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Russia : the urgent necessity of an ambitious industrial policy

E. Louvert

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Tel (7-095) 926-0411
Fax (7-095) 926-0299
E-mail info@recep.ru
Web www.recep.ru
Russia 107996 Moscow, K-31, GSP-6
Kuznetsky most str., 21/5, entr.1

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RECEP, Eric LOUVERT

I. The comeback of industrial policy

1) the still crucial role of industry in modern economies

In most OECD countries, the share of industry has decreased over the past decades to represent nowadays only about 20% of GDP. Since Daniel Bell's seminal work in 1976[1], many economists and political leaders have advocated the thesis of the post-industrial society, where services will play the leading role. However, the role of industry is much more important than statistics seem to show.

First, if we think in terms of final consumption, the contribution of industrial goods is closer to 40%, and the decreasing share of industry is mostly due the growing outsourcing of non-core activities by industrial firms, from catering and cleaning to IT services. And this figure is generally even higher in terms of employment at about 50%. Moreover, if we take into account only marketable GDP (excluding such activities as education, health, police which are to some extent marketable but more generally undertaken by the public sector), the share of manufactured goods in final consumption is probably closer to 60% in most OECD countries.

Second, manufactured goods happen to be much more exportable than services (although one should notice that with the expansion of new communication technologies, which have significantly decreased the need for physical proximity, services tend to be more and more exportable, as shown by the surge of outsourcing of IT services, distance medical diagnostics, etc.), with goods being typically 4 times more important than services in trade turnover (exports plus imports) in OECD countries. Indeed, nearly all success stories in the history of economic development have been built around the export of manufactured goods (India, where IT accounts for nearly 25% of total exports is rather an exception). Therefore, in most countries, a strong industry turns out to be crucial for the trade balance and macroeconomic stability[2].

Third, industry achievements are essential to allow for productivity gains in services. It is not difficult to convince oneself that the surge of trade would have not been possible without modern shipping technologies, that computers play a major role in most service activities (banking, large-scale retail, etc.), and that the use of mobile phones has had a significant impact on the productivity of the whole economy.

2) The need to diversify Russian economy

According to World Bank calculations, commodities represent about 35% of Russian GDP, and 50% of industrial output. At the same time, Russia faces a huge and growing trade deficit on manufactured goods in nearly every sector, with very few noticeable exceptions such as defence equipments.

This situation represents a large risk for the country. First, natural resources will not last forever, and the country should prepare itself to the post oil and gas period. Second, as clearly demonstrated by Christophe Cordonnier[3], Russia is not rich enough in natural resources to guarantee high living standards to its population. Russia ranks only 11th in terms of oil and gas reserves per capita, far behind countries in

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[1] "The Coming of Post-Industrial Society: A Venture in Social Forecasting" by Daniel Bell, 1976

[2] The UK is often quoted as an example of country where financial services compensate for an underdeveloped industrial basis, although industry accounts to nearly 18% of GDP. This wrong perception is due to the high specialisation of British industry, in particular with a strong pharmaceutical industry.

[3] "Russia: natural resource rent and competitiveness", Christophe Cordonnier, RECEP, 2005

the Middle-East which themselves are conscious of the imperative necessity to diversify their economy. Third, macroeconomic stability is at risk in case of a swing in commodity prices. Fourth, productivity gains are usually low in commodities, preventing the country to achieve significant growth rates necessary to increase the living standards.

In its efforts to diversify its industry, Russia can rely on a number of favourable conditions. Contrary to many rent economy countries, Russia still has a strong scientific and technological base, as well as a well-educated work force, inherited from the Soviet period. Indeed, with a limited trade with the rest of the world, Soviet industry was highly diversified, and accumulated a specific know-how and general engineering competencies in many industrial branches. Moreover, the State and industrial groups enjoy substantial revenues on the back of high commodity prices, and thus can find resources to finance the initial investments required to diversify the economy. This is all the more true as the political and macroeconomic stability could permit to have a longer-term approach of the future of the country. Finally, the size of the domestic markets allows for a relatively independent approach of diversification, whereas smaller countries have to take much more into account the strategy of other nations.

3) Russian State has a major role to play

It is not only the current picture of Russian industry which is alarming, but also the recent trend. Indeed, if strategies carried out by large industrial groups were successful in basic commodities such as oil and metals (investments in new technologies, growth of output, cost cutting, …), the private sector has globally been unable to expand into activities based on more sophisticated products over the past decade. Moreover, foreign investment was relatively low, and mainly concentrated in commodities. It is estimated that 70% of the high GDP growth recorded in the past few years stems from the oil and gas sector (directly or indirectly through purchases of pipes, wagons, etc.). The food sector, which is traditionally less globalised than most other industries, due to the cost of transporting the goods and the importance of local tastes, is probably the only non-commodity success story - but nevertheless it accounts for a more than 10 bn USD trade deficit - and it is interesting to note that the nearly all the non-commodity industrial wealths come from this sector in the recent ranking published by Forbes[4].

There are many reasons why the private sector has proven unable to develop a more diversified economy in recent years, but they can be brought together into two categories. First, it is the lack of competitiveness of Russian economy: a low labour productivity, a strong rouble, the scarcity of management and marketing skills, high corruption and administrative barriers, poorly developed banking sector, etc. Second, it is the perception of a high risk associated with an investment in Russia: an uncertain legal framework, a poor law enforcement, the arbitrary of administrations (reinforced recently by the Yukos affair), etc.

It appears to move away these obstacles, the Russian State has a major role to play by implementing a more business-friendly economic policy. But as it will be shown further, empirical and theoretical arguments suggest that, beyond the fact of creating an environment favourable to entrepreneurship, Russian State should intervene more directly by supporting strategic sectors: this is what we call industrial policy.

II. Industrial policy : where do we stand ?

1) The comeback of industrial policy

Industrial policy has had its hours of glory after the second world war, when many countries elaborated policies aimed at catching-up the economic lead of the US. The most impressive results are certainly found in Asia, in particular in countries like Japan and Korea which experienced long periods of exceptional growth through a close cooperation between the State and large private companies. In

[4] "100 wealthiest Russian businessmen", Forbes Russia, May 2005

Europe, France is the country where the intervention of the State was the strongest, culminating in the 80s with the nationalisation program of the newly elected socialist government.

But these policies have been severely criticised over the last two decades, and the dominant ideology, known as the “Washington Consensus”, advocated a large wave of deregulation and a minimal intervention of the State in the economy. Indeed, from a practical point of view, the liberalization of trade in the framework of the GATT / WTO, significant public deficits of rich countries and the globalisation of companies limited the room for manoeuvre of the States. More generally, the idea prevailed that the State is less qualified than market forces to pick-up the champions of tomorrow, and that its role should be limited to the creation of a favourable environment for growth (see Romer and the implications of the theory of endogenous growth[5]).

However, the huge amounts spent by the United-States out of the federal budget to finance public (more than 100 bn USD, mainly through 6 federal agencies[6]) but also private (about 40 bn USD, through direct financing or tax exemptions) R&D, with a focus on a limited number of strategic sectors (in particular defence, IT, biotechnologies), suggest that this country has always implemented an active industrial policy[7], not to mention its aggressive trade policy aimed at protecting American industry (for instance automotive and semiconductor industries against Japanese and Korean imports in the 80s, steel industry against European imports in 2002, clothes and textiles against Chinese imports more recently). And the interventionism has only increased in recent years, notably after the terrorist acts in 2001 (budget for federal research increased by 40% between 2001 and 2005).

In France, a report published in early 2005 and commissioned by the French president Jacques Chirac to Jean-Louis Beffa, the CEO of the Saint-Gobain (the world's largest building materials company), concluded that the country should revive the practice of large national programs which permitted to give birth in the 60s and 70s to most of its industrial successes (aeronautics, nuclear energy, microelectronics). Simultaneously, the French government announced in late 2004 a policy of support for “Competitiveness Clusters”, designed to promote development of world class high technology clusters combining R&D centres and industry. Regions were invited to put forward proposals, and the government is currently selecting up to 15 out of more than 100 projects. Total funding will be 750 M€ over 3 years, provided approximately equally by regions and the Government.

There are several reasons for this revival of industrial policy in the world. First, international competition has become much tougher, in particular with the rise of China and India which are often perceived as a major threat to industries of OECD countries, and the States try to support their industries, all the more so as there is at the same time a growing gap between the strategy of global firms and the interest of their country of origin. Second, technologies tend to change more rapidly and to be more capital intensive, sparking off a need for coordination between the actors and for State financing of early R&D expenditures.

In Russia, the case for industrial policy seems even more justified. Indeed, it is difficult to imagine that, in a country where central planning has shaped to such an extent the economic structure, the State should not interfere at all. The successful Chinese example, where the government continues to give orientations to the private sector[8], seems to prove that State should play a more active role in the transformation of Russian industry. Besides, the definition by the State of clear strategic orientations for the country is urgent, because the country is losing at high speed its huge non-tangible assets accumulated during the Soviet period, and one may fear that within a decade the loses will be irreversible.

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[5] "Increasing Returns and New Developments in the Theory of Growth.", Romer, Paul., 1991

[6] Department of Defense (DOD), Department of Health and Human Services (HHS), National Aeronautics & Space Administration (NASA), Department of Energy (DOE), National Science Foundation (NSF), US Department of Agriculture (USDA)

[7] President Clinton has argued that it is both appropriate and necessary for government "to directly support" and "accelerate the development of technologies critical for long-term economic growth," giving "special attention" to those industries that "are going to explode in the twenty- first century."

[8] China uses the tools which proved themselves in other Asian countries, but also leverages its large market size by promoting its own standards.

2) arguments in favour of industrial policy

There are several theoretical reasons advanced to justify the intervention of the State.

First, companies, often under the pressure of financial markets in mature economies, tend to be too short-term orientated, and are reluctant to undertake projects which entail a high degree of uncertainty. The risk associated with these projects may have different origins: technology, competition, markets, etc. Therefore, It may be the role of the State to compensate for the lack of entrepreneurship of firms by reducing the total level of risk (for instance by securing a minimum market through public purchases, or by protecting national firms from foreign competitors), or by sharing the risk with the private sectors (through public financing of R&D). Dani Rodrik[9] gives an illustration of this argument for emerging countries: the risk, in terms of cost, but also of markets, associated with the adaptation of a foreign technology to local conditions is often poorly remunerated. If the entrepreneur fails in his venture, he bears the full cost of his failure, but if he is successful, he has to share the value of his discovery with other producers who can follow his example and flock into the new. To end the deadlock in such a situation, the State may partly subsidize the initial attempt. This was for instance the case in Chile where the public entity Fundacion Chile set up a salmon farm in the early 1980s using a technology adapted from Norway and Scotland, enabling the country to become afterwards one of the world's biggest salmon exporters (see Agosin 1999[10]).

This argument also applies to traditionally centralised countries where the uncertainty may come from the State itself, that is when the profitability of the project directly depends on future public decisions. In France for instance, the slow development of biotechnologies is often related to the lack of clear commitment of the State regarding the future drug policy (in terms of refunding of medical expenses). In Russia, the argument of the necessity for the State to reduce the risk perceived by the private sector finds a rather unusual application. Indeed, the threat of a revision of the privatizations of the 90s, which has been increased by the Yukos affair, has certainly deterred oligarchs to invest into long-term projects, and the State should clarify this situation through an amnesty or a on-off payment by large financial and industrial groups to compensate for supposedly unfair privatisation prices.

Second, a certain degree of coordination between the actors is necessary for some activities (especially in early R&D phases), either to achieve economies of scale, or to avoid useless and harmful competition. The State is often the only actor which can impose this coordination which otherwise would have difficulties to emerge between private companies. There are many examples of such interventions, for instance the creation of the aeronautic group EADS by European countries[11], or the cooperation of large private companies in the framework of strategic innovative programs in Japan under the supervision of the MITI (Ministry of International Trade and Industry). In Russia, the decision to constitute holdings in the defence and aeronautic industries is also a illustrative example of a policy aimed at avoiding useless competition between enterprises[12] and achieving a critical mass permitting to compete on world markets. This argument is particularly important in Russia where trust is usually very limited between companies and transaction costs high.

Third, some activities may not be profitable enough by themselves, but create significant positive externalities for the rest of the economy. This is typically the case with fundamental research, or the development of some infrastructures. In such a situation, the subsidizing by the State is the solution. In Taiwan for example, the government invested 65 million USD to develop a world-class orchid industry, paying for common infrastructures (genetics laboratory, quarantine site, shipping and packing areas,

[9] "Industrial Policy for the Twenty-First Century", Rodrik D., 2004
[10] "Trade and Growth in Chile: Past Performance and Future Prospects", Agosin, Manuel, 1999
[11] After the merger of the founder companies Aerospatiale Matra (France), CASA (Spain) and Dasa (Germany)
[12] The struggle between Severnaya Verf and Baltiski Zavod, the two main Saint-Petersburg shipyards for surface warships, within Russia and on export markets, was certainly harmful to the industry, both in terms of image and finances

utilities, …), leaving to private firms the cost of the greenhouses (although the government was also providing low-interest credit to farmers).

Fourth, due to increasing globalization of markets and production centres, the interest of a nation and its firms may diverge. For instance, a private company may not take into account the social cost of unemployment in its decisions of delocalisation. In 2004, the French government vetoed the take-over of the French pharmaceutical company Aventis by Novartis in the name of the preservation of decision and R&D centres in France. Environmental or defence issues are also examples of activities where the interest of profit-driven firms and States may be quite different.

3) arguments against industrial policy

Symmetrically, there is no shortage of arguments against industrial policy.

First, and this is probably the main and most mentioned criticism, governments are supposed to be less qualified than the private sector to select the sectors and the enterprises to be supported, as well as the appropriate measures, because of a lower understanding of the functioning of markets and companies, but also because it is easier to be unrealistic when you do not commit your own money. This argument is more often quoted for emerging countries which supposedly lack the competent bureaucracies to design and implement appropriate policies.

Second, it is considered that industrial policies often fail because clear obligations or objectives are rarely assigned to recipients, and therefore enterprises tend to enjoy the support in the short term without taking the courageous decisions which would permit to become more competitive in the longer term. Moreover, it is alleged that the administrations are poorly equipped to control and monitor the implementation and the result of industrial policy.

Third, the choice of sectors and enterprises is deemed to foster corruption, in emerging countries which have weak institutions but also in more developed ones where political campaigns can be financed, openly or not, by industrial groups which then expect some advantages in response to their investment. One can only notice the coincidence between the financing of President Bush first campaign by energy and defence enterprises and the multiple measures taken in favour of these sectors during the first mandate.

Fourth, it is often argued that international rules no longer allow for industrial policy, and that an interventionist government would be likely to be sanctioned by international institutions. Quite similarly, game theory

4) industrial policy: a non-exhaustive tool-box

Domestic taxation
A first way for the State to support a particular sector is to reduce the fiscal pressure. This can be done by playing on a number of taxes : VAT, tax on profits, social security payments, etc. The support can be permanent, or transient, and attached or not to the achievement of some targets (investment, exports, recruitment, R&D expenditures, etc.). It may concern companies, but also the population (for instance deduction from the tax base of investments in energy saving equipments in Germany).

Subsidies to acquire new goods or equipments
To boost the sales of a particular sector, the State may subsidize the acquisition of its goods, as it was the case in France in the 90s for the acquisition of new cars (produced in France) replacing cars older than 5 years. The advantage of such a measure is that it avoids the problem of misuse of the funds allocated by the companies, and is fair from a competition point of view since it does not favour a particular enterprise.

Legislation

By drawing a new piece of legislation, the government can foster the development of an industry. As an example, the Danish wind industry would probably not have established itself as a world leader without the clear commitment of the country to renewable energy.[13]

Refundable advances on future revenues
With this scheme, extensively used in Europe to support the aeronautic industry, the governments finance the early R&D investments to develop a new product, and the funds are then reimbursed if sales are successful. It is well adapted to large projects with significant investments in early stages, and presents the advantage of being accepted by the WTO.

Trade policy
The use of tariff or non-tariff trade barriers create an artificial advantage to local firms which was theoretically justified at the end of the XIXth century by the Austrian economist List under the name of "infant industry" argument[14]. Indeed, a transient protection may be needed to give time to local producers to catch up with more advanced foreign competitors, especially when the industry is subject to "learning-by-doing"[15]. As long as protectionism is reasonably limited in time, it seems to be fair, and eventually it permits to foster competition. This argument was extensively used during the XXth century by emerging markets, for instance by Japan after the war, but also by more advanced economies like Europe and the US to protect their automotive and electronic industries from Japanese manufacturers. The are two main risks associated with this argument : first, the protection may become permanent, thus distorting competition, and second, it is not guaranteed that local firms will make the necessary efforts to become competitive (they may play instead an end-of-game strategy). Moreover, in complex modern economies, it is not always easy to estimate the global impact of a protection on the overall economy, since the increase in cost of imported goods will have a negative impact on other sectors which could more than offset the positive stimulus to local production.

Export subsidies
The State can encourage exportes by subsidizing the additional costs companies face to approach new foreign markets, for instance participation in exhibitions, recruitment of dedicated salespersons. Beyond public subsidies, insurance companies, like COFACE in France or HERMES in Germany, can also finance the initial marketing or certification investments, and the enterprise reimburses on future export revenues.

Credits at a preferential rates (bonified credits)
In the past, when financial markets where much less open and integrated, the government could grant easier access to international (as in Korea) or domestic (in countries with more sophisticated financial systems) credits, especially if a large part of the banking sector was public as it was the case in France. Now banks are much more integrated in international capital markets, but governments can still lower the cost of credits by guaranteeing them (thus reducing the risk premium), or even by paying a part of the interest rate.

Capitalistic interventionism
The State can modify the capitalistic structure of a sector by fostering or vetoing deals (merger, acquisition, splitting, bankruptcy, …). The presence of the State as a shareholder facilitates such interventions, but it is not a necessary condition, as shown by the numerous actions of the agencies in charge of supervising competition (the most famous example is probably the splitting of AT&T in the 80s). Of course, sensitive industries (defence, nuclear energy, …) justify more easily the State intervention than others.

Public procurement
Public purchases are a major tool to support local industry. For instance, in Great-Britain, the level of reimbursement of drugs is linked to the R&D expenditures of pharmaceutical companies on British

[13] "Wind Energy Policy in Denmark: 25 Years of Success – What Now?", Soren Krohn, 2002
[14] See for instance "What Did Frederick List Actually Say? Some Clarifications On The Infant Industry Argument", Mehdi Shafaeddin, 2000
[15] See "Learning by doing and international trade in semiconductors.", Scherer, F.M., 1996

territory. The Marrakech Agreement on Public Procurement Contracts signed in 1994 limits such initiatives, but there are many different ways to by-pass these obstacles, for instance by defining quotas for SMEs as in the US (foreign SMEs are unlikely to compete) or strict specifications which cannot be met by foreign competitors.

R&D policy
Fundamental research is a public good which drives the entire industry, and as such should be largely financed by the State. However, the budget may also finance more applied R&D efforts. The main levers of the research policy are the total budget, its allocation by activity (biotechnologies, materials, etc.) and sectors, the recipients of the funds (publics centres, private companies), the degree of as the coordination between the public and the private sectors.

Infrastructures
General infrastructures (roads, railways, telecommunication networks, power transmission, etc.) are key factors for the economic development of a country, particularly in a huge country like Russia with significant import and export physical flows, and have to be publicly financed in most cases. The investment decisions may favour particular sectors, and therefore may come under industrial policy.

Clusters and technoparks
Examples like the Silicon Valley or Minatec in France (microelectronics) show that the geographical proximity of large and small companies, public research centres, can significantly enhance the competitiveness of an industry. These clusters, which require a close coordination between all the actors, would not the emerge without the participation of federal and local administrations and the initial incentives or subventions they can provide to enterprises, or the general infrastructures or public research they finance.

Education
The availability of a well-educated work force is a prerequisite to develop most industries, and the choices made in terms of allocation of resources can be viewed as an element of an industrial policy.

5) Examples of successes and failures

The most impressive examples of successful industrial policies can probably be found in the development of Asian countries during the second half of the XXth century, in particular Japan and Korea.

Korea experienced a tremendous economic growth since the early 70s, based on a close coordination between the State and a few large industrial conglomerates (chaebols)[16]. Theses private groups were assigned sectors (chronologically textile, steel, chemical, shipbuilding, automotive, electronics) and were supported by the State under the condition of achieving export targets. In some cases, the threat of nationalisation of these groups could act as a clear incentive to follow the State industrial policy. Even if the cronyism involved by such an environment became obvious after the Asian crisis in 1997, the overall impact on Korean economy is undoubtedly very positive if one thinks that Korea was one of the poorest countries in the world in the 50s.

Japanese experience, starting from just after the war, is a bit different, since it relied more on early technological catch-up and domestic demand. The policy tools to achieve these objectives were a high level of protectionism of domestic markets, substantial wage increases to fuel domestic demand, and large R&D programs involving industrial groups under the supervision of the MITI. This permitted Japan to become one of the richest countries in the world with world leaders in many industries such as steel, automotive, electronics, machine-building.

In Europe, France is the country which experienced the strongest intervention of the State, a tradition which dates back to Colbert, Louis XIV's chief minister who aimed at creating strong national companies

[16] See “Reforming Korea's Industrial Conglomerates” by Edward M. Graham (2003) for a detailed analysis

(textile, shipbuilding, arms, paper). The objective of the successive governments, with the help of the Commissariat au Plan (planning agency), was to rebuild the country after the war, and then to create national champions in some strategic sectors such as aeronautics, nuclear power, railway equipments, microelectronics. This was successfully achieved through a mix of public subsidies, public R&D programs and State purchases benefiting to large public companies. It is sometimes even argued that the nationalisation program in the early 80s permitted to create solid and large companies able to compete internationally (and that these groups could not have been created by market forces only).

The United-States have successfully used several industrial policy tools, such as protectionism which permitted in particular to save the domestic automotive industry from the overwhelming wave of Japanese imports (as in Europe), or massive R&D spending directed to the defence sector which were to a great extent at the origin of the US predominance in high-tech.

In Latin America, Chile would certainly have not become an large exporter in the agro-food industry without the intervention of the State, and Brazil's aircraft manufacturer Embraer owes a lot to public support[17].

There are also many examples of failures in the history of industrial policy.

In France, the successive government desperately tried to support for many years the company Bull, a manufacturer of IT hardware. The French-British supersonic aircraft Concorde, a pure example of industrial policy, was certainly a wonderful technological achievement, but a commercial failure because of the oil shocks in the 70s.

To promote its European HDTV (High Definition Television) standard, European Union discouraged competition by a series of EC directives, and being isolated from the pressures of competitors, engineers were not forced to develop superior or commercially viable systems before the standard was selected. As a result, the American standard established itself as the norm.

The wave of protests aroused by the recent lift on textile quota restrictions on China indicates that the protection did not reach its goal since most of the players did not prepare themselves to this event announced a decade ago.

In developing countries, we could draw a nearly endless of import-substitution strategies which have failed. For instance, the Indian industrial policy started in 1956 and which combined a heavy protectionism with a strong public sector was a disaster, and Indian industry shut itself out of global markets. When India eventually opened up its economy, the global market for manufacturing products made with unskilled cheap labour alone had already been taken by other countries.

6) lessons from the past

Failures are unavoidable…
The determination of strategic sectors to be supported is a difficult exercise. It should be based on a strategic analysis including the strengths and weaknesses of the country to objectively choose activities it can be good at, but also the spillovers to the rest of the economy, the strategy of competitors, as well as a prospective vision of the markets. However, the future being uncertain, failures are unavoidable (and actually no failure at all would probably mean that the government does not take enough risks), and the real important criterion is that real successes should pay for failures.

…but the overall impact of past industrial policy is certainly positive
The global impact of industrial policy is impossible to assess. Dani Rodrik thinks that there are few industrial successes in the developing world behind which a form of public support does not stand:

[17] See "Credit Where Credit Is Due: Open Economy Industrial Policy and Export Diversification in Latin America and the Caribbean", Andrew Schrank (2004)

“Scratch the surface of non-traditional export success stories from anywhere around the world, and you will more often than not find industrial policies, public R&D, sectoral support, export subsidies, preferential tariff arrangements, and other similar interventions lurking beneath the surface”. Moreover, this author estimates that overall, successes largely pay for failures.

The choice of appropriate measures is important...
As shown above, there is a wide range of measures which can be adapted to the concrete situation. Obviously, a measure should be tailored to the particular need of a sector. For example, if it is a problem of technology, to erect trade barriers will not help. Generally speaking, support should target barriers and market failures rather than enterprises, first to reduce the risk associated with the real behaviour of the recipient, but also to not distort competition. However, if it is easily achievable in relatively atomised sectors like the food industry, it is the case in more concentrated sectors, but then the supportive measure should be chosen so as to give to the recipient the maximum incentives. In countries where the level of corruption is high, the policy should be designed so as to minimise the risk of misuse of public funds.

…but a careful implementation and monitoring are key to success…
Past experience tends to show that the majority of large failures are due to a poor implementation and monitoring of the industrial policy. Enterprises benefiting from public support should be assigned very clear objectives, with a credible threat of withdrawal. Thus, the results achieved and the efficiency of the public funds allocated should be closely monitored. As Dani Rodrik puts it: “The trick for the government is not to pick winners, but to know when it has a loser.” In this respect, the recent decision of the British government to not support the automotive manufacturer Rover is courageous.

…and thus industrial policy should be focused and transparent
To permit a close monitoring, efforts should be concentrated on a limited number of projects. The management of the industrial policy should be as transparent as possible to limit the risks associated with lobbying and corruption. In terms of organisation, the government should create special task forces of competent bureaucrats which should report directly to the highest level of the State. Moreover, the globalisation of industry calls for international cooperation, or at least the participation of international experts in the elaboration of industrial policy.

III. Industrial policy : a tentative approach for Russia

1) segmentation of industry and global strategy

Russia has a rather unusual distribution of industrial sectors, with specialisations at the two extremes of the valued-added scale: a huge production of commodities, and some outstanding specialisations in very science-intensive sectors (military equipments, aeronautics and space). But industry is rather poorly developed, and sometimes very weak, in the middle. This is of course the result of central planning in Soviet Union which was giving the priority to energy, metallurgy and defence, leaving behind most industries orientated toward the final consumer.

A natural industrial strategy for Russia would be :

A) to consolidate and strengthen main export sectors (the “cow milk”)
B) to favour import substitution, whenever possible, in sectors for which it experiences the main trade deficits
C) to create new export specialisations for the future

For each of these main lines, we will describe briefly the types of sectors concerned, and we will give a justification for State intervention by analysing the hurdles to the a market development and suggesting supportive measures. Finally, we will give a few general recommendations for industrial policy implementation.

2) Strengthen specialisations

Which sectors ?

A rapid analysis of Russian exports suggests that the country has strong positions in two main categories of sectors:

- commodities : hydrocarbons, metals, minerals and wood
- some equipments for defence, space and energy : ships, fighters, arms, launchers, nuclear power plants,…

But these strong positions are not secured for ever. First, all the sectors listed above are highly capitalistic, and huge investments will be necessary, since Russia has in the past 15 years essentially relied on investments realised during the Soviet period. In oil and gas, the country will remain one of the world largest exporters only under the condition that it will invest heavily in exploration and transportation infrastructures. In military equipments, the main clients (India and China) will become more demanding in terms of technology, and Russian manufacturers will face the necessity to develop new equipments. Second, cost advantage will decrease with the rise of energy and transportation costs, which will be particularly harmful for industries like metallurgy, due to the energy intensive feature of these productions and the transportation of ore and final products over long distances.

Beyond the necessity to prepare the future, the leading role of Russia in these sectors represents a very good opportunity to stimulate other activities. Indeed, Russia could increasingly transform on its territory the raw materials it exports. This is particularly the case for the wood sector, where downstream transformation industries (pulp, paper, furniture, …) could be significantly developed. Moreover, the country could take advantage of its position as a world producer of commodities to foster the emergence of strong enterprises in sectors which are suppliers to these industries, for instance, the manufacturing of equipments for the mining and oil industries.

Why and how is State intervention needed?

There are several reasons which justify State intervention in the sectors listed above:

- the importance of commodities for the budget
- the need for cooperation in sectors with a large number of players
- the role of energy and military equipments in Russian diplomacy

Since commodity sectors are so important for the budget, it is clear that the State has a role to play by setting the tax regimes which apply to them. This fiscal commitment in the long term should be credible in order to create a friendly business environment, and the level of taxation should be enough to permit a global modernization of the economy, but not too high, otherwise it would deter investment.

Privatisation of Russian industry resulted in a relatively atomised capitalistic structure. This can be explained by the willingness of the government in the early 90s to privatise quickly, preferring thus deals based on plants rather than larger industrial groups during the voucher privatisation, and to create a more competitive environment. For instance, there are four players (Evrazholding, Severstal, Magnitogorsk and Novolipetsk) producing more or slightly less than 10 Mt (while Mittal Steel, the world largest producer, produces slightly more than 40 Mt), a large number of significant producers of hydrocarbons (oil and coal), three sizeable aircraft manufacturers (Ilyushin, Tupolev and Yakovlev), etc. In some sectors (for instance aluminium where Rusal accounts for about 75% of Russian output), a consolidation has occurred, but in the majority of the cases, lack of confidence between the actors, as well as a frequent control by a management unwilling to step down, have hindered this process. Therefore, the State is entitled to intervene to foster the creation of larger and stronger industrial groups, in particular in the defence and aeronautic sectors where it is often still a significant shareholder. Apart from capitalistic integration, the State can also promote cooperation between the actors on topics such as specialisation (products and markets), infrastructures and R&D.

Finally, energy and military exports are important levers of Russian foreign policy, and as such their development cannot be totally left to the private sector which would not take into account in its decisions the general influence of Russia, both economically and politically. However, the danger to subject excessively economic choices to political goals, especially in a country with a long tradition of centrally planned economy, should not be underestimated, as clearly illustrated by the Yukos affair.

3) import substitution

Which sectors ?

We could draw a nearly endless list of sectors and goods for which Russia experiences a significant trade deficit, either measured by the share of import on domestic market or in absolute terms by the size of the deficit : food products, clothes, electronic appliances, cars, etc.

But the numerous failures of import substitution policies in emerging markets show that the task of selecting the sectors which should benefit from State support is particularly arduous. We believe that three main criteria should be retained in this choice:

- the impact on Russian economy
- the potential competitive position of Russia in this sector
- the ability to rapidly implement an appropriate industrial policy and measure its impact

Impact on Russian economy

The impact of a import substitution policy, which can be first estimated by the size of the trade deficit, is probably the most obvious criterion to be retained. Indeed, to achieve economies of scale and to limit the risks associated with a lack of concentration of efforts, support should target a limited number of sizeable sectors, and those for which Russia records large trade deficits are good candidates. However, in a country which, being still on its transition path, will experience significant changes in its market structures in the future, the current picture should be completed with some analysis of market trends. For instance, it is clear that Russia will have to compensate for the lack of investment since the 90s in many sectors such as heating systems, and therefore imports of such equipments should surge in the future. Moreover, beyond the size of the deficit, current or future, externalities on the rest of the economy should also be taken into account. For instance, imports of plastic polymers may not be that significant overall, but their impact on the competitiveness of the light industry is certainly, since the trade-off between importing or producing locally goods for which they account for a significant part of the value (bumpers in the automotive industry for instance) will highly depend on the availability of cheaper local producers (transportation costs are high). In such a situation, the support from the State to the construction of a plant in Russia could make sense, since private investors may not integrate in the risk / profitability analysis the induced impact on the overall industry.

Potential competitiveness

The potential competitive position of Russia is the second natural criterion. As a first approximation, we can divide potential competitiveness, that is once the main hurdles have been cleared, into several elements :

- cost of factors
- economies of scale
- technological know-how
- marketing and organisational skills

The cost of factors is the most often mentioned source of competitiveness, and it is necessary to remind a few facts. First, labour cost in Russia are much higher than in many Asian countries, in particular China and India, especially if productivity is taken into account. Therefore, a Russia with abundant natural resources is probably already too rich to compete with China or India on goods requiring very cheap labour such as clothes, toys, etc. Second, if energy is cheap, many materials are not necessarily inexpensive in Russia. Take stainless steel, where imports from rich countries account for about 30% of domestic demand: prices are higher in Russia than in western Europe (custom duties and transportation

costs). The development of a country like Korea started with a competitive heavy industry, capable of supplying the domestic industry with cheap materials. Products where transportation costs are high (for instance building materials or some products of the agro-industry) are also good candidates for import substitution.

The availability of cheap factors is not sufficient to achieve cost efficiency, and economies of scale may be not less important. In this respect, contrary to many other countries in Central and Eastern Europe, the size of Russian population and market is a good argument to establish a local production of most consumer goods. However, this is not necessarily the case for investment goods, which represent more than 40% of Russian imports. Therefore, support should target in priority sectors for which Russian market justifies, possibly through a stimulus on demand, the building of a plant.

Technological know-how should not be a major obstacle for most productions, since there is in Russia a large and deep industrial base of competencies inherited from the Soviet period, as well as a good level of scientific and technical education. However, in some sectors like the automotive industry or applications of advanced electronics, Russian enterprises are lagging behind by nearly 30 years, and a local competitive industry will probably not appear without foreign investment.

Marketing skills, that is the ability to design and to sell products adapted to the needs of the customers, was a rather scarce resource in Russia at the beginning of the transition. Many examples, such as Wimm Bill Dann, Baltika or Russki Standart, prove that Russian companies are able to catch up, but the lack of marketing culture, especially when it comes to small and medium enterprises or exporting, should not be underestimated.

In his book "Avantage France"[18], Andre Safir shows that national culture predisposes to excellence in certain types of activities, either sectors or phases in the productive cycle. Roughly, American are relatively good at developing a new activity, and French at streamlining it, and Japanese at optimising it (late phase of the product cycle). In a similar way, we believe that Russian have a clear talent to generate breakthroughs, but are relatively weaker when it comes to market them (see the previous point) and to streamline operations in the more mature phases of the business cycle. Therefore, we think that industries where competitiveness depends on a very tight control of manufacturing processes are probably not the easiest targets for industrial policy.

Ability to implement and monitor rapidly

As explained above, experience shows that the capacity to recognise and correct its errors is not less important than the judicious choice of sectors and measures for the overall success of State intervention. Therefore, the efficiency of an industrial policy aimed at promoting import substitution will probably be higher when results can be achieved and measured quite rapidly. This argues in favour of sectors which are not too capital intensive with relatively short investment cycles.

Why and how is State intervention needed?

The sectors listed above encompass a huge diversity of cases: food industry is traditionally a low capital-intensive sector where middle-size companies prevail, while the automotive industry is highly capitalistic and dominated by large world manufacturers. From a competition point of view, there are three types of situations:

- Similar productions but cost disadvantage (i.e. clothes, food)
- Russian production much lower in quality (i.e. cars)
- No Russian production at all (i.e. equipments for automotive industry)

In order to make sure that public intervention is needed, and then to adapt properly the supportive measures, a careful analysis, based on a market survey of producers and distributors, of the obstacles to a natural "market-driven" import substitution has to be undertaken. However, provided the Russian market

[18] "Avantage France", Andre Safir, Village Mondial, 1999

is large enough to justify an investment, we believe that there are two main reasons why import substitution does not occur naturally:

- cost disadvantage of production in Russia
- risk, either real or perceived, associated with an investment in Russia

Cost analysis

The main drivers of the cost efficiency of the enterprises of a sector are:

- the cost of purchases: intermediary consumption (raw materials, parts, components) or equipment
- the labour cost and productivity
- the industrial organisation of the branch

Since the option of buying from foreign suppliers exists, cost disadvantage on purchases is due to transportation, on which the State has little influence, and import taxes, on which it can easily play. The dilemma, clearly illustrated by the automotive industry, is the following: should the State decrease custom duties (on parts, components and equipments) to make local production more competitive in the short term, but with little incentive to invest in component manufacturing, or should it try to protect local suppliers through higher duties (infant industry argument), thus increasing the cost of cars in the short term, in order to achieve an absolute competitive advantage in the longer term? As shown by the experience of other countries like Brazil, Turkey and China, the answer is probably that both strategies should be implemented, but sequentially: the priority is to attract automotive manufacturers (without them, suppliers will not develop anyway), possibly though higher duties on cars and lower duties on parts, and then to increase duties on parts, while decreasing duties on cars, in order to attract suppliers.

The level of wages is probably not a major obstacle, apart from productions for which specialisation would not make sense anyway because of a clear cost disadvantage when compared to Asian countries (clothes, …). However, low labour productivity is a serious problem in Russia, and the State can intervene in two ways. First, when this low productivity is related to the general economic and social environment, it can fight each of the impediments (numerous employees to deal with red-tape, problem of alcoholism, lack of formation, …) with general economic and social measures, but this is not precisely what we defined as industrial policy. But when lack of productivity is due to the existence of a large enterprise vital for a region or a town and whose productivity is burdened by its social responsibilities, then the administrations, federal or local, have a clear role to play to foster the development of new activities which will create new jobs.

Apart from the cost competitiveness of any plant taken individually, economic theory emphasises the importance of the industrial organisation of the sector, and in this respect Russia faces two main difficulties. The first is the lack of horizontal integration which we already mentioned. The State can promote concentration in many different ways, for instance by financing the acquisition of targets, by subsidising of the social cost associated with the restructuring, by guaranteeing public purchases to the new entity, not to mention the case when it is a major shareholder. The second difficulty is the too advanced vertical integration inherited from the Soviet period, and extended by the lack of confidence between enterprises (in a predatory environment, the concept of “core-business” is not rooted in the culture of managers, and the natural temptation is to control main suppliers or clients, fearing that at some stage they may threaten the profitability or even the independence of the company). This is also on of the main obstacles to the development of SMEs in Russian industry, and the State response may be the promotion of clusters, as in Toulouse in France around Airbus.

Risk analysis

Apart from cost efficiency, risk is the other main element in the decision to invest in Russia, and in most cases it has to do with the global business framework: macroeconomic stability, law environment, efficient and fair functioning of courts, etc.

However, there exist some specific risks related to the role and the State as a direct player in certain sectors, in particular in strategic sectors (energy, defence), natural monopolies or oligopolies (railway, electricity), sectors where trade policy and investment agreements are important (automotive industry), …

A first recommendation is that the State should reduce the risk it can generate by making credible and transparent its own commitments. The Yukos affair shows that much remains to be done in this field. Second, the State could share the risk with the private sector in projects which are important for the global competitiveness of Russian industry (as the EBRD), or which have a clear demonstrative effect (public investment into a small scale pilot project). This may be an option to the strategy of decreasing public debt below levels which are already low from a macroeconomic point of view.

4) new export specialisations

From short term to long term

We think that industrial policy aimed at fostering new and more diversified exports should be designed according to three time frameworks :

- short term : the aim is to support productions which already exist but which, for some reason, cannot find export markets
- medium term : the aim is to spur the emergence of productions for which there is already a market but which need investments and developments
- long term : the aim is to position Russia on technologies and markets which do not exist but present a great potential

Short term specialisations

As of today, there are a lot of Russian products which cannot find their export market for various reasons, and they can be found in nearly all types of sectors:

- raw materials and components
- consumer goods
- equipments

If large commodity market are easy to approach, with a limited number of large producers and end-clients or intermediaries, things are much more complex with more specific materials or components, where the markets are more fragmented and requirements in terms of services or quality are higher. Typically, engineering industry, made up of thousands of small and medium size enterprises, is a large consumer of special steels and alloys, metal components, which are produced in Russia often at much lower cost than in Western Europe. Besides, these companies face a fierce international competition, in particular from Asia, and are eager to reduce cost of purchases. However, when it comes to dealing with a large number of clients with specific requirements in a long-term relationship, we believe that Russian suppliers often lack the culture, or simply the organisation, to identify the clients, approach them and understand their needs, ensure a good logistics and a stable quality, etc.

The same applies to a number of consumer goods produced in Russia, from articles for artists to bone-china, which meet market requirements in terms of quality and are very competitive price-wise. If the markets are often easier to identify than in the previous case, Russian producers tend to think that cheap prices will be enough to increase rapidly export volumes producers, and underestimate the initial investment necessary to become known on a new market. Moreover, logistic and packaging issues are often neglected.

Many Russian equipments are very competitive in terms of price and performance, and could be sold on international markets, as it is already the case with weapons for which Russia is one of the major exporters. However, they usually suffer from a deficient image, not so much because of the product itself (although in some cases a light and easy adaptation of the design or of some components may significantly improve the perception), but mostly because of the poor services provided by Russian firms. Indeed, a decent customer relationship (with dedicated managers speaking at least English), credible contractual guarantees, respect of delays, training of users and quick availability of spare parts are all elements which are not less important than the initial price of the equipment itself. Moreover, Russian

manufacturers often lack the financial resources to provide financing schemes which are also crucial in the choice of the customer. The example of the space rockets or the Be-200 (amphibious aircraft produced by the company Irkut), whose marketing is ensured by foreign companies, clearly show that Russian producers have difficulty to sell their equipments by themselves.

From the analysis above, we suggest that public support should concentrate on :

- economic intelligence
- training
- export financing

As many advanced countries, Russia should have a network of chambers of commerce in the most interesting export markets whose tasks should be to elaborate market surveys (translating existing market surveys in Russian would be a first step), to link Russian firms with the main clients, to widespread information about the exhibitions, the tenders, logistic and certification issues, etc. Such representations already exist, but we have noticed quite often that, being very far from Russian firms, they tend to work with foreign firms interested in the Russian market. Moreover, it is extremely important to ensure that their work is available to the majority of Russian firms, and here we could recommend an internet portal as a good tool (that would also permit to measure the efficiency of their work). In addition, common export approaches, whereby several firms unite their efforts, should be encouraged. As the experience of many other countries shows, such a policy would be all the more efficient as it will rely on the vast community of Russian living abroad.

We believe that education and training is another area where the State could help enterprises. As far as education is concerned, there are very few specialisations focusing on exports, and they should be developed to create specialists in this field. Moreover, adult continuing training at firms could be encouraged through a partial financing of the cost.

Finally, since the approach of export markets is costly and risky, the State should, as it is the case in most OECD countries, participate in the financing. Participation to the exhibitions, business trips, translation of web sites and brochures, cost of certification could be partially financed. For larger projects requiring significant up-stream investments, these subsidies could be reimbursable.

Medium term specialisations

We have in mind productions for which there is an export market, but no Russian offer quickly available. Therefore, the idea is to create a new specialisation, possibly but not necessarily based on a existing know-how.

The choice of the sectors to be supported is probably more difficult than in the import-substitution case where data from the customs were a good . Indeed, when it comes to the creation of a future specialisation, the danger is that policy makers tend to select activities according to their desires - and high technologies and automotive industry are more prestigious than more basic industries - rather than to real possibilities. An ambitious vision for the future is probably necessary (otherwise a company like EADS would not be born), but there is only a fine line between a vision and an impossible dream! Moreover, beyond the lack of objectivity of the policy makers, the future itself is uncertain, in terms of markets and technologies. It is possible to limit this uncertainty by selecting large and mature markets, but then competition will be fierce, and as we suggested above we doubt that this is the kind of environment where Russian enterprises have a real comparative advantage.

However, we believe that there may be some guidelines to avoid major failures.

First, this is the existence of a significant potential market within Russia. This gives more room for manoeuvre to implement the industrial policy, for instance through publics purchases or initial protectionism, and eventually to create a national champion benefiting from a strong domestic base. A company like Areva would not be a world leader in nuclear technologies without its large domestic market

(more than 70% of electricity is generated in nuclear power plants in France). Moreover, the investment associated with the creation of a competitive environment (for instance through dedicated infrastructures, education, public R&D, …) will more likely be helpful in the longer term, even if the initial choice for the national champion turns out to be wrong. One could think of many sectors which could be interesting candidates, among which :

- environmental technologies and equipments : needs to recycle wastes, decontaminate soils, reduce energy consumption are huge in Russia
- transportation equipments such (trains, ships, aircrafts) : geographic characteristics of the country, necessity to replace an ageing fleet
- equipments for oil and gas and mining industries : Russia will be a major exporter for decades

Second, many projects have been developed by research institutes or design offices, often as civilian applications of military or space technologies, such as floating nuclear power stations or air-cleaning technologies developed for the Mir station[19]. However, due to a lack of financing or commercial culture, most of these projects have been frozen. It would probably make sense to revive the most promising through State support.

Third, if it is probably too difficult for Russia to target large world markets for consumer goods, we think that it would be interesting to specialize on technologies and equipments for emerging markets, revisiting the concept of "intermediary technologies" first developed by E.F. Schumacher. The underlying idea is that most equipments manufactured by large industrial groups are too sophisticated and costly for poor emerging markets, but that there would be a solvent demand for more basic technologies. A good recent example is the Logan, the new car by Renault which will be produced in Moscow as well as in other emerging countries and has been designed in a completely new way in order to minimize production costs. Indeed, this concept is not new in Russia since Soviet Union used to export extensively its equipments to emerging countries of the socialist block, but with the change of political regimes and the lack of attractiveness of Russian offer in terms of product, services and financing (in the past the purchases were largely captive), the volumes have dramatically dropped. However, Russia has many assets to target these markets :

- as a new player on many markets, the risk to cannibalise the existing production is not relevant (this was an argument often advanced by auto-manufacturers to not develop cheaper cars)
- Russia has the experience of producing simple and robust equipments (think of the Kalachnikov machine-gun!), in particular thanks to the lack of sophisticated electronics
- the cost of developing new designs is probably substantially less in Russia and there is a very important know-how
- the production process is likely to be based on a limited automation (cheap labour force), and therefore can be transposed more easily to emerging markets than technology from more advanced countries

Altogether, we believe that Russia should take advantage of its well-educated work force and its outstanding scientific and technological experience to target productions with higher value-added, and equipments are probably more appropriate than consumer goods. In this respect, a model for Russia is probably Germany which has very strong positions in the engineering industry.

State support is crucial to foster the development of these new specialisations, since the machine-building sector is overall in crisis. A first step is certainly to restructure the sector in order to avoid harmful competition and to create players with the minimum size to compete on international markets. This is relatively feasible when the State is still a major shareholder, as it is still the case in the defence industry, but if not, the perspective of State support may play as a strong incentive to accept mergers. In a second step, this support should be aimed at permitting the manufacturers to develop new products and to access new markets. This could be achieved through a various set of measures:

- public financing of R&D investments on a limited number of programs
- temporary protection and public purchases in order to restore a sound financial situation

[19] This technology is now used by the foreign company AirInSpace (http://www.airinspace.com/index_fr.htm) for application in particular in the health and food industries.

- State guarantee on export contracts
- Etc.

We think that it is urgent to implement an ambitious industrial policy in mechanical engineering. Indeed, the know-how inherited from the Soviet period may disappear rapidly. Civilian aeronautics is for instance a good example of an industry which urgently needs a strong State support.

Long term specialisations

Beyond the specializations corresponding to markets which already exist, a country should prepare its future by exploring technologies and markets of tomorrow. Most rich OECD countries have drawn lists of key technologies for the future, among which biotechnologies and nanotechnologies are probably the most often quoted. If Russia, with its exceptional scientific potential, can theoretically aspire to a non-marginal role in these technologies, it should not overestimate the contribution to these fashionable and breakthrough technologies to its economy. Indeed, the markets for these innovations will be abroad, and it is very likely that the Russian successful start-ups will either migrate abroad or their patents and know-how will be bought by foreign industrial groups, with very little spillovers for Russian economy. For instance, R&D units which will work on new biodrugs will have to be close to markets to obtain marketing authorisation, but also because they will be much more customised than traditional drugs coming from biochemistry. Moreover, these very promising technologies require huge investments in early phases, and Russia lacks the capital market necessary to accompany the growth of new companies.

Therefore, we suggest that Russia should concentrate in priority on technologies for which:

1. the scientific base gives Russia an advantage over other countries
2. there will be a market in Russia
3. excellence can be achieved without huge investments
4. there are Russian or foreign enterprises capable to undertake the production in Russia

In this respect, technologies related to energy, transport and telecommunications, environment, which will be of the greatest importance in the XXIth century, could be the most promising for Russia. The elaboration of strategic programs should be entrust to a independent group of experts including representatives of the government, research institutions, the private sectors (large indsutrial groups and SMEs) from Russia and foreign countries, since these programs should be integrated in a framework of cooperation with other nations.

The path followed recently by France may be an interesting example for Russia, in particular because these two countries have in common the traditional strong involvement of the State in the economy. Indeed, the report commissioned by the French president to the CEO of the Saint-Gobain, concluded that France should focus on about ten programs, and allocate from the budget around 1 bn EUR per year. These funds will be managed by the Agency for Industrial Innovation created for this purpose, directly under the supervision of the Prime-Minister. Each program will be managed by a large industrial group which will have the mission of establishing partnerships with public research institutes and SMEs, and its objective will be to elaborate a prototype after which may start the phase of industrialisation.

The report suggests a list of interesting technologies for these programs, but the final decision will be taken by the Agency after a tender.

5) some general recommendations for the implementation of an industrial policy in Russia

To create a new agency under the responsibility of the highest level of the Russian State
International experience suggests that Russia should create a new agency in order to elaborate, implement and monitor the industrial policy. To clearly show its importance, this agency should be under the responsibility of the highest level of the Russian State. Endowed with its own budget, it should have a very broad recruitment policy in order to encompass the interests of all the actors involved (Russian State, researchers, private companies), and establish partnerships with similar agencies in other countries.

Energy	**Transport**	**Environment**	**Health**	**IT**
Fuel cell **Renewable energies :** - photovoltaic - bio-fuel - wind **Nuclear 4th generation** **Treatment of final nuclear wastes** **Deepwater oil and gas exploitation** **Energy saving constructions**	**Safe and intelligent car** **Clean automotive :** - Fuel cell - hybrid bio-fuel - hybrid electric - nanomaterials **Aeronautics of tomorrow :** - new aircrafts - automation of air-traffic control **High-speed train of new generation** **Fast transport by sea** **Automatic metro of new generation**	**Control and treatment of environmental damages** **Clean agriculture** **Water management** **CO2 sequestration** **Management of ecosystems**	**Biophotonics** **Cancer** **Noninvasive Surgery** **Fertility** **Infectious Diseases** **Degenerative Diseases** **Food quality and security**	**High-speed networks :** - HD television - high-speed internet - mobile phones of 4th generation **New interfaces :** - Radio-frequency identification - electronic identity **MEMS** **Security of networks** **Telemedicine**

To focus on a few strategic programs
Since the implementation and monitoring of programs are the most difficult part of any industrial policy, the intervention of the State should focus on a limited number of strategic programs, probably about ten.

To select the programs in a very transparent way involving international experts
The choice of the sectors which will benefit from State support should be made, as explained above, taking into account the advantages of Russia, the markets (both in Russia and abroad), foreign competition as well as the implementability of an industrial policy. We think that this analysis should be undertaken in a very open and transparent way, involving representatives from the State, research institutes, private companies, … In particular, the participation of renowned international experts would guarantee that the final choice will be relatively immune to lobbying attempts.

To condition the support to the achievement of clear objectives
The cost and the efficiency of the support should be regularly reviewed, and the enterprises benefiting from State support should be assigned clear objectives. If they fail to achieve them, the support should be stopped. As for the selection of sectors, this monitoring should involve representatives of many different entities.

To select measures which are immune to corruption
Corruption can be feared whenever there is a close interaction between the public and the private sector. Therefore, measures of any industrial policy should be chosen in the broad too-box of policy-makers so as to minimise this risk.