

PATH-DEPENDENCE EFFECT IN SCIENCE AND TECHNOLOGY POLICY: CASE OF RUSSIA

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Objective

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- To analyse the effects of the Soviet legacy and transitional post-Soviet period of the 1990s on the existing national innovation system (NIS) of Russia and to assess its present stage of development or, in other words, to understand the problems of the modern NIS through the prism of history (path-dependence effect) which became the cause of its present imperfections.



Outline

- Soviet NIS: main features.
- NIS of Russia in the transitional period in 1990s: main factors and results of its disintegration.
- State activity as the main driver of the Russian NIS since the 2000s: the venture capital system as an example.
- Conclusion and discussion.

A role of a NIS

- Innovative economic and technological development in any country is a key factor in ensuring its competitiveness in modern conditions.
- One of the priority areas of this development is the formation of an effective national innovation system (NIS).



Soviet legacy



- The planning system of the USSR created certain patterns in the formation of the R&D and S&T spheres both in the country as a whole and at the level of individual enterprises.
- To a large extent, they were determined by state tasks in the arms race imposed on our country by the Western powers. Therefore, the volumes and proportions of the distribution of funds for R&D and S&T in the USSR were in favor of the military defense complex.
- R&D and S&T in production and transfer of new technologies for industries and enterprises that were not related to the defense sector were on the periphery of state industrial policy.

R&D in the USSR



- In the 1970s the USSR had a high level of total R&D expenditure - about 4% of GDP;
- The share of military/space expenditure in it amounted >70%;
- The share of expenditure incurred by the enterprises themselves (an analogue of business expenditure) was <10%;
- Weak institutional links between R&D, production and import of technology;
- Weak, or completely absent, links between marketing, production and state procurement;
- Weak involvement in world competition in most sectors (with the exception of areas related to the arms race);.

The USSR example shows that high R&D expenditure by itself does not guarantee successful innovations, their diffusion, and productivity (*Freeman, 2004*).

NIS in the transition period: general picture

- In the 1990s there was a transition from a planned economic system to a more market oriented economy. Each [state] enterprise had to independently and very quickly reorganise its activities and establish interaction with other enterprises of different ownership forms.
- It was necessary to learn how to work without state orders.
- Since the process was unprepared for and largely chaotic, it led, in fact, to paralysis of economic activities of enterprises and the previous innovation system.

New tasks of enterprises in the sphere of innovation

All Russian enterprises and organisations needed a significant amount of time to change their functional structure:

- to find a new scheme of interaction with industry research institutions;
- to realise the need to develop the R&D centre inside the enterprise or create it if it was absent;
- to form full-fledged functional market elements of: departments of marketing, strategic development, promotion and marketing, strategic decision-making centres;
- to organise new relationships with other contracting firms (including customers) within/instead of the crumbling old NIS structure (*Narula, Jormanainen, 2008*).

NIS in 1990: main problems

- The development of the NIS was not on the list of priority tasks of the country's economic reforms. Therefore we had lack of any significant progress in such reforms.
- This was a period of general degradation of the NIS both in terms of infrastructure and human capital. It was practically bloodless due to a lack of funding, and its human capital was lost through a brain drain and its technology was lost through theft. For example, often during that period, Russian patents appeared in patent offices of other countries without the knowledge of their authors (*Lundvall, 2007*).

External competition factors

- The liberalisation of the Russian economy in the 1990s was accompanied, as is known, by the opening of borders for imported goods, which led to a change in the market conditions in the country: imported high-tech goods filled the market.
- Russian high-tech enterprises faced problems with the sale of their products due to the lack of state orders and high competition with imported goods.
- Therefore, they began to curtail production. In turn, this led to problems in the operation of related enterprises (engineering design bureaus, laboratories, research institutes) - *the domino effect* caused devastating consequences for the entire NIS.

Internal competition factors between sectors of Russian economy

- The 1990s were characterised by the revitalisation of a number of industries. These included trade and intermediary, financial (including the stock market), banking and hydrocarbon (oil and gas) activities.
- A significant reduction in government expenditure on R&D has led to significant job losses in the R&D sector.

Professionals' problem

- A shortage of professional researchers developed in the Russian NIS. It was associated with the relocation abroad of many scientists, especially young ones. Soviet education was one of the best in the world, and abroad our scientists were offered much more favorable financial conditions than in Russia in the 1990s.
- A sharp aging of the researchers in Russia was observed: the proportion of employees over the age of 50 was more than half among all researchers.

Disintegration processes in the territory of the former USSR

- State borders appeared between the republics of the former USSR.
- Technologically interconnected enterprises during the Soviet period were often located in different republics of the USSR, but with its collapse, these technological chains had to be disconnected and then legitimised anew.
- This led to even greater problems in the functioning of the Russian NIS, where elements were cut off by the new state borders.
- In addition, the post-Soviet republics, like Russia, were engaged in political and economic reorganisation, temporarily leaving the problems of the functioning of the NIS on the periphery of their attention.

Consequences of privatisation

- The massive privatisation that took place in the 1990s also had a negative effect.
- Often, new private owners tried to increase the efficiency of their assets by reducing non-core, and most importantly, costly units. These units typically included laboratories, design bureaus, and research centres.

NIS in the context of the general economic situation in 1990s

- The economic situation in the country intensified the effect of dismantling the structure of relations within the “old” NIS of the Soviet type.
- Due to the decrease in state funding for certain sectors of the economy and projects, the former giant enterprises in the non-resource sector of the economy worked intermittently which, as a result, led at times to non-payment to their contractors, among which there were R&D structures.
- The situation was exacerbated by double-digit inflation. As a result, in Russia, on January 1 1998, the ruble (the national monetary unit) was redenominated by 1000 times, with new bank notes being issued at 1 new ruble for 1000 old rubles.
- During this period there was a significant reduction in R&D expenditure by the state: their share in GDP during the 1990s did not exceed 0.5%.

Lessons of the transitional transformation for the Russian NIS

- The significant upheavals of the 1990s largely discredited the idea of organising the economy on the market bottom-up principles, including in the innovation sphere.
- The sharp transition from centralised to market mechanisms in fact disorganised the Russian NIS.
- Reforms of the 1990s clearly demonstrated that the state's attempt to withdraw from participating in the interaction of participants in innovation processes led to negative consequences for the NIS of Russia.

The role of the state

- It was demonstrated that it is impossible to ignore the historical traditions of our country, where state and government agencies constantly played a very significant role both in organising innovative breakthroughs and in supporting scientific and technological economic development.
- If in Western countries the state acts primarily as a market regulator and guarantor of private property, in Russian realities it is the main participant in the economic process and has a decisive influence on the course of development of almost any sphere of the economy. The centralised institutions in Russia have played and continue to play a significant role.

New trend since 2000s

- The main trend of institutional change in our country after the 1990s consists in gradually strengthening the role of government agencies which had collapsed before.
- We are witnessing a recovery period of centralised mechanisms in their updated forms in accordance with the challenges of the modern times.
- At the same time, there is a permanent search for the institutional balance of centralised and market instruments.

Capital for innovation

- Venture Capital Funds (VCF) and Private Equity Funds (PEF) play a special role in innovation.
- These funds support projects in those sectors in which a breakthrough is expected and in which the risks of doing business are acceptable.
- VCF and PEF expand the volume of resources attracted to the innovation sphere and help to stimulate innovation.

VCF and PEF in Russia

- In Russia, in order to expand sources of investment resources, a national venture capital market is also being formed.
- VCFs are **more active** than PEFs and are more involved in financing seed projects.
- With the help of such investments, the research process is financed to create inventions that should later become innovations. The total capital of VC funds amounts to almost 80% in the VCF and PEF market, and their share in the total number of these funds is 70%.

Russian venture company



- Russian Venture Company (RVC – established in 2006) is a state fund of funds and a development institution in the Russian venture capital market.
- The mission of the company is to create a mature venture capital market through the consolidation and development of resources, competencies and initiatives on the part of investors, investment portfolio managers and entrepreneurs so as to create and promote innovative products and technologies in priority technology areas, making Russia a leader in the global technology market.

RVC as an instrument of a state

- The state status of a company is determined by its authorised capital, which is 100% owned by the Russian Federation represented by the Federal Agency for State Property Management of the Russian Federation
- The decision to establish the RVC was made on the basis of Order of the Government of the Russian Federation No. 838 of 06/07/2006, Resolution of the Government of the Russian Federation No. 516 of 08/24/2006, Federal Law No. 208 “On Joint-Stock Companies”, December 26, 1995.



Main areas for investment

- The priority areas for investing venture capital funds formed with the participation of the RVC JSC are determined in accordance with the List of critical technologies approved by the President of the Russian Federation, that is, they are fixed by the top level of management.
- RVC uses its own funds to carry out investment activities. The funds are formed by the government contributions to the authorised capital, as well as additional capital formed by the results of its financial and economic activities.

RVC as a regulator

- In order to form venture capital funds, RVC organises and conducts competitive selection of a trust management company to which RVC transfers its own funds for management by the trust company.
- The distribution of finances takes place on the basis of agreed procedures (tender and tender conditions). RVC acts here as a regulatory centre through which the accumulation and distribution of resources between participants in investment activities take place.

The main tasks for RVC

- The RVC Charter determines that the main task of its economic activity is primarily to ensure balanced production of the entire economy of the country and its regions.
- The objectives of RVC JSC are:
 - to promote the implementation of state policy in the development of the Russian innovation industry;
 - to develop the innovation market infrastructure,
 - to create the infrastructure of the innovation and venture ecosystem;
 - to stimulate its growth, as well as demand for innovative companies.

Not profit only

- The effective financial and economic activities of RVC are understood to follow such business processes and procedures, as a result of which either the total profit received is maximised, or the costs are minimised in cases where profit from the corresponding asset is not expected or impossible, or is possible only indirectly.

Institutional analysis

- In the process of evolutionary selection, institutions that are not effective, die off or are modified, adapting to relationships that are historically rooted.
- Attempts to ensure the dominant role of market institutions in Russia in the 1990s did not bring the expected results.
- Therefore, at present, we are witnessing the restoration process of updating centralised mechanisms in society. The formation and functioning of the domestic venture capital market by the RVC is an example.

Institutional problems

- Ongoing institutional reforms are often not coherent.
- With regard to the NIS, an institutional design project has not yet been formed that provides for the necessary balance of market and centralised institutions for the productive interaction of the main participants of the NIS - government, business and science.
- Many problems remain in the legal field.

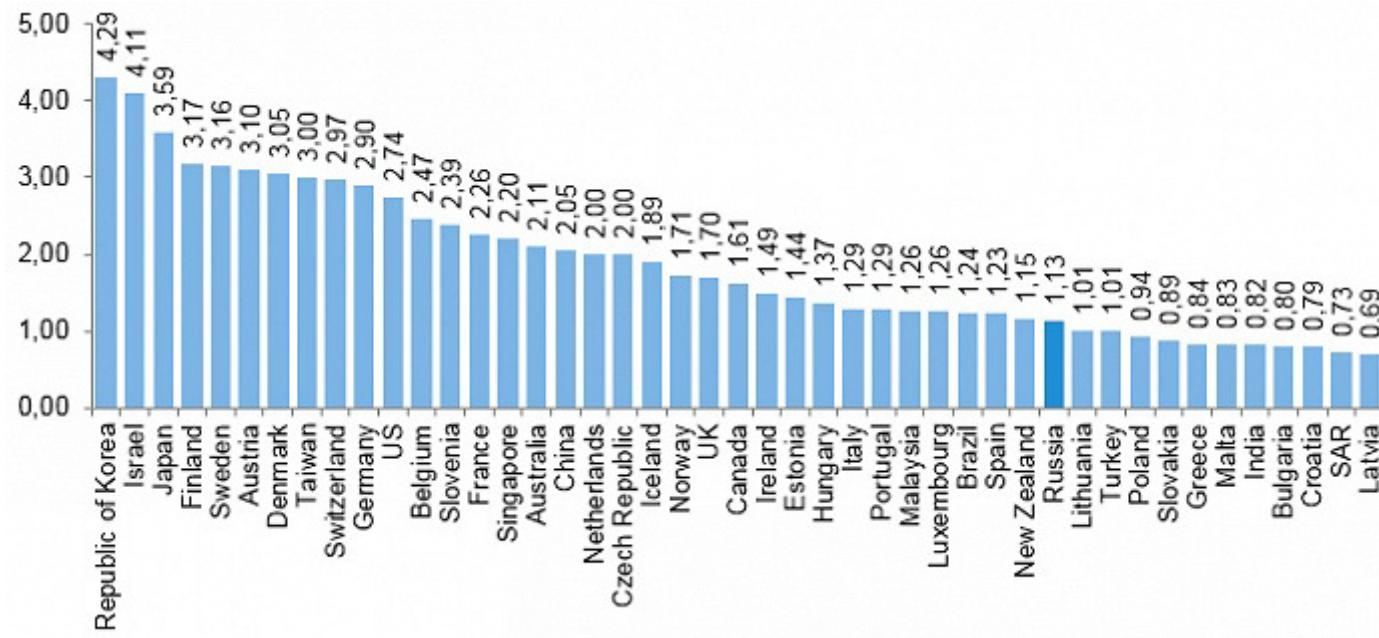
Patenting as one of the problems

- If a Russian company intends to enter the global market with a product, investors do not recommend it to register in the patent field of the Russian Federation, as this may lead to the discovery of product properties by competitors without adequate protection of intellectual property from the still insufficiently mature Russian legal institutions (*Roffey, 2013*).
- The investment cycle in non IT sector (the period from the beginning of R&D until the industrial level) is from 4 to 10 years. During this time, information about the product may leak and be imitated by competitors. Therefore, patent protection of Russian inventions is becoming increasingly important.

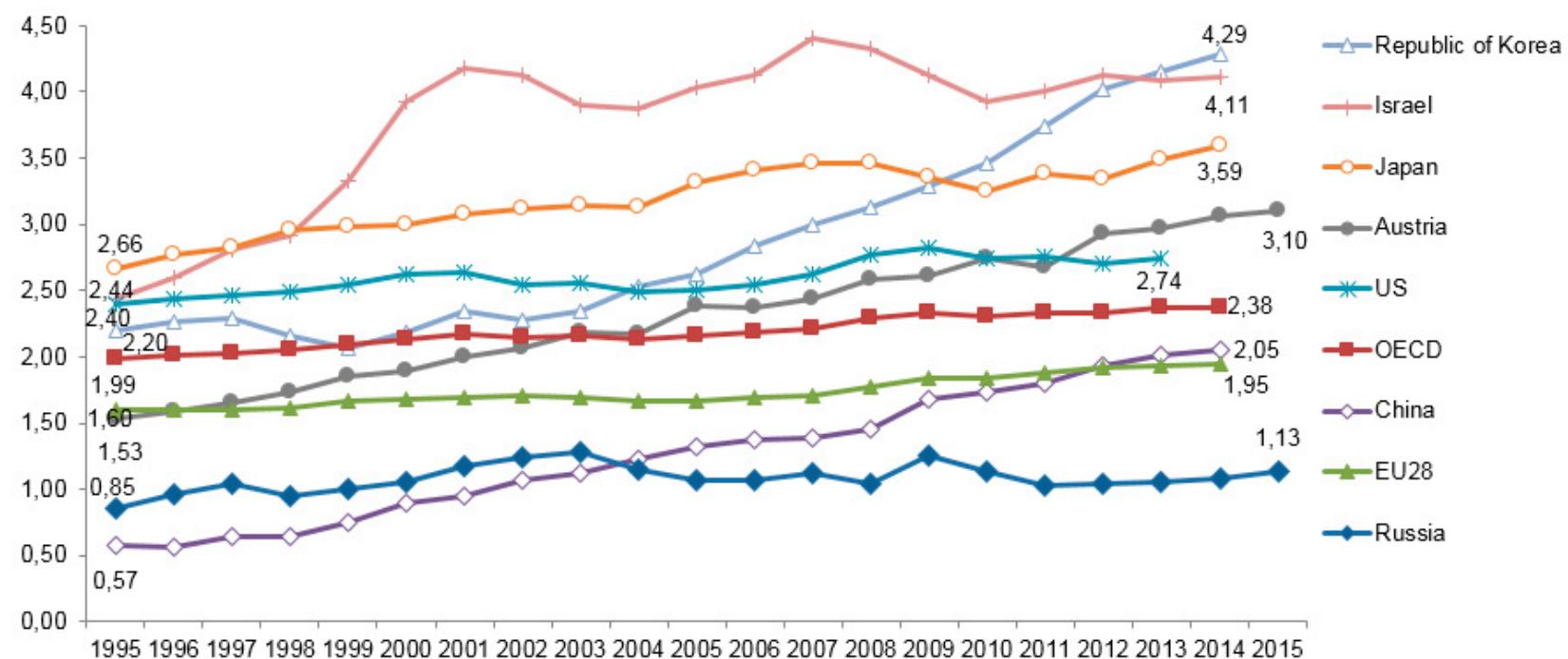
Interaction between centralised and market institutions

- In recent years, effective interaction of the state, science and business has intensified.
- There is an increasing consolidation of efforts and a clarification of the distribution of responsibilities and powers between the state and the private sector (*Kamko, Kirdina-Chandler, 2018*).
- Since 2016, business structures have been participating in the formation of the country's economic course, legislative activity and the examination of decisions of state bodies.

Internal R&D expenditures as a share of GDP (%), by country: 2015

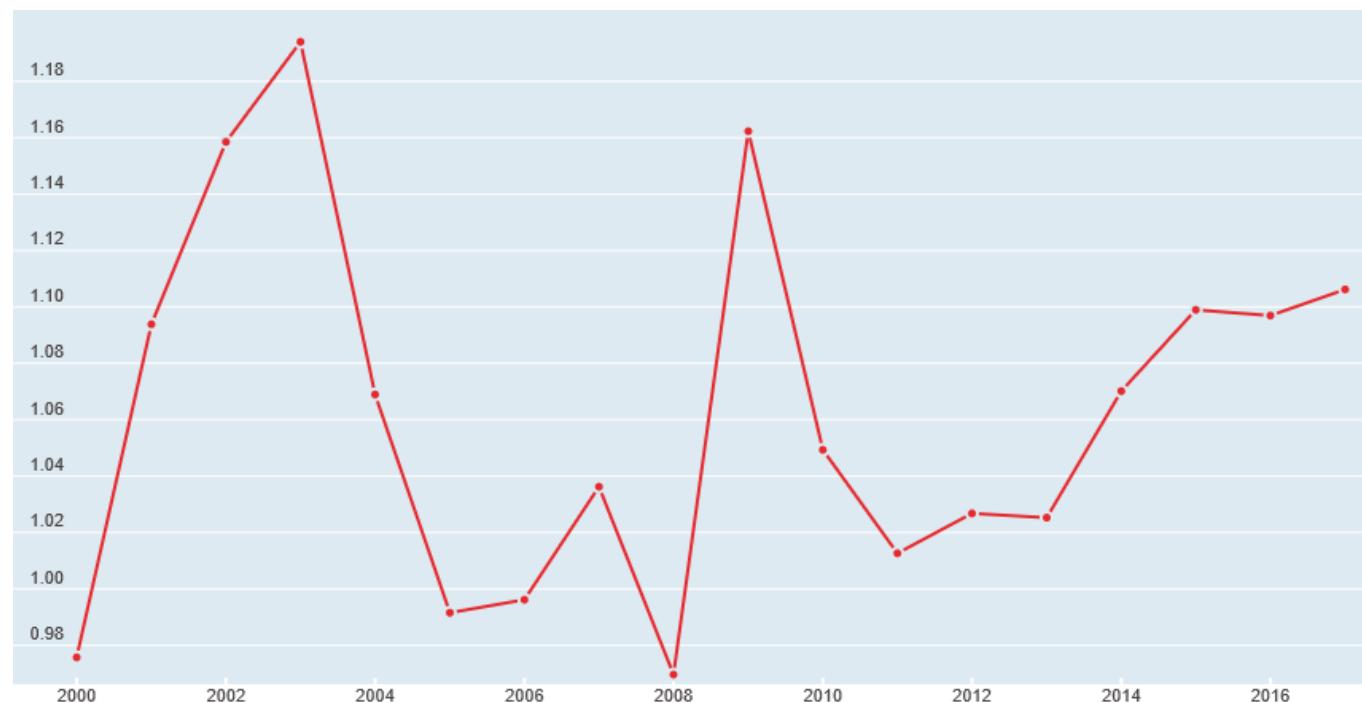


Growth of internal R&D expenditures as a share of GDP: 1995–2015



Gross domestic spending on R&D, Russia, % of GDP, 2000 – 2017

Source: OECD Science, Technology and R&D Statistics: Main Science and Technology Indicator



Conclusion

- The analysis showed that the current state and the further development strategy of the NIS are connected with the presence of historically developed features (path dependence effect), which are necessary in the institutional design project of the Russian innovation system.
- At the same time, it is important not only to use borrowed institutions that have proved their effectiveness in a different institutional environment, but also to modify the traditional institutions that provided for the country's development in previous periods, taking into account the challenges of the time.
- This is one of the conditions for the effective operation of the Russian NIS.

Discussion

- Awareness of the scope, depth and consequences of the transformations, that have taken place in transitional Russia, challenges simple application of the theoretical approaches of foreign scientists from countries with developed and relatively stable market economies to building an effective NIS taking account of Russian realities. First of all, we are talking about the role of the private firm as a central element where innovations are generated.

Discussion cont.

- The views on the central role of private firms and business structures in a NIS are hardly 100% applicable to Russia.
- To some extent, these views may be true for the largest state-owned corporations, which can afford their own R&D departments, marketing, production and promotion of innovative products, as well as full participation in international competition for sales markets. However, such corporations do not act on their own in Russia, but with a high level of support from the state (*Kirdina, 2010*).
- The role of state structures and institutions is perhaps the most important for ensuring the innovative development of our country.

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**Спасибо за
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