

UCL SSEES  
Centre for Comparative Economics

**Modernization through large S&T projects: Assessing Russia's  
Drive for Innovation-Led Development via Skolkovo Innovation  
Centre**

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## **Abstract**

'Skolkovo' innovation city near Moscow is Russia's latest high-profile manifestation of a policy shift towards diversification and innovation based growth. This paper aims to understand the institutional, historical and comparative contexts at an early stage when implementation in Skolkovo has just begun. It also aims to analyse the opportunities and challenges offered by Skolkovo in a comparative perspective by using a framework that evaluates Skolkovo's early developments in terms of the extent it can contribute to a Russian system of innovation. We aim to demonstrate the value of academic discourse in policy issues, arguably an indispensable input into the ex-ante evaluation of state modernization projects. Our argument is that Skolkovo is meant to be a de facto 'mission oriented innovation eco-system' which is quite a new type of challenge for Russia. We outline the broad systemic obstacles facing Skolkovo as well as the opportunities for its growth.

**Keywords:** innovation, Skolkovo innovation city, Russia, technological modernization, Schumpeter, growth theory, proximity, interactions

## 1 INTRODUCTION

*'Some men see things as they are and ask why. Others dream things that never were and ask why not.'*

--George Bernard Shaw (1856 – 1950), quoted by Steve Geiger, COO of Skolkovo Foundation, in his presentation 'Innovations Model' at the Skolkovo Roadshow, Institute of Directors, London, February 20, 2012<sup>1</sup>

Launched in 2010, Skolkovo is the latest high-profile manifestation of a policy shift of Russia towards diversification and innovation based growth. This paper aims to understand the institutional, historical and comparative contexts at an early stage when implementation in Skolkovo has just begun. At first glance, this may seem premature but we believe that our analysis is interesting not only for Skolkovo's managers but also for a broad policy and academic audience.<sup>2</sup> We want to explore whether the assumptions underpinning the objectives of Skolkovo are backed by historical and comparative evidence. By expanding the debate from a narrow Russian and investment context to include broader historical and comparative perspectives, we aim to demonstrate the value of academic discourse in policy issues. We consider this to be an indispensable input into the ex-ante evaluation of such an important modernization project for Russia.

The Skolkovo project forms part of a broader political agenda to modernise the country's economy, political system, and society. This latest modernization project began in earnest in 2007 when the Ministry of Economic Development started to develop a federal, long-term strategy on social and economic development to 2020, which aimed to make Russia an innovation and knowledge based economy by focusing the country's development on the long-term national priorities of dynamic economic development, better quality of life, national security, and strengthening Russia's global position (Ministry of Economic Development of Russia, 2008). Many experts from Russia and abroad, however, have criticised this long-term program because of its promotion of innovation over imitation of technologies: they argue that a country behind the technological frontier, such as Russia, needs to first imitate new technologies and processes in order to reach the frontier level before innovation makes sense (Connolly, 2011, p.452). The political support for economic modernization and innovation increased during Medvedev's presidency (2008-12) when he repeatedly stressed the need for modernization to reduce Russia's dependency on natural resources and drive sustainable economic growth. His 2009 speech to the Federal Assembly outlined the state's new 5 priority spheres in science and technology as energy efficiency, telecommunications, space technologies, nuclear energy, and pharmaceuticals. Medvedev added nanotechnology to this

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<sup>1</sup> Geiger resigned as Chief Operating Officer of Skolkovo Foundation in December 2012.

<sup>2</sup> The paper draws on a workshop 'Russia's Skolkovo in Comparative and Historical Context' which was held at the School of Slavonic and East European Studies, University College London (UCL) on Wednesday June 13, 2012. A summary of the workshop and podcasts of the 4 sessions of the workshop can be accessed [here](#).

list soon after in 2009 and a state corporation, 'Rosnano', was formed in 2011 to implement the state's policies on nanotechnology (New Europe Brussels, 2009; EBRD, 2010, p.138).<sup>3</sup>

The importance of Skolkovo stems from vastly different views on prospects for modernization of Russia. From an optimist's perspective, the increase in macroeconomic, political, and social stability since the turn of the 21<sup>st</sup> century has generated many pockets of vitality in the Russian economy (IMF, 2012, p.15; Adelaja, 2012, pp.26-8). On the other hand, pessimists point out that capital flight is rampant and administrative barriers to growth are high (Aslund 2007; ERBD, 2012; Åslund, Guriev and Kuchins, 2010). In view of such divergent assessments, understanding the context matters and hence Skolkovo cannot be viewed in isolation from the larger socio-economic landscape of Russia. Moreover, diverging views are due to the nature of social change which emerges through the accumulation of micro projects by actors who seek to challenge incumbents and dominant practices. It is inevitable that actors' views on this process will significantly differ. We hope to minimize these biases by exploring the issue in comparative perspective and by confining ourselves to the design of Skolkovo with limited analysis of implementation issues.

This paper aims to analyse the opportunities and challenges offered by Skolkovo and the extent to which it can contribute to strengthening Russia's system of innovation. It is hoped that by examining successful cases of innovation clusters in countries that, like Russia, have somewhat deficient institutional frameworks, some issues and conclusions can be drawn which may be relevant for Skolkovo. In addition, we believe that our conclusions are relevant for countries undertaking or planning similar modernization projects.

Specifically, we want to address the following questions:

- How do the present Russian policies on innovation compare with *previous* efforts to modernise via science & technology?
- How does Russia's innovation policy *compare* with other emerging economies and 'advanced' economies?

What are the chances of success for a top-down innovation project such as Skolkovo that is directed and governed by an authoritarian political system and is created as an enclave?

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<sup>3</sup> In his speech at a national forum on nanotechnology in October 2009, President Medvedev emphasized that Russia must reduce its national economic dependence on oil exports and reorient towards technology-based growth.

The importance of Skolkovo is broader and stretches well beyond its boundaries. Namely, Skolkovo is an expression of a view also strongly present in more developed countries, whereby supporting innovation via new technology based firms (NTBFs) is believed to be a key driver of growth and structural change (European Commission, 2010; OECD, 2010; WEF, 2011). Hence, the lessons from Skolkovo may have broader implications that go well beyond Russia and other so called 'emerging economies.' The remainder of the paper is structured as follows. The next section (section 2) presents briefly Skolkovo's origins, development, goals, governance, and structure. Section 3 outlines the theoretical perspective and reviews the empirical research on the relationship between economic growth, innovation and the role of 'science cities' within which the Skolkovo case can be understood. Section 4 discusses the opportunities that Skolkovo offers to be a catalyst for innovation development across the rest of Russia, while section 5 then highlights the challenges Skolkovo faces. Finally, section 6 offers three broad conclusions.

## 2 ON SKOLKOVO

Skolkovo is an innovation centre about 20km west of the centre of Moscow city, called Russia's 'Silicon Valley' by the world's media (although this impression may be wrong as its employees do not in fact see Skolkovo as such). Operational since 2010, it is perhaps the most high-profile manifestation of policy shift in Russia towards diversification and innovation-based growth. It is designed to be a fully-functioning city where scientists, researchers and entrepreneurs can live, work and interact. A French architecture firm won a contract to design the buildings and landscape, and construction began in the summer of 2012 on land formerly used for cucumber farming.

The origins of Skolkovo are interesting because it was started and became operational so quickly. Brief discussions between three key political actors on the idea of Skolkovo in the context of Medvedev's political and economic modernization agenda preceded Skolkovo's official 'birth' in the spring of 2010. These figures were Dmitry Medvedev, then President of Russia, Arkady Dvorkovitch, presidential advisor in the presidential administration, and Vladislav Surkov, First Deputy Chief of Staff to the President and known as the 'grey cardinal' of the Kremlin at the time.<sup>4</sup> Skolkovo came into existence in the spring of 2010 with the creation of the Skolkovo Foundation, the governing body for Skolkovo. Victor Vekselberg, an oligarch and owner and president of a large Russian conglomerate, Renova Group, is the President of Skolkovo Foundation and co-chair of the Skolkovo Foundation Council. The first components of Skolkovo innovation city have been operational since early 2011. We argue that such high-level support was critical to Skolkovo becoming a reality relatively quickly: the necessary presidential decrees and laws on Skolkovo were signed off within 6 months of its creation (Federal Law No. 244 'On the innovation centre of Skolkovo', September 28, 2010).

Skolkovo aims to be a physical and virtual 'cluster' to promote technological innovations and to provide high quality infrastructure, human capital and a corporate environment that will together help to encourage technological innovations.

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<sup>4</sup> Interview with Artyom Morozov, adviser at Skolkovo Foundation, June 18, 2012, held in Skolkovo Foundation office, Moscow.

According to the Vice President for International Partnership Development in Skolkovo Foundation, the mission of Skolkovo is four-fold (Lenihan, 2012):

- Diversify the Russian economy through innovation and entrepreneurship;
- Integrate Russian science and technology into the global economy;
- Develop human capital through world-class research;
- Nurture competitive knowledge-based companies.

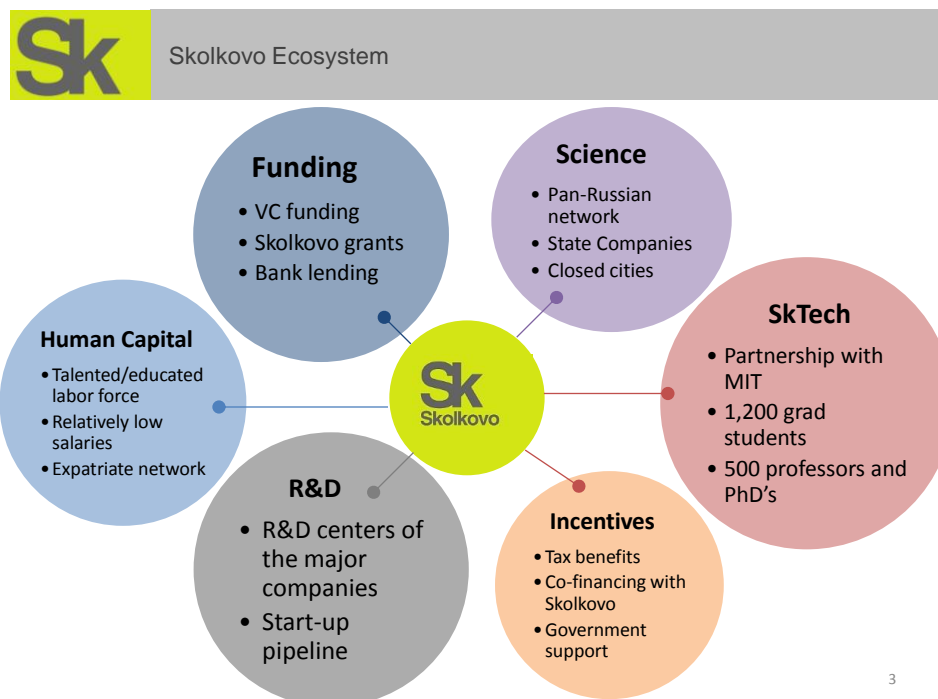
Skolkovo conceptualizes itself as a new 'ecosystem' of innovation (

Figure 1). In addition to providing funding and other support to start-ups, it will encourage multinational companies to locate some of their research and development (R&D) in Skolkovo, provide financial and political incentives to businesses to relocate to the site, offer a world-class graduate education in business and entrepreneurship, and support the development of fundamental and applied science across Russia by fostering a pan-Russian network to unite existing centres of science across Russia and large state companies. The managers of the city of Skolkovo are keen to foster *interactions* between the businesses, students, and researchers – a key element of an ecosystem as interactions can stimulate demand for innovations. This demand is not known in advance but rather discovered through interactions by private firms, government bodies, and researchers. Skolkovo's conceptual model as an innovation ecosystem makes it fundamentally different from the Soviet model of R&D and innovation, which focused on high spending on specific technologies that were needed by specified, known users (primarily, the military).<sup>5</sup> Skolkovo aims to become 'the basis for a vast ecosystem that spans all of Russia and brings together researchers, entrepreneurs and investors in five 'clusters' (The Economist, 2012). These five clusters include IT, a sector where Russia has strong capabilities both historically and currently, as well as biomedical science, energy-efficiency, space and nuclear technologies. The five areas of science are also the national priority industries in the short to mid-term. The ecosystem of Skolkovo, its champions hope, will help Russia modernise its economy.

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<sup>5</sup> The issue of Skolkovo's model of innovation is discussed more in section 3 of this paper.

**Figure 1. Skolkovo's ecosystem**



Source: (Lenihan, 2012)

In addition to a physical presence in a specific territory, it will also exist in the virtual sphere because it plans to connect with other innovation centres in different parts of Russia and to be the hub for a 'pan-Russian network' of science that incorporates former closed cities and state companies (Lenihan, 2012). The planned innovation city of Skolkovo is very well-financed. In 2010, the year of official approval and the start of construction, it received 3.9 billion roubles or approximately USD 122 million or GBP 76 million (Rossiskaya Gazeta, 2010).<sup>6</sup> In addition, in August 2013, the government of Russia announced that the [Skolkovo Foundation](#) would receive 135.6 billion more roubles (approximately USD 4.1 billion or GBP 2.6 billion) from the federal government between 2013 and 2020, ending months of uncertainty about its future amid allegations of corruption.<sup>7</sup>

It is worth mentioning that data on actual investments and operational expenditures of Skolkovo are hard to find as such information is not publicly available, so we can only rely on Russian and international media sources. These media sources give very different estimates. Moreover, researchers and commercial firms based in the UK and other Western European and North American countries are partnering with Skolkovo. This should further increase estimated investments and it shows that the international community is interested in developments in innovation in Russia.

<sup>6</sup> Currency exchange rates as of January 1, 2014, and according to [www.xe.com](http://www.xe.com) (<http://www.xe.com/currencytables/?from=RUB&date=2014-01-01>).

<sup>7</sup>For more information on the corruption allegations concerning Skolkovo, see section 5.5 of this paper.



In summary, the main organizations that form the Skolkovo hub ecosystem are:

**I. Skolkovo innovation centre:**

- Skolkovo Institute of Science and Technology (SkTech) for graduate education;
- Corporate partners:
  - These include large international companies such as Siemens (German origin), Nokia (Finnish origin), IBM (American origin), Johnson & Johnson (American origin), Tata (Indian origin), and Boeing (American origin). As of January 2013, 24 large corporate have signed up to be a part of Skolkovo.
  - Large Russian companies including Lukoil (oil), TNK-BP (oil), Sistema (large multi-industry conglomerate), Sberbank (banking), Rosatom (nuclear energy), and Renova (strategic investment).
  - Siemens, for example, has just over 200 employees engaged in R&D based in Skolkovo. The company chose to do some of its global R&D in Skolkovo, because of the opportunity to be part of a governmental project and hence to build a working relationship with government officials.
- Infrastructure for startups (clusters, a technopark which – from 2014 – will provide supporting infrastructure for new, innovative companies and assist in commercializing new technologies). These new companies should be new technology-based firms (NTBFs), which are commonly defined as particular types of small and medium sized enterprises that are more innovative in developing or using new technologies and newer than a ‘typical’ firm (OECD, 1998, p.219);

**II. Skolkovo Foundation Board of Trustees**

1. 15 top Russian politicians and bureaucrats (its members include three representatives of the Presidential Administration, four Ministers, the President of the Russian Academy of Sciences, Mayor of Moscow, head of the Association of Innovative Regions of Russia, the general director of the Russian Venture Company, and the Chairman of the State Corporation ‘Bank for Development and Foreign Economic Affairs’ (Vneshekonombank);<sup>8</sup>
2. Chaired by Prime Minister Medvedev;
3. The is de facto the highest decision-making body of Skolkovo;
4. It meets once per year to review performance (in combination with the Foundation Council) and to approve the most major investment decisions.

**III. Skolkovo Foundation Council (Board)**

1. The Council is like a corporate board of directors and meets quarterly to approve budgets, review performance (together with the Board of Trustees), and to approve major investments (if not subject to Board of Trustees approval);
2. 17 members who have senior positions in the Russian government and the Russian and global private sector, of whom 11 are Russian men and 6 are men from other countries;

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<sup>8</sup> Information correct as of October 2, 2014. Available at:  
<http://community.sk.ru/foundation/team/p/popechsovet.aspx>

3. The Council is co-chaired by Craig Barrett (Retired CEO/Chairman, Intel Corporation) and Victor Vekselberg (President of the Skolkovo Foundation); other members include John T. Chambers (Chairman and Chief Executive Officer of the Cisco Systems, Inc.), Eric E. Schmidt (Executive Chairman of Google Inc.), Suresh Prabhu (Chairperson, Council on Energy, Environment and Water, India), and Esko Aho (Prime Minister of Finland, 1991-95, and Executive Chairman of the Board, East Office of Finnish Industries Ltd).<sup>9</sup>

The members of the Skolkovo Foundation Board of Trustees and Foundation Council are, by some accounts, less engaged than could be expected from the board of a start-up. A start-up board aims to actively support and give guidance to the new company rather than simply approving budgets and decisions.<sup>10</sup>

#### **IV. Scientific Advisory Council**

1. This council sets priorities for R&D at Skolkovo and is comprised of leading Russian and international scientists;
2. Consists of 27 leading scientists of which 10 are from outside Russia.<sup>11</sup>

#### **V. Skolkovo Foundation**

Skolkovo Foundation is the body governing the innovation centre of Skolkovo. It is responsible for constructing and managing Skolkovo innovation centre, attracting talented researchers via offering grants, benefits, and simplified bureaucratic procedures, etc.

#### **VI. Skolkovo Industrial Advisory Board (IAB)**

The IAB is a feedback mechanism for major companies

#### **VII. 'Greater Skolkovo'**

While not formally part of the Skolkovo innovation city, there is another private organization with the same name located in the same part of Moscow city – the Moscow School of Management SKOLKOVO. This has led to some confusion in the media about the exact composition of Skolkovo innovation city. However, this business school is not part of the state-run Skolkovo. Nevertheless, because of similar aims and the potential to be a powerful component of Skolkovo's innovation ecosystem we include brief information about it here.

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<sup>9</sup> Information correct as of October 2, 2014. Available at:  
<http://community.sk.ru/foundation/team/p/foundationboard.aspx>

<sup>10</sup> Anonymous interview, June 2012, Moscow.

<sup>11</sup> Information correct as of October 2, 2014. Available at:  
<http://community.sk.ru/foundation/team/p/konsultsovet.aspx>

1. Moscow School of Management SKOLKOVO. As a privately funded and run business school designed to compete with the world's top business schools, it is organizationally and physically separate from the innovation centre Skolkovo. It is located 4km away from the site of Skolkovo innovation centre by foot (although by car or public transport it is 10km away due to the absence of a direct road between the management school and innovation centre).<sup>12</sup> The school of management has existed since September 2006 (the date of a ceremony to lay the foundation stone on the future site) and accepted its first students on the Executive MBA course in January 2009. It is the brainchild of a team of senior Russian and international business leaders, with the support of top-level politicians including Putin and Medvedev. Its president is Ruben Vardanian, in whose words the school aims to: "...create a new educational centre in Moscow that will train leaders and entrepreneurs for emerging markets and that will be known for its innovative approach to teaching." (*The Times*, 2008).

### 3 ECONOMIC GROWTH, MODERNIZATION AND SCIENCE CITIES

As discussed in the previous section, the ultimate aim of the Skolkovo project is to foster Russia's technological modernization and thus ensure the basis for long-term growth based not solely on its natural resources. The most appropriate current theoretical perspective on R&D, innovation and growth is Schumpeterian growth theory (Aghion & Howitt, 1992). This perspective can be useful to understand the possible effects of Skolkovo on modernization and growth in Russia.

According to Schumpeterian growth theory, R&D is not necessarily a direct source of growth but can lead *indirectly* to growth due to the interaction effects between R&D and other (institutional) factors (Aghion, 2004). Unlike in endogenous growth theory (Romer, 1993) what matters is not only the intensity of R&D but also the probability of R&D leading to innovation, and the extent to which innovation is likely to contribute to productivity growth (Aghion, Harmgart & Weisshaar, 2011). Interactions between R&D, innovation and productivity are affected by institutional context which should differ depending on the position of the country in relation to the technology frontier. Thus, in the Schumpeterian growth model technological progress (and growth) is a result not just of R&D but of R&D in combination with other factors such as competition, property rights, financial development, education, and macroeconomic stability.

The Schumpeterian paradigm introduces the idea of a technological frontier which represents the forefront of knowledge and the latest technologies that exist globally. A country's or firm's progress differs according to how far it is from the frontier. Countries or firms behind the frontier should grow faster and catch up to the global technological frontier because they benefit from knowledge spillovers from those on the frontier. Firms or countries behind the frontier can imitate technological activities, whereas those at the frontier must continually innovate to stay in that position. Moreover, policies and institutions that favour imitation are not the same as those that favour leading - edge innovation (Aghion, Harmgart & Weisshaar, 2011).

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<sup>12</sup> According to online map tool offered by the Russian language search engine yandex, <http://maps.yandex.ru>. Last accessed September 20, 2012.

Insights from Schumpeterian growth theory can be applied at a micro level, looking not at a whole industry but at specific kinds of firms – NTBFs. Skolkovo aims to attract such firms in the belief that they promote growth. Based on the insights from Schumpeterian growth theory, a plethora of other factors and processes should be in place to ensure the positive effects of NTBFs on growth. A good example of the complex link between R&D and growth are the debates about the so-called ‘paradoxes’: situations where a country has a high R&D input but low innovation output such as the European paradox (Dosi, Llerena & Labini, 2006) and Swedish paradox (Bitard et al., 2008). There are also mismatches between poor innovation effort and good economic performance, such as the Norwegian puzzle (OECD, 2007; Koch, 2007). In the past, there have been countries with good science and poor economic performance (e.g. UK) or vice versa (e.g. Japan). Recently, Coad and Reid (2012) defined the ‘Scottish conundrum’ as a country with a strong higher education research sector but poor R&D innovation output (like Sweden) and with ‘hidden innovation’ but without dynamic growth (the opposite of Norway). These examples suggest that the links between R&D, innovation and growth are not trivial and need further exploration.

This theoretical and empirical insight has strong relevance for Skolkovo. It suggests that the success of Skolkovo— both in its own right and as a catalyst for innovation and modernization more widely throughout the country –depends not only on investment in R&D and the creation of NTBFs but also on the extent to which these NTBFs have indirect effects on growth. In fact, evidence suggests that it is unrealistic to expect NTBFs to become high growth firms. A strand of literature on firm dynamics suggests that firm growth is essentially a random walk (i.e. due to chance) , and that it is not possible to target high growth firms. Evidence from the UK, US, Finland and Korea shows that high growth firms are found in a wide range of sectors and across all regions (BERR, 2008; Rigby et al, 2007) and that there is no link between high technology sectors and high growth firms (Rigby et al, 2007; Henrekson and Johansson, 2010).

Many governments of OECD countries have long supported NTBFs in particular over large firms, believing that they help commercialise new knowledge, help bring about structural change in product markets and contribute to increasing the skill level and mobility of labour (OECD, 1998, p.219). However, disappointment about the expected roles of NTBFs in many countries has begun to emerge recently (Coad and Reid, 2012). There appears to be a strong mismatch between the assumptions of technology policy about these firms and their true nature. In reality, these firms are actually well established corporate spinoffs, not start-ups. They do not undertake large amounts of in-house R&D, do not have intellectual property rights (IPR), many are not growth oriented, and they derive their competitive advantage from the knowledge of users or customers (see for evidence, Brown and Mason, 2014; and Radosevic, Savic & Woodward, 2010; Radosevic, 2011 in the context of Eastern Europe).

A new perspective argues that it is an innovation ecosystem rather than NTBFs or large firms per se that are driving innovation. In other words, large firms (such as Apple) interact with small technology based firms (such as software companies developing apps for Apple products) which innovate based on large firms’ stable technology platforms (Mandel, 2011, p.6).

What role might NTBFs play in Skolkovo? They could be potential high growth firms, which is what Skolkovo is trying to achieve through its technopark and grants to start-ups. However, as research shows high growth firms are not necessarily high tech firms and the capacity of policy or a state

modernization project to target such firms is expected to be quite low. An alternative objective would be to think of NTBFs as new actors in a Russian industrial and knowledge system which can foster structural change and productivity growth through linkages with other firms. NTBFs may not be high growth firms themselves but act as knowledge suppliers to other firms i.e. as specialised suppliers.

This does not mean that NTBFs cannot arise exclusively on the basis of radical innovation nurtured in Russia. However, this rarely seems to happen, especially if policies aim to target such firms. In fact, the expectation that NTBFs in science based areas may become a source of growth of value added and employment is not consistent with new evidence which shows that the innovation patterns in small firms are more diverse than generally believed (De Jong and Marsili, 2006). They can play an important role in innovation but much less as a direct source of innovation. Rather, science-based small firms can play important roles in interacting with suppliers and customers by responding to suppliers' proposals (Pavitt, 1984) or by being customer driven i.e. relying on understanding customers' needs as a source of their innovations. Science-based small firms use knowledge from universities and research institutes as a source of innovation, but they also draw heavily on customers' needs (De Jong and Marsili, 2006). Overall, the majority of NTBFs are not a direct and independent source of growth, but rather an indirect source of new knowledge, employment and value added. They require a market (users) for the new technologies produced, which is what Russia and many other CEE countries lack. In the context of CEE, NTBFs are only one of three generic types of firms which would be better methodologically defined as knowledge intensive enterprises (Radosevic, Savic & Woodward, 2010).

Territoriality (spatial proximity) is considered to be one of the drivers of innovation. Proximity facilitates the interaction of people and organisations, especially in contexts where exchange of tacit knowledge and informal communication are crucial ingredients of the innovation process. Yet spatial proximity is just one of several kinds of proximity. Building on the work of French scholars in the 1990s, Boschma (2005) argues that there are five important aspects of proximity that can enable or constrain innovation processes and learning, depending on the context:

- i) **cognitive** – meaning absorptive capacity to take in new ideas;
- ii) **organizational** – meaning the degree of shared relations, autonomy and control within an organizational arrangement (e.g. 'on-the-spot' market, joint venture, or hierarchically organized firm);
- iii) **social** – the socially embedded relations between agents at a micro level;
- iv) **institutional** – socially embedded relations between macro-level institutions; and
- v) **geographical** – the 'spatial or physical distance between economic actors, both in its absolute and relative meaning'.

He summarises these dimensions and the possible problems that can arise from too much or too little proximity, as well as the ways to overcome these problems (Boschma, 2005, p.71). Insufficient proximity may lead to opportunism, misunderstanding and lack of externalities while too much proximity can lead to different types of lock ins, lack of novelty and inertia. Following Boschma, we can say that geographical proximity can help learning and innovation but it is neither enough nor necessary. Cognitive proximity is always needed in addition to geographic closeness, and the other kinds of proximity can replace geographic proximity to solve problems of coordination. Thus,

Skolkovo needs to find the right balance between different proximities: too little and there may be problems of misunderstanding, opportunism, or no spatial externalities or spillovers; equally, too much proximity could cause problems such as no new ideas or knowledge, too much bureaucracy, no economic rationale, lock-in, inertia, or lack of openness. Skolkovo may be able to overcome a lack of geographic proximity, caused by the geographic spread of firms and residents across Russia. However, it could only achieve success in innovation growth with the presence of other forms of proximity too (such as organizational, cognitive, social or institutional).

The innovation studies literature suggests that Skolkovo by itself will not be the driver of growth by itself but could *indirectly* contribute to growth by interacting with the rest of the Russian innovation system and economy. International links are there to ensure world excellence and flow of new ideas and fruitful interaction with national R&D. Skolkovo's NTBFs should be one of several inputs into technology based economic growth of Russia and should crucially operate as specialized suppliers. The formation of NTBFs is only one way by which projects like Skolkovo can contribute to technological modernization and economic growth. In fact, the primary objective of Skolkovo should be 'to become the basis for a vast ecosystem that spans all of Russia' (The Economist, 2012) rather than to generate NTBFs. The rich experience of the science and technology cluster that developed in Cambridge, UK from the late 1970s shows that R&D firms often contribute to the regional economy not by making new products, but rather by providing knowledge-intensive business services, especially R&D contract services (Probert, Connell & Mina, 2013). So instead of expecting Skolkovo firms to extract value from their research through direct commercialization of their S&T, their major contribution could be R&D services. In that respect, Skolkovo's aims are multifaceted and include the diverse possible impacts of R&D on the economy and national innovation system.

Salter and Martin provide a useful way to think about the variety of mechanisms by which Skolkovo's R&D efforts can affect growth (2001). They distinguish six ways R&D can contribute to economic growth: 1) increasing the stock of useful knowledge; 2) training skilled graduates; 3) developing new instrumentation and methodologies; 4) creating networks and promoting social interactions; 5) increasing capacity for problem solving in technological and scientific fields; and 6) creating new firms. NTBFs in Skolkovo may be successful in indirectly triggering growth through one or more of these mechanisms.

Skolkovo may contribute to growth by increasing the stock of useful knowledge, i.e. by improving excellence and international integration of Russian R&D system. Through helping to create new technologies – defined not only as technological hardware but also tacit knowledge, techniques, and methods for design and development – opportunities for knowledge spillovers (transfer) across the Russian economy arise. Researchers attached to Skolkovo move to other organizations, maintain existing affiliations or carry out joint projects with researchers in other places in Russia or abroad. In this way, we would expect to see two-way knowledge exchanges and creation, both from and into the innovation centre.

Moreover, Skolkovo has set itself ambitious targets to train skilled graduates. The new Skolkovo Institute of Science and Technology (SkTech) has been set up to provide graduate education, modelled on and with an operational partnership with the Massachusetts Institute of Technology (MIT) in USA. It aims to integrate research, education, innovation and entrepreneurship around the 5 broad research clusters of Skolkovo innovation centres. By the time its research and education

programmes get up and running (in 2013 as a pilot year and from 2014 fully operational), SkTech aims to have 15 research centres (each with 3-4 labs), 1200 graduate students and 300 postdoctoral students, and world-class international faculty, researchers and industrial partners (Lenihan, 2012).<sup>13</sup> SkTech thus has the potential to contribute to Russia's economic growth. However to achieve this goal some important conditions must be met. Students or researchers at Skolkovo would need some incentives to stay in Russia for work or further study in order for Russia's economy to benefit from their skills and knowledge; recent trends indicate that a high proportion of Russia's graduates and postgraduates leave Russia in search of better opportunities (EBRD, 2012, p.63).

New or mature firms based in Skolkovo could help fuel growth through being networkers. In this sense, they would help to create the networks and social interactions which Salter and Martin (2001) claimed can lead to growth. There are certainly many firms (941 resident companies including a few dozen foreign firms as of early August 2013) that have already signed up to the Skolkovo initiative.<sup>14</sup> In addition, SkTech and the school of management provide 'clusters' of researchers and students, while the Foundation Board, Foundation Council and Advisory Council provide channels for politicians, bureaucrats and international leading scientists to provide their inputs and interact with the other actors of the new Skolkovo 'ecosystem' of innovation. This mass of firms, researchers and others gives the potential for networking and interactions. However, as firms are not obliged to have a physical office on the Skolkovo site just outside Moscow they may decide not to relocate their employees to Skolkovo and instead just take a grant (if a start-up) or cooperate with Skolkovo virtually or for marketing purposes. In other words, there is scope for opportunism which should be countered by incentives for commitment.

Initially, Skolkovo may seem to be a mission-oriented mechanism and a top-down enclave based on the linear innovation model logic. However, this view is too simplified and neglects the fact that the main objective is to create an 'innovation eco-system' which by definition requires element of diffusion policy. In this respect, Skolkovo can be considered as a project between mission and diffusion oriented initiatives (Ergas, 1986). Hence, it seems more appropriate to define Skolkovo as a '*mission oriented innovation ecology*' which is historically quite a new challenge for Russia. As pointed out by Loren Graham (2010) 'mission oriented initiatives of the past (nuclear weapons, launching a satellite into space) had 'a sharply focused goal, so sharply focused that the Russians knew exactly when they had reached it'. This is much less possible for Skolkovo which aims to be a hub for a 'pan-Russian network' of science that incorporates former closed cities and state companies.

Several other factors make Skolkovo an even more new and challenging project whose outcomes are of great relevance not only for Russia but also for many emerging economies, especially CIS countries.

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<sup>13</sup> Information also taken from Skolkovo official website in 2012, <http://community.sk.ru/news/>, last accessed September 26, 2014

<sup>14</sup> The number of innovative start-ups has increased rapidly from 368 in February 2012 to over 860 in March 2013 and the majority of start-ups (approx. 33%) are in the IT cluster (Skolkovo official website, last accessed March 22, 2013). By August 2013, the number of resident companies had risen to 941, including a few dozen foreign ones (Kouzbit, 2013)

We may expect much stronger structural constraints of a ‘technologies push’ project such as Skolkovo in relatively unfavourable ‘framework’ and institutional conditions. The enclave approach seems to be the natural first step to influence the landscape of Russian S&T which still largely operates as a post-Soviet R&D system (Radosevic, 2003). Like any other national S&T policy, Russian S&T policy cannot fully compensate for deficient framework conditions. Often, the key solutions lie not in narrowly-focused S&T and innovation policy but in the broader economic reforms in ‘non-technological’ areas such as entrepreneurship and the business environment. Mechanisms of ‘creative destruction’ or industry dynamics in Russia are still weak and are compounded by weak market demand for knowledge intensive services. A developed innovation and technology policy is indispensable for changing unfavourable framework conditions but its effects may be too weak when confronted with strong rent-seeking opportunities from natural resources based sectors.

On the other hand, we should not neglect the potential of initiatives like Skolkovo, Rusnano and research universities, coupled with the growing export of Russian software. These may generate a momentum of their own and create pockets of growth in Russia, independent of natural resources. If these niches of new modes of growth could link up and reach a critical mass, this may generate alternative growth regime in Russia. There may be some potential for these changes to generate new linkages in the Russian innovation system, which at present is characterised by a lack of interactions between the main pillars of the ‘triple helix’ model (university-industry-government relations) – the Russian Academy of Sciences and the Universities, government, and industrial institutes (for example, Leydesdorff & Meyer, 2006). Some scholars prefer to label the Russian and Ukrainian innovation systems, for example, as ‘double helix’ to reflect the lack of linkages between government, industry and academia (Dezhina, 2013; Yegorov & Koretsky, 2013). In addition, Skolkovo has the potential to become a hub of international networking, which thus can deepen international R&D networking and sourcing and potentially help establish linkages in knowledge-based activities between foreign firms and domestic firms.

While Skolkovo is often heralded as Russia’s own Silicon Valley, it may be more appropriate to compare Skolkovo with initiatives in countries that, like Russia, have deficient institutional frameworks. Some countries have created relatively successful innovation clusters or ecosystems based on the model of Silicon Valley despite the predictions of economic or innovation theories. Such theories often emphasise – usually drawing on empirical evidence from Western European countries and the USA – a decentralised, cooperative industrial system as important for successful innovation. For example, Silicon Valley’s success relative to Boston’s Route 128 has been attributed to the former’s decentralised, cooperative industrial system: the extent and nature of social division of labour, the extent and nature of links between customers, suppliers, and competitors in a sector or sectors, and internal firm organization (firm’s degree of horizontal coordination, decentralization and allocation of responsibilities and task specialization). Regional institutions and culture (such as universities, business associations, professional societies and local governments) are also important and interact with firms in the region (Saxenian, 1996, p.7-8). At a national level, different aspects of governance and public policy (institutional setting, character of arenas, ways of setting priorities, allocation procedures, regulation and cultural orientation) were shown to be very relevant to the differing innovation performance of Germany and the USA (Kuhlmann & Shapira, 2006).

In contrast to such theories, there are countries that have – or had in the recent past – relatively weak institutional frameworks but which have succeeded in created ‘local innovation clusters’.



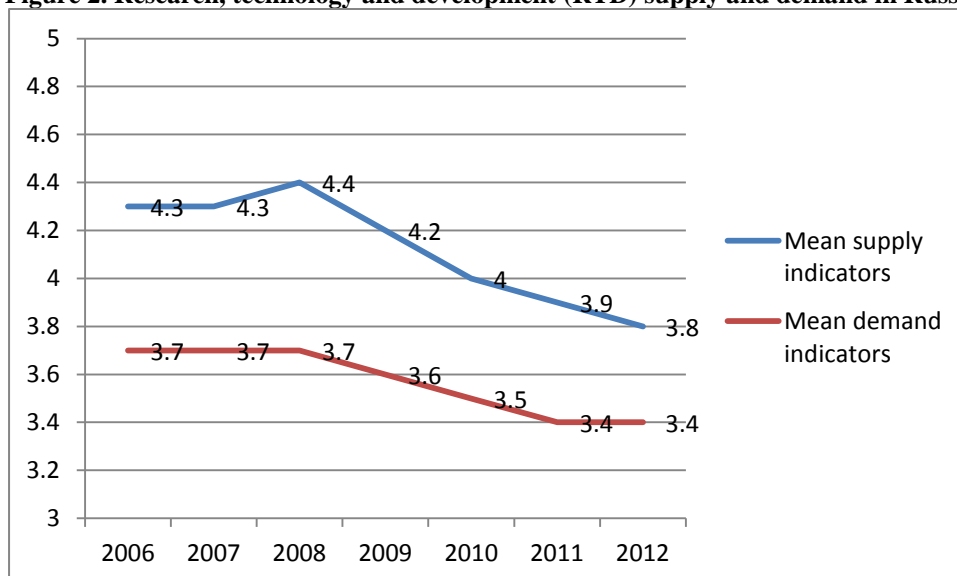
These include Taiwan (in the 1980s), South Korea (in the 1970s), and China in 1990s/2000s (Radelet and Sachs, 1997; Ozawa, 2009). Their successes are based on enclaves: confined localities with favourable institutional and economic conditions which would have been impossible to introduce in the entire economy.

More generally, a variety of external and internal factors for supporting innovation should be in place for projects like Skolkovo. Firm-specific and the wider conditions for firm innovation in the UK are well depicted in, for example, a recent study by NESTA, the UK’s innovation foundation. Factors internal to firms include talented managers (with international experience) and managers who have experienced failure. In addition, the study also mentions the importance of external factors such as good infrastructure (for example, access to fast internet), access to finance and skills, public research, competition, and demand for innovation (Miles et al, 2009).

External factors of innovation include, in addition to sources of potential demand and markets for knowledge-intensive services (KIS), favourable institutional and resources linkages, such as skilled professional networks and funding sources for different stages of the innovation process. Demand for innovation is a crucial factor that is lacking in most CEE and CIS countries. Demand for new technologies is complex and does not automatically come from an increase in market demand but rather depends on the size of firms, firms’ strategies and the organisation of the economy; in other words, technological demand is ‘derived demand’ (Radosevic, 2011, p.368).

Figure 2 below shows an assessment of the factors of demand and supply for R&D and technology in Russia. Although based on a subjective assessment of factors by the business community in Russia, it confirms that Russia – similar to other post-socialist economies – tends to have a relatively greater supply of research, technology and development than demand i.e. they have supply surpluses and demand gaps.

**Figure 2. Research, technology and development (RTD) supply and demand in Russia**



Source: <http://www.weforum.org/issues/competitiveness-0/gci2012-data-platform/>

Note: Figure 2 shows averages for a set of demand and supply indicators for each year from 2006 to 2012. **Demand** is measured as average assessment in each year of the following indicators: extent of orientation towards customers, firm's technological absorption level, sophistication of buyers, sophistication of production process, extent of staff training, capacity for innovation, firm's R&D spending and government procurement of advanced technologies. **Supply** is measured as the average assessment in each year of the following indicators: availability of scientists and engineers, quality of maths and science education, local availability of specialised research and training services, quality of scientific research institutions, quality of education and quality of education system.

## 4 OPPORTUNITIES OF SKOLKOVO

In this section, we discuss the opportunities that Skolkovo innovation centre presents and examine the extent to which it could be a catalyst for innovation development across Russia. The opportunities of Skolkovo include resources (both tangible and intangible), its openness and transparency, enclave nature (separation from the rest of Russia), and finally, its strong state and government support.

### 4.1 Resources

First, Skolkovo aims to provide to resident companies and scientists financial resources and land. The government of Russia committed USD132 million to Skolkovo in 2010 (3.9 million roubles), which represents a sizeable 0.007% of Russia's GDP (World Bank, 2011).<sup>15</sup> By the end of June 2012, almost £160 million (US\$247 million or 8,110 million roubles) has been approved to be distributed via 135 grants. As of the summer of 2012, about 25% of the 400 start-ups in Skolkovo have received a grant. 400 hectares of land has been set aside for Skolkovo, about 20km to the west of Moscow in Moscow region – a region where available land is scarce for the level of demand (Skolkovo official website, 2012). As of early 2012, the master planning for the city had been completed and construction begun. The first part of the city is planned to be ready in 2014. The rapid mobilisation of such large quantities of financial and land resources is an impressive achievement, which is due in large part to the authoritarian political system characterised by a high concentration of power held by the most senior politicians (President and Prime Minister) in Russia. It is a particularly rapid mobilization of resources when compared to the time required to launch a similar initiative in a Western democratic country, where bargaining and negotiations between the political executives, parliament and state agencies can drag on for several months or years.

Second, a resource that Skolkovo can provide to its tenants is access to the market, both Russian and international. By bringing international and Russian companies (large companies and start-ups) together in one physical and virtual space, Skolkovo aims to facilitate interactions in the market. Providing market access is therefore critical to encourage technology-based competition. For foreign companies, Skolkovo may be a potential facilitator in accessing Russian markets. Equally, Russian

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<sup>15</sup> Based on GDP figures from World Bank's World Development Indicators, Russia's GDP (current US\$) was US\$1.858 trillion (USD 1,858,000,000,000) in 2011 (World Bank, 2011)

companies are hoping that this may be a way to get access to MNCs that decide to cooperate with Skolkovo. Yet, these things are much less possible to implement by decrees because they are largely in the hands of market actors and a variety of other interests in Russia. Overall, it is too early to say whether Skolkovo is succeeding in expanding corporate access to Russia's domestic market.

There is some evidence that Skolkovo is beginning to implement its promises of facilitating access to Russian government officials. This links to the issue of market access for foreign firms as – even after Russia's long-awaited accession to the WTO on August 22, 2012 – market access in Russia is largely connected to informal institutional issues related to the operation of specific markets.

The Skolkovo Industrial Advisory Board (IAB) is a mechanism for major companies to give their feedback and opinions to government officials. The IAB meets three times a year and consists of around 10 people from the Skolkovo Foundation Council and from the government. The success of the IAB as a mechanism is somewhat assured by the fact that top-level political figures have supported Skolkovo since its inception. Nevertheless, the IAB has some challenges which it must overcome if it is to prove effective operationally and in terms of policy. Operationally, there are questions about which government officials would be part of the IAB. Will these be junior or senior level officials? How will they be appointed to the IAB? Will their tenure on the IAB be for a fixed term? Moreover, regarding policy formation even if government officials listen to businesses' concerns voiced at the IAB meetings, will the officials be obliged to follow up on the concerns?

Third, Skolkovo has the potential of providing access to new knowledge created within its tenant companies. Although it is too early to assess the long-term results, some indications can be seen. In the first 6 months of 2012, start-ups attached to Skolkovo submitted 45 applications for intellectual property (utility patents, trademarks and software patents) across all 5 cluster areas of research (

Table 3 below). The IT cluster was by far the most active in submitting applications: this cluster submitted 25 applications (11 to register a trademark, 8 to acquire a utility patent, and 6 to acquire a software patent). In contrast, the 4 other research clusters only submitted 6 or 8 applications each.

**Table 3. Applications for intellectual property from Skolkovo-registered start-ups, January - June 2012**

	Skolkovo cluster					
Results for January - June 2012	IT	Energy	Biomed	Nuclear	Space	Total
<b>Submitted:</b>	25	6	8	6	0	<b>45</b>
<b>Applications for utility patents, including Russia and international</b>	8	5	7	6	0	<b>26</b>
<b>Applications for registration of a trademark</b>	11	1	1	0	0	<b>13</b>
<b>Applications for software patents</b>	6	0	0	0	0	<b>6</b>
<b>Concluded patent searches</b>	5	6	4	0	8	<b>23</b>
<b>Received applications for the preparations of IP assets</b>	13	15	12	3	0	<b>43</b>
<b>Prepared applications for IP objects</b>	9	8	7	3	0	<b>27</b>

Source: Skolkovo official website (2012).

Fourth, Skolkovo aims to concentrate and thus enable access to critical number of researchers. Skolkovo Foundation is actively trying to recruit Russian scientists who are studying for higher degrees or working abroad. Skolkovo Foundation managers hope that by concentrating researchers and scientists in one geographic place and by facilitating interactions between them, Skolkovo will facilitate interactions between companies (both established and start-ups) so that knowledge can flow more freely. This is encouraging for attracting talent yet the *question remains how Skolkovo plans to attract real talent* and how it defines real talent.

The Foundation is marketing Skolkovo as a place where Russian talent can have access to many opportunities (financial and physical labs/offices for experiments) and be protected from the vagaries of Russia's bureaucracy which can often stifle creative scientific talents and innovations. In addition, Skolkovo Foundation has already recruited a number of international management and corporate experts to work in the Foundation with the idea that they will help ensure Skolkovo has an international orientation and becomes part of a global scientific culture. For example, the Skolkovo Foundation Council contains many previously mentioned non-Russian members. Similarly, prominent international scientists including Nobel Prize laureates Roger David Kornberg and Jean-Mari Lehn, Siegfried Dais (Vice-Chairman, Bosch GmbH), Richard Lerner (President, Scripps Research Institute) sit on the Scientific Advisory Council.

In the spring of 2012, Skolkovo was also actively recruiting researchers at a more junior level by offering favourable living conditions. For example, in 2012 Skolkovo Tech advertised widely among the global academic communities for junior researchers with PhDs. The criteria for tenure-track and more senior tenured positions advertised on an academic network related to entrepreneurship in April 2012 included: a completed PhD in either a field connected to the 'organizational aspects of technological innovation and entrepreneurship', or 'in natural sciences or engineering with an

outstanding record of research and teaching in a field related to organizational aspects of technological innovation and entrepreneurship, and active involvement in practical innovation and entrepreneurship activities.’ In addition, further criteria include ‘... abilities to collaborate across disciplinary boundaries, and investigate applied research problems, have a commitment to education and desire to work with innovation and entrepreneurship communities within and outside Skolkovo Tech (Entrepreneurship Research & Policy Network, 2012a).

However, identical positions were re-advertised on the same website in late July 2012 which suggests that they did not receive adequate or suitably qualified applicants in the first announcement three months earlier (ERPN, 2012c). Moreover, generous and internationally competitive compensation was included in the July 2012 advert – something missing from the April advert. This indicates that Skolkovo Tech was prepared to provide more incentives to entice excellent researchers:

‘REMUNERATION: Compensation packages are aligned with the best international standards in the field. Travelling and research funds, as well as relocation provisions for singles and families are an integral part of the package.’ (ERPN, 2012c).

Furthermore, in 2012 Skolkovo Tech was also recruiting for an Entrepreneurship & Innovation Education Program Manager. This position aimed to help in the ‘development of a comprehensive education program and curricula at the Skolkovo Tech in support [of] SkTech’s Entrepreneurship and Innovation mission and strategic initiatives.’ They hoped to recruit somebody with 3-5 years of practical experience in educational development or a related field, and a PhD (or equivalent) or Master’s Degree in natural sciences, engineering, science or engineering education (ERPN, 2012b).

## **4.2 Openness and transparency**

Skolkovo presents another opportunity via the self-proclaimed emphasis on openness, both internationally and in its business model. This culture of openness and transparency, as seen for example in the management’s pledge to put much information online in the public sphere, is a departure from Soviet model of science and innovation. Moreover, Skolkovo seeks foreign partners. SkTech is a private, graduate teaching university that will be a key part of Skolkovo innovation centre and has signed a partnership with Massachusetts Institute of Technology (MIT) in the USA. SkTech hopes to learn from the experience of MIT and in some way replicate MIT on Russian soil. It aims to educate 1200 graduate students, recruit around 300 postdoctoral researchers, and recruit 200 professors, the latter ‘appointed according to international standards and procedures’ (MIT website, 2012). Until the construction of Skolkovo is completed and SkTech has a physical presence in Skolkovo, many of the graduate students and professors who have already been recruited will be based at MIT in the USA.

Internationally, Skolkovo has formed links with the corporate world. Foreign businesses and companies are asked to sign an agreement to carry out some of their R&D activities in Skolkovo. For example, to date 19 large corporations have signed agreements to establish R&D facilities at Skolkovo, including Schneider Electric. The total amount of spending on research projects in Skolkovo to date is 21.8 billion roubles (approx. £440 million). A total of 2,219 employees are working on research projects run by Skolkovo’s corporate partners. For example, in late December

2012, Skolkovo Foundation, RUSNANO (the state-owned nanotechnology company), Rostelecom (the state-controlled telecommunications company), Russian Venture Company and the microelectronics Russian company ITFY (whose main strategic partner is IBM) signed a memorandum to jointly establish an electronic technology centre (Venture News, 2012).

### 4.3 Global scientific culture

For a country that for the most of its modern history had closed science, ensuring that Skolkovo is international and part of a global scientific culture is critical. A cultural change in Russian research and science is an essential part of Russia’s modernization and push for an innovative and knowledge-based economy. Such a shift in culture is limited by the closed character of Russian and Soviet science (for example, co-publications and joint projects with scholars in other countries; the institutional separation between research and teaching in the Soviet period). The new initiatives related to international peer assessment and recruitment of more international faculty are promising steps in the right direction; they will strongly help Skolkovo develop in the mid- to long-term. One of Russia’s newly-established ‘National Research Universities’, the Higher School of Economics (HSE) is indicative of these shifts: HSE has moved up from 8th to 6th place out of 1500 universities for number of papers published in the last 12 months in the university rankings of the international Social Science Research Network published in August 2012 (HSE, 2012). So, Skolkovo’s capacity to create a new kind of research culture (different to the present culture that exists elsewhere in much of Russia) and be part of a global scientific culture will be shaped by the opening of Russia’s R&D and higher education system.

Table 1 below shows the planned numbers of researchers, scientists and students, and other residents in Skolkovo City once it is fully operational from 2014. We can see that in total there will be almost 45,000 people on site (Geiger, 2012). However, it is too early to assess the numbers of scientists and researchers brought to Skolkovo.

**Table 1. Categories of all researchers and residents in Skolkovo City**

	Numbers of people (planned)
Total residents	10000
Total employed	26000
Professionals employed	6000
Graduate students, faculty and staff	2500
<b>Total</b>	<b>44500</b>

### 4.4 Enclave nature

Paradoxically, part of Skolkovo’s apparent attraction to foreign businesses lies in its enclave nature: its separation from the rest of the economy and society. This means that Skolkovo does not have to

overcome many of the administrative and institutional hurdles and constraints faced by companies and organisations elsewhere in Russia, and can thus operate more efficiently. It will not be obliged to comply with Russian standards. Skolkovo will be subject to its own building regulations, separate from the regulations in force for the rest of the country. In addition, Skolkovo will be an almost tax exempt, free economic zone (for example, resident companies will not have to pay profit tax or VAT, and companies will get a refund on any laboratory costs). The innovation city will have a certain amount of autonomy in the provision and management of public utilities such as water and electricity. However this autonomy is limited because Skolkovo will remain dependent on Moscow city for existing infrastructure (for example, water piped from Moscow city) and it seems unlikely that the planners and developers would want to spend huge sums of money to build their own independent infrastructure (Blyumin, 2010).<sup>16</sup>

Skolkovo's enclave feature is an advantage in country with deficient and poorly functioning institutional framework. However, being an enclave may also hinder the chances of Skolkovo to be fully open and interact with other countries and the rest of Russia and of Skolkovo becoming part of an effective, functioning innovation ecosystem. So, while in the early phases of its operation its enclave nature is an advantage, Skolkovo may not turn itself into a source of change and spillover effects for the Russian innovation system. We discuss this in the next section (section V).

#### **4.5 Strong state support**

As already mentioned above, the concept and implementation of Skolkovo has been led from the centre, directed by key political figures at the centre of Russia's state. The fact that the Skolkovo project has such strong support from the state can arguably be an advantage for its future development. In Russia under presidents 'Putin-Medvedev' (2000 to present), informal rules and practices have more importance than formal laws and hence having a 'friendly ear' at the apex of power can be a good thing for Skolkovo. Any legal, political or bureaucratic obstacles which could block or stall the development of the innovation centre could be smoothed over or removed altogether with the assistance of senior political figures who support Skolkovo. Parallels can be drawn with Korea's recent history. The experience of South Korea's rapid industrial development and economic growth in the 1960s and 1970s under the military regime led by Park Chung-hee is well-known. The extremely successful industrial and economic growth in South Korea was coupled with increasingly authoritarian policies, signs of a strong state (Amsden, 1989).

Like in South Korea, Skolkovo's top-level political supporters has so far played an important catalysing role for the development of Skolkovo. However this top-level support could equally prove a weakness in the longer-term for Skolkovo as political support for grand, state projects in Russia can be temporary and quickly replaced by another competing project (for example, president Putin's National Priority Projects in healthcare, education, housing and agriculture have been almost

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<sup>16</sup> Information on Skolkovo's autonomy in public utilities confirmed by an anonymous interview with an employee at Skolkovo Foundation, Moscow, September 2012.

forgotten within 6 years after they were grandiosely launched in September 2005). In addition to potential policy inconsistencies one should recognise differences in external environment in the period of Korean largely domestic led modernization and today's need for Russia to integrate itself in MNCs knowledge networks and thus supplements its current mode of domestic led modernization with links and leverages through strategic partnerships with foreign R&D organizations and MNCs.

## **5 EMBEDDING THE ENCLAVE: CHALLENGES SKOLKOVO FACES**

In the previous section, we discussed the potential opportunities Skolkovo offers in the form of access to ample financial resources, access for companies to available talent and a mechanism of contact with government officials, linkages with other countries, an enclave nature, and strong state support. Despite the fact that the Skolkovo project only started in 2010, some worrying trends are evident which may undermine its success. These are ambiguous legacies of similar examples from the Soviet past, challenges in fostering interaction within Skolkovo firms and organizations, difficulties in creating mission oriented innovation eco-system, embedding enclave and the role of the predatory state in this process. These challenges may undermine the integration of Skolkovo in both the Russian innovation system and in international R&D and innovation networks.

### **5.1 Ambiguous legacies and path dependency**

Skolkovo is an entirely new project that signifies a radical break with the transition period. However, it also carries strong imprints of legacies and path dependencies. It is somewhat similar in design (though with important differences) to previous efforts such as the Soviet Union's closed cities, 'sharagas', and science cities (Cooper, 2012). These institutional continuities include certain 'ways of thinking and doing things' – practices and institutions.

In the Soviet Union, the state prioritised technological development and innovation by creating special enclaves – enclosed territories or cities isolated from the rest of the country. Essentially this means the state promoted innovations in a particular confined geographic area, separate from the rest of the society and economy and with little or no diffusion. Three partly overlapping forms of such cities could be discerned in the Soviet past. First, the 'sharaga' (special-regime enclaves) were one kind of enclave innovation initiated by Soviet rulers in the early 1930s: these 'sharaga' were staffed by imprisoned scientists and technical specialists and had some success in developing new technologies. This success may have been because they had a narrow specialisation, adequate financial resources and were tightly controlled. Second, science cities or towns (called 'naukograd' now in Russian) developed around strategically important research centres from the 1950s and were often connected to the military hence they occupied a position of relative prestige and received funding from the centre. Scientists were allowed to travel for research to other cities in the Soviet Union and, occasionally, to countries outside the Soviet Union so there was some, albeit limited, knowledge exchange and mobility of human capital. Science cities still exist today and have been quite successful in developing local concentrations of high research and scientific excellence but less successful in commercialisation in a market economy i.e. in translating research and scientific



resources into innovations. Third, closed cities (ZATO) are another historical example of an 'enclave innovation' policy, created to fulfil the Soviet state's priorities in nuclear weapons from the 1940s to the end of the 1980s. Such closed cities hosted research institutes, design organizations and production facilities in a relatively small geographic territory. The scientists and engineers who lived there had comfortable lives and good standard of living; they were responsible for example for the development of lasers which were used for military purposes (for example, Vladimir 'Raduga' (Raduzhnyi) closed city in the 1970s). However, the closed cities lived in a regime of utmost secrecy (Cooper, 2012). This limited the possibilities for transfer of technology and knowledge.

These legacies have ambiguous effects on Skolkovo which shares some similarities with the linear model of innovation that existed in the Soviet Union. However, it must be remembered that Skolkovo aims to be an 'innovation ecosystem' which by nature is not linear. The linear innovation system has been a widespread and influential model of innovation in much of the world throughout the 20<sup>th</sup> century (Bush, 1945; Godin, 2006 ; OECD, 1992). This model of innovation treats innovation as a linear process from R&D as initial inputs, to fundamental science, to full-scale production of the finished product and commercialisation of the product. It also focused efforts on a few specific technologies that had a known user (predominantly, the military). In the Cold War context, such a way of thinking justified large sums of money spent on R&D: policy makers argued that more R&D spending would automatically produce more technological innovations and thus allow their country to get ahead of their ideological rival in the quest for technological and economic development (for example, USA and former USSR).

The similarity between Skolkovo and the model of innovation in the Soviet period is the volume of financial resources put into Skolkovo. We can deduce that political figures and government officials responsible for starting Skolkovo, by investing such a lot of federal funds into Skolkovo (see section II), view financial investments as the most critical factor in determining the success of Skolkovo, in line with a linear model of innovation. However, the similarities with a linear view of innovation end there as Skolkovo city aims to be a novel kind of 'innovation ecosystem', a grandiose project that will be both a physical hub (the infrastructure and people in the city) and a virtual hub (online network to connect with other centres of science and research in Russia). The designers of Skolkovo want to encourage interactions among scientists, researchers and employees of the resident start ups and large firms. Skolkovo designers and government officials probably recognise that it is a very challenging ambition: innovation is inherently uncertain and specific to firms. It is a collective and cumulative process that involves risks with no guarantee of getting rewards in return (Mazzucato, 2011, p.34). The Soviet legacies and path dependencies are not very helpful for integrating Skolkovo nationally and internationally. In fact, they seem to be liabilities and new practices have to be learnt to that objective.

## **5.2 Fostering interactions within Skolkovo city: physical and/or virtual proximity?**

Another challenge facing Skolkovo is how to foster and support interactions between individuals working in different companies that have ties to Skolkovo. A large body of literature within the systems of innovation approach stresses the beneficial effects of interactions and networks for innovation, seen for example in the form of high tech industrial regions or clusters. Finegold, for

example, defines the most successful clusters as ones which are self-sustaining and 'high-skill ecosystems' (Finegold, 2006, p.398; see also Edquist (ed.), 1997 and Considine, Lewis & Alexander, 2009).

Based on what we see so far in Skolkovo, it seems that Skolkovo already faces some obstacles in terms of fostering interactions although these obstacles may be mitigated if Skolkovo can build up its virtual network to connect entrepreneurs, scientists, and venture capitalists across Russia. One obstacle to interactions is the unenforced relocation by firms of their R&D to the city. Companies who receive a grant from Skolkovo Foundation, as well as those who have the status of 'Skolkovo resident' without a grant, do not at present have any obligation to relocate their R&D or production to the innovation city (The Economist, 2012, p.51). Hence, the Skolkovo Foundation needs to find the right balance between creating incentives (coerced or voluntary) for companies to have a physical presence in Skolkovo and developing a virtual network for innovation to substitute for physical interactions on site.

Some insights which may be relevant for Skolkovo's challenge of fostering interactions between scientists, entrepreneurs and other researchers come from another Soviet legacy: from the work of a Soviet philosopher (Georgiy Schedrovitsky) on collective thinking. Schedrovitsky was the head of an informal scientific community called the Moscow Methodological Circle. This group developed 'organizational activity games' (*organizatsionno-deiatelnostnye igry*, or ODI, in Russian) in 1979 as a way to understand complex problems in a country's economy and to organize collective thinking (Shchedrovitsky & Kotelnikov, 1988, p.1). The games tried to (re)organize activity or economic systems. In the 1980s these kinds of games became popular with games organized in many different towns across the Soviet Union (1989 was the peak year with over 100 games organized). These open, activity games were a public form of '*critical and innovative thinking that developed outside the control of the governing political structures.*' (Rotkirch, 1996, p.34) In this way, they gave participants '*a space for reflection.*' (ibid., p.40) Despite the emphasis on openness and reflection, there was still an internal hierarchy within each game: a game would always have a leader who was de facto 'worshipped' and determined the game's structure and organization (ibid.). Examples of the various types of games held included games to create and develop radical innovations and games to solve fundamental scientific problems. For example, the town of Surgut requested a game to examine the problems of self-government and regional cost accounting in the Surgut region.

The games were organized as follows. The players were a multi-disciplinary group of people ('...usually physicians, city planners, designers, engineers, pedagogues or psychologists', Rotkirch, 1996, p.34). The total group size ranged from 10-100 players and over the course of between 5 and 20 days the group gathered to discuss a given problem and develop collective thinking. The idea was to encourage the whole group to work together and initiate collective thinking.

To what extent are Soviet 'organizational activity games' relevant for contemporary Russia's Skolkovo? Certainly, the games developed in a different and specific political, social and economic context. The games were a way for intellectuals to meet others with similar professional or social interests in an informal, apolitical atmosphere. They were part of the dissident movement in the 1980s which contributed to the fall of the Soviet Union. However certain elements could be reproduced in Skolkovo such as the gathering of knowledgeable people to discuss a set problem, the

inter-disciplinarity, informality, and the encouragement of innovative ideas. Such games could help foster interactions among the Skolkovo community, which are important for innovation according to the global theoretical and empirical innovation literature. To sum up, borrowing some ideas from the Soviet organizational games of the late 1970s and 1980s may be a way to overcome the lack of physical proximity in Skolkovo. Yet to succeed as an innovation ecosystem, Skolkovo must foster and support the creation of regular interactions between researchers, entrepreneurs, scientists, venture capitalists, students, and businessmen – both in a physical sphere and virtually – because interactions and collaborations have often been found key for stimulating innovations. It would be important to enhance the 5 kinds of proximity depicted by Boschma (see section 3 above): cognitive, social, organizational, institutional, and geographic proximity. Finally, the role of the government in providing a supportive regulatory, legal, and financial environment for these interactions and networks is crucial.

### **5.3 Forever an enclave, or how to create demand for innovation?**

There is a major challenge that Skolkovo remains an enclave. An enclave is typically a territory that is isolated from the rest of the country and protected from state legislative and regulatory requirements by being given exemption status and special privileges. Skolkovo's success will be contingent on the extent it can be enlarged: in other words, how Skolkovo interacts with the rest of Russia and with the world. Hence, a possible outcome of Skolkovo can be the strong stream of S&T results coming from an area that in other respects remains an enclave. In other words, Skolkovo could be a S&T success but not really an economic success in terms of economic spillovers, linkages and commercial results. It could become one of the excellent S&T centre in the country but not a source of structural change and innovation-based growth.

While acknowledging that innovations are specific to firms, we emphasise that innovations cannot happen in isolation: an interactive environment is crucial. Skolkovo enclave will be highly dependent on technology demand from either Russian or international partners and markets. NTBFs in Skolkovo should become 'specialized suppliers' and providers of R&D services (Pavitt, 1984; De Jong and Marsili, 2006) rather than direct sources of new products. Specialised suppliers are a category of innovative firms that produce technologies which are essential inputs into other sectors.

The ability of firms attached to Skolkovo to become any of these kinds of firms depends on whether they can attract the necessary talent (such as entrepreneurs with the skills and capabilities to offer new technologies to other companies) and also depends on the level of demand for the new products and processes from elsewhere in Russia and other countries. Will the many large firms in Russia demand the new technologies made by Skolkovo-based firms? To summarize, Skolkovo will require: a) entrepreneurs capable of offering new technologies to other companies; and b) companies in other sectors interested in buying Russian high-tech components, services or technologies.

### **5.4 Beyond mission versus diffusion-oriented technology policies: mission oriented innovation eco-system?**

The linear model of innovation was more inclined to foster 'mission-oriented initiatives' than diffusion oriented initiatives. Ergas (1986) distinguishes between mission oriented (or 'technology

push') and 'diffusion-oriented' technology policies. Examples of countries with preferences for the former kind of policies in science and technology include the USA, UK, France and Russia: they set clear national goals as targets, and their policies encourage radical innovations to meet their national priorities. In contrast, Germany, Switzerland and Sweden for example exhibit technology policies which are mainly diffusion-oriented: they have more decentralised technology policies which Ergas argues are more successful for a gradual and incremental adaptation to change because they spread technological capacities throughout the country's industrial structure.

Mission-oriented initiatives certainly predominated in the Soviet Union. For example, the state had clear goals in the field of nuclear weapons. In addition, in space technology the Soviets wanted to be the first to launch a satellite into space. What about in Russia today: do mission-oriented or diffusion-oriented technology policies predominate? The long-term socio-economic development strategy to 2020 № 1662 that was passed in 2008 sets out the state's priorities to modernize the country and make it an innovative, globally competitive, and leading country by 2020. Thus the 2020 strategy document is an example of how innovation is closely tied to the state's priorities. Turning to Skolkovo, the five research clusters (energy, IT, nuclear, space, and biomedical science) around which the innovation centre functions mirror the state's national priorities, so in this sense it is another example of a mission-oriented policy. At the same time, however, Skolkovo aims to be a large 'innovation ecosystem' that will cover not just the physical site near Moscow but also incorporate and link with all regions of Russia via the virtual sphere. Creating an 'innovation ecosystem' requires elements of diffusion-oriented policies, so this is something Skolkovo would need to incorporate in its quest to be an innovation ecosystem. To summarize, we argue that Skolkovo is trying to develop a 'mission-oriented innovation ecosystem'. This means that its objectives are shaped by the state's priorities in science and technological innovation (the five research clusters) and by a wish to create a physical and virtual space that reaches out to other centres of scientific excellence and innovation in Russia.

## **5.5. The problem of the predatory state and corruption**

Two other challenges for Skolkovo to overcome are the 'grabbing hand' of bureaucrats and other officials, and the risk of corruption from within Skolkovo. These challenges risk undermining Skolkovo's openness and transparency, which we discussed above (section four) as sources of potential success for the innovation city. First, officials, often those in the lower levels of Russia's vast bureaucracy, can get big personal gains at the expense of the large sums of public funds transferred to Skolkovo. Second, employees of the various organisations part of the Skolkovo project may have incentives to siphon off some funds for personal gain.

Indeed, throughout 2013, various English and Russian language media outlets reported on allegations of corruption at Skolkovo which surfaced as part of an audit by Russia's Investigative Committee and a later inquiry by the Prosecutor General's Office. For example, in mid-February 2013, two managers in the Skolkovo project (Kirill Lugovtsev, former director of the finance department of the 'Skolkovo Foundation for New Technologies Development and Commercialisation Centre', and Vladimir Khokhlov, general director of the customs-finance company 'Skolkovo') were accused of embezzlement of funds equal to nearly USD800,000 or 23.8m roubles (Radio Free Europe

Radio Liberty, 2013). Other examples surfaced between February 28, 2013 and March 1, 2013. Four leading Russian daily broadsheets (*RBK Daily*, *Izvestia*, *Vedomosti*, *Kommersant*) published reports about alleged corruption at Skolkovo in that period. No criminal case has been opened yet about these latest allegations which are threefold:

1. Alleged money laundering concerning the transfer of federal funds totalling 3.5 billion roubles - intended for Skolkovo - from the state budget to a private bank. Investigations centred on the fact that this money appeared to sit in an account of the bank for a long time, and that the ultimate owner of this bank (Metkcombank) is Viktor Vekselberg, who is also the president of Skolkovo Foundation. Skolkovo publicly denied any wrongdoings, saying these financial transfers to Metkcombank were returned last year, and a vice president in Skolkovo Foundation said that the transfer was made in 2010 because Skolkovo is a non-state foundation and cannot receive state funds directly;
2. Alleged transfer of a 400 million rouble grant from Skolkovo to an organisation that is not legally allowed to receive such grants which are aimed at Skolkovo resident firms (a vice-president of Skolkovo Foundation later said that the recipient of this grant was SkolTech university and so this transfer was in accordance with the 2010 federal law on Skolkovo); and
3. Alleged transfer by a daughter organization of Skolkovo (the Foundation for New Technologies Development and Commercialization Centre) of more than 37 million roubles in 2011 to subcontractor organizations for work done without contracts (*Izvestia*, 2013; *RBK Daily*, 2013; *Kommersant*, 2013; *Vedomosti*, 2013).

Later accusations emerged in the media based on the inquiry by the Prosecutor General's Office. In October 2013, the prosecutors claimed that the Skolkovo management had overpaid for some services, such as promotional videos (paid 54 million roubles, whilst the real cost stated by prosecutors was 5 million roubles or less) and consulting services (for which Skolkovo paid 600 million roubles whereas the alleged real cost was 200 million roubles). In addition, the prosecutors claimed that Skolkovo gave grants through 'shadow schemes' which issued funds to 'allegedly fictitious' companies or firms affiliated with Skolkovo, some of which were located in offshore zones (*The Moscow Times*, 2013).

Of course, it could be that these allegations are unfounded and part of the state's attempt to undermine Skolkovo. The state is not a homogenous entity and so even though Skolkovo is a state-led project, some government officials or bureaucrats could be jealous of Skolkovo's generous state support and wish to sabotage its success. For example, in its article published on March 1 2013, *Vedomosti* quoted the first deputy chair of the Duma Committee for science and technology, Dmitry Novikov (member of Russia's Communist Party), as saying that '*Skolkovo has been a mistaken project from the beginning, the resources...should have gone to existing science centres instead*' (*Vedomosti*, 2013). Some observers have commented that '*these investigations are part of an ongoing feud*' between the law enforcement agencies, known to be anti-liberal and hardliners, and the more liberal officials led by Medvedev (*The Moscow Times*, 2013). It is beyond the scope of this paper to explore further whether these allegations are true or not. They only suggest that a grand project

such as Skolkovo cannot be insulated from informal practices, including potential criminal allegations, prevalent in Russia.

## 6 CONCLUSIONS

Skolkovo is an impressive large scale, state-led effort to technologically modernise and diversify Russia by establishing a potential new source of knowledge generation and innovation development. As can be expected, this initiative has already got widely differing reactions, ranging from sceptics to strong supporters.

In this paper, we examined Skolkovo's design and objectives and briefly touched on its early efforts largely in a broader comparative perspective. We are sceptical regarding the capacity of academic inquiry to give any kind of ex-ante definite verdicts on such modernization projects. However, academic analysis could be an important input into ex-ante policy evaluation of such important modernization attempts. We see its value primarily in providing a framework and thus generating a range of questions and issues which can drive ex-ante policy analysis. With this in mind we offer three provisional conclusions.

First, Skolkovo represents the realisation of political will held by some of Russia's top policy makers to shift their country towards a trajectory of technology-based growth. In essence, it is a wish to shift the sources of growth and comparative advantage away from natural resources (like oil and gas) towards value-enhancing domestic R&D capabilities and market oriented innovation. Russia is currently classified as a country with growth based on efficiencies in standard technologies rather than a country with innovation-driven growth (see WEF, 2012<sup>17</sup>; and Radosevic, 2011). However, a strategic shift towards growth based on innovation strongly depends not only on the political will and skilled management of Skolkovo's 'ecosystem' but even more on whether the requirements for technology-based competition exist in Russia. This assumes not only institutional requirements in terms of respect for property rights, including IPR, but even more on sophisticated demand from both export and local markets. The multiple technical interdependencies in new products and processes require certification and standards, after sales services, and warranties. Barriers to growth are related to technological knowledge and also marketing. Local firms competing in technology need affordable access to a sound technical infrastructure and finance to upscale production. In short, the issue is (in the language of new structural economics, see Lin, 2012) *whether Skolkovo is a comparative advantage-following (CAF) or comparative advantage-defying (CAD) project*. If Skolkovo is too isolated from Russia's latent comparative advantages, there is the danger that the gap between what Skolkovo as a future knowledge hub and technology broker can offer is far too distant from the rest of Russia's economy: disembodied enclave that will achieve S&T but not economic results. Equally, industrial upgrading of Russia is a moving target as many Russian companies are going global and medium size companies seem to be emerging as a dynamic segment, which may generate demand for sophisticated knowledge services and niche technologies.

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<sup>17</sup> According to the World Economic Forum (WEF) 2012-2013 report, Russia is ranked 67 out of 144 countries (2012-13) in the Global Competitiveness Index, a composite index of 12 main blocks of which one is innovation. Russia's position in this index has fallen in recent years from 63<sup>rd</sup> in 2010-11.

Second, the novelty of Skolkovo is that it is *a de facto mission oriented attempt* to create an *innovation ecosystem*. In that respect, its success cannot and should not be measured by the number of NTBFs, patents or similar discrete items alone but measured more through criteria like training of skilled graduates, international knowledge networking and capacity of Russian S&T networks to integrate globally into MNCs and public R&D networks of other countries. NTBFs should not be seen as a direct source of gross value added or jobs but rather as specialised suppliers, science-based firms, customizers, technology brokers and knowledge providers. This is inherently difficult. There is a risk that Skolkovo becomes a place where multinationals carry out their R&D activities, benefiting from the capabilities and scientific and technical knowledge that remain in Russia, but does not benefit Russia. In this respect Skolkovo may become a successful exclave rather than enclave. MNCs can then export these benefits overseas rather than help to create a networking hub for Russian firms in specialized knowledge based niches and technologies. This process may not be balanced and is overloaded with risks. Indeed, it will take some time for local R&D and technology demand from non-oil and gas sectors in Russia to emerge and reach a critical mass.

Third, Skolkovo is *a litmus test for whether Russia's political economy is able to tolerate and generate a shift* from a hitherto largely domestically-controlled modernization towards a pattern of integration of domestic R&D and innovation capacities into innovation networks of MNCs and international public R&D projects. This shift is a cultural change which should be promoted by the country's top leadership more than it has in the past. Skolkovo has the opportunity to capitalize on its newly-forming international linkages with researchers, students and international firms to promote a global scientific culture within Russia. Skolkovo should help Russian science and innovation be a part of this scientific culture, and assist Russia to incorporate global standards of excellence and bring in new ideas and skills. However, this requires a favourable broader environment to signal that such cultural change is welcome and incentivized.

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