

Fueling Progress: How Innovation is Driving Growth in Russia's Oil and Gas Industry

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Abstract:- There has always been a linkage between the technological innovation of the country and its industrial development. . In the current paper, technological innovation in oil and gas companies has been considered research and development, patents applications and information and communication technology (ICT). Moreover, the oil and gas sector development has been measured in the form of oil and gas sector production and oil and gas sector export.

I. INTRODUCTION

A. Oil and Gas Sector of Russia

Oil and gas sector of Russia has great significance for Russian economy and is considered to be one of the profitable sectors of the country¹. The technological innovation in this particular sector might lead towards the development of the sector as well as decrease in the negative impacts caused by the sector on the environment such as emission of pollutants in air and water². The role of R&D, patents application and ICT technology are significant in this regard. However, in Russia, despite of all the significance and profitability of the oil and gas sector, there has been scarcity of the focus on technological innovation investment by the respective companies and this ignorance of technological innovation might result in stagnant or decreasing growth and development of the Russian oil and gas sector ultimately impacting the economy of the country. If this issue is not focused and an effective research is not conducted on this matter, it might lead towards the decrease in growth and development of the oil and gas sector of Russia and may also cause environmental and health hazards by the energy sector due to certain harmful emissions.

B. The Influence of Technological Advancement on the Growth of Oil and Gas Companies

Research and development (R&D) departments in oil and gas companies demonstrate their innovative inclination by addressing environmental concerns and improving processes. Patent applications and ICT also play crucial roles in innovation within these companies. Despite fluctuations in oil prices, Russia prioritizes technological innovation in its oil and gas sector, resulting in significant industry development. Technological advancements in Russia's oil and gas industry involve digitalization for competitiveness and higher value. However, Russia's progress in digitalization and technological advancement is perceived as slow compared to competitors, with a lack of interdisciplinary integration.

Few Russian enterprises have achieved complete digitalization and interdisciplinary integration, though it is seen as a significant success.

These advancements result in enhanced productivity, time savings, and improved security in oil and gas enterprises, but challenges remain due to fluctuations in oil and gas prices.

II. CURRENT SITUATION

A. Development Status of Oil and Gas in Russia

Renewable resources restoration is essential for the energy and environmental development of countries and energy consumers. In 2013, the development of new technologies being used for the conversion of renewable energy resources was amounted to be 500 GW³. In 2002, Russia became the world's largest oil producer by overtaking Saudi Arabia. Its output reserves increased its domestic needs and this industry planned to export more. However, this replacement cannot be long term in the Organization of Petroleum Exporting Countries (OPEC) worldwide in the international oil markets. As per recent statistics, Russia was the third largest oil producer worldwide and accounts for approximately 12% of the global production of crude oil. The economy of this country is heavily dependent on the export of energy resources and energy, Russia was 2nd largest oil exporter as per the statistics of 2019 and 2020. It is expected that Russia will continue to impose its position in the market with strong backing.

There are less prospects of foreign investment of oil and gas in Russia especially for the United States and other international industries. Oil and gas industry of Russia needs development and focus on the areas primarily including the research of the rare and major areas, secondly the expansion of the industries to the new provinces in the continent, the high-quality characteristics such as the porosity, permeability, viscosity and density of the oil and gas products needs to be put on the priority listings. The focus needs a shift from the extensive development towards the intensive development⁴.

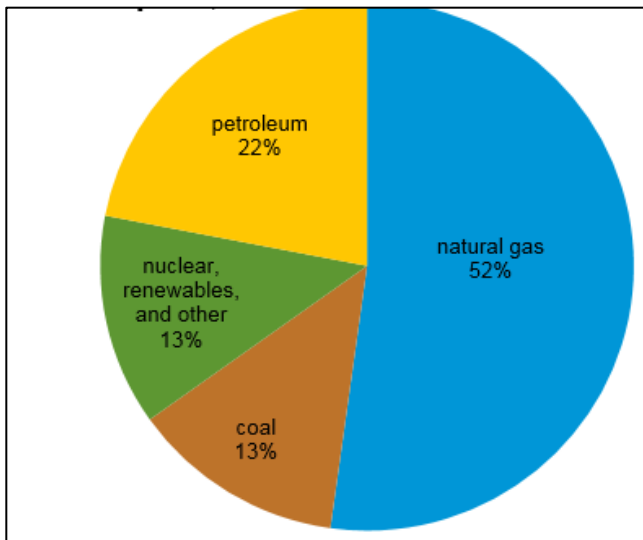


Fig 1: Energy Consumption in Russia

The above figure shows Russia’s primary energy consumption of the year 2016. According to the figure the consumption of natural gas was 52%, petroleum was 22%, coal was 13% and other resources like renewables etc. made 13% of the total share. Source: Energy Information Administration, based on BP statistical Review of World Energy 2017⁵.

B. Current Situation of Oil and Gas Technology Development in Russia

The oil and gas sector constitutes the largest proportion of Russia's economy and plays a central role in the nation's advancement of resource innovation. More than 70% of the natural gas reserves of Russia are located in the Arctic zone that cost more than 20 trillion dollars and almost 83% gas and 12% oil production is carried out there. Unfortunately, the raw material potential is not completely developed there. Russia is still developing in its Arctic regions to establish hydrocarbon deposits in the areas of Kola Peninsula, in Norilsk, in the northern regions of Western Siberia. Important oil and gas production unit are in Nenets Autonomous district and Yamal respectively.⁶ (Safronov & Sokolov, 2014).

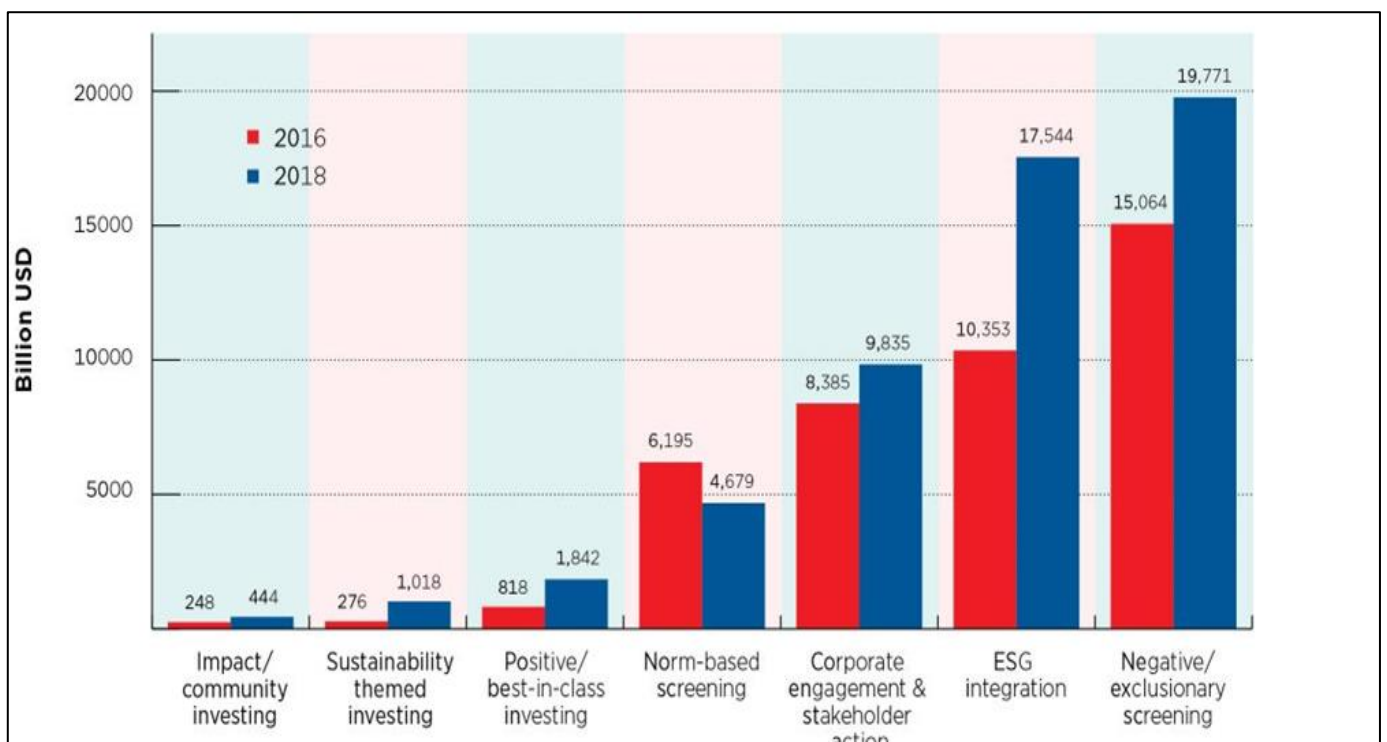


Fig 2: Sustainable Growth Strategies
Source: Global Sustainable Investment Alliance⁷

C. Research and Development Investment of Russian Oil and Gas Enterprises

The mining challenges can be overcome by the use of innovative technologies and the mineral resources are the keys to the development of any country. New technologies develop when the areas face certain issue of mineral resource depletion or the extraction of very complex minerals or under tough conditions is required. Then the technologies implementation helps to make the resources available.

Mining activities should be carried out with complete consideration of the economics and the ecological systems and the agreements of local people. The extraction should be done at substantial rates in order to attain stability at environmental as well as economic and consumption level. Resources must be utilized efficiently and with responsibility. Technological developments are an integral part of the non-renewable resources’ sustainability.

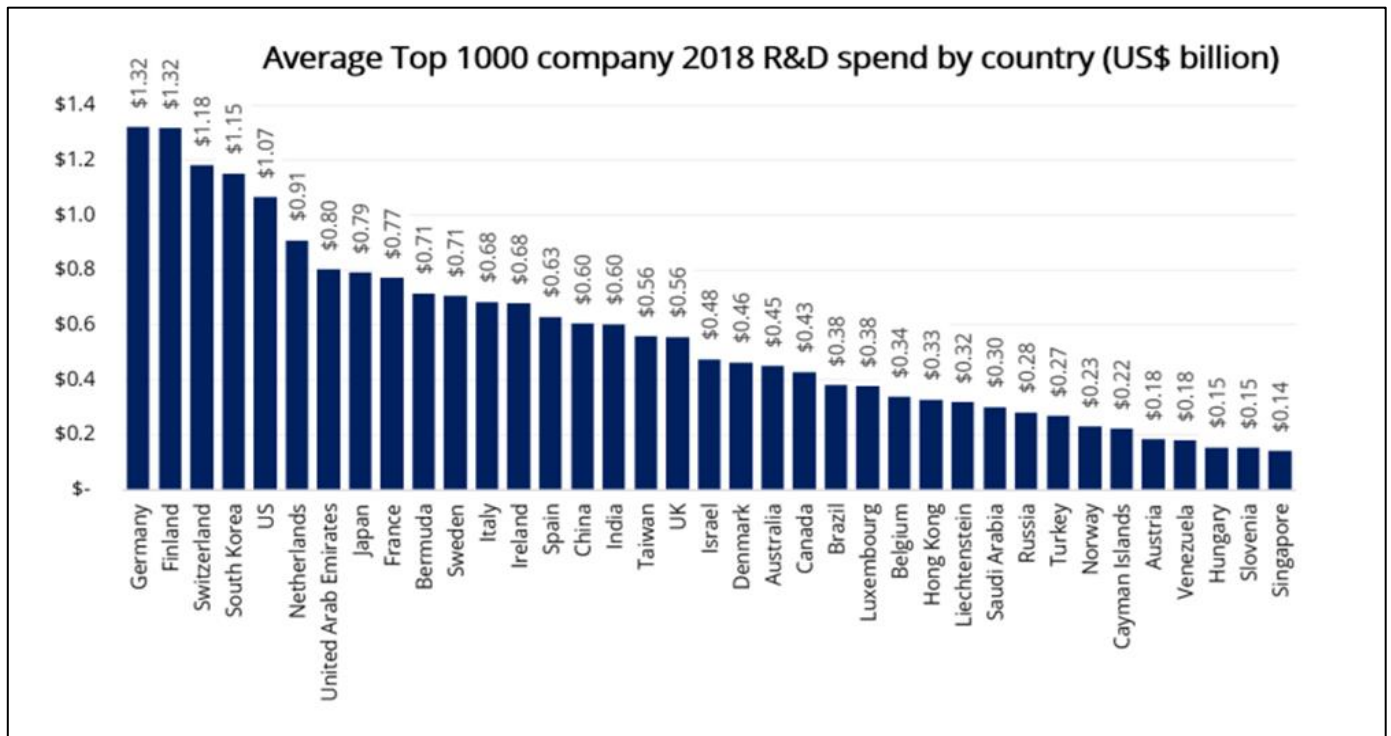


Fig 3: 2018 R&D Expenditure by Country

The above figure shows the top companies in the year 2018 that spend their expenditure on the R n D department in billion dollars with Germany being on top.

D. Current Situation of Technological Innovation in Russia

Horizontal drilling meterage in Russia has increased 3 time over the past 8 years and this technology aids to reduce the labor costs as well. A new form of well drilling management is under the industrial testing with the new and

improved system involving the single drilling command and control centre based in a mobile well site office. This helps to develop the timely resources and optimizes the work. Also, there is an increase in the labor productivity. Instrument supervision is also being introduced. Hydraulic fracturing is a future oriented technique in Russia and it can help to extract the tight oil and depleted oil fields. It also eliminates the needs of extensive horizontal drilling. Technology equipment and software still needs to be incorporated in this sector.

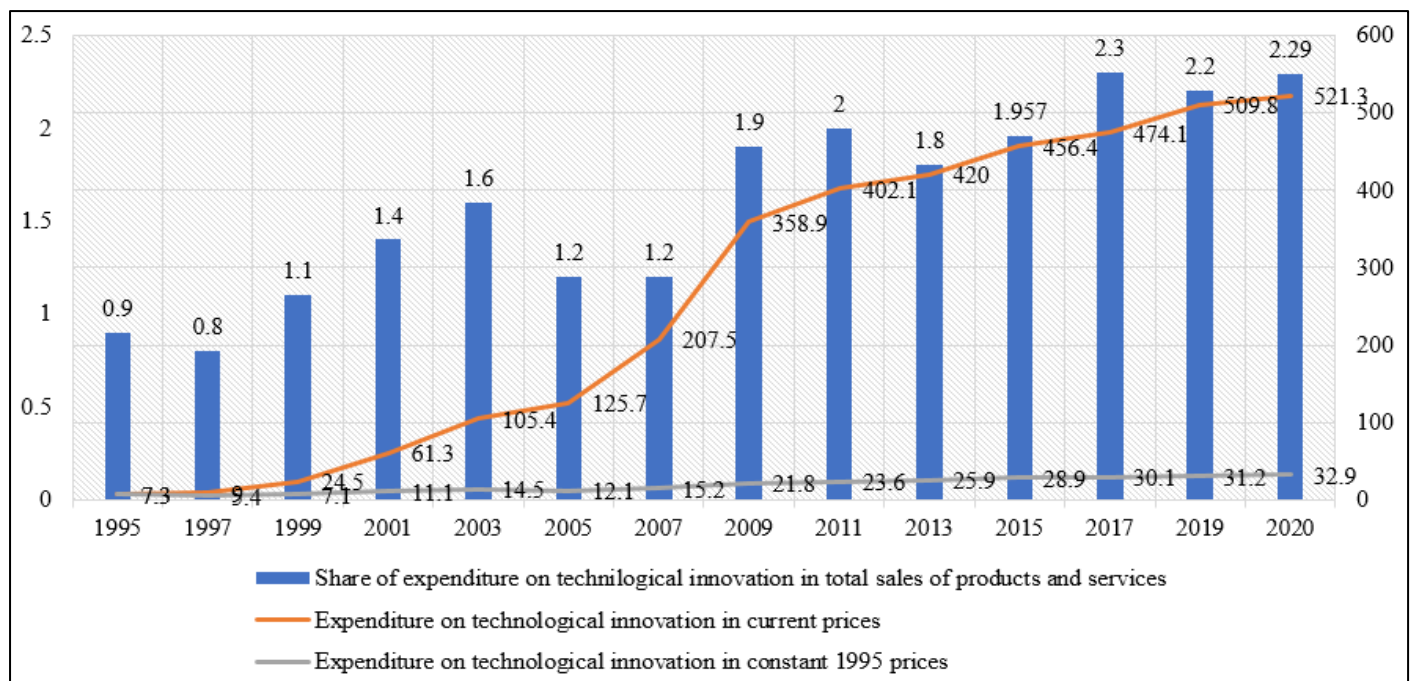


Fig 4: 1995-2008 Expenditure in Russia for Technology Innovation

The above figure shows the expenditure of Russia in the department of technological innovation with their current prices and the constant prices by the year 1995⁸.

III. TRENDS IN RESEARCH & DEVELOPMENT AND OIL/GAS PRODUCTION/EXPORT IN RUSSIA

The series of the graphs below are presenting the trend in the research and development being carried out for the purpose of technological innovation in Russia, along with the levels of oil and gas production and export for the period under consideration.

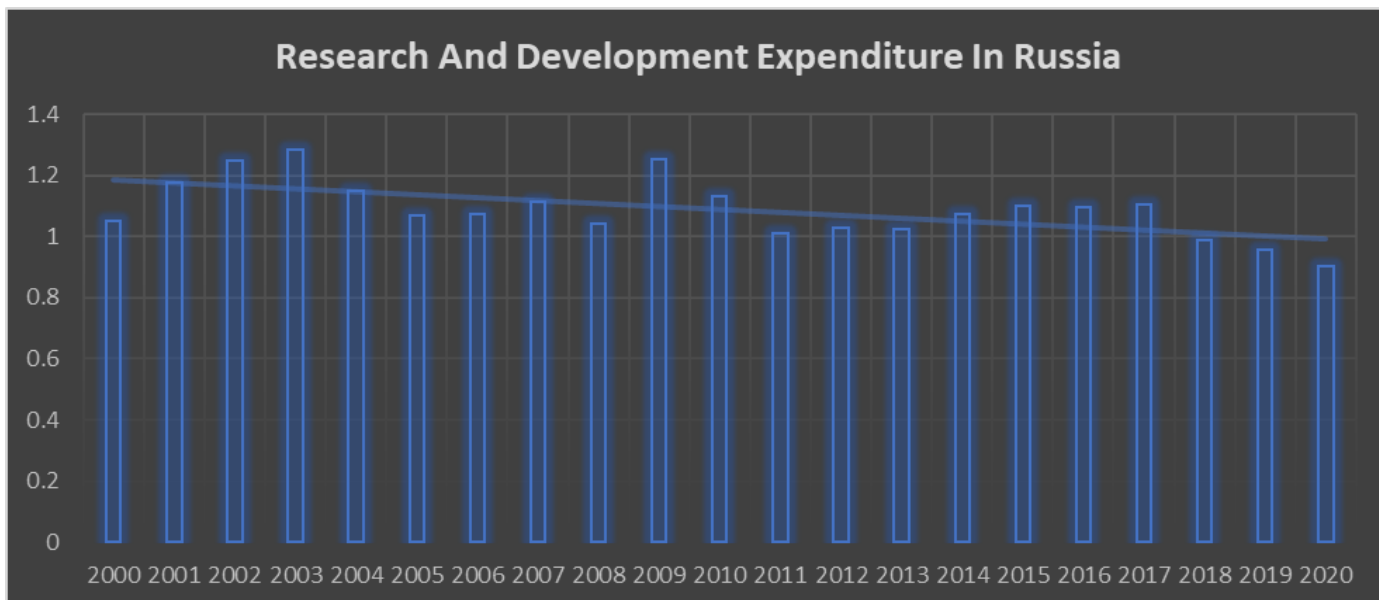


Fig 5: Research and Development in Russia

The presented figure illustrates the expenditure allocated in Russia towards research and development. Research and development serve as the primary drivers of innovation for both firms and countries, highlighting the critical importance of adhering to this process.⁹ It can be seen that the expenditure on research and development has been

surmisable in Russia, however, it has been somewhat declining for the previous three years. The highest expenditure recorded for the research and development activities is for 2009 and 2002, ranging in between 1.28 and 1.25 billion dollars. The expenditure or expense amount in 2020 can be seen to be the lowest in the period of evaluation.

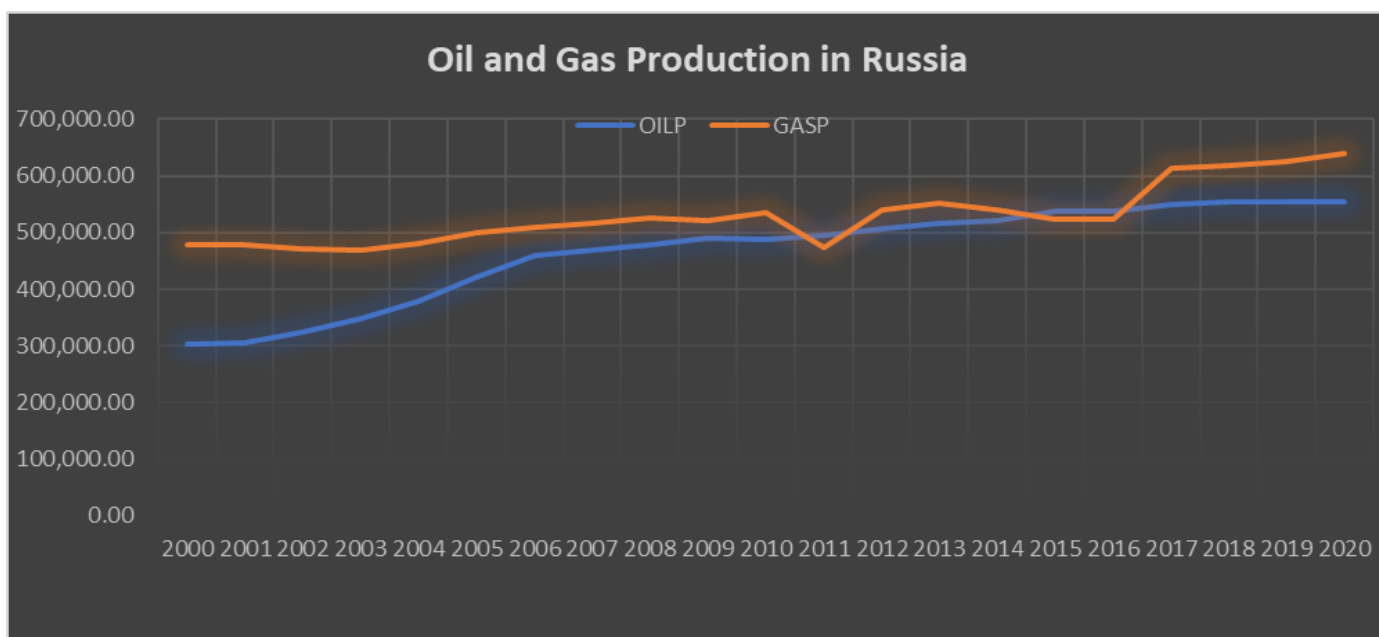


Fig 6: Oil and Gas Production in Russia

The figure above is presenting the comparison between the production of gas and oil in Russia for the period of 2000-2020. In 2019, Russia roughly produced 679 billion cubic meters of natural gas and there was an increase in volume from the previous years. The country has been ranked as the second leading producer of oil and gas worldwide in 2018 and

was the second leading producer of oil in 2019, falling just behind the US. However, it can be seen that production ratio of Russia is greater in terms of natural gas. The production amount of both energy fuels has been on a path of incessant growth, since the period of evaluation i.e., the production has been on an increasing trend.

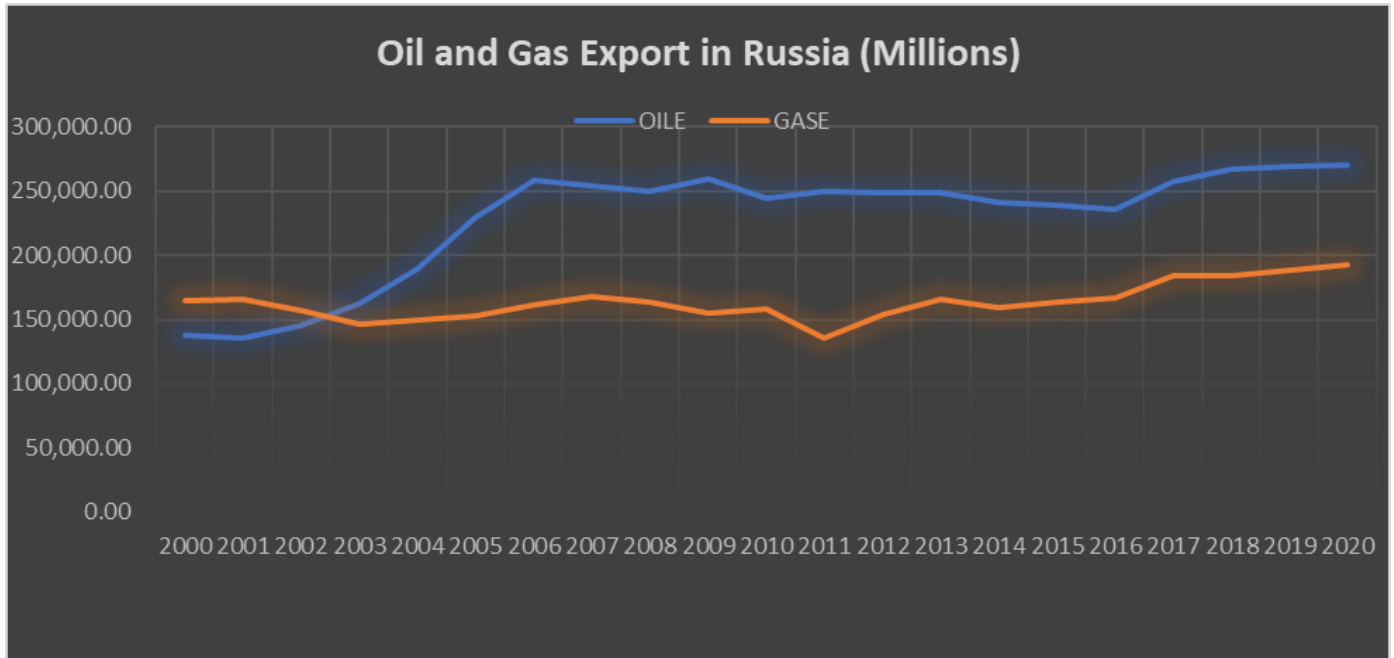


Fig 7: Oil and Gas Export

The figure above is displaying the relative trend in the export of fuel energy i.e., oil and gas. The blue line is indicative of the oil export whereas the orange trend line is indicative of the export performance of gas. In the previous figure it was discovered that the country, Russia, is producing relatively more gas than oil, however in this image there is a contrasting development. Despite the fact that the country has a larger production ratio of gas, there is more export of oil being carried out. The exports have been on an increasing trend for both of the fuels, however the export value of oil ranges in between export value of 150 million dollars and 300 million dollars whereas the export value of gas resides between the 150 million to 200 million dollars.

IV. ANALYZING TECHNOLOGICAL STATISTICS IMPACTING RUSSIAN OIL AND GAS INDUSTRY GROWTH

The statistics paint a nuanced picture of the Russian Oil and Gas Industrial Growth, revealing both positive and negative influences from various factors. Firstly, it's evident that the industry has experienced positive effects from information and communication technology (ICT) adoption and resident patent applications. These elements have contributed positively to the growth trajectory of the sector, potentially by enhancing operational efficiency, facilitating communication and collaboration, and fostering innovation within the industry.

Conversely, the statistics also indicate a negative impact stemming from research and development (R&D) expenditure. While R&D is traditionally considered a driver of innovation and growth, its adverse effect on oil and gas industrial growth in Russia suggests that the allocation of R&D funds may need to be reassessed. This could entail scrutinizing how R&D resources are deployed, potentially reallocating them to areas where they can yield more significant benefits or exploring alternative innovation strategies.

Furthermore, the energy pivot to Asia has introduced a new dynamic, leading to a widening surplus capacity in the westbound oil pipeline. While in its energy security concerns i.e. minimizing the transit risk played active pipeline diplomacy and the new pipeline ventures¹⁰. While this pivot may offer strategic advantages in terms of market diversification and geopolitical considerations, it also presents challenges in managing surplus capacity effectively. This underscores the importance of strategic planning and infrastructure development to ensure a balanced distribution of oil resources and mitigate potential disruptions in supply chains.

Despite these findings, the statistics suggest that, over the past two decades, the mean production of oil and gas in Russia has not been significantly influenced by technological innovation factors such as ICT adoption, resident patent applications, or R&D expenditure. This may indicate a need

for deeper analysis to understand why these factors have not translated into substantial impacts on production levels.

Within the Russian state, however, ICT adoption has shown promise in increasing the ratio of patent applications by residents and boosting gross domestic product (GDP) growth from a developmental perspective. This suggests that while technological innovation may not have directly impacted production levels, it has played a crucial role in driving broader economic development and fostering innovation culture within the country.

In summary, the statistics highlight the complex interplay between various factors influencing the Russian oil and gas industry's growth. While some factors like ICT adoption and resident patent applications have shown positive effects, others like R&D expenditure have yielded negative outcomes. Moving forward, policymakers and industry stakeholders must carefully analyze these statistics to develop strategic interventions that maximize the benefits of technological innovation while mitigating potential drawbacks.

V. PROBLEM OF THE FOCUS ON TECHNOLOGICAL INNOVATION INVESTMENT BY RUSSIA

Oil and gas sector of Russia has great significance for Russian economy and is considered to be one of the profitable sectors of the country¹. The technological innovation in this particular sector might lead towards the development of the sector as well as decrease in the negative impacts caused by the sector on the environment such as emission of pollutants in air and water¹. The role of R&D, patents application and ICT technology are significant in this regard. However, in Russia, despite of all the significance and profitability of the oil and gas sector, there has been scarcity of the focus on technological innovation investment by the respective companies and this ignorance of technological innovation might result in stagnant or decreasing growth and development of the Russian oil and gas sector ultimately impacting the economy of the country. This issue needs to be addressed immediately for the development and increased profitability of oil and gas sector and for the betterment of the overall Russian economy. If this issue is not focused and an effective research is not conducted on this matter, it might lead towards the decrease in growth and development of the oil and gas sector of Russia and may also cause environmental and health hazards by the energy sector due to certain harmful emissions.

VI. CONCLUSION AND RECOMMENDATION

Thus, after critically evaluate the statistical outcomes, it becomes concluded that there is a significant and positive influence of information and communication technology on enhancing the oil and gas industry export. Also, the patent application by the Russian residents caused a positive and significant influence on its oil and gas industrial export, but research and development expenditure caused a significant

and negative impact on the Russian oil and gas industrial export from 2000 to 2020.

Based on the statistical analysis presented, the following recommendations can be made for the Russian state:

➤ *Investment in Information and Communication Technology (ICT):*

- ICT has proven to significantly enhance the growth and export capabilities of the oil and gas industry. Therefore, prioritizing investments in ICT infrastructure and capabilities within the sector is crucial. This could involve upgrading existing systems, investing in advanced technology solutions, and promoting digitalization across all operational aspects of the industry.
- By improving ICT infrastructure, oil and gas companies can streamline operations, optimize production processes, and enhance communication and collaboration within the industry. This, in turn, can lead to increased efficiency, productivity, and competitiveness in the global market.

➤ *Encouraging Patent Applications:*

- Patent applications and information and communication technology (ICT) also play crucial roles in innovation within these companies¹¹. Supporting and incentivizing patent applications by residents can foster innovation within the oil and gas sector. Patents not only protect intellectual property but also incentivize companies to invest in research and development to create new technologies and solutions.
- By encouraging patent applications, the state can stimulate a culture of innovation, attract investment in technology development, and enhance the reputation of the Russian oil and gas industry as a hub for innovation and technological advancement.

➤ *Reassessing Research and Development (R&D) Expenditure:*

- Research and development (R&D) departments in oil and gas companies demonstrate their innovative inclination by addressing environmental concerns and improving processes¹². While R&D is essential for driving innovation, its negative impact on oil and gas industrial exports suggests a need for a reassessment of R&D expenditure allocation. This could involve reevaluating priorities, reallocating resources, and exploring alternative approaches to innovation.
- Focusing R&D efforts more effectively, such as targeting specific technological challenges or collaborating with research institutions and industry partners, can optimize the impact of R&D expenditure on industry development and export competitiveness.

➤ *Strategic Energy Pivot:*

- The widening surplus capacity in westbound oil pipelines resulting from the energy pivot to Asia underscores the importance of strategic planning. The state needs to manage surplus capacity effectively to ensure balanced distribution of oil resources and minimize disruptions in supply chains.
- Strategic planning should involve assessing market demand, infrastructure capacity, geopolitical factors, and regulatory considerations to guide the energy pivot strategy and mitigate potential risks associated with surplus capacity.

➤ *Integrating ICT for Economic Growth:*

- However, Russia's progress in digitalization and technological advancement is perceived as slow compared to competitors, with a lack of interdisciplinary integration¹³ (Gaisina et al., 2017; Gershman et al., 2016). The positive correlation between ICT, patent applications, and GDP growth highlights the potential of integrating ICT more broadly across sectors to stimulate economic growth and development. This could involve

promoting digitalization initiatives, fostering collaboration between ICT firms and other industries, and investing in digital skills development.

- By leveraging ICT for economic growth, the state can drive innovation, enhance productivity, create new job opportunities, and improve overall competitiveness in the global market.

➤ *Continued Monitoring and Evaluation:*

- Continuously monitoring and evaluating the impact of technological innovation, including ICT, patent applications, and R&D expenditure, is essential for informed decision-making and policy formulation.
- This ongoing assessment enables the state to identify emerging trends, assess the effectiveness of existing policies and initiatives, and make necessary adjustments to optimize the impact of technological innovation on the oil and gas industry's development and export performance.

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