. 2008;22(1):52–71. DOI: 10.31468/cjsdwr.550
11. Mayne J. Performance auditing: cozy, comfortable and in need of challenge. *Optimum Online*. 2010;40(3). URL https://www.academia.edu/6468855/Performance_Auditing_Cozy_Comfortable_and_in_Need_of_Challenge (accessed on 31.03.2020).
12. Johnsen Å., Meklin P., Oulasvirta L., Vakkuri J. Performance auditing in local government: An exploratory study of perceived efficiency of municipal value for money auditing in Finland and Norway. *European Accounting Review*. 2010;10(3):583–599. DOI: 10.1080/09638180126803
13. Johnsen Å., Reichborn-Kjennerud K., Carrington T., Klarskov Jeppesen K., Taro K., Vakkuri J. Supreme audit institutions in a high-impact context: A comparative analysis of performance audit in four Nordic countries. *Financial Accountability & Management in Governments, Public Services and Charities*. 2019;35(2):158–181. DOI: 10.1111/faam.12188
14. Pollitt C. Performance audit in Western Europe: Trends and choices. *Critical Perspectives on Accounting*. 2003;14(1–2):157–170. DOI: 10.1006/cpac.2002.0521
15. Jokipii A., Di Meo F. Internal audit function characteristics and external auditors' co-sourcing in different institutional contexts. *International Journal of Auditing*. 2019;23(2):292–307. DOI: 10.1111/ijau.12162
16. Lukashov A.I. Development of internal public financial control in the general government sector. *Vestnik Finansovogo universiteta = Bulletin of the Financial University*. 2014;(2):24–29. (In Russ.).
17. Goreglyad V. Modernization of the financial control system. *Gosudarstvennaya sluzhba = Public Administration*. 2015;(1):50–55. (In Russ.).
18. Semenenko A.M. Audit of the effectiveness of the use of budget funds of a constituent entity of the Russian Federation (on the example of the Belgorod region). *Molodoi uchenyi = Young Scientist*. 2019;(2):265–269. URL: https://moluch.ru/archive/240/55514/ (accessed on 31.01.2020). (In Russ.).
19. Pavlyukova A.O., Lozitskaya O.I. Performance audit of budget spending: Features and problems. In: Economic science today: Theory and practice. Proc. 9th Int. sci.-pract. conf. (Cheboksary, 23 Feb., 2018). Cheboksary: Interaktiv plyus; 2018:134–138. (In Russ.). DOI: 10.21661/r-469556
20. Bagratuni K. Yu. Emphasis on improving state financial control in implementing state programs. *Ekonomika i predprinimatel'stvo = Journal of Economy and Entrepreneurship*. 2016;12–4:90–92. (In Russ.).

ABOUT THE AUTHORS

Ol'ga I. Lozitskaya — Cand. Sci. (Econ.), Senior Lecturer, Department of Public Finance, Financial University, Moscow, Russia
olozitskaya@gmail.com

Natal'ya L. Voronina — Master's student, Public Sector Finance, Financial University, Moscow, Russia
n.voronina.00@bk.ru

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The Impact of Currency Regulation Policy on the Country's Export Potential: The Case of Armenia

E.M. Sandoyan[a], A.G. Galstyan[b] ✉
Russian-Armenian (Slavonic) University, Yerevan, Armenia
[a] https://orcid.org/0000-0002-2848-4946; [b] https://orcid.org/0000-0002-7800-7232
✉ Corresponding author

ABSTRACT

The impact of currency regulation on the country's export potential has been the focus of scientific research and discussion among economists for years. Currency regulation is a backbone element to maintain the competitiveness of the country's economy, macroeconomic stability, and to stimulate economic growth. **The aim** of this research is to analyse the impact of the exchange rate of the Armenian national currency (dram) on the country's export potential, as well as the choice of a currency regulation policy stimulating export expansion and economic growth in Armenia. The study employed t**he methods** of statistical and comparative analysis, as well as the construction of logistic assumptions. The authors conducted a statistical analysis of the dynamics and structure of Armenia's exports by product groups and countries. They revealed that, with the exception of exports to Russia, Armenia's exports to other countries has a high ratio of raw materials. As known, the exchange rate has the greatest impact on the price competitiveness of finished products in foreign markets. The authors evaluated the impact of currency regulation policy implemented in Armenia on the export potential and competitiveness of Armenian goods, especially in the EAEU markets. **The results** show that Armenia is not able to maximize its export opportunities due to the uncompetitive exchange rate of the national currency. **The key conclusion** of the research is the thesis that Armenia should abandon the non-market mechanisms for ensuring exchange rate stability, the Central Bank should immediately shift to a policy of free-floating national currency and non-intervention, which will significantly expand the presence of Armenian finished products in foreign markets, especially in the Russian Federation.

Keywords: export potential; currency regulation policy; exchange rate; economic growth

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INTRODUCTION

The impact of currency regulation on the country's export potential has been the focus of scientific research and discussion among economists for years. Currency regulation is a backbone element to maintain the competitiveness of the country's economy, macroeconomic stability, and to stimulate economic growth.

The most important achievement of macroeconomic regulation is long-term sustainable economic growth. However, developing countries often prefer targeting short-term problems at the expense of long-term outcomes, which typically harms the country's standard of living and quality of life. At the same time, the mechanisms of macroeconomic regulation presuppose a long-term strategy of economic development, including in the area of monetary policy. From this point of view, currency regulation policy plays an important role in ensuring sustainable rates of economic growth.

On the other hand, sustainable long-term economic growth requires a stable commodity and foreign exchange markets to ensure a stable currency system and favourable conditions for external trade.

In developing countries, exchange rates of national currencies tend to be overvalued, which has a negative impact on exported goods by lowering producers' real prices. For example, real exchange rate misalignments occur in markets where nominal exchange rates are not allowed to adapt to the changes in economic fundamentals, thereby reducing incentives and profits, leading to a decline in investment and export volumes, thus having a negative impact on economic growth [1]. Countries such as Japan, Hong Kong, Singapore, North Korea, Taiwan, and China, among others, have successfully developed

and applied models of economic growth where the exchange rate was used as a primary tool [2].

Exchange rates and the choice of currency regulation policy are the focus for discussions by economists especially for emerging economies [3–5].

In this context, the case of Armenia is of particular interest. The main hypothesis of the study is that the currency regulation implemented over the last ten years has led to a significant reduction of Armenia's export potential and consequently a slowdown in economic growth.

LITERATURE REVIEW

The impact of the country's currency regulation on export potential has been the focus of economic debate for years. The choice of currency regulation policy is very important in the context of the country's external competitiveness, macroeconomic stability, and economic growth.

In general, there are two ways to improve the trade balance of a country. The first is an internal approach and is based on the supply-side policies that improve productivity, reduce inflation and taxes and lead to a more efficient labour market. These measures lead the growth of exports and GDP. The second way is the currency depreciation, which leads to changes in relative prices of imports and exports [6].

Preserving a fixed foreign exchange rate is a policy that can help ensure certain price stability by effectively introducing monetary confidence. This can often lead to a real appreciation of the effective exchange rate, which leads to a reduction in reserves, makes export more expensive while making import cheaper.

S. Kurtovic [7] found evidence for the J-curve while examining the relation between the exchange rate and the trade balance. The study shows a long-term cointegration between the exchange rate and the trade balance. The implication of the J-curve effect deriving from the Marshall-Lerner conditions is that the country's trade balance moves in the form of the J-curve in the event of a devaluation of the national currency. First of all, the total value of imports increases because of the higher price of imported goods and exceeds the total value of exports. This leads to a trade deficit. However, devaluation increases the demand for exports, which leads to an increase in export volumes. In the end, the trade balance becomes positive.

On the other hand, for many years, some researchers have believed that the floating exchange rate creates additional volatility, leading to a decline in international trade. Thus, a fixed exchange rate regime would be more appropriate [8–10]. Moreover, Hericourt et al. emphasized that emerging countries should be careful when relaxing their exchange rate regime: moving to a fully floating regime without the adequate level of financial development could also prove to be very hazardous for trade performance [11].

Later, economists found that floating rates did not diminish foreign trade, but had a positive effect on exports. M. Feldstein [12] argued that the flexible exchange rate regime was more desirable for foreign trade than the fixed one. Similarly, according to D. Rodrik [13] and S. Bhala [14], an overvalued exchange rate may impede export, thereby economic growth, when an undervalued national currency may stimulate the tradable sector.

Competitive and even undervalued currencies have been used by many countries to achieve export-led growth, especially by economies in emerging Asian markets. The cornerstone of such a model is the maintenance of external price competitiveness to promote export and economic growth. C.-W. Hooy, S.N. Law and T.H. Chan [15] studied the impact of renmimbi on the exports to China. They found a significant positive impact of real exchange rate depreciation on exports of high-technology and medium-technology final and intermediate goods. In another research, K. Wondemu and D. Potts [16] studied the impact of real exchange rate changes on the export performances of Ethiopia and Tanzania. They suggested that while overvaluation is harmful to exports, undervaluation of the real exchange rate boosts export supply as well as export diversification. They have found out that a high rate of growth in exports is associated with periods of undervalued currencies. Moreover, comparing the two countries, they concluded that Tanzania has better export performance since it maintained an undervalued real exchange rate.

IMF provides a thorough analysis about the influence of exchange rate on commodity prices and trade volumes. Their findings support some earlier evidence

of a positive association between the terms of trade and the real exchange rate of commodity exporters. Thus, the exchange rate depreciation leads to lower export prices and higher import prices, which in turn leads to growth of exports and reduction of imports[1].

The literature review and the empirical experience of countries show that it is very important to maintain exchange rate competitiveness, but is unnecessary to have an undervalued exchange rate.

The export-led model requires the economy to maintain stable and predictable external price competitiveness. This may preclude the application of the de facto floating exchange rate regime. Economies with emerging markets in Asia usually link their currency to other currencies. Even in countries where the de jure floating exchange rate regime was implemented, countries often took measures to stabilize or depreciate the nominal exchange rate, with the ultimate goal of keeping the real exchange rate relatively undervalued. This policy is politically ambiguous, and many insist that some Asian countries engage in currency manipulations [17].

However, the policy of keeping the real exchange rate relatively devalued can cause inflationary pressures in the economy. Therefore, it is accompanied by a trade-off between external competitiveness and domestic price stability[2]. It is assumed that the export-led model can be effectively implemented in countries where domestic inflationary pressures can be contained by means other than the currency regulation. Countries with low and manageable inflation rates may gradually pay more attention to enhancing external competitiveness. In any case, developing and transition economies may seek to use the exchange rate as a tool to create favourable and predictable conditions for the tradable sector of the economy.

As long as productivity in the tradable sector is high, countries are encouraged to maintain a relatively high level of external competitiveness for tradable goods to make the resource allocation to the tradable sector attractive. The works by D. McLeod and E. Mileva [18], J. Aizenman and J. Lee [19], G. Benigno et al. [20] have the "learning by doing" effect, exogenous for certain firms operating in the tradable sector of the economy; therefore, a weak real exchange rate is necessary to support the tradable sector. In these models, underestimating the currency acts as a subsidy for export.

Based on the empirical analysis of several countries, D. Rodrik [21] confirms that competitive and undervalued exchange rates are more likely to contribute to export growth and differentiation than overvalued ones. Rodrick provided a more detailed explanation in another work [22]. The depreciation of the real exchange rate is, by definition, an increase in the relative prices for tradable goods, compared to the non- tradable sector; he argues that an undervalued currency may enhance the relative profitability of the tradable sector and causes it to expand (at the expense of the nontradable sector).

Some empirical studies confirm the link between foreign exchange rates, export growth and differentiation (e.g., R. Nouira et al. [23]). Exchange rate adjustments partially offset financial losses from safeguard measures applied to the tradable sector.

B. Balassa [24] argues that the devaluation of the national currency is equivalent to the simultaneous application of import duties and export subsidies at the same rates. Therefore, the transition to free trade and simultaneous currency depreciation can be seen as a replacement of existing safeguards with a united customs duty and subsidy, which will keep the trade balance unchanged. However, such a belief is based on the assumption that there is no market distortion or, even if there are market distortions, they affect all segments equally. However, D. Rodrick [25] argues that the impact of internal institutional weaknesses and market distortions on the tradable sector is greater than the impact on the non-tradable sector. In such a situation, a deliberate devaluation of the real exchange rate may be a "second best" solution to partially improve the situation. Such a policy measure promotes structural changes, increases export volumes, and improves economic growth by altering internal trade conditions in favour of the tradable sector.

[1] International Monetary Fund. 2015. World Economic Outlook: Adjusting to Lower Commodity Prices. Washington (October). URL: https://www.imf.org/en/Publications/WEO/Issues/2016/12/31/World-Economic-Outlook-October-2015-Adjusting-to-Lower-Commodity-Prices-43229 (accessed on 11.02.2020).

[2] Does currency depreciation necessarily result in positive trade balance? New evidence from Norway Haris Dzanan and Mansur Masih. MPRA Paper No. 82103, 2017. URL: https://mpra.ub.uni-muenchen.de/82103/ (accessed on 11.02.2020).

Sustainable development of the Armenian economy against the growing competition in both foreign and domestic markets is only possible if the competitiveness of the national economy and its entities is radically increased. Moreover, our research shows that implementing a floating exchange rate and export-led model can accelerate the economic growth of Armenia [26]. The relevance and practical significance of the issue necessitates the analysis of the role of currency regulation for the competitiveness of the national economy.

THE IMPACT OF FOREIGN EXCHANGE RATE ON THE EXPORT POTENTIAL IN ARMENIA

According to the results of the literature review, the exchange rate has a significant impact on export volumes and potential. Now we will proceed to the analysis of the impact that the Central Bank of Armenia's exchange rate regulation has on the country's export potential.

As we have shown in our research papers (e.g., [27]), despite the declared floating exchange rate policy, the CBA nonetheless de facto conducts a managed, sometimes even fixed exchange rate regime. Among the factors directly influencing the exchange rate of the Armenian dram we can distinguish market channels, as well as non-market mechanisms applied by the monetary authorities. The two main instruments used by the Central Bank of Armenia to manage the exchange rate are direct interventions in the foreign exchange market and reserve requirement doubled in December 2014 to stop the devaluation of the Armenian dram.

It is known that the foreign exchange rate mainly affects the external competitiveness of consumer products. Meanwhile, the export volumes of raw materials, generally, are influenced by their quantity in a particular country and the international demand.

First, let us look at the dynamics of Armenia's export structure by product groups. *Fig.1* shows that until 2014, 75–80% of Armenia's exports concentrated in the four main product groups: minerals, gemstones, metals, alcoholic and non-alcoholic beverages. Since 2013–2014, the cigarette export has increased significantly; in 2018, it already was 11.1% of Armenia's total export (267.6 million US dollars) and occupied the 4th place (*Fig. 1*).

We should highlight that the significant increase in cigarette export volumes is due to the sharp increase in demand for Armenian cigarettes in the UAE, Iraq and Syria (*Fig. 2*). Over the past five years, exports of this product to Iraq have increased by more than three times, to Syria — by19 times, to the UAE — by 15 times, to Georgia — by almost 4 times. The dynamics of the export to Russia shows no significant growth.

50–67 — Textile and footwear (*Fig. 3*) is another new sector in Armenian exports that has sustainable growth rates. The products of this group are almost entirely exported to Russia, Italy and Germany. At the same time, the increase in exports was observed in all three countries during the period under review. However, the most significant growth was recorded in 2015, and was due to the sharp increase in exports to Russia. It might be caused by the tense political situation in Russia, since during that period the embargo policy led to supply shortages in some Russian commodity markets.

Here are 15 largest export partners of Armenia according to the data of 2018, as well as the dynamics of the exports structure by country during 16 years (*Fig. 4*).

By statistics, Armenian export to some countries has significantly increased in 2018 against 2013, which was the pre-crisis year (to Russia — by 2 times, to Switzerland — by 13 times, to Iraq — by 3 times, to the UAE — by nearly 8 times, to Syria — by 19 times, to the Netherlands — by 2 times, to Italy — by 2 times). As mentioned above, exports to Syria, to the UAE and to Iraq were driven by increased demand for Armenian cigarettes in these countries.

On the other hand, exports to the US, Belgium and Canada decreased more than by two times.

To find out what caused this significant change in Armenia's export structure, let us consider the export structure by country and commodity, with commodity exports of at least 500 thousand US dollars by country during the last 9 years (*Fig. 5*).

The decrease in exports to the United States was mainly driven by a 60% decrease in the exports of metals. On the other hand, the sharp decline in exports to Belgium is due to a decrease in diamond exports by almost 40%, as well as the cessation of metal exports, which amounted to $81 million in 2014. In the case of Canada, the reason was the ces-

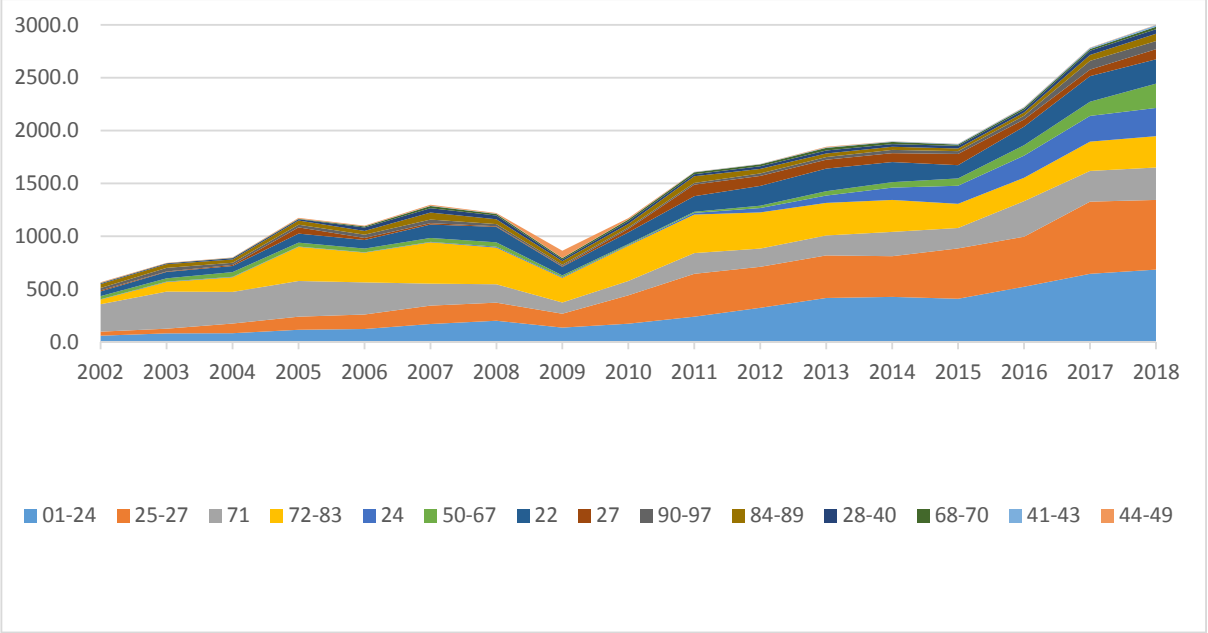

Fig. 1. **Armenia's export volumes by major product groups, million US dollars, 2002–2018**

Source: Customs Service of the Republic of Armenia. URL: http://www.petekamutner.am/ (accessed on 13.11.2019).

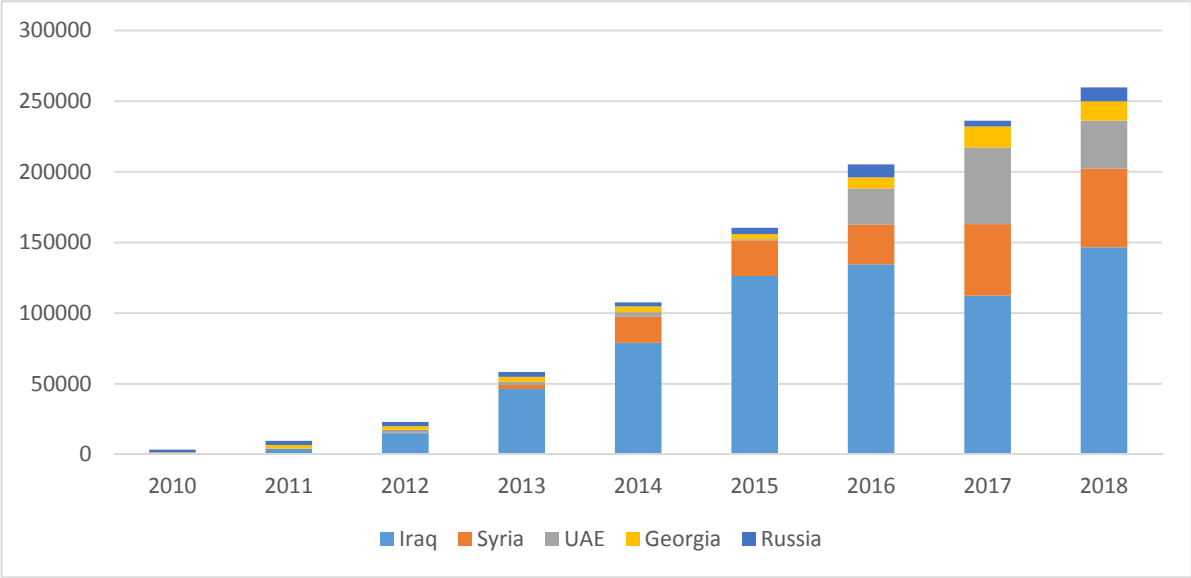

Fig. 2. **24 — Cigarette export from Armenia by partner countries, thousands US dollars, 2010–2018**

Source: Customs Service of the Republic of Armenia. URL: http://www.petekamutner.am/ (accessed on 15.11.2019).

sation of gold exports, which in 2016 amounted to 131 million US dollars.

The sharp increase in exports to Switzerland during recent years was mainly due to a tenfold increase in the exports of minerals (copper, precious metals), as well as a 6-fold increase in watches and its parts. At the same time, in 2014, gold exports to Switzerland almost stopped, falling from 136 million US dollars to 321 thousand US dollars, and restored its previous volumes in 2017. The increase in exports to Italy, as already mentioned, was due to the increase in exports of textile products. In the case of the Netherlands, the increase was due to the export of metals.

Thus, with the exception of exports to Russia, the structure of Armenian export by product in the case of other countries is mainly concentrated in the field of raw materials. As already mentioned, the factors affecting the export of raw materials are mainly ex-

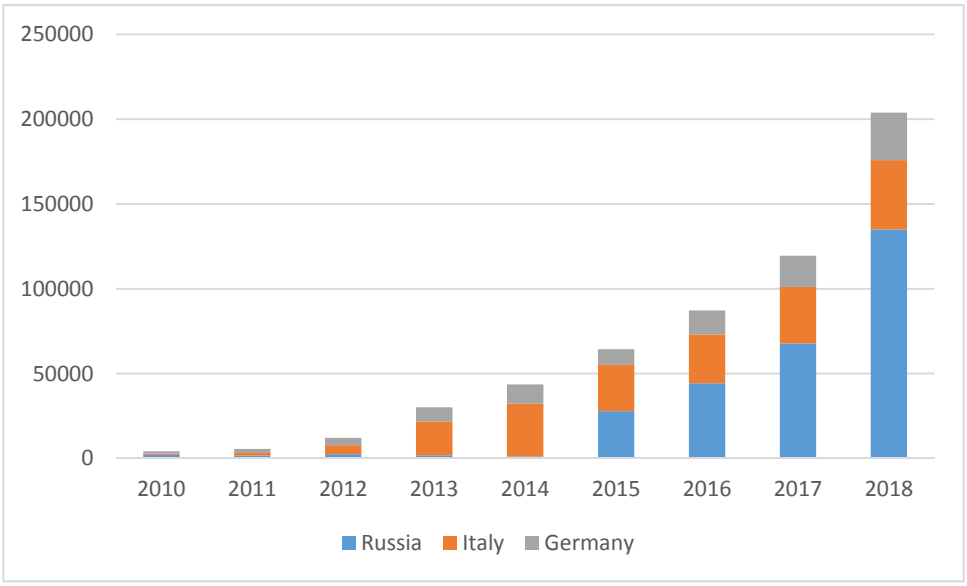

Fig. 3. **50–67 — "Textile, Footwear" exports from Armenia by partner countries, thousands US dollars, 2010–2018**

Source: Customs Service of the Republic of Armenia. URL: http://www.petekamutner.am/ (accessed on 15.11.2019).

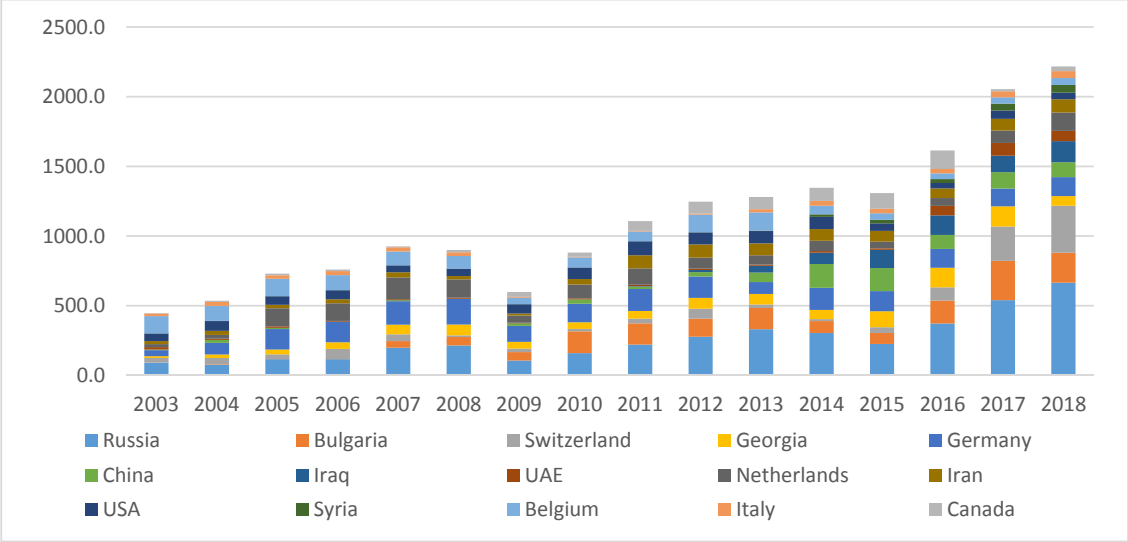

Fig. 4. **Export structure of Armenia by country, million US dollars, 2003–2018**

Source: World Integrated Trade Solution. URL: https://wits.worldbank.org/ (accessed on 15.11.2019).

ogenous. We can say that foreign exchange rates have almost no impact on their export potential.

Given Armenia has been a member of the EAEU since 2015, it can be concluded that competitiveness of the tradable sector of the economy in the markets of Russia, Belarus, Kazakhstan and Kyrgyzstan is of primary importance for Armenia. As discussed in the literature review, the foreign exchange rate of the country has a significant impact on the external trade competitiveness, and in this respect, maintaining a competitive exchange rate against the overvalued currency is at the forefront.

From this point of view, it is important to study the dynamics of both nominal and real exchange rates of the EAEU member states during 2014–2018.

As we can see from *Table 1*, in the EAEU, the nominal exchange rates of the national currencies of Belarus and Kazakhstan have depreciated at a higher rate than Russian rouble; the opposite is observed in the cases of Kyrgyzstan and Armenia in 2018. Moreover, the Armenian dram has remained relatively stable compared to the national currencies of the other countries. Although the devaluation process in the other EAEU member countries was accompanied

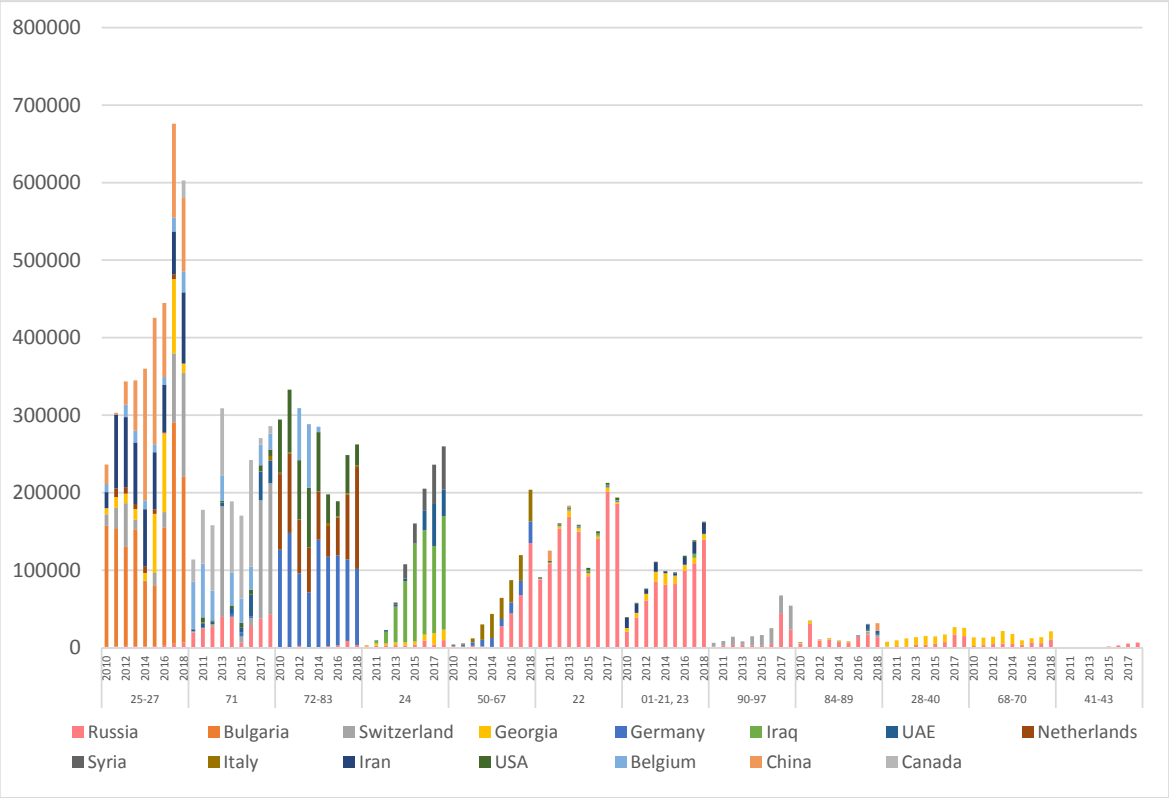

Fig. 5. **Export structure of Armenia by products and countries, thousands US dollars, 2010–2018**

Source: Customs Service of the Republic of Armenia. URL: http://www.petekamutner.am/ (accessed on 16.11.2019).

Note: 01–24 — Food, agricultural products; 25–27 — Minerals; 71 — Precious stones, metals; 72–83 — Metals and products; 24 — Cigarettes; 50–67 — Textile, footwear; 22 — Alcoholic, non-alcoholic beverages; 27 — Fuels; 90–97 — Other products; 84–89 — Vehicles, equipment; 28–40 — Chemicals, rubber; 68–70 — Ceramics, glass, products made of stone, gypsum; 41–43 — Fur, leather, products.

by higher inflation rates than in Armenia, it did not result in the neutralization of the devaluation results, evidenced by the dynamics of the real effective exchange rate (*Table 2*).

The real exchange rate is very important for the country's external competitiveness. *Table 2* clearly shows that given the real exchange rate devaluation in the economy of Kazakhstan, Belarus and Russia, accompanied by a real appreciation in Armenia, the tradable sector of the Armenian economy has somewhat lost its competitiveness in the EAEU, particularly in the Russian market. All of this significantly limits Armenia's export potential in the EAEU markets. Meanwhile, the membership to the EAEU significantly increases export opportunities for Armenia, especially given the size of the Russian economy.

Therefore, it is necessary to consider the export structure of Armenia to Russia and its dynamics. *Fig. 6* represents the structure of the Armenian exports to the Russian Federation by major product groups during the last 9 years.

Until 2014, the traditional major export groups to Russia were alcoholic and non-alcoholic beverages, food and agricultural products, which accounted for 60–65% of total exports. However, by 2018, their constituted about 50%. At the same time, since 2014, a new, dynamically developing group of textiles and footwear has emerged in the export structure. In 2018, it already accounted for 23.7% of exports to Russia (150 million US dollars).

It is obvious that about 80% of Armenian exports to Russia are consumer goods affected by the foreign exchange rate.

Let us now consider the dynamics of the structure of the three major product groups presented. *Fig. 7* shows products with exports exceeding 3 million US dollars, which are included in the group of food, agricultural products. The export structure of this product group has quite interesting

Table 1

Dynamics of the nominal exchange rates of the EAEU member countries to the US Dollar, 2014–2018

Country / Year	2014	2015	2016	2017	2018	Devaluation, 2018/2014, %
Armenia	416	478	480	483	483	16.06
Belarus	1.02	1.59	1.99	1.93	2.04	100.00
Kazakhstan	179	222	342	326	345	92.73
Kyrgyzstan	54	64	70	69	69	28.35
Russia	38	61	67	58	63	65.72

Source: The World Bank database. URL: https://data.worldbank.org/ (accessed on 18.11.2019).

Table 2

Dynamics of the real effective exchange rate of the EAEU member countries (2010=100), 2014–2018

Country / Year	2014	2015	2016	2017	2018	Change, 2018/2014, %
Armenia	102.5	108.4	107.6	104.0	104.5	2.0
Belarus	95.8	92.4	84.7	80.7	81.2	–14.6
Kazakhstan	97.9	102.7	76.4	81.9	80.2	–17.7
Kyrgyzstan	110	115.1	113.2	113.3	114.5	4.5
Russia	99.4	82.9	82.6	95.7	88.3	–11.1

Source: Eurasian Economic Commission. URL: http://www.eurasiancommission.org (accessed on 18.11.2019).

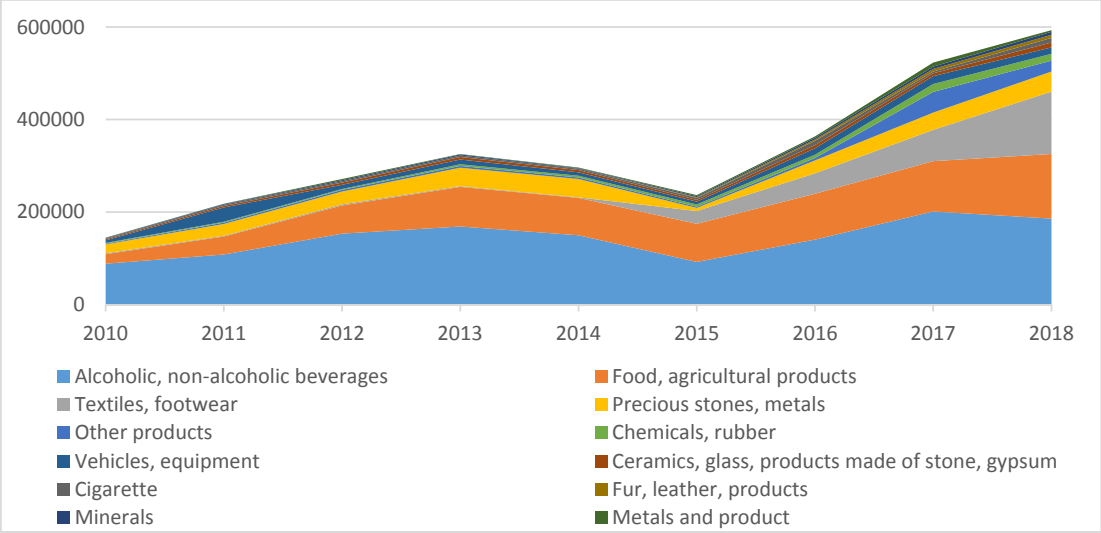

Fig. 6. **The structure of Armenian export to Russia by major product groups, thousands US dollars, 2010–2018**

Source: Customs Service of the Republic of Armenia. URL: http://www.petekamutner.am/ (accessed on 19.11.2019).

dynamics. In the pre-crisis year of 2013, the largest share in this product group belonged to the following products: fish, fresh fruits (apricots, cherries, peaches, etc.), crayfish and canned fruits. Together they accounted for 70–75% of export of the whole product group. However, in 2018, the first place by its share in exports went to the tomato exports — 23 million US dollars against 270 thousand US dollars in 2013. We should also mention that such an increase in exports was due to the tense political situation in Russia. Moreover, a large part of tomato exports from Armenia is a re-export. The

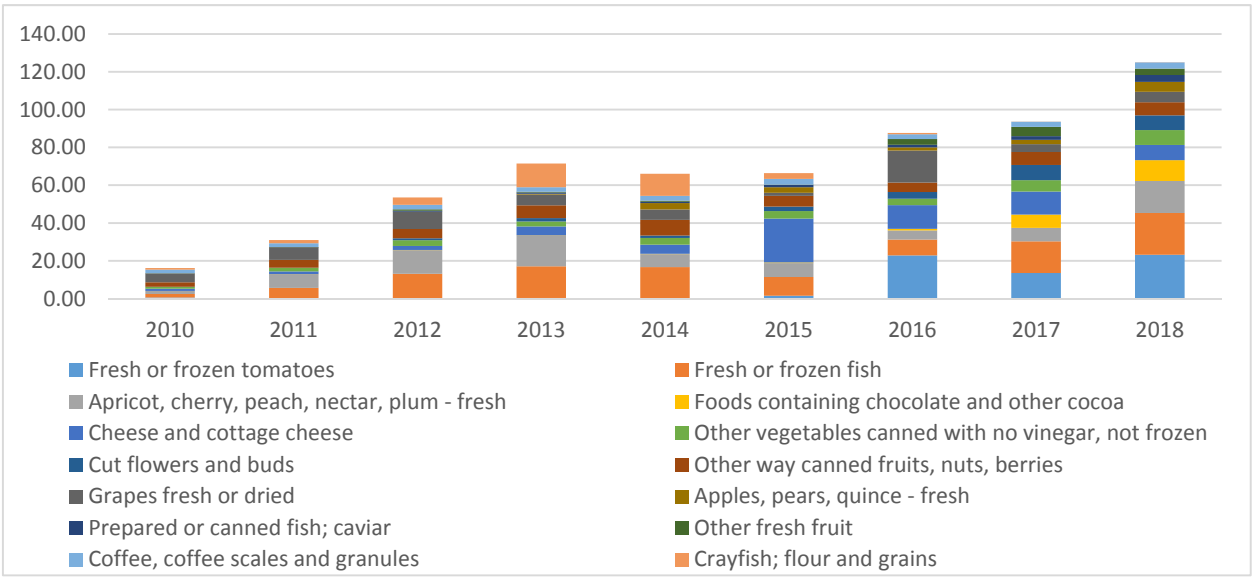

Fig. 7. **"Food, agricultural products" export structure to Russia, million US dollars, 2010–2018**

Source: Customs Service of the Republic of Armenia. URL: http://www.petekamutner.am/ (accessed on 19.11.2019).

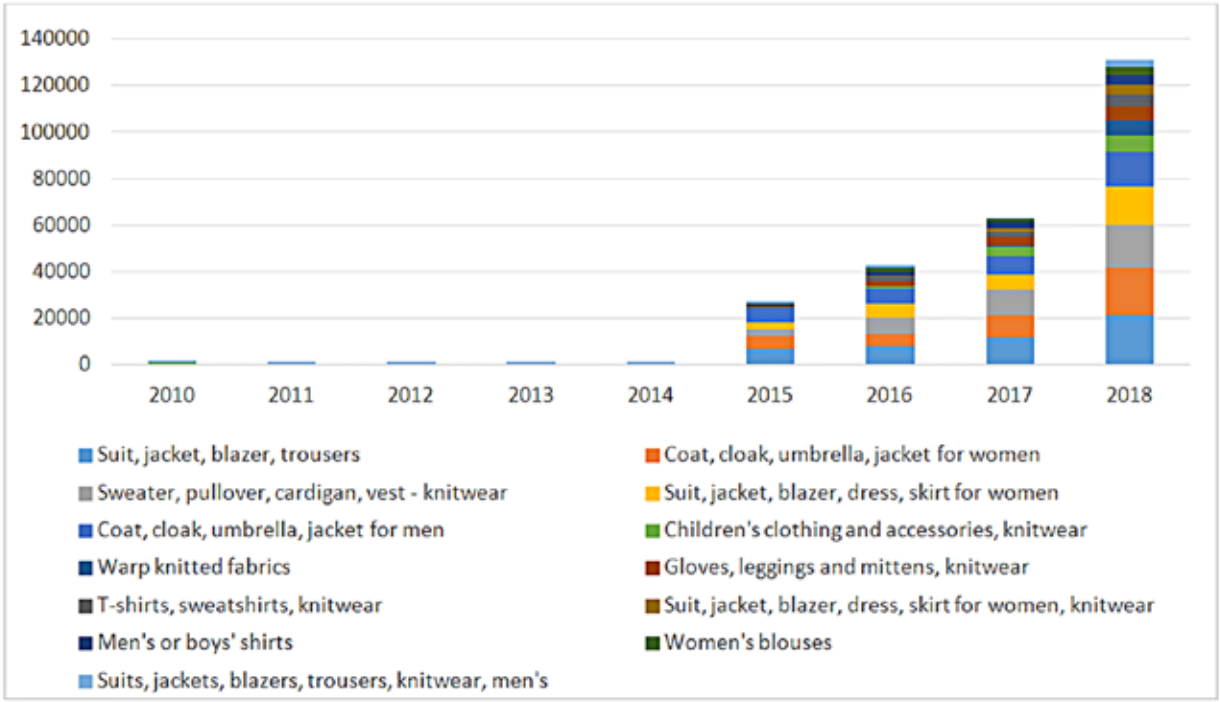

Fig. 8. **"Textile and footwear" export structure to Russia, thousand US dollars, 2010–2018**

Source: Customs Service of the Republic of Armenia. URL: http://www.petekamutner.am/ (accessed on 19.11.2019).

result of the embargo policy in Russia is also, for example, a five-fold increase in cheese exports in 2015, which has been halved, although it remains at a high level. At the same time, there has been a sharp increase in the number of individual products over the years, which has not been maintained (e.g. grapes, potatoes, cabbage, etc.).

The next major traditional export product group is alcoholic and non-alcoholic beverages. The volumes of exports of this group are in stagnation (*Fig. 6*). Compared to 2013, the growth in 2018 was only 10% not considering inflation. The situation in this traditional export sector again indicates a certain loss of competitiveness of Armenian products in the Russian

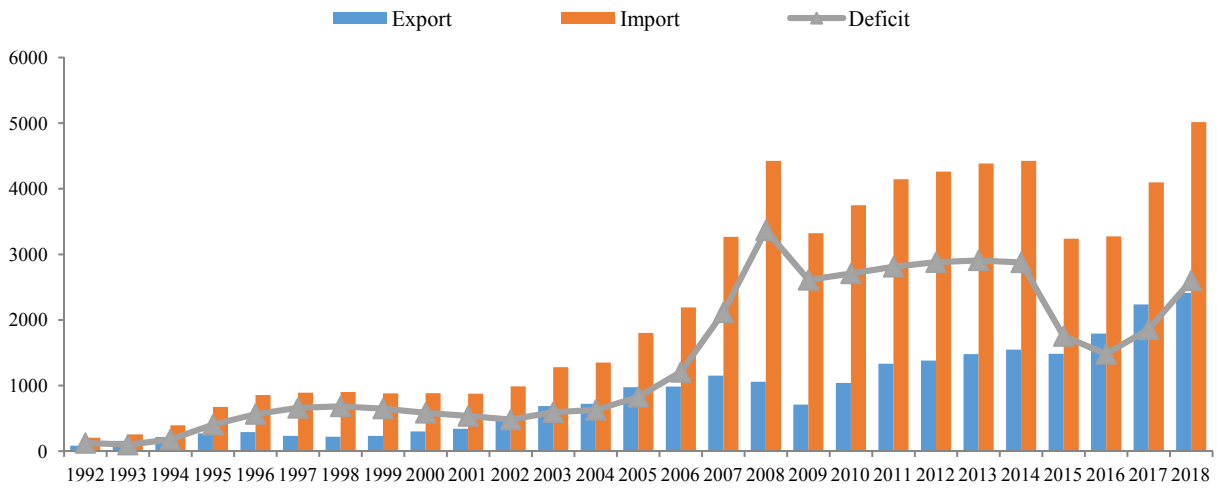

Fig. 9. **Trade balance of Armenia, million US dollars, 2003–2018**

Source: National statistical service of Armenia. URL: http://www.armstat.am/ (accessed on 19.11.2019).

markets. Finally, there is the third-largest group — textiles and footwear — that started growing during the regional crisis (*Fig. 8*).

As we can see, textiles are the only sector that shows steady growth rates, again linked to Russia's embargo policy as well as the tense political environment with Turkey.

Since 2014–2015, due to the tense political relations between Russia, the US, the EU, the sanctions against Russia, as well as Russia's embargo policy, there was a shortage of supply in some Russian product markets.

At the same time, Armenia's membership in the EAEU since 2015, it has opened wide export opportunities for Armenian products. However, according to the analysis, the impact of the exchange rate on exports in Armenia is not determined. The contradictory results are primarily due to the structure of exports, which changed at different times due to factors not determined by market forces (e.g. political factors). As discussed above, the increase in Armenian exports to Russia is mainly due to the political reasons, which created supply shortage in some commodity markets. At the same time, Armenia fails to make the most of the available opportunities, taking open segments in the Russian markets, due to a non-competitive exchange rate. Among the EAEU member countries, Armenia and Kyrgyzstan are the only countries where the real effective exchange rate has even appreciated. According to the literature and empirical review, the real exchange rate appreciation harms exports performance and it is important to maintain competitive exchange rates. The loss of competitiveness of the tradable sector of the Armenian economy on Russian commodity markets limits Armenian export potential, preventing it from showing higher and sustainable growth rates. What are the channels of such restriction?

As production costs in the national market are in Armenian drams, the overvalued exchange rate leads to a decrease in incentives for export growth in the tradable sector, while at the same time reducing the competitiveness of exporters in foreign markets. On the other hand, the overvalued exchange rate artificially lowers imports value, making it difficult for domestic producers to compete with foreign producers. This is evidenced by the growing deficit of trade balance despite the steady export growth rates (*Fig. 9*). Thus, the trade balance deficit is growing rapidly due to non-competitive exchange rate of Armenian dram, while imports grow faster due to low prices.

CONCLUSION

Since Armenia joined the EAEU, it has lost the ability to protect domestic producers from imports of economic union member countries using tariff or non-tariff methods, the only tool to protect domestic production is the exchange rate. A competitive

exchange rate can serve as a tool for import restriction (by price increase) and export subsidization (by price reduction).

Thus, only a competitive exchange rate can increase the competitiveness of the tradable sector of the Armenian economy in foreign, particularly Russian, markets, while serving as a tool to promote exports and protect domestic producers. Competitive exchange rates will create incentives for production growth in the tradable sector of the economy due to high profitability.

Overall, Armenia should abandon the non-market mechanisms of ensuring exchange rate stability; the Central Bank should immediately shift to a free-floating exchange rate and non-intervention policy, which will significantly expand the presence of Armenian finished products in foreign markets, especially in the Russian Federation.

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REFERENCES

1. Conrad D., Jagessar J. Real exchange rate misalignment and economic growth: The case of Trinidad and Tobago. *Economies*. 2018;6(52):1–23. DOI: 10.3390/economies6040052
2. Eichengreen B. The real exchange rate and economic growth. *Commission on Growth and Development Working Paper*. 2018;(4). URL: http://documents.worldbank.org/curated/en/868701468152077108/pdf/577040NWP0Box31UBLIC10gc1wp10041web.pdf (accessed on 13.11.2019).
3. Bostan I., Toderaşcu C., Firtescu B.-N. Exchange rate effects on international commercial trade competitiveness. *Journal of Risk and Financial Management*. 2018;11(2):1–11. DOI: 10.3390/jrfm11020019
4. Rose A.K. Exchange rate regimes in the modern era: Fixed, floating and flaky. *Journal of Economic Literature*. 2011;49(3):652–672. DOI: 10.1257/jel.49.3.652
5. Ghosh A.R., Ostry J.D., Qureshi M.S. Exchange rate management and crisis susceptibility: A reassessment. IMF Working Paper. 2014;(11). URL: https://www.imf.org/external/pubs/ft/wp/2014/wp1411.pdf
6. Kurtovic S., Halili B., Maxhuni N. Bilateral trade elasticity: B&H versus its seven trade partners. Munich Personal RePEc Archive. MPRA Paper. 2016;(72297). URL: https://mpra.ub.uni-muenchen.de/72297/1/MPRA_paper_72297.pdf
7. Kurtovic S. The effect of depreciation of the exchange rate on the trade balance of Albania. *Review of Economic Perspectives*. 2017;17(2):141–158. DOI: 10.1515/revecp-2017–0007
8. Muhia J., Gachunga M.J. Effect of exchange rates volatility on imports and exports. *Mediterranean Journal of Basic and Applied Sciences (MJBAS)*. 2018;2(4):102–108.
9. Safuan S. Exchange rate volatility and export volume: The case of Indonesia and its main trading partners. *European Research Studies Journal*. 2017;20(3A):3–13. URL: https://www.ersj.eu/dmdocuments/2017-xx-3-a-1.pdf
10. Tunc C., Solakoglu M.N., Hazar A., Babuscu S. Exchange rate volatility and trade: External exchange rate volatility matters. Munich Personal RePEc Archive. MPRA Paper. 2018;(86401). URL: https://mpra.ub.uni-muenchen.de/86401/1/MPRA_paper_86401.pdf
11. Héricourt J., Poncet S. Exchange rate volatility, financial constraints, and trade: Empirical evidence from Chinese firms. *The World Bank Economic Review*. 2015;29(3):550–578.
12. Feldstein M. Europe's Monetary Union: The case against EMU. The Economist. June 13, 1992. URL: https://www.nber.org/feldstein/economistmf.pdf
13. Rodrik D. Growth strategies. NBER Working Paper. 2003;(10050). URL: https://www.nber.org/papers/w10050.pdf
14. Bhala S. Economic development and the role of currency undervaluation. *Cato Journal*. 2008;28(2):313–340. URL: https://pdfs.semanticscholar.org/1b82/3707855694a294fed7545a142caf8aedf92a.pdf
15. Hooy C.-W., Law S.-H., Chan T.-H. The impact of the Renminbi real exchange rate on ASEAN disaggregated exports to China. *Economic Modelling*. 2015;47:253–259. DOI: 10.1016/j.econmod.2015.02.025

16. Wondemu K., Potts D. The impact of the real exchange rate changes on export performance in Tanzania and Ethiopia. African Development Bank Group. Working Paper. 2016;(240). URL: https://www.afdb.org/en/documents/document/working-paper-240-the-impact-of-the-real-exchange-rate-changes-on-export-performance-in-tanzania-and-ethiopia-91015
17. Abdul Aziz M., Widodo T. Exchange market pressure: Evidences from ASEAN inflation targeting countries. Munich Personal RePEc Archive. MPRA Paper. 2017;(80919). URL: https://mpra.ub.uni-muenchen.de/80919/1/MPRA_paper_80919.pdf
18. Dzanan H., Masih M. Does currency depreciation necessarily result in positive trade balance? New evidence from Norway. Munich Personal RePEc Archive. MPRA Paper. 2017;(82103). URL: https://mpra.ub.uni-muenchen.de/82103/1/MPRA_paper_82103.pdf
19. McLeod D., Mileva E. Real exchange rates and growth surges. Fordham University. Department of Economics. Discussion Paper. 2011;(4). URL: https://archive.fordham.edu/ECONOMICS_RESEARCH/PAPERS/dp2011_04_mcleod_mileva.pdf
20. Aizenman J., Lee J. Real exchange rate, mercantilism and the learning by doing externality. *Pacific Economic Review.* 2010;15(3):324–335. DOI: 10.1111/j.1468–0106.2010.00505.x
21. Benigno G., Converse N., Fornaro L. Large capital inflows, sectoral allocation, and economic performance. *Journal of International Money and Finance*. 2015;55:60–87. DOI: 10.1016/j.jimonfin.2015.02.015
22. Rodrik D. The real exchange rate and economic growth. *Brookings Papers on Economic Activity.* 2008;(Fall):365–412. DOI: 10.1353/eca.0.0020
23. Nouira R., Plane P., Sekkat K. Exchange rate undervaluation to foster manufactured exports: A deliberate strategy? CERDI, Etudes et Documents. 2010;(10). URL: https://www.academia.edu/14956344/Exchange_Rate_Undervaluation_to_Foster_Manufactured_Exports_A_Deliberate_Strategy (accessed on 13.11.2019).
24. Balassa B. Incentive policies and export performance in sub-Saharan Africa. *World Development*. 1990;18(3):383–391. DOI: 10.1016/0305–750X(90)90125-H
25. Rodrik D. Industrial policy: Don't ask why, ask how. *Middle East Development Journal*. 2009;1(1):1–29. DOI: 10.1142/S1793812009000024
26. Sandoyan E., Voskanyan M., Galstyan A. Impact channels of currency regulation on economic growth: The case of Armenia. *Journal Global Policy and Governance.* 2018;7(2):3–12. DOI: 10.14666/2194–7759–7–2–001
27. Sandoyan E., Voskanyan M., Galstyan A. Assessment of key factors of the foreign exchange rate formation in Armenia. *Finansy: teoriya i praktika = Finance: Theory and Practice.* 2018;22(5):27–39. DOI: 10.26794/2587–5671–2018–22–5–27–39

ABOUT THE AUTHORS

Edvard M. Sandoyan — Dr. Sci. (Econ.), Prof., Director, Institute of Economics and Business, Russian-Armenian (Slavonic) University, Yerevan, Armenia
edward.sandoyan@rau.am

Ani G. Galstyan — Postgraduate student, Department of Economics and Finance, Russian-Armenian (Slavonic) University, Yerevan, Armenia
ani.galstyan@rau

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Assessment of the Development of the Social Infrastructure of Russian Regions and its Impact on Demographic Processes

R.V. Fattahov[a] ✉, M.M. Nizamutdinov[b], V.V. Oreshnikov[c]
[a] Financial University, Moscow, Russia; [b,c] Institute for Social and Economic Research UFRC RAS, Ufa, Russia
[a] https://orcid.org/0000-0002-5863-7982; [b] https://orcid.org/0000-0001-5643-1393;
[c] https://orcid.org/0000-0001-5779-4946
✉ Corresponding author

ABSTRACT

The subject of the study is the demographic development of the regions of the Russian Federation. The dynamics of the key indicators at the federal and local levels define **the relevance** of the issue. State financial resources aimed at implementing measures to stimulate fertility growth and increase life expectancy often fall flat. **The aim** of the study is to determine the impact of the elements of the regional social infrastructure on demographic processes. The research **methods** follow from assessing particular parameters of social infrastructure development, and Rosstat statistical data for 2010–2018, as well as data by the Ministry of Finance of the Russian Federation. The authors carried out a structural, correlation data analysis, formed a complex of regression equations, and used the methods of normalization and ranking of indicators. The study **resulted** in an approach to the sequential convolution of particular indicators, which characterize the development of individual areas of social infrastructure, into integrated indicators for the considered areas; the following determination of the integral indicator of the development of regional social infrastructure as a whole. The authors calculated integral indicators of social infrastructure development for the identified areas in the constituent entities of the Russian Federation. **The scientific novelty** of the approach consists in developing a set of integrated indicators, based on the assessment of social infrastructure development aimed at the indicators of natural and migration movement of the population. The authors **concluded** that the development of public policy measures in the field of demographic development, as well as an appropriate financial base, should consider the impact of social infrastructure elements on the components of demographic development. The results can be useful for building a comprehensive model of socio-economic development of the Russian regions.

Keywords: social infrastructure; public funding; demographic processes; correlation analysis; standardization of indicators; provision of services; regions of Russia

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INTRODUCTION

According to the norms of Russian law, "The Russian Federation is a social State whose policy is aimed at creating conditions for a worthy life and a free development of man"[1]. It is not surprising that about 60% of consolidated budget is spent on the development of the social sphere, including such areas as healthcare, education, and culture. In support of this, the overwhelming majority of national projects implemented in accordance with Presidential Decree No. 204 of May 7, 2018, "On National Goals and Strategic Tasks of the Development of the Russian Federation for the Period until 2024" are socially-oriented. At the same time, one of the most important is the national project Demography, whose costs amounted to 498.3 billion roubles as of January 1, 2020 (i.e., about 31.1% of all costs for national projects)[2].

Most other projects are also directly or indirectly aimed at improving the demographic situation in the country [including the national project Healthcare (157.1 billion roubles)]. However, despite the measures taken, in 2019, even the migration flow from abroad could not compensate for the natural decline in the country's population. According to Rosstat estimates, the total population decline is about 35.6 thousand people[3] for the second year in a row. Moreover, most researchers predict worsening of the situation.

Despite the country's budget surplus and measures taken (including those announced in the message of the President of the Russian Federation on January 15, 2020), financial resources that could be used to improve the demographic situation are limited. In this regard, to develop public policy measures in this field, it is necessary to identify the most significant factors that have a decisive influence on demographic processes.

The analysis shows that the majority of researchers consider various elements of social infrastructure, created both from public and private funds, as these factors [1]. However, the question of a complex assessment of the development of the social infrastructure of the region from the standpoint of its impact on demographic processes has been studied insufficiently. A similar situation determined the relevance of the study and the results obtained.

ELEMENTS OF SOCIAL INFRASTRUCTURE

The problem of studying the impact of social infrastructure on the demographic development of territorial systems is largely due to the inconsistency of the object of study. On the one hand, the current list of works devoted to the analysis of the structure and development trends of social infrastructure both in the Russian Federation [2] and abroad [3–5] is rather long. However, it is largely due to this fact that there are many approaches to the very concept of "social infrastructure" and, as a result, other issues related to it — structure, development, need for it, and interconnection with other components of social life.

In this study, we do not aim to conduct a comparative analysis of existing approaches to this definition, and therefore, we will consider just one of them. Social infrastructure is a complex of objects (enterprises, institutions, organizations and structures) that provide the environments of public production and the life of the population, the formation of a physically and intellectually developed, social-minded individual [6]. Social infrastructure includes objects of healthcare, education, cultural and leisure sphere, housing and communal services, trade and services, etc.

[1] The Constitution of the Russian Federation (adopted by a nationwide vote on 12.12.1993).

[2] Preliminary data on federal budget expenditure execution for the implementation of national projects as of January 1, 2020. Ministry of Finance of the Russian Federation. URL: https://www.minfin.ru/ru/press-center/?id_4=36929-predvaritelnye_dannye_ob_ispolnenii_raskhodov_federalnogo_byudzheta_na_ryealizatsiyu_natsionalnykh_proektov_na_1_yanvarya_2020_goda (accessed on 05.02.2020).

[3] Preliminary estimate of the resident population as of January 1, 2020 and an average of 2019. Rosstat. URL: https://www.gks.ru/folder/12781 (accessed on 05.02.2020).

In 2018, according to Rosstat[4], more than 60% of the consolidated budget of the Russian Federation was allocated to social and cultural events, including education (42.2% of this sphere), healthcare (13.3% of this sphere) and social policy (33.8% of this sphere). In addition, another 10.2% was aimed at supporting the housing and communal services sector. In the regional context, the share of budget expenses on social and cultural events was less than 40% only in two regions. They include the Chukotka Autonomous region (which at the same time is leading in expenses on housing and communal services) and the Kaliningrad region (where a significant increase in expenses on the national economy has been since 2016). In these regions, the value of the indicator was 32.8 and 30.1%, respectively. In 21 constituent entities of the Russian Federation, its value is 70% (the Republic of Chechnya is leading with 79.0%). Thus, we can state that expenses on social infrastructure are decisive in terms of establishing the country's financial policy.

Developing each of these spheres in the region can be characterized by many indicators. In this regard, the research on this topic provide various approaches to determining the number and composition of the indicators and their grouping. For example, the World Bank is assessing social infrastructure by the following indicators [7]:

1. Number of hospital beds.
2. Number of doctors.
3. Number of primary school teachers.
4. Number of secondary school teachers.

However, in most cases, a longer list of indicators is used. In particular, the reviews are given in works [8, 9]. In this regard, it seems appropriate to move from considering particular indicators to some integral parameters of the development of a particular sphere. In our opinion, to solve this problem, we should consider indicators characterizing the development of healthcare, the cultural and leisure sphere, housing and communal infrastructure, education, and the trade and services sphere. At the same time, we should consider that, on the one hand, the change in funding these areas influences the level of their development. On the other hand, for the final consumer of services, only the actual state of these sectors makes sense. Moreover, using purely financial indicators would require using various deflators to make it possible to compare the indicators. While physical indicators do not have this drawback.

Considering the healthcare sector, we should note that the Decree of the President of the Russian Federation No. 204, which describes the tasks stipulated by the national project in the field of healthcare, implies focusing on eliminating staff shortages in medical organizations, reducing the waiting time in medical organizations, optimization of the work of medical organizations. These issues are also considered by foreign studies [10].

We suggest considering the provision of medical services as a development indicator of social infrastructure in this sphere. It is a synthetic indicator that includes such parameters as the number of hospital beds, the capacity of outpatient clinics, the number of doctors of all specialties, and the number of nursing staff. Moreover, we would to include the morbidity rate per 1000 people to assess the effectiveness of the available options. All indicators are considered not as absolute but as specific (i.e. per capita).

It should be noted that the capacity of outpatient organizations is largely determined by the availability of appropriate staff. This raises the question of the actual duplication of indicators and the excessive number of the considered parameters. We conducted a correlation analysis to test this hypothesis. *Table 1* presents the obtained results.[5]

[4] Regions of Russia. Socio-economic indicators. 2019. Rosstat. M., 2019. P. 1204.

[5] Hereinafter, the data presented in the statistical collections "Regions of Russia. Socio-economic indicators" for 2015–2019 and on the official website of Rosstat. URL: https://www.gks.ru.

Table 1

Healthcare Correlation Matrix

	Number of hospital beds	Capacity of outpatient organizations	Number of doctors	Number of nursing staff	Morbidity
Number of hospital beds	1.00				
Capacity of outpatient organizations	0.53	1.00			
Number of doctors	0.44	0.40	1.00		
Number of nursing staff	0.58	0.57	0.49	1.00	
Morbidity	0.28	0.44	0.20	0.39	1.00

Source: developed and compiled by the authors based on Rosstat data. URL: https://www.gks.ru (accessed on 18.02.2020).

The table shows that there is no significant dependence (at least a linear pair dependence) between the considered indicators (the maximum value is 0.58), which allows further use of total selected factors.

To exclude the influence of the factor of indicator dimensions, they are first preset by the formula

$$Y_i^n = \frac{Y_i - Y_{\min}}{Y_{\max} - Y_{\min}} \quad (1)$$

where Y_i — is the value of the indicator for the *i*-th region; $Y_{\min}$, $Y_{\max}$ — are the minimum and maximum values of the indicator for all considered regions, respectively; Y_i^n — is the normalized value of the indicator for the *i*-th region.

The integral indicator of the development of the healthcare system is calculated by the formula

$$Y_{health}^n = \sqrt[4]{Y_{bed}^n * Y_{out}^n * Y_d^n * Y_{ns}^n}, \quad (2)$$

where Y_{health}^n is the value of the integral indicator of provision of healthcare services in the region;

Y_{bed}^n is the normalized value of the indicator "Number of hospital beds per 10,000 people" in the *i*-th region;

Y_{out}^n is the normalized value of the indicator "Capacity of outpatient organizations per 10,000 people" in the *i*-th region;

Y_d^n is the normalized value of the indicator "Number of doctors of all specialties per 10,000 people" in the *i*-th region;

Y_{ns}^n is the normalized value of the indicator "Number of nursing staff per 10,000 people" in the *i*-th region;

Y_{mor}^n is the normalized value of the indicator "Morbidity rate per 1000 people" in the *i*-th region.

The indicator of provision of cultural and leisure services could be calculated in a similar way. After the indicators are normalized, they are convolved by the formula

$$Y^n_{c-l} = \sqrt[5]{Y^n_{th} * Y^n_{sp} * Y^n_{lib} * Y^n_{camp} * Y^n_{vaf}}, \quad (3)$$

where Y^n_{c-l} is the value of the integral indicator of provision of cultural and leisure services in the region;

Y^n_{th} is the normalized value of the indicator "Number of spectators in theaters and number of visits to museums per 1000 people" in the *i*-th region;

Y^n_{sp} is the normalized value of the indicator "Number of gyms and flat sports facilities per 1000 people" in the *i*-th region;

Y^n_{lib} is the normalized value of the indicator "Library stock per 1000 people" in the *i*-th region;

Y^n_{camp} is the normalized value of the indicator "Number of children who went to children's health camps per 1000 people" in the *i*-th region;

Y^n_{vaf} is the normalized value of the indicator "Number of people accommodated in voluntary accommodation facilities per 1000 people" in the *i*-th region.

In this case, we revealed no significant connection between the considered indicators (*Table 2*).

According to the analysis of housing and communal infrastructure (as part of social infrastructure), it should be noted that "improvement of the housing stock" is a very wide concept and includes (according to Rosstat) water supply, sanitation (sewage), heating, bathtubs (shower), gas (mains, liquefied), hot water supply and outdoor electric stoves. At the same time, these parameters cannot be equally applied for various territories (including, due to objective, for example, geographical and natural-climatic features). In particular, these aspects should be considered when analyzing the regions of the Far East (Kamchatka Krai, Magadan region, Chukotka Autonomous region) in terms of the housing stock equipped with gas supply. At the same time, the availability of bathtubs and floor electric stoves is extremely heterogeneous in the regions of Russia. In this regard, within the study, improvement of the housing stock is determined as the average value of such indicators as water supply, sanitation, heating and hot water supply.

On the other hand, the Decree of the President of the Russian Federation "On National Goals ..." implies not only an increase in housing construction to at least 120 million square meters per year, but also a radical increase in the comfort of the urban environment, creation of a mechanism for direct participation of citizens in its formation. At the same time, it is necessary to provide affordable housing for middle-income families.

The correlation analysis did not reveal a significant connection between the considered indicators (*Table 3*).

Accordingly, the integral indicator is calculated by the formula

$$Y^n_{hous} = \sqrt[5]{Y^n_{rp} * Y^n_{em} * Y^n_{impr} * Y^n_{com} * Y^n_{exp}}, \quad (4)$$

where Y^n_{hous} is the value of the integral indicator of housing and communal infrastructure in the region;

Y^n_{rp} is the normalized value of the indicator "Total area of residential premises, in average per inhabitant" in the *i*-th region;

Y^n_{em} is the normalized value of the indicator "Proportion of emergency housing stock in the total area of the entire housing stock" in the *i*-th region;

Y^n_{impr} is the normalized value of the indicator "Proportion of the total area with water supply, sanitation, hot water supply" in the *i*-th region;

Y^n_{com} is the normalized value of the indicator "Commissioning of residential buildings per 1000 people" in the *i*-th region;

Y^n_{exp} is the normalized value of the indicator "Proportion of household expenses on housing and public utilities" in the *i*-th region.

Provision of education services is also an indicator that includes a number of particular parameters characterizing different levels of education [11]. In particular, they include:

Table 2

Correlation matrix of indicators of the cultural and leisure sphere

	Visiting theaters and museums	Gyms and flat sports facilities	Library stock	Number of children who went to children's health camps	Number of people accommodated in voluntary accommodation facilities
Visiting theaters and museums	1.00				
Gyms and flat sports facilities	–0.25	1.00			
Library stock	0.18	0.35	1.00		
Number of children who went to children's health camps	–0.22	0.38	0.29	1.00	
Number of people accommodated in voluntary accommodation facilities	0.47	–0.26	0.05	–0.06	1.00

Source: developed and compiled by the authors based on Rosstat data. URL: https://www.gks.ru (accessed on 18.02.2020).

Table 3

Correlation matrix of indicators of housing and communal infrastructure

	Housing	Substandard housing	Housing improvement	Housing commissioning	Expenses on housing and public utilities
Housing	1.00				
Substandard housing	–0.16	1.00			
Housing improvement	0.09	–0.11	1.00		
Housing commissioning	0.28	-0.06	0.08	1.00	
Expenses on housing and public utilities	0.42	0.26	0.20	–0.07	1.00

Source: developed and compiled by the authors based on Rosstat data. URL: https://www.gks.ru (accessed on 18.02.2020).

5. Provision of preschool children with places in organizations engaged in educational activities for educational programs of preschool education and childcare; places per 1000 children.

6. Number of teachers in organizations engaged in educational activities on educational programs of primary, basic and secondary general education per 1000 students.

7. Number of students in afternoon and night shifts in organizations engaged in educational activities for educational programs of primary, basic and secondary education.

8. Number of students enrolled in undergraduate, specialty, graduate programs per 10,000 people.

When developing a national project in education, the Decree of the President of the Russian Federation sets objectives, including: to introduce new methods of training and education at the levels of basic and secondary general education, to create conditions for the early development of children under three years old, and to introduce a national system of professional growth for teachers, to update vocational education, and to develop a system of continuous updating of their professional knowledge by working citizens. That is, it is not a question of a particular educational level, but of the entire educational system, covering preschool education, secondary, higher, etc.

The correlation analysis (*Table 4*) showed that the dependence between these indicators is also insignificant.

At the same time, a bigger number of students in afternoon and night shifts is considered as a negative phenomenon.

The integral indicator is calculated by the formula

$$Y_{ed}^{n} = \sqrt[4]{Y_{pre}^{n} * Y_{teach}^{n} * Y_{shift}^{n} * Y_{stud}^{n}}, \quad (5)$$

where Y_{ed}^{n} is the value of the integral indicator of educational services in the region;

Y_{pre}^{n} is the normalized value of the indicator "Provision of preschool children with places in organizations engaged in educational activities for educational programs of preschool education and childcare; places per 1000 children" in the *i*-th region;

Y_{teach}^{n} is the normalized value of the indicator "Number of teachers in organizations engaged in educational activities on educational programs of primary, basic and secondary general education per 1000 students" in the *i*-th region;

Y_{shift}^{n} is the normalized value of the indicator "Number of students in afternoon and night shifts in organizations engaged in educational activities for educational programs of primary, basic and secondary education" in the *i*-th region;

Y_{stud}^{n} is the normalized value of the indicator "Number of students enrolled in undergraduate, specialty, graduate programs per 10,000 people" in the *i*-th region.

An assessment of the development of the region's social infrastructure in the sphere of trade and services implies a study of indicators characterizing retail trade, public catering turnover, volumes of paid services to the population, including household, transport and communication services. These indicators also make it possible to assess the income level of the population. Considering the high share of the shadow economy in a number of regions of the Russian Federation [12, 13], the indicators of the expenses of the population are often more adequate in reflecting the standard of living, than average monthly wages of employees of enterprises and organizations or average per capita monetary incomes of the population. Besides, one may use indicators characterizing this sphere not from a financial point of view, but in physical terms, including density of various types of roads, volume of transportation of people and goods, number of buses, number of connected devices of various types of communication, etc. However, the analysis helped establish the redundancy of this set of parameters. In partic-

Table 4

Correlation matrix of education indicators

	Provision of places for pre-school education	Provision of teachers	Students in afternoon shift and night shift	Students
Provision of places for pre-school education	1.00			
Provision of teachers	–0.09	1.00		
Students in afternoon shift and night shift	–0.50	–0.02	1.00	
Students	–0.26	–0.05	–0.15	1.00

Source: developed and compiled by the authors based on Rosstat data. URL: https://www.gks.ru (accessed on 18.02.2020).

Table 5

Correlation matrix of trade and services indicators

	Retail	Catering	Paid services	Domestic services	Transport services	Communication services
Retail	1.00					
Catering	0.63	1.00				
Paid services	0.77	0.59	1.00			
Domestic services	0.37	0.24	0.49	1.00		
Transport services	0.67	0.54	0.90	0.24	1.00	
Communication services	0.63	0.51	0.81	0.08	0.79	1.00

Source: developed and compiled by the authors based on Rosstat data. URL: https://www.gks.ru (accessed on 18.02.2020).

ular, *Table 5* presents a part of the correlation matrix that shows a close correlation between the volume of paid services to the population and the volumes of transport and communication services. In this regard, it seems appropriate to exclude the indicator "Volume of paid services to the population" from further consideration.

With this in mind, we suggest calculating the integral indicator by the following formula

$$Y^n_{trade} = \sqrt[5]{Y^n_{retail} * Y^n_{cat} * Y^n_{dom} * Y^n_{trans} * Y^n_{comm}}, \quad (6)$$

where Y^n_{trade} is the value of the integral indicator of trade and services in the region;

Y^n_{retail} is the normalized value of the indicator "Retail trade turnover" in the *i*-th region;

Y^n_{cat} is the normalized value of the indicator "Public catering turnover" in the *i*-th region;

Y^n_{dom} is the normalized value of the indicator "Volumes of domestic services per person" in the *i*-th region;

Y^n_{trans} is the normalized value of the indicator "Volumes of transport services per person" in the *i*-th region;

Y^n_{comm} is the normalized value of the indicator "Volumes of communication services per person" in the *i*-th region.

The development of each of these spheres is impossible without adequate financial support. In modern conditions, we refer not only to public funding, but also about private investment. Moreover, the role of the state in this case should be primarily in providing the conditions for expanding the possibilities to finance social infrastructure by enterprises and organizations, since its development is not actually the goal of the implemented measures, but serves to achieve a goal of a higher national character — to solve the demographic problem. Thus, the adoption of measures to financially stimulate a particular area should be evaluated from this position. For this, scientifically based approaches should be developed, including those based on the methods of economic and mathematical modeling.

APPROACH TO MODELING AND ASSESSING THE IMPACT OF DEVELOPMENT OF THE REGION'S SOCIAL INFRASTRUCTURE ON DEMOGRAPHIC PROCESSES

Considering the impact of the development of social infrastructure and the financing of these areas on the demographic parameters of the Russian regions, it is necessary to study the complex impact of various parameters. In this regard, it is necessary to convolve indicators of the development of social infrastructure in certain areas of social life into a general indicator of the development of social infrastructure. However, one should consider the fact that one or another aspect of the development of social infrastructure can have a different impact on the elements of the demographic situation. Thus, an analysis of the literature suggests that healthcare development indicators influence more on changes in the birth rate in the region, rather than the cultural ones [14]. At the same time, the provision of housing and the possibility to obtain a quality education will become a significant factor for migration.

In this regard, a general integral indicator of the development of social infrastructure would not allow considering differences in the degree of influence of each component on the demographic situation. In our opinion, it is better to formulate three integral indicators based on a general list of components of social infrastructure, however, with different weight characteristics, depending on the degree of their influence on birth rate, mortality and migration. In this case, the most difficult and controversial issue is to determine weight characteristics for each of the elements in the equation. The expert method is most commonly used in this case. However, regarding the problem under consideration, the expert approach is applicable to a very limited extent and requires involving a large number of various specialists. We assumed that improvements in any sphere of the development of social infrastructure should not be considered as a reason for worsening the situation in any element of the demographic development of the territory, i.e. weight characteristics must have a value equal to or greater than zero.

Having examined various methods and criteria for determining weight coefficients, we proposed the following algorithm for their determination.

At the first stage, a correlation analysis is carried out to determine the relationship between the parameter of the demographic situation and the development levels of social infrastructure in each of the spheres under

Table 6

Correlation analysis results and normalized values of correlation coefficients (in brackets)

	Birth rate	Mortality	Migration
Healthcare	0.02 (0.89)	0.02 (0.64)	–0.40 (0.00)
Education	–0.43 (0.00)	–0.38 (0.10)	0.12 (0.54)
Culture	–0.24 (0.38)	–0.46 (0.00)	–0.02 (0.40)
Housing	–0.38 (0.10)	–0.24 (0.29)	0.56 (1.00)
Trade and services	0.07 (1.00)	0.28 (1.00)	0.10 (0.52)

Source: developed and compiled by the authors based on Rosstat data. URL: https://www.gks.ru (accessed on 18.02.2020).

consideration. These correlation coefficients will be further interpreted as the basis for determining the weight characteristics. For this, they are normalized. Normalized values of indicators act as weight characteristics. Thus, all weights have values from 0 to 1. As noted above, all indicators were also pre-normalized to exclude the influence of different sizes of indicators. At the same time, we considered indicators for 85 constituent entities of the Russian Federation that allowed the formation of relevant data series.

Table 6 presents the results of the correlation analysis.

The significance of the calculated linear correlation coefficients (at $\alpha = 0.05$), determined by the Student's criterion, in most cases exceeds the threshold value. Pairs "Culture" — "Migration" and "Culture" — "Birth rate" are the exceptions. However, to keep the logic of the research, these factors were not excluded from further consideration.

The results can be interpreted as follows.

The development of healthcare has a positive effect on the parameters of birth rate and mortality, since the volume and quality of the medical services are fundamental for a healthy and active life. However, the key factors of migration are completely different parameters. Job search [15], getting a higher education [16], and returning to one's previous place of residence are the most often reasons for migration. In this case, the factors of developing the push-pull migration are not considered [17]. In this regard, the impact of the healthcare development on migration is much lower than the impact of the development of social infrastructure in education. On the other hand, the mortality rate is much higher among people of the older age. The development of the education system cannot have a significant impact on this indicator.

Cultural and leisure services are not regarded as priority for any of the elements of the demographic system of the region. These needs are secondary, and people are mostly ready to re-

fuse some of them in favor of other factors. Besides, some of them can exist without developed social infrastructure in this sphere. For example, theaters and museums can be replaced by cinemas, TV shows or relevant content in the Internet, and attending cultural events is possible within tourist trips to more developed regions and cities [18]. The lack of public libraries is compensated by the possibility to buy (receive) books, both paper and electronic, as well as to replace reading with watching movies or getting information in a different way. Popular workout trainings, as well as other types of sports that do not require special facilities, partially compensates for the lack of sports facilities.

According to the study, the value of the integral indicator of housing and communal infrastructure is primarily significant for the migration component of the demographic situation, which is also determined by the role of housing as an indicator of the quality of life of the population. At the same time, a low level of housing is typical for many regions with a high birth rate. In the republics of Chechnya, Dagestan, Ingushetia, Tyva, leading in the total birth rate, housing per capita is only 55–72% of Russia's average value.

The trade development shows, on the one hand, the availability of infrastructure for retail trade, and on the other hand, the financial ability of the population to purchase goods and pay for services. Thus, the indicator to a certain extent characterizes the standard of living of the region's population in general, and not just in relation to trading activities. In this aspect, a significant correlation with improvements in terms of mortality, migration and birth rate becomes obvious. Moreover, this approach allows us to include in the financial model of the social infrastructure formation not only public funds and investments of private companies, but also the financial resources of the population.

The obtained normalized values of indicators regarding the impact of the elements of social infrastructure on the parameters of the demographic situation were the basis for calculating the integral indicators of the development of social infrastructure for the selected areas by formulas (7) — (9).

$$Y^n_{SI\_birth} = 0.89 * Y^n_{health} + 0.38 * Y^n_{c-l} + 0.10 * Y^n_{hous} + 1.00 * Y^n_{trade}, \quad (7)$$

$$Y^n_{SI\_mort} = 0.64 * Y^n_{health} + 0.10 * Y^n_{ed} + 0.29 * Y^n_{hous} + 1.00 * Y^n_{trade}, \quad (8)$$

$$Y^n_{SI\_migr} = 0.54 * Y^n_{ed} + 0.40 * Y^n_{c-l} + 1.00 * Y^n_{hous} + 0.52 * Y^n_{trade}. \quad (9)$$

The resulting set of models ultimately links private indicators of the development of social infrastructure and parameters of the demographic movement of the population in the regions of Russia. Separately from the general economic-mathematical model of the region's development, these equations have significantly less practical significance than if they were considered as a structural element of such a model. We find it sensible to integrate the results into a comprehensive regional development model [19], which includes the parameters of economic, monetary and other activities of the state.

ASSESSMENT OF DEVELOPMENT OF SOCIAL INFRASTRUCTURE IN THE REGIONS OF THE RUSSIAN FEDERATION

The developed set of equations was tested on the reported statistical data on the socio-economic development of the constituent entities of the Russian Federation. *Table 7* presents the calculation results.

The analysis of the results of ranking the regions by the integral indicators of the development of social infrastructure showed a very high differentiation. By the development of social infrastructure in terms of its effect on birth rate, the difference was 5.03 times (the minimum value in the Nenets Autonomous region is 0.3, the maximum is in Moscow 1.51). From the point of view of the impact of social infrastructure on mortality,

Table 7

Integral indicators of social infrastructure development for selected areas

A constituent entity of the Russian Federation	An integral indicator of social infrastructure development			A constituent entity of the Russian Federation	An integral indicator of social infrastructure development		
	$Y^n_{SI\_birth}$	$Y^n_{SI\_mort}$	$Y^n_{SI\_migr}$		$Y^n_{SI\_birth}$	$Y^n_{SI\_mort}$	$Y^n_{SI\_migr}$
Moscow region	0.83	0.85	1.23	Bryansk region	0.87	0.86	1.21
Kaliningrad region	0.93	0.90	1.38	Voronezh region	1.24	1.19	1.42
Leningrad region	0.68	0.69	1.12	Kaluga region	0.89	0.84	1.24
Krasnodar region	1.17	1.07	1.32	Kursk region	1.06	1.05	1.33
Sevastopol	0.99	0.88	1.24	Lipetsk region	1.13	1.09	1.35
Komi Republic	0.82	0.76	0.96	Oryol region	0.86	0.84	1.20
Republic of Kalmykia	0.70	0.66	0.93	Ryazan region	0.90	0.85	1.15
Astrakhan region	0.98	0.93	1.14	Tambov region	1.06	0.99	1.35
Kabardino-Balkarian Republic	0.75	0.74	1.04	Tula region	0.81	0.81	1.14
Karachay-Cherkess Republic	0.61	0.60	0.88	Republic of Adygea	0.80	0.80	1.16
Republic of North Ossetia — Alania	1.01	1.00	1.18	Republic of Mordovia	0.84	0.80	1.14
Stavropol region	0.92	0.90	1.11	Nizhny Novgorod region	0.98	0.95	1.21
Republic of Bashkortostan	1.03	1.01	1.32	Penza region	0.85	0.83	1.23
Mari El Republic	0.70	0.67	1.09	Samara region	0.83	0.84	1.14
Udmurt republic	0.84	0.82	1.09	Saratov region	0.87	0.86	1.08
Chuvash Republic	0.89	0.82	1.14	Ulyanovsk region	0.77	0.77	1.13
Perm region	0.83	0.81	1.02	Novosibirsk region	0.88	0.88	1.20
Orenburg region	0.92	0.88	1.12	Vladimir region	0.85	0.79	1.15
Chelyabinsk region	0.81	0.79	1.08	Ivanovo region	0.74	0.72	1.01
Republic of Khakassia	0.81	0.78	1.08	Kostroma region	0.79	0.76	1.12
Zabaykalsky Krai	0.84	0.76	0.88	Smolensk region	0.90	0.81	1.05
Krasnoyarsk region	0.91	0.85	1.05	Tver region	0.78	0.72	1.06
Irkutsk region	0.77	0.74	1.03	Yaroslavl region	0.94	0.85	1.19

Continuation of Table 7

A constituent entity of the Russian Federation	An integral indicator of social infrastructure development			A constituent entity of the Russian Federation	An integral indicator of social infrastructure development		
	$Y^n_{SI\_birth}$	$Y^n_{SI\_mort}$	$Y^n_{SI\_migr}$		$Y^n_{SI\_birth}$	$Y^n_{SI\_mort}$	$Y^n_{SI\_migr}$
Omsk region	0.92	0.85	1.07	Republic of Karelia	0.78	0.70	1.05
Tomsk region	0.83	0.82	1.10	Arkhangelsk region	0.96	0.88	1.00
Moscow	1.51	1.38	1.51	Vologda region	0.70	0.68	0.98
Saint Petersburg	1.46	1.28	1.58	Novgorod region	0.97	0.85	1.16
Republic of Tatarstan	1.14	1.09	1.45	Pskov region	0.76	0.70	1.10
Sverdlovsk region	1.11	1.08	1.25	Republic of Crimea	0.80	0.68	0.96
Tyumen region	0.94	0.88	1.07	Volgograd region	0.95	0.90	1.11
Khanty-Mansiysk Autonomous region — Ugra	0.87	0.84	1.01	Rostov region	0.89	0.87	1.13
Kamchatka Krai	0.86	0.80	1.09	Kirov region	0.83	0.79	1.04
Khabarovsk region	1.24	1.14	1.18	Kurgan region	0.56	0.55	0.99
Sakhalin region	1.18	1.11	1.18	Altai region	0.75	0.72	1.03
Murmansk region	0.89	0.85	0.98	Kemerovo region	0.82	0.77	1.04
Yamal-Nenets Autonomous region	0.79	0.75	0.81	Primorsky Krai	0.95	0.86	1.00
Altai Republic	0.74	0.61	0.90	Amur region	0.97	0.82	0.86
Republic of Buryatia	0.93	0.82	0.86	Jewish Autonomous region	0.70	0.62	0.81
Tyva Republic	0.72	0.60	0.67	Nenets Autonomous region	0.30	0.34	0.92
Republic of Sakha (Yakutia)	0.87	0.78	0.80	Republic of Dagestan	0.50	0.63	1.03
Magadan region	1.17	1.03	1.10	Republic of Ingushetia	0.45	0.52	0.83
Chukotka Autonomous region	0.80	0.74	0.92	Chechen Republic	0.32	0.46	0.97
Belgorod region	1.06	1.04	1.44				

Source: developed and compiled by the authors.

the same regions are the leaders and outsiders. Here, Moscow (1.38) is 4.06 times ahead of the Nenets Autonomous region (0.34). From the point of view of migration processes, the presented approach made it possible to obtain differences between the maximum value in St. Petersburg (1.58) and the minimum one in the Republic of Tyva (0.67) at the level of 2.36 times. In most cases, there is a connection with the differentiation of Russian regions by economic parameters, which is consistent with studies by other authors [20]. One should discuss the complex influence of heterogeneous factors and the mutual strengthening of differentiation processes.

CONCLUSIONS

The study results are the ratings of the constituent entities of the Russian Federation by the development of social infrastructure. They suggest that the social infrastructure of the region can have different effects on individual components of its demographic development. In this regard, creating favorable conditions for migration growth in the region does not guarantee an increase in the birth rate or a decrease in the mortality rate, and vice versa. Forecasting the population of a particular territory requires a deep analysis of all the components and factors of demographic processes. Therefore, developing public policy measures in the field of demographic development and, consequently, an appropriate financial base, should consider how much the development of a particular component of the region's social infrastructure affects each component of its demographic development. The results may be of further use to state authorities at the federal and regional levels in solving the corresponding problems.

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REFERENCES

1. Oidup T.M., Adadimova L. Yu., Chupikova S.A. Analysis of alternative methods of financial support of social infrastructure. *Ekonomicheskii analiz: teoriya i praktika = Economic Analysis: Theory and Practice*. 2015;(2):28–35. (In Russ.).
2. Vasil'eva O.N., Zhakhov N.V., Likhacheva V.V., Likhacheva E.V., Petechel T.A., Romanov E.V., Tupikina E.N., Khablak V.V., Yurchenko A.A. Socio-economic development: Problems and solutions. Stavropol: Logos; 2015. 156 p. (In Russ.).
3. Boeri A., Longo D., Gianfrate V., Lorenzo V. Resilient communities. Social infrastructures for sustainable growth of urban areas. A case study. *International Journal of Sustainable Development and Planning*. 2017;12(2):227–237. DOI: 10.2495/SDP-V12-N2–227–237
4. Vaznoniene G., Pakeltiene R. Methods for the assessment of rural social infrastructure needs. *European Countryside*. 2017;9(3):526–540. DOI: 10.1515/euco-2017–0031
5. Chin M.S., Chou Y.K. Modelling social infrastructure and economic growth. *Australian Economic Papers*. 2004;43(2):136–157.
6. Altuf'eva T. Yu., Ivanov P.A., Sakhapova G.R. Financing the development of territorial entities at different stages of the life cycle: Public and private resources. *Izvestiya Ufimskogo nauchnogo tsentra RAN = Proceedings of the RAS Ufa Scientific Centre*. 2019;(3):53–60. (In Russ.). DOI: 10.31040/2222–8349–2019–0–3–53–60
7. Kokurin D.I., Nazin K.N. Formation and implementation of the infrastructure potential of the Russian economy. Moscow: TransLit; 2011. 336 p. (In Russ.).
8. Sardarov T. Social infrastructure regulating in an emerging economy. *Academy of Strategic Management Journal*. 2018;17(3):1–12.

9. Amador-Jimenez A., Willis C. J. Demonstrating a correlation between infrastructure and national development. *International Journal of Sustainable Development & World Ecology*. 2012;19(3):197–202. DOI: 10.1080/13504509.2011.644639
10. Kou L., Xu H., Hannam K. Understanding seasonal mobilities, health and wellbeing to Sanya, China. *Social Science and Medicine*. 2017;177:87–99. DOI: 10.1016/j.socscimed.2017.01.051
11. Aitova Yu. S. The quality of education as a factor in the formation of migration flows in the Russian Federation. *Vestnik Tyumenskogo gosudarstvennogo universiteta. Sotsial'no-ekonomicheskie i pravovye issledovaniya = Tyumen State University Herald. Social, Economic, and Law Research*. 2018;4(2):80–93. (In Russ.). DOI: 10.21684/2411–7897–2018–4–2–80–93
12. Bun'kovskii D. V. Legal and illegal entrepreneurship in modern conditions. Irkutsk: East Siberian Inst. of the RF Ministry of Internal Affairs; 2019. 173 p. (In Russ.).
13. Martyshenko S. N. Analysis of monitoring data on socio-economic processes in municipalities. *Informatsionnyye tekhnologii modelirovaniya i upravleniya*. 2012;(6):506–512. (In Russ.).
14. Sturiale L., Scuderi A. The evaluation of green investments in urban areas: A proposal of an eco-social-green model of the city. *Sustainability*. 2018;10(12):4541. DOI: 10.3390/su10124541
15. Kobzeva A. Yu., Ataeva A. G. Basic factors of the formation of labor potential of the region in the context of strengthening intermunicipal ties of urban agglomerations. *Fundamental'nyye issledovaniya = Fundamental Research*. 2015;(11–6):1184–1189. (In Russ.).
16. Maniu I., Maniu G. C. Educational marketing: Factors influencing the selection of a university. *SEA — Practical Application of Science*. 2014; II(5):37–42.
17. Ulyaeva A. G., Migranova L. I. Study of the processes of pendulum labor migration in the urban agglomeration. *Vestnik Belgorodskogo universiteta kooperatsii, ekonomiki i prava = Herald of the Belgorod University of Cooperation, Economics and Law*. 2017;(5):179–193. (In Russ.).
18. Nizamutdinov M. M., Oreshnikov V. V. An approach to identifying factors in the formation of migration processes in the regions of Russia. *Ekonomicheskii analiz: teoriya i praktika = Economic Analysis: Theory and Practice*. 2018;17(5):906–918. (In Russ.). DOI: 10.24891/ea.17.5.906
19. Fattakhov R. V., Nizamutdinov M. M., Oreshnikov V. V. Tools for substantiating the parameters of the region's strategic development based on adaptive-simulation modeling. *Region: ekonomika i sotsiologiya = Region: Economics and Sociology*. 2017;(1):101–120. (In Russ.). DOI: 10.15372/REG20170105
20. Akhmetov T. R. The quality of innovative growth as the main criterion for substantiating the priorities of territorial development. *Regional'naya ekonomika: teoriya i praktika = Regional Economics: Theory and Practice*. 2019;17(5):818–834. (In Russ.). DOI: 10.24891/re.17.5.818

ABOUT THE AUTHORS

Rafael' V. Fattakhov — Dr. Sci. (Econ.), Prof., Department of Public Finance, Financial University, Moscow, Russia
fattakhov@mail.ru

Marsel' M. Nizamutdinov — Cand. Sci. (Tech.), Assoc. Prof., Head of the Department of Economic and Mathematical Modeling, Institute of Social and Economic Research, UFIC RAS, Ufa, Russia
marsel_n@mail.ru

Vladimir V. Oreshnikov — Cand. Sci. (Econ.), Senior Researcher, Department of Economic and Mathematical Modeling, Institute of Social and Economic Research of UFRC RAS, Ufa, Russia
voresh@mail.ru

Authors' declared contribution:
Fattakhov R. V. — introduction; relevance of the research topic and problem statement; development of the research methodology; interpretation of the results.
Nizamutdinov M. M. — selection justification of indicators for analysis; conclusions and recommendations based on the study results.
Oreshnikov V. V. — statistical data analysis; description of the calculation method; analysis of the results; tabular and graphical presentation of the results.

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Financial and Economic Consequences of Distribution of Artificial Intelligence as a General-Purpose Technology

V.E. Rasskazov
Rostelecom PJSC, Moscow, Russia
https://orcid.org/0000-0001-5593-2591

ABSTRACT

The **relevance** of the article is due to increasing attention of the state and corporations to artificial intelligence technologies, developing strategies and increasing investments in technology. **The aim** of this article is to study artificial intelligence as a general-purpose technology, its distribution features and approaches to assessing and modelling the impact on production, organization finances and the economy. The study employed the **methods** of an AI qualitative analysis according to the classification of general-purpose technologies and a regression analysis of company production factors. The author analysed the data of 21 public Russian companies in the industry of hydrocarbon production, mining and metal production for 2014–2018. He proposed a model to assess the impact of AI technology on production, organization finances and the economy. The correlation analysis proved that capital expenditures and the market value of companies have a close relationship. The study revealed low productivity of assets of Russian companies. The investor expects to receive 28 kopecks for each rouble invested in the company's assets, whereas foreign markets show a one to one ratio. The study highlighted the cyclicality of the performance of the company factors. The research did not expose general-purpose technology signals in the given time interval. The author **concluded** that under a quality classification, artificial intelligence is a general-purpose technology; however, at this stage, it is impossible to empirically observe the economic effect of the technology distribution. The proposed model may be of further use to study the effect of artificial intelligence on the finances of a company and the economy. The potential consequences of market monopolization due to the distribution of AI technologies allow for an argument for the state regulation of the technology adaptation process by business.

Keywords: general-purpose technology; Artificial Intelligence; Solow's paradox; J-curve; analysis of production factors; financial and economic analysis

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INTRODUCTION

General-purpose technologies (GPTs) are a class of technological innovations, characterized by pervasiveness, innovation spawning and high potential for subsequent improvements. Steam engine, electricity, internal combustion engine, computers and biotechnology — each of these technologies once became a catalyst for complementary innovations and economic development of humanity, and thus, a general-purpose technology. Such technologies allow numerous improvements and use cases that contribute to increasing the return on production factors. It is no coincidence that GPTs are considered one of the most important engines of growth of society [1].

At the same time, GPTs are extremely rare. According to Richard Lipsey and Kenneth Carlow, only 24 technologies in the human history fall under this classification [2]. The researchers used the following classification criteria:

- the technology is based on a general multipurpose principle;
- initially, the functionality was limited, but as technology develops, it becomes widespread in the economy due to lower cost of use;
- the technology contributes to many related innovations.

Available estimates have shown that the pervasive IT revolution supported 0.60% of labour productivity annual growth between 1995 and 2005 and the use of robots within manufacturing raised the annual growth of labour productivity by 0.36% between 1993 and 2007 [3]. The economic effect of the spread of a particular technology may seem insignificant, but the cumulative effect of the spread of several GPTs reaches 2.0–2.5% of the annual labour productivity growth [4]. In the long run, this doubles labour productivity every 30–35 years. For comparison, in the period XIII — XVIII centuries the annual labour productivity growth in the Netherlands was only 0.2% [5].

Among the emerging technologies, the most likely GPT is artificial intelligence (AI). Unlike other innovations, united by the concept of "digital economy", such as the Internet of things, virtual reality, quantum computing and distributed ledger technologies, only AI meets the criteria proposed by R. Lipsey. The others either do not have a general principle, or are limited in development and application, or do not contribute to the development of related innovations[1].

Optimistic researchers believe that the development and spread of AI may lead to the fastest paradigm shift in technology history [6]. It is almost impossible to imagine a process or hardware where AI could not be applied. The possibilities of using AI are many times greater than the automation potential discovered with the spread of IT in the 1980s.

The study object is the impact of AI technologies on social development. The subject of this work is the study of the consequences of distribution of AI as a general-purpose technology. To achieve the aim of the study, it is necessary to perform the following tasks: to assess the innovative potential of AI, the features of similar GPTs, such as IT, as well as to trace the effect of the spread of AI in the economy.

INNOVATIVE POTENTIAL OF ARTIFICIAL INTELLIGENCE AS A GENERAL-PURPOSE TECHNOLOGY

Artificial intelligence is a general term that refers to hardware and software capable of intelligent behavior. The concept of "artificial intelligence" has existed since the 1950s, when AI referred to systems designed to simulate the work of experts. The AI algorithm operation is built on the optimization of some function based on a large number of observations. AI allows for the automated

[1] Will AI, Blockchain, AR and/or VR become a general-purpose technology? Hackernoon. Sept. 15, 2017. URL: https://hackernoon.com/ai-blockchain-ar-vr-etc-which-one-is-a-general-purpose-technology-9b5510ca25e3 (accessed on 02.04.2020).

solution of complex optimization problems when the developer has no information about data behavior and cannot set a linear data processing function.

AI innovative potential is to automate the search for a "data structure". Such functionality of a computer program makes large-scale automation of processes economically viable by reducing the cost of searching for missing information and making decisions. AI algorithms make it possible to calculate probabilistic outcomes or, in other words, "predictions" [7].

Classical linear algorithms used in IT are based on formalizing human-readable if-then logic. For example, if a person has reached the retirement age, then s/he will be rejected a credit. Usually, the system designer sets this logic of the program's work with data, and the utilization efficiency and the development of the algorithm depend directly on the conversion rate of knowledge about the business or process into machine-readable code.

It can be assumed that if management methods used by leading firms were used in the entire economy, it would be possible to empirically observe the declared productivity growth from GPTs.

In the case of AI algorithms, the developer does not write complete data processing logic, but only general rules — the design of the algorithm. Next, the algorithm searches for a suitable data structure necessary to optimize the function (*Fig. 1*). A model evolving from the observations is able to fill in the missing information — to predict. The predictions of the missing data supplement the incoming information about the new situation, so that the decision-making process can be fully or partially automated. Using the program's work result data allows the algorithm to develop considering the new information on the data structure.

AI performance depends directly on how well the cumulative data characterizes total situations that will employ the model obtained by the algorithm. Understanding this principle is important for a fair assessment of the AI utilization potential.

Despite the fact that only some AI researchers aim to imitate the human mind, historically, human intelligence is often used as a criterion for AI assessment. The human mind should not be the only criterion for comparing AI, since AI algorithms already perform some tasks much better than people do. Therefore, their performance should not be compared with people, but only with other AI solutions.

Artificial intelligence is capable to generate knowledge about the data structure much faster than humans are. At the same time, AI requires more observations than a person to learn how to navigate data. A computer is able to work without rest and with a more stable return than a person is. The program code can be infinitely replicated to many machines, which allows scaling the application of the AI algorithm with minimal costs. These features entitle to classify artificial intelligence as a GPT with more confidence.

Unlike the AI that exists today, a person knows how to work with data of high abstraction. Previous experience not related to the current task, and the ability to work with multimodal data (combining image, sound, semantics, etc.) [8] help a person effectively solve new unstructured problems. The other side of the human ability to use related experience is the danger of distorting perception, bias and using past attitudes to solve the current problem.

Perhaps in the future, a cross-functional, "wide", artificial intelligence will appear to program more abstract logic. However, the current AI technologies enable automating and optimizing such human abilities as perception,

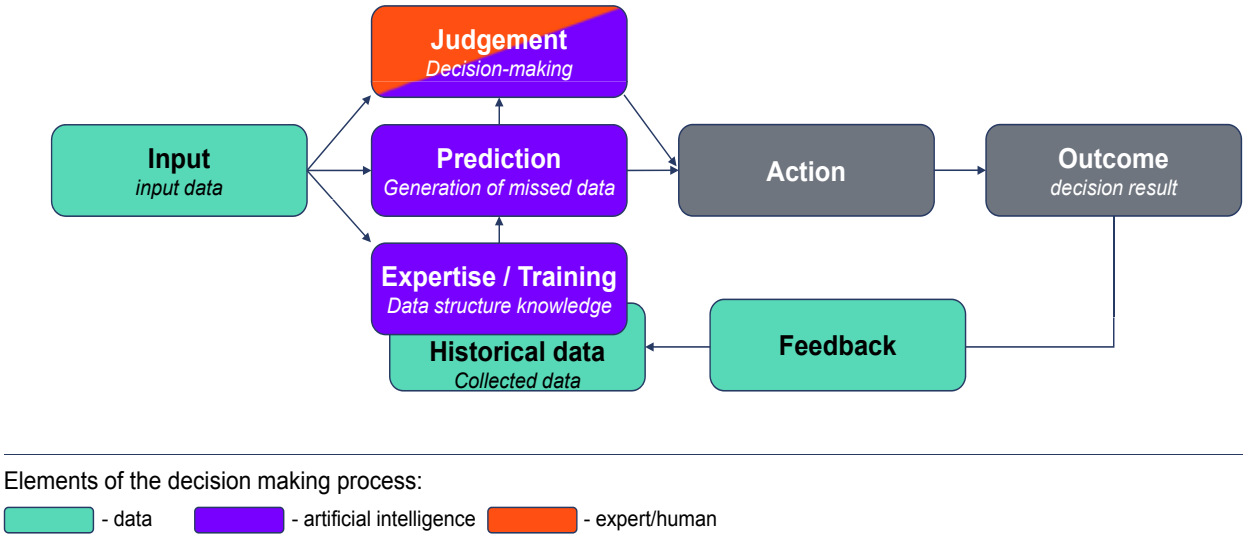

Fig. 1. **Artificial intelligence in decision making**

Source: compiled by the author.

understanding, reasoning, planning and communication, which makes it possible to use these abilities in a digital environment.

SOLOW'S PARADOX AND STIMULATING GPTS

Despite prior high expectations, it is difficult to evaluate the economic effect of AI utilization. If artificial intelligence is a GPT, the return on using the technology should be seen in the efficiency growth of production factors in each sector of the economy. Meanwhile, there is much empirical evidence that the so-called Solow's paradox often shows in relation to AI.

In the early period of total infatuation with computers, Nobel Prize winner Robert Solow [9] noted: "You can see the computer age everywhere but in the productivity statistics". The expected value of AI technologies often differs from objective indicators of business performance. The introduction of artificial intelligence in practice is often combined with production inefficiency.

There are three most popular approaches to Solow's paradox in the literature:

1. **Specific effect measurements**

The technology has a qualitative impact on people's lives, but the statistical tools used are not able to evaluate its impact in full [10].

2. **Uneven diffusion of innovations**

Slight gradual improvements are observed mainly in consumer technology. At the same time, the innovation diffusion in the economy is slowing down [11].

3. **Time lag between the appearance of innovation and its effect**

Potential for productivity growth already exists, but implementation methods and a deep understanding of innovation, important for the distribution of the technology in the economy, are not yet available.

While the first and the second explanations have not yet found empirical evidence, the theory of innovation diffusion barriers seems most likely. Many researchers support this explanation, since this approach helps remove the contradiction between the obvious long-term technological prospects of AI and low-key performance in the short term.

Every technological revolution caused by GPTs had leading companies capable of benefiting from innovations [12]. It takes time before other firms can learn to use GPTs and productivity growth will affect the economy as a whole. There are companies in various industries that lead in the adaptation of new technologies. These market leaders typically rely on less labour and more patents. Most of the AI developments are carried out in state

research institutes and universities, while in IT-leading countries the entrepreneurial sector is the development driver of this direction [13].

It can be assumed that if management methods used by leading firms were used in the entire economy, it would be possible to empirically observe the declared productivity growth from GPTs. In this hypothetical scenario, the assessment of productivity growth from AI will not require new measurement tools, and the effect of technology diffusion will be no less significant than from the previous technological revolutions.

Sustaining the trend of concentrating AI utilization benefits among leading firms will result in market monopolization. This feature of innovation diffusion leads to redistributing market shares and creating market entry barriers for other participants. Therefore, to maximize public benefits and accelerate the growth of the national economy, the state should regulate the spread of GPT, including artificial intelligence technology. That is why more than twenty states have released AI strategies and programs for 2017–2018 at the national level [14].

The approaches of countries to describe the strategy are similar, and each strategy somehow highlights the following aspects of AI regulation:

- stimulation of scientific research;
- talent development, skills and education;
- public and private sector adoption;
- ethics and inclusion, standards and regulations;
- data and digital infrastructure.

The implementation of a national program following these principles should contribute to the democratization of technology.

IMPLEMENTATION AND DIFFUSION OF ARTIFICIAL INTELLIGENCE

Studying the influence of GPT on the company's productivity, the authors of the article "The productivity J-curve: How intangibles complement General Purpose Technologies" [15] drew attention to a systematic underestimation of output and productivity in the early years of investments in technological business development. Investments in intangibles, including AI, at the beginning of the investment cycle (the R&D and the beginning of implementation) do not create additional output, which means they underestimate the overall production productivity. In the long term, the accumulated innovative potential, on the contrary, leads to reassessing the growth of returns from production factors. This gives the performance dynamics a J-shape.

The J-curve effect is often cited in macroeconomics to explain the multidirectional effects on the trade balance of the devaluation of the national currency at different time periods [16]. In the case of a firm, this approach helps explain the temporary decrease in returns on production factors when making large-scale investments in innovations. The fact is that investments aimed at creating an intangible asset base harm sales promotion and capacity building. Therefore, in the short term, the productivity of the firm-innovator is estimated below the expected values. Since technological development of a company often leads to new types of capital and requires investment in intangible assets, the diffusion of a new GPT may lead to the J-curve at the firm or state level, as explained by Solow's paradox.

A key feature of the introduction and diffusion of artificial intelligence technologies is the need to set the algorithm specifically for each firm. Previous GPTs, such as computers, electricity, and internal combustion engines, spread linearly, as they were "product" GPTs. To solve the problem a GPT implementation it was enough to connect the engine to the working elements of the existing machine. With AI, it is a "process" GPT, which means a different procedure for introducing technology into the company activities. The start of AI utilization requires accumulating large data volumes characterizing the main business

processes, which means that the moment of return on investment will be postponed.

The more the companies leading in the implementation of GPTs are ahead, the higher will be their productivity and the promise to reduce the cost of the final product. The process is clearly cumulative. Due to AI, the leading company will take a larger market share and make more transactions, which means it will accumulate more observations about production processes and will further improve AI.

The lagging firms, on the contrary, lose production volumes and slowly accumulate the data necessary for setting AI algorithms. Having lost the scale of production, these technologically weak market players can no longer automate internal processes due to AI. Anyway, the leader in the use of AI technologies creates barriers to market entry and losses for lagging firms.

Lack of regulation of AI technology diffusion may lead to monopolization of industries by leading firms. In some cases, monopolization is associated with an inefficient distribution of benefits from the GPT development; however, with moderate regulation, monopolization of industries can have a positive effect on the economy due to scale of production and capital accumulation [17].

The impact that monopolies have on society depends on their regulatory and social environment. If a monopoly is dominant due to effective investments in innovative product development, rather than artificially restraining competition by high marketing costs and price dumping, then the monopoly may stimulate progress and bring more benefits to society than the competitive market condition.

The evidence from practice shows [18] that post regulation of monopolies by the tools of antitrust law rarely takes effect, since it is extremely difficult to determine the level of competition necessary for the economy. The artificial restriction of market leading firms often leads to negative externalities.

The solution is to preventively regulate and support competition in the market. In terms of AI technologies, this could be stimulating research, developing human resources and creating a national information infrastructure[2]. Implementing the national strategy and program for AI development in Russia should contribute to the balanced diffusion and regulation of AI technologies in the Russian economy.

Russian literature is revealing the attitude to the diffusion and implementation of AI technologies. Artificial intelligence can help solve the problems of reducing the working-age population and modernizing obsolete production capacities [19]. Along with the productivity problem, there is an issue of proper stimulation and allocation of economic profit from AI as a new production factor [20].

The more the companies leading in the implementation of GPTs are ahead, the higher will be their productivity and the promise to reduce the cost of the final product.

The domestic literature puts forward a hypothesis that AI will transform the nature of human labour and will free the human resource for more complex and creative tasks [21]. Nevertheless, the ethical use of AI remains the problem. Its solution will require a phased transformation of the organizational structure through additional investments and the accumulation of new managerial experience in the field of artificial intelligence technologies [22], as well as the definition of AI as an object of legal relations [23].

[2] Almanac "Artificial Intelligence". Current state of the AI industry in Russia and the world. No. 1. M.: Center for Competence Research Institute on the basis of MIPT in the field of "Artificial Intelligence"; 2019. P. 153

APPROACH TO THE ANALYSIS OF GPT EFFECT

Assessing GPT effect often employs an approach based on factorial analysis. It is necessary to reveal the relationship between the company's total output and production factors. The company's net receipts at time t is as follows [24]:

$$Y = p * F(K, N, I, A). \quad (1)$$

where Y is the company's net receipts; p is the price of goods; K is the vector of capital goods (assets) with price r; N is the vector of variable costs (operating expenses) with price w; I is investments with a price z; A denotes the total productivity of production factors.

The present value of a firm can be expressed as the total cash flows to the date.

$$V_0 = \int_0^{\infty} \left[p * F(K, N, I, A) - w'N - z'I \right] * u(t) dt, \quad (2)$$

where $u(t)$ denotes cumulative discount factor.

According to the transformations described in work [15], the equation for a firm valuation can be as follows

$$V_0 = \sum_{j=1}^{J} \lambda_{j,0} * K_{j,0}, \quad (3)$$

where λ is the coefficient adjusting the value of production assets (K), and j is the index of different types of capital used in production. The use of coefficient λ characterizes the adjusting costs of production assets. For a company investing in intangible assets and improving performance, the λ/z indicator (ratio of the premium rate to the cost of investment) is expected to be more than one.

By showing the dependence of value of companies on production factors, i.e. assets (total assets, TA), operating expenses (sales, general and administrative costs, SG&A) and expenses on innovation (research and development, R&D), it is possible to assess the effect of each production factor on the company's value

$$Market\,Value = \alpha + \beta_1 TA + \\ + \beta_2 SG\,\&\,A + \beta_3 R\,\&\,D + \varepsilon. \quad (4)$$

For an empirical performance assessment of the production factors, coefficients β for companies of various sizes and industries can be considered. This approach should help assess the effect of investment in innovation on production factors.

Further decomposition of production factors to determine the element characterizing the accumulation of data may help find a connection between the payback period of investments in process automation and the size of the company. Identifying this pattern is useful to find the optimal investment strategy in AI technology, as well as to find the necessary measures for state regulation of the new GPT.

EXPERIMENT

The experiment used the data from Russian public companies in the hydrocarbon, mining and metal industries. Collecting data to assess the effect of industry production factors is a laborious process, so the number of companies in the sample was limited to 21 and the time period 2014–2018 (*Table 1*). The focus on mining industries is justified by a similar operating model for these companies. Adding the financial serves, engineering, or trading sectors to the common database could create noise in obsving the accumulation effect of technological base.

Unlike foreign companies, Russian business does not consider or declare R&D expenses. For the purposes of the study, this is a complication, since it was assumed that investments in new technologies would be described precisely by investments in R&D. As a possible workaround, in addition to the factors described above, the study assesses the impact of annual capital investments.

Table 1

List of companies in the sample

Oil and gas		Metals and mining	
Gazprom	Tatneft	Evraz	Mechel
LUKOIL	NOVATEK	NLMK	ALROSA
Rosneft	Slavneft	Rusal	TMK
Surgutneftegas	Russneft	Nornickel	Polyus
Transneft		Severstal	ChelPipe
		MMK	Polymetal

Source: compiled by the author.

Table 2

Correlation of database parameters

	MV	TA	COGS	SG&A	other OPEX	total OPEX	CAPEX
MV	1						
TA	0.65	1					
(COGS)	0.80	0.76	1				
(SG&A)	0.61	0.58	0.82	1			
(other OPEX)	0.77	0.46	0.76	0.59	1		
total OPEX	0.84	0.70	0.97	0.81	0.88	1	
CAPEX		0.92	0.85	0.64	0.70	0.84	1

Source: compiled by the author.

To create the model, we compiled a database of annual reporting indicators for companies including such parameters as: market value of paper at the end of the year (market value, MV), assets (total assets, TA), production cost (costs of goods sold, COGS), sales costs (sales, general and administrative costs, SG&A), other operating expenses (other OPEX), total operating expenses (total OPEX) and capital expenses for the period (CAPEX).

The correlation analysis of parameters show that the capital expenses (CAPEX) and market value (MV) of the company have a close direct relationship (*Table 2*). This relationship validates the inclusion of CAPEX in the model. In the case of operating expenses, the inclusion of cost does not make economic sense; and other operating expenses are calculated by companies in different ways. Therefore, the model will deploy the synthetic parameter "operating expenses minus production costs".

In the regression model, beta coefficients were calculated for each individual period with the point of intersection of axis at zero. It is interesting that if the intersection point of the OY axis is not fixed, one can see a change in the axis intersection point for the period 2014 to 2018 by + 131%. This is close to the growth of the price index for the respective industries, + 122%, which means that the sample describes the market quite well.

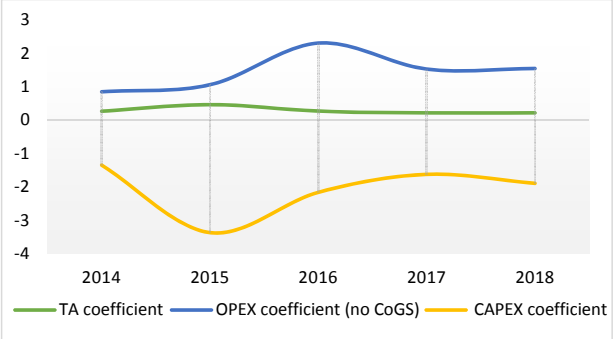

Fig. 2. **Beta model regression coefficients by production factors**

Source: compiled by the author.

The obtained values of production factors correspond to foreign studies. *Fig. 2*, presumably, presents two effects specific to the Russian market and the selected time period — low asset performance and the investment cycle of the technological base update.

An important difference between the obtained data from the results in foreign studies (*Fig. 3*) is in the low asset performance. If for the American market the value close to one is economically sound, then the graph shows the asset performance ratio close to 0.28 (*Table 3*). The investor expects to receive 28 kopecks for each rouble invested in the compa-

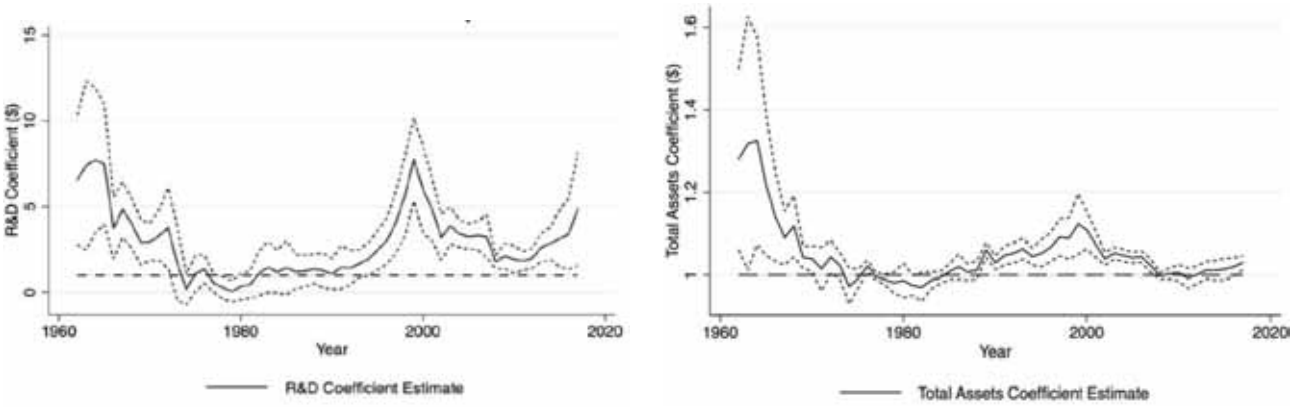

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Fig. 3. **Beta ratios for assets and R&D**

Source: study by Brynjolfsson E. et al.[15, p. 24, 25]. URL: https://economics.stanford.edu/sites/g/files/sbiybj9386/f/brynrocksyv_j-curve_final.pdf (accessed on 02.02.2020).

Table 3

Average value of the coefficients and their change

	β average value	CAGR, 2014–2018, %
TA coefficient	0.28	–5
OPEX coefficient (no CoGS)	1.46	16
CAPEX coefficient	–2.08	9

Source: compiled by the author.

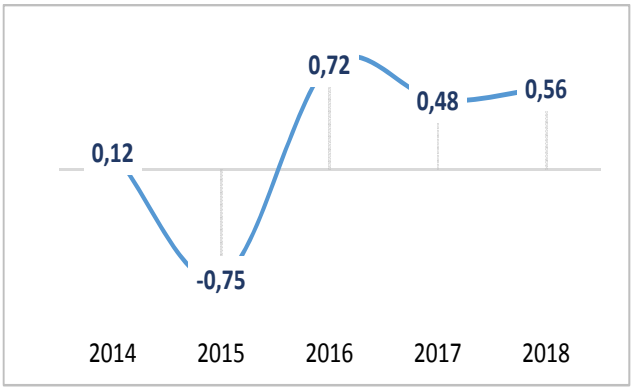

Fig. 4. **Beta model regression coefficients by production factors**

Source: compiled by the author.

ny's assets, whereas foreign markets show a one to one ratio. Such a low return on assets also explains the negative CAPEX coefficient, as investors consider investments in the company's capital as an inefficient management of funds that reduces the company's valuation.

The low asset performance may be explained by a high level of debt of companies, a high government share in business and a negative macroeconomic background.

Fig. 2 shows the progress of the investment cycle, due to which the OPEX performance is growing. A new, more advanced asset base allows companies to mine large volumes of resources with less labour and variable costs. The intensity of the use of assets is also growing (*Table 4*), which is seen in the growth of operating expenses relative to the volume of assets.

Table 4

OPEX and CAPEX costs to assets, %

	2014	2015	2016	2017	2018	CAGR
OPEX/TA	11.8	10.6	14.8	17.0	20.0	14.2
CAPEX/ TA	7.1	8.9	8.9	9.4	8.8	5.5

Source: compiled by the author.

$$\Delta effect = \sum_{i=1}^{n} \beta_{OPEX} * OPEX_i + \\ + (\beta_{CAPEX} + \beta_{TA}) * CAPEX_i. \quad (5)$$

In conclusion, we can assess the cumulative effect of changes in the production factors performance over the observed period (*Fig. 4*). In the period 2014–2018, one can observe the progress of the cycle. We cannot be sure whether it was an investment cycle or a change in market conditions, justified by the influence of macroeconomic factors.

The cycle resulted in the increased OPEX performance by 40%. The mere technological base update is unlikely to produce this result, so the impact of macroeconomic factors is plausible. Nevertheless, since asset performance has remained virtually unchanged, we may speak about the transition of the industry to a more efficient and technologically advanced operating model.

The study results allow for the conclusion that it is hardly possible to single out the effect of investments in new technologies, and even more so artificial intelligence, by observing fundamental and market indicators.

We noticed the general trend and cyclical development of the market, but it is easy to relate them to individual production factors, such as increasing the technological base or investments in the creation of new technologies.

CONCLUSIONS

The article provides arguments regarding the role of artificial intelligence in improving the efficiency of business and national economies as a "process" general-purpose technology. The paper also provided arguments for the investment in automation of production with AI technologies: increasing the return on production factors and creating sustainable competitive advantages by increasing barriers to entry into the industry.

The low asset performance may be explained by a high level of debt of companies, a high government share in business and a negative macroeconomic background.

The experiment made it possible to find the cyclical development of the market, which can be associated with the transition of companies to an improved and more technologically advanced operating model. However, we failed to identify a causal relationship between investments in new technologies and increased returns on the company's production factors due to a lack of necessary data in the official statements of the companies. Thus, the analysis of fundamental and market indicators of companies does not provide effective indicators for investment decisions regarding the development of the technological base of the company, or investments in AI technologies. The main reason for this conclusion is the lack of open data sufficient to conduct a focal study. Available indicators are not indicative since their value is affected by many factors.

The management may be skeptical about investment decisions on the development of AI technologies due to the short-term planning horizon and the specifics of motivation. Implementing a business development strategy with artificial intelligence is within the range of 5–10 years, which goes beyond the KPI of investment decision-makers. Moreover, investments in new technologies have a negative impact on the company's performance while accumulating production potential. Therefore, decisions on investments in AI will be made mainly by business owners, and in the case of many Russian enterprises — by the government.

Studies on the patterns of the GPT diffusion in the economy support moderate government intervention in the development of AI technologies. As is the case with the Internet or semiconductors, financing research and developing infrastructure will take a long time before there appear market motivators for adaptation and further development of GPTs.

REFERENCES

1. Bresnahan T. F., Trajtenberg M. General purpose technologies "Engines of growth"? *Journal of Econometrics*. 1995;65(1):83–108. DOI: 10.1016/0304–4076(94)01598-T
2. Lipsey R. G., Carlaw K. I., Bekar C. T. Economic transformations: General purpose technologies and long-term economic growth. Oxford, New York: Oxford University Press; 2006. 624 p.
3. Muro M., Andes S. Robots seem to be improving productivity, not costing jobs. Harvard Business Review. June 16, 2015. URL: https://hbr.org/2015/06/robots-seem-to-be-improving-productivity-not-costing-jobs
4. Bergeaud A., Cette G., Lecat R. Productivity trends in advanced countries between 1890 and 2012. *The Review of Income and Wealth*. 2016;62(3):420–444. DOI: 10.1111/roiw.12185

5. Van Zanden J.L., van Leeuwen B. The character of growth before 'modern economic growth'. The GDP of Holland between 1347 and 1807. Centre for Global Economic History. Utrecht University. CGEH Working Paper. 2011;(4). URL: https://warwick.ac.uk/fac/soc/economics/seminars/seminars/conferences/venice3/programme/hollandvenice12march2011.pdf
6. Kelnar D., Kostadinov A. The state of AI 2019: Divergence. London: MMC Ventures; 2019. 151 p. URL: https://www.mmcventures.com/wp-content/uploads/2019/02/The-State-of-AI-2019-Divergence.pdf
7. Agrawal A., Gans J., Goldfarb A. Prediction machines: The simple economics of artificial intelligence. Boston, MA: Harvard Business Review Press; 2018. 272 p.
8. Gardner H. et al. The theory of multiple intelligences. In: Sternberg R.J., Kaufman S.B., eds. Cambridge handbook of intelligence. Cambridge, New York: Cambridge University Press; 2011:485–503.
9. Solow R. We'd better watch out. New York Times Book Review. New York Times. 1987;(July12):36. URL: http://www.standupeconomist.com/pdf/misc/solow-computer-productivity.pdf
10. Syverson C. Why hasn't technology sped up productivity? Chicago Booth Review. Feb. 05, 2018. URL: http://review.chicagobooth.edu/economics/2018/article/why-hasn-t-technology-sped-productivity
11. Gordon R.J. Is U.S. economic growth over? Faltering innovation confronts the six headwinds. NBER Working Paper. 2012;(18315). URL: https://www.nber.org/papers/w18315.pdf
12. Autor D., Dorn D., Katz L.F., Patterson C., Reenen J.V. The fall of the labor share and the rise of superstar firms. NBER Working Paper. 2017;(23396). URL: https://www.nber.org/papers/w23396.pdf
13. Tsvetkova L.A. Technologies of artificial intelligence as the factor of digitalization of economy in Russia and in the world. *Ekonomika nauki = The Economics of Science*. 2017;3(2):126–144. (In Russ.).
14. Dutton T. An overview of national AI strategies. Medium. Politics + AI. June 28, 2018. URL: https://medium.com/politics-ai/an-overview-of-national-ai-strategies-2a70ec6edfd
15. Brynjolfsson E., Rock D., Syverson C. The productivity J-curve: How intangibles complement General Purpose Technologies. NBER Working Paper. 2018;(25148). URL: https://economics.stanford.edu/sites/g/files/sbiybj9386/f/brynrocksyv_j-curve_final.pdf
16. Feenstra R., Taylor A. International macroeconomics. 3rd ed. New York: Worth Publishers; 2014. 576 p.
17. Ison S., Wall S. Economics. 4th ed. Harlow: Pearson Education Ltd; 2007. 564 p.
18. Easterbrook F.H. Limits of antitrust. *Texas Law Review*. 1984;63(1):1–40. URL: https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=2152&context=journal_articles
19. Dudenkova E.N. Artificial intelligence as a factor in the development of production of old industrial regions. In: Proc. 2nd Int. sci. forum "Step into the future: Artificial intelligence and the digital economy. A revolution in management: A new digital economy or a new world of machines". Moscow: State University of Management Publ.; 2018:169–176. (In Russ.).
20. Korablev A. Yu., Bulatov R.B. Machine learning in business. *Azimut nauchnykh issledovaniy: ekonomika i upravleniye = ASR: Economics and Management (Azimuth of Scientific Research)*. 2018;7(2):68–72. (In Russ.).
21. Sineva N.L., Vagin D. Yu., Lebedeva O.A., Tumanova A.O., Olenina L.A. Innovative and technological development and artificial intelligence. *Innovatsionnaya ekonomika: perspektivy razvitiya i sovershenstvovaniya*. 2019;(2):397–404. (In Russ.).
22. Korolev O.L., Apatova N.V., Krulikovskii A.P. "Big data" as a factor in changing decision-making processes in the economy. *Nauchno-tekhnicheskie vedomosti Sankt-Peterburgskogo gosudarstvennogo politekhnicheskogo universiteta. Ekonomicheskie nauki = St. Petersburg State Polytechnical University Journal. Economics*. 2017;10(4):31–38. (In Russ.). DOI: 10.18721/JE.10403
23. Ponkin I.V., Red'kina A.I. Artificial intelligence from the point of view of law. *Vestnik Rossiiskogo universiteta druzhby narodov. Seriya: Yuridicheskie nauki = RUDN Journal of Law*. 2018;22(1):91–109. (In Russ.). DOI: 10.22363/2313–2337–2018–22–1–91–109

24. Lucas R. E., Jr. Adjustment costs and the theory of supply. *Journal of Political Economy*. 1967;75(4, Pt. 1):321–334. URL: https://pdfs.semanticscholar.org/608b/2f6c950c7f2d841e016f4ea53b850fd9cbd5.pdf

ABOUT THE AUTHOR

Vladislav E. Rasskazov — Program Manager, Business development department, Rostelecom PJSC, Moscow, Russia
rasskazov.vladislav@gmail.com

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