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**Economic development and restructuring:  
Look after Russian context**

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**JEL Codes : O16, E58**

**Keywords : Economic development, saving and capital investment, central banks and their policies, Russian economy**

# **Economic development and restructuring:**

## **Look after Russian context**

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### **Abstract**

The main approaches to the determination of growth and development in the contemporary global economy are examined. Special attention is given to the measures of services, mainly in the spheres of health and finance, and of those services increasing knowledge. The paper discusses the short run advantages of the Russian economy, connected to natural resources, on the one hand, and to the scientific and technological culture of the workforce, on the other hand. It analyses the utilization of the accumulated financial resources, provided by the sale of natural resources, for investment in mega-projects in the sphere of science-intensive production and financial control. A schema of the flexible reconstruction of the existing system of production with the aid of the credit policy by the Central Bank is proposed.

JEL : O16 - Economic Development: Saving and Capital Investment; E58 - Central Banks and Their Policies; Russian Economy

### **Résumé**

Les principales approches de détermination de la croissance et du développement dans l'économie globale contemporaine sont examinées. Une attention particulière est accordée aux méthodes de prise en compte du secteur des services, principalement ceux des finances, ceux de la connaissance et de la santé. Le papier discute les atouts à court terme de l'économie russe, liés aux ressources naturelles, d'une part, et à la culture scientifique et technologique suffisamment élevée de la population, d'autre part. Il rapporte l'utilisation des moyens financiers accumulés grâce à la vente des ressources naturelles, pour l'investissement des mégaprojets dans la sphère scientifiquement intensive de la production. Un schéma de la reconstruction flexible du système productif existant à l'aide de la politique de crédit par la Banque Centrale est proposé.

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## **Economic development and restructuring:**

### **Look after Russian context**

#### **Introduction**

How can one evaluate the capacities of any country to integrate the global economy with a positive effect for its population? Governments have to decide the objectives of long run development and consider adequate indicators to measure and, especially, to control progress.

Discussions around such problems as economic growth and social development regularly require the reconsideration of economic categories connecting the rent positions of natural resources with the effectiveness of human activity which also has a rent capacity.

In the 1960's and 70's the strategy of national development was based on the idea of prioritized investment in physical capital and in infrastructure. Economists emphasized the necessity of replacing simple labour force by perfect machines and robots. They raised also questions about such problems as how to use monocultural economic specialization for the accumulation of capital (Konovalova (1972) Tulpanov (1969)), and how to develop strategies to assure complementarity between the manufacturing and labour complexes in processes of scientific and technological improvement.

In our time the analogous questioning develops according to the following guiding principles: One studies the significance of knowledge accumulation for modern economics; one concludes that economic growth requires the redistribution of resources and human activity in favour of non-material spheres, the substitution of manufacturing for the production of knowledge and particularly in service industries. In this respect the new stage of globalisation becomes a complementary factor of growth because it enhances connections between national economies and contributes the strategy of extending information and diffusion of knowledge. Now, the accumulation of knowledge is important not only for the advancement of science, but also for industries that use the results of this knowledge development activity.

Researchers note the following peculiarities of this type of "knowledge-based" economies: first, a reduction of "competition" occurs (Aghion & alii (2005)), in light of which secondary financing of the already carried out innovation is of no earthly use (Peaucelle & Peaucelle (1978)); second, one turns attention to the creative destruction of manufacturing systems caused by innovation, described by Shumpeter; and, third, one observes the increase of business activity risks (Aghion & alii (2001)). Not all industries become knowledge-intensive in countries whose economy is based on knowledge. But even in the economically weakest countries, with monoculture specialisation, knowledge-intensive industries can exist. The intensity of research conducted by the firms and the intensity of competitive capacity depend to a high degree on the sphere of activity.

Two factors connect competition and innovation: innovation is necessary, in order to avoid competition and to attain monopoly status but, at the same time, it strengthens competition, because the development of new goods, as a result of the innovative activity, reduces the intensity of new research. L. Soete (2001), drawing on numerous empirical studies has shown that the accumulation of relative superiority (in terms of: the skills to produce and to act, the degree of the qualification of the workforce, and the capability for innovation) explains the stability of the dissimilarity between the efficiencies of various economic systems. The relative weakness of the industrial and scientific potential of any country, write J-L. Beffa (2005), in comparison with its competitors, is not necessarily connected with the

weakness of the scientific sector of its firms, but is connected to a larger degree with the country's specialization in production with low technological intensity.

This diagnosis can be applied to the economy of Russia. The energy sources sector, considered as one of low technological intensity, is a uniquely important line in the diagram of the creation of its GDP: energy rent is evaluated at 26% of GDP.

In the current period the finance, as a sphere of services taking part in strategic management of firms and territories becomes an activity intensive in knowledge and innovation. Pascal Petit (2005) suggests paying special attention to 3 indices, which can become the new key parameters of economic development. The first of these is the innovative capability of services, determining the dynamics of a new technological system of production; the second is the logistic capacity of services, which allows enhancing flexibility in the division of labour between firms; and, third, the introduction in practice of new financial criteria of management.

The services as communication, business and finance become knowledge-intensive, but science to no lesser degree impinges on the processes of medical services (Boyer (2004)), education and finance. The evaluation of the impact of financial activity on social and economic development is an important task of economic theory.

In this work I describe the mechanism for achieving the assigned goals of Russian development with 1) the aid, in the long run, of new technology through highly risky mega projects and 2) the goals of flexible reconstruction, using financial means.

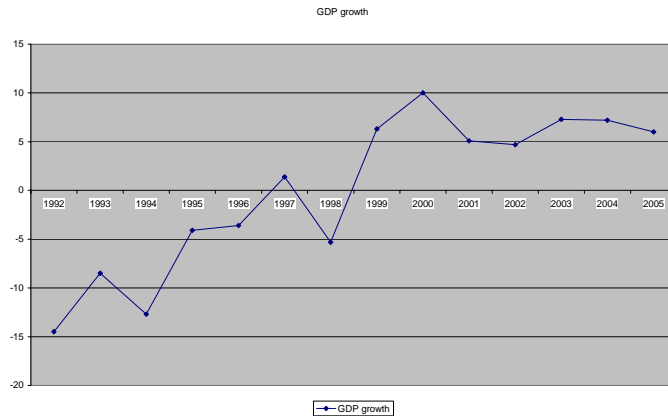
The paper includes the model, which describes the way to use credit policy in governing the dynamics of firms' shifts between classes of risk. Such credit policy can control creative economic restructuring.

## **1. Indicators of development**

In the first years of the 21st century, the Western countries have let the rates of GDP growth fall while some Eastern countries have doubled and trebled them. It creates the disappointment among the persons supporting that economic growth is the motor of development. To dispel this distress one must guess the distinctions between the analysis of growth rates of gross national product and that of the expansion of wealth (absolute size of gross national product). It is especially important to determine the qualitative improvement of the well-being of the population, because the gaps are so great that it appears necessary to reconsider once again the concepts of "growth" and of "development". Classifications of territories and countries, depending on the choice of indicators, are extremely different, signifying the profound erosion of the social types of regulation, based on these indicators.

### *Advantages and inconveniences of economic growth indicators*

In the overwhelming majority of studies, the rate of GDP increase is used as an indicator of growth and the index of GDP per capita as an indicator of the country's wealth. The next graph represents the real GDP growth in Russia for 1992-2005.



The average rate of growth of GDP per capita in Russia until 1952 was 1.5%. In comparison, the world average increase of GDP per capita for this period was 2.1%. In absolute numbers the GDP per capita knew disastrous decrease in 1990s. For all that, in 2002, Russia was at 53rd position in the world.

#### Russia: GDP per capita (PPP-\$)

1990	1995	2000	2002
8340	5930	7240	8230

Sources: ONU

These indicators are simple and telling for a country's growth. However, comparisons on the basis of both indexes can introduce significant distortions and inaccuracies into the analysis, because different methods exist to calculate GDP, creating different numbers. In some definitions, chosen by the ONU for example, the GDP includes the commodity and non commodity sectors, but boundaries between these sectors in the different countries are defined differently. For example, in 2005 the rate of growth of China, using OECD methodology, was 16.8% and only 9% using the national method.

The methods for evaluating prices are extremely imprecise also for more than half of GDP, for commodities as well as for non commodity sectors and, in particular, for services. A propos, at the end of the 20th century services became the major sector structuring all spheres of activity.

In 2005 Russian statistical agencies carried out a new classification of economic activity, which make it possible a better accounting of lately emerged activities, and services in particular. The principal difference with previous classification by branches is the absence of "Industry" as type of activity. In its place one finds three sections: "Natural resources mining", "Manufacturing" (which includes Editing and Sound recording) and "Production and distribution of electric power, gas and water". The section "Real estate, lease and services' granting" takes account, among many others, of activity related to scientific research and innovation. By number of enterprises and the value of turnover the most important section is "Retailing, wholesale, repair of cars, motors, consumer services. The section "Manufacturing" provides an important share of profits – 27.1%.

## *Advantages and inconveniences of indicators of human development and of lifespan*

The countries choosing the people wellbeing as major objective of development were the first to proceed to modernisation of their health, education and research systems, and they achieve upright results by observing the evolution of indexes especially elaborated.

Thus, the indicator of human development is another known indicator for international comparisons. In 2004 the European countries, accordingly to it, took the positions from the first (Norway) to 48th (Latvia), Russia took the 62nd position, and China the 85th.

The rating in terms of life expectancy at birth gives a different picture: China, as well as Latvia, 71.6 years; Norway 79.4 years; and Russia, only 65.3 years.

To evaluate correctly the impact of different factors on health or on the quality of life means to be able to control complex systems having several characteristics. The researcher has to:

- distinguish the exogenous and endogenous variables;
- be able to model and test the interrelationships;
- obtain statistically steady and significant results;
- be able to compare forecasts with outcomes if the analysis proceeds through simulation of policies.

Since the studied field is complex, the usual methodology consists in simplifying the problem. One creates a model, which reflects a logical graph of impact of cause on outcomes, for each cause and on all outcomes. The “realistic” character of such a graph depends on the judgement of the investigator.

Similar problems arise when one seeks to classify firms accordingly to their economic efficiency<sup>2</sup>, but in such case one escapes biases related to psychological self-appreciations by humans (Peaucelle (2004)). Indeed, the subjective methods exist to measure the quality of life and of health qualitatively. They are based on individual or collective assessments and consist in collecting the opinions of experts, or in accumulating the results of individual investigations. The difficulties related to this approach are numerous because the questions in the survey can be interpreted differently according to the cultural context, social standards or economic situation. Therefore, the investigations should be specific for each country (territory) and yet comparable at the same time.

## **2. Major factors of development in Russia**

According to the theory of K. Marx, rent is the special case of super-profit derived from the investment of capital in the activities performing minerals and ground, and subtracted from the capitalist's income by the owner of the natural resources. From the different reasons of its origin one distinguishes two types of rent: absolute rent, actually a super-profit exceeding the average rate of profit in other industries; and differential rent, which is a difference in the sizes of rent depending on the qualities of natural resources and on labour productivity in resource-sector. A share of this rent belongs to entrepreneur whose investment adds to labour productivity.

The president of the economic section of RAS, Dmitry Lvov, considers that if one evaluates all undistributed profit of modern Russia on the basis of 100, general labour brings in 5 percent of profit, business 20 percent, but 75 percent is provided by natural resources: gas, oil, forest, fish and etc. Consequently, basic profit is created by the natural potential of the country, it is the absolute rent, and an owner must dispose of this super-profit. In Russia

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<sup>2</sup> I'll come again to firms' rating in the section 4 and in Annex 2 of this text.

the owner is the entire population or its representative, the state. The differential rent is very low in Russia, for example, the cost of extraction of one barrel of oil in this country is equal to 15 \$, while it is only 5\$ in Saudi Arabia

In the analysis of potential acceleration of economic development one can also evaluate rents constituted because of utilisation of scientific and technological innovations created by people. For example, Frolov (2004) selects two new types of rent in economic relations in the modern global world. Namely, technological rent 1 is an activity of economic agents involved in high-processing industries, as compared to activity in other industries with low technological intensity. Technological rent 2 is derived from the use of an innovative business cycle providing local monopolistic profit as compared to competitors.

It is possible to conclude in accord with these definitions that in the 1980's rent 1 was the engine of economic growth in Russia, as evidenced in the aviation industry, robot construction, rocket-space engineering, and radio electronics, all of which are highly technological, knowledge-intensive productions. And this type of rent was promoted and used by the state (USSR). From the middle of the 90's comparative advantages went to firms, possessors of rent 2, that accumulated front-rank technologies, such as computer engineering, software, tele-communications, biotechnology; nanotechnologies, photonique, and highly skilled personnel for their use. Russia is in late in constituting the social relations of rent 2 type, and in initiating the new manner of Regulation. The usage of knowledge (mathematic, computer sciences) based financial services in the restructuring of economy at national level would generate the rent 2 super-profits.

#### *Scientific and innovative potential of the Russian economy*

At the present time the position of the Russian economy is determined, as I specified before, by the concentration of gross profits in raw materials and in industries of low technological intensity: oil, gas, petrochemical, ferrous and non ferrous metallurgy.

The labour potential of Russia is greatly reduced for many reasons: by a demographic crisis (large death rate and weak birth-rate), by low health status among the active workforce, by a lowered level of education among young people and by a decline of the indices of scientific effectiveness. I'll illustrate here only the last assertion and I use for this purpose only one indicator: the index of quoted Russian authors' scientific works [other indicators are considered in Peaucelle (1999)].

Position in the world of Russian science by scientific domains and its change (the index of scientific citations)

Scientific domains	USSR 1983	1990	1995	2001	2002	2003
Fundamental biology		4.3	1.7	1.4	1.4	1.3
Medicine		2.7	0.7	0.5	0.5	0.5
Applied biology/ecology		2.6	1.9	1.7	1.7	1.6
Chemistry		15.3	6.9	5.6	5.4	5.1
Physique		13.5	7.3	7.3	6.9	6.4
Space sciences		7.5	4.0	4.2	4.3	4.1
Engineering		6.0	3.2	3.1	2.9	2.7
Mathematic		4.9	3.9	4.4	4.4	4.2
Total	8.4	7.2	3.3	2.9	2.8	2.6

Sources: OST, Indicators 1998, 2004



The decline of position of Russian science may be traced in all fields of knowledge. Mathematics suffered less than all others, from 1990 to 2002, a 14 percent decline; but medical sciences had the worst loss, with an 81 percent decline. In the academic world, even after a considerable worsening of positions, certain works of Russian mathematicians, physicists and chemists remain highly esteemed. The last Russian Nobel laureates are physicists, J. Alfiorov (in 2000) and V. Guinsburg (in 2003), the winner of Fields medal 2006 would be G. Perelman<sup>3</sup>.

The sector of knowledge-intensive industry is represented mainly by the industries of the defence complex, including aviation, rocket-space and electronics; by the communications and radio industries; by the chemistry industry; by atomic shipbuilding; by the pharmaceutical industry; by production of chemical fibres; and by production of complex medical equipment. In 2003, these industries and not services were domineering in the knowledge-intensive sector, with 77% of this sector turnover. These industries suffered considerably during the last fifteen years.

In the USSR, the aviation industry formerly produced more than 25% of world aviation technical equipment and it employed 1.5 million persons. Now only 516 thousand persons are employed by this industry, and in its scientific sphere no more than 40 thousand persons are employed. The industry is represented by 315 enterprises and by 250 companies that exploit civil aero-techniques. There are 70 enterprises that specialise in R&D: 20 in airplanes and helicopters, 20 in engines, and 30 in devices, aggregates, and systems. Frolov (2004) writes that the deterioration of general funds in the aviation industry is 51%. The rocket-space industry strongly suffered, too. Between 1992 and 1998, there was an almost 9 fold decline in production volume and a 19 fold decline in investment. Russia is looking currently for closer ties to Western aeronautic sector in order to have access to technologies that Russian industry lacks. For that, in 2006 Russian state bank Vneshtorgbank had accumulated a stake of 5 percent in the European Aeronautic Defence and Space company, which control aircraft manufacturer Airbus. It seeks now (September 2006) a “blocking minority” interest to have an impact on this company policy.

The atomic industry is an aggregate of enterprises, research institutes and project-designer organizations based on radio-active ores, on production of radioactive materials, on development, production, repair, modernization and utilization of nuclear radiation reactor options, on equipment of atomic electric power stations, and on utilization of nuclear weapons. In 2002 this industry employed 338.2 thousand persons, but not all of them can be considered as scientifically qualified workers.

The structure of employment changes with quick expansion of services. This brings about the reorientation of young people gifts’ from technical secondary and high instruction disciplines to business and management ones (see following table).

Mainly, one observes the same type of reorientation of the students in the specialized secondary and higher schools of technical teaching between 1994 and 2002 that are: reduction in the entries in the field of education, art and culture, agriculture and health. By contrast, the request is largely increasing for the matters of economy and management, social sciences and services. The study undertaken by Ibraguimova (2003) shows that the increase in students’ admission and quota in the programmes of economy and management occurs mainly thanks to increased flows of women who would seek to adapt their formation to the supported request on behalf of the business, accountancy and office staff. The graduates of these schools would probably not act neither as reformers of the economic and financial system nor as innovators in theoretical economics, while commentators often think it observing the figures of students multiply in the discipline of economics, management and finance.

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<sup>3</sup> G.Perelman refused the medal for personal reasons.

Structural changes of admissions in secondary and high professional schools by education domains between 1994 and 2002 (%)

Domaines of education	State Secondary professional schools		All high professional schools	State high professional schools
	Admission	Quota	Admission	Quota
Education	-2,7	-3,9	-1,9	-0,9
Culture and arts	-1,0	-1,2	-0,3	-0,4
Humanities and social sciences	+5,1	+4,9	+2,1	+4,6
Economy and management	+0,8	+2,8	+12,6	+11,1
Sciences	+2,2	+1,6	-1,8	-2,2
Engineering	+0,3	-0,3	-8,5	-8,4
Agriculture	-2,6	-3,6	-2,5	-2,4
Health and Social security	-3,0	-1,3	-1,4	-3,1
Services	+1,0	+0,9	+1,8	+1,7

Sources : Ibraguimova (2003) pp.43-45

V. Nikitin (2006) reports the current matching (level of coverage) between the ICT graduates in Information and Communication Technologies (ICT) and industries' demand in these specialists in Russia. Amongst the 47 ICT areas of knowledge that compose the base for statistical classification of professionals required on specific ICT segment of labour force, 17 have a coverage level fewer than 50% signifying a discontented adaptation of instruction system to industrial needs. Some of the most priority segments of demand, as specialists in "means of communication" and in "means of automatics" are poorly covered. By contrast the coverage of demand in masters in "business computer sciences" is satisfactory that corroborate with Ibragimova (2003) remark of new requests of university diplomas among the population. Russia should develop the specialised instruction for sectors of knowledge-based services as: "system administration", "information resources management and training", and "knowledge management".

*Place of oil and gas sector in export, their contribution to creation of the Russian Funds of growth and development*

Russia accumulated significant financial reserves during a time of strong increase in the prices of natural resources, such as gas and petroleum, which it exports.

I give here a rather short picture of the current economic situation.

Russia's general exports are double the general imports (\$75 milliard and \$37 milliard respectively in first semester of 2006) .

The structure of Russia's exports in 2003 (UN, Commodity Trade Statistics Database): oil 40%, gas 14%, manufactured goods without metallurgy 16%, iron and steel 7%, nonferrous metals 6%, foods and raw materials without gas and oil 9%, other commodities 8%.

The profits of the power sector strongly depend on world prices on its products. According to the Russian Ministry of Finance, the increase of one dollar for the price of a barrel of oil gives 0,5% of GNP growth, one billion dollars of federal budget growth (0,3% of GNP) and two billion dollars of profit from exports.

#### Some indicators of Russian foreign trade

	2002	2003	2004	2005
World price for the oil in \$ for a barrel	23,7	27,2	34,5	50,6
Export Milliard \$	107	136	183	245
- in % GNP	31	32	32	32
- in volume	8,9	10,5	11,2	3,8
Import Milliard \$	61	76	97	125
- - in % GNP	18	18	17	16
- in volume	9,9	19,3	23,3	29,8
Balance of foreign trade.	46	60	86	120

Sources: ЦМАКП -2005

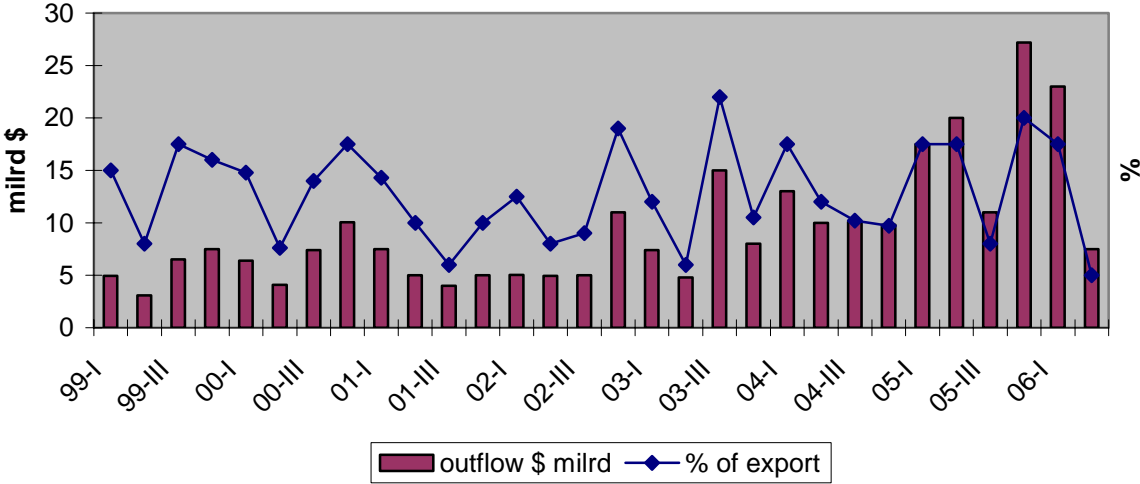
The question is: how can these financial reserves be best used in support of human development? One can use the reserves in shaping the fund for public scientific and innovative development, or as the fund for national technological agencies, for programs of regional development, for petroleum investment trusts. The resources can be used also to support exports, to reduce the tax load on firms (compensation for the falling incomes), or for the expansion of credit for development through the Russian bank.

Russian authorities began by constituting the state Stabilization Fund financed from the extra profits of the budget, based on the cost of one barrel of oil in excess of \$27. It includes also the profits gained from the savings on interest-bearing payments in the case of early pay off of external debt. The Stabilization Fund is made up to oblige the recurring expenses of the budget to remain below the minimal receipts, i.e. receipts which would be always collected, independently of the economic situation on the energy resources' markets. The state makes a decision to save, so as to ensure the normal development of the country in the event of abrupt deterioration of the exporting conditions. At the beginning, the savings of the Fund were converted into foreign currencies and paid on the accounts of the Russian federal Treasury. In 2006 the stabilization Fund comprises approximately 60 billion dollars and the reserves of exchanges consist of more than 200 billion dollars. The operations of placement of the surplus receipts of the Funds are entrusted to the ministry for Finances and to the central Bank, which manages the accounts in foreign currencies. The ministry for Finances invests the funds in the foreign assets on three accounts, one in dollars (45%), another in euros (45%) and a third of pounds sterling (10%). The Russian Central Bank proceeds by the acquisition of the claims of 14 developed foreign States. It prefers to compose its portfolio of low risked public obligations. For the moment, the Russian authorities did not have enough boldness to place these large public money sums of the Stabilization Funds inside Russia, and to convert them in Russian financial instruments.

Natural absolute rent must be used on behalf on all the population of Russia, as the owner of natural resources. However, presently the average rate of taxation in the country is about

24% of a firm’s profits, and for oil companies, for example, it is far less, contrary to economic theory, according to which it must be higher than the average. Thus, super-profits from the natural resources of the country are appropriated by companies exploiting these natural backlogs. The greater part of these super-profits is taken out by the owners of companies and invested in foreign countries for expansion of their capital.<sup>4</sup>

**Gross outflow of private capital**



The government uses national financial facilities to repurchase Russian private companies and to reinforce the nationalized sector. It should get a greater part of the rent derived from high prices on natural resources exploitation and invest these sums in the development of an innovative energetic sector, think the economists of OECD R.Ahrend and W.Tompson (2005)). I consider that Russian state should in priority increase the welfare expenditures, because 15% of the population live under the poverty threshold and the life expectancy is very low (see section 1). Contrary to that in 2006 the Investment Fund of Russia was created following the same principals as the Stabilization Fund. Its principal destination is to finance mega projects supported by private institutions.

**3. Long run development using mega high-tech projects**

The dynamics of scientific and technological development of the USSR was characterized by prominent gaps in the various fields and by the periods of relative relaxation. The capacity to concentrate the efforts at the critical times of the history, the national will to achieve the victory that could be military or scientific, is at the origin of the significant progressions in the 20th century. To join again this type of development contemporary Russia, with its liberal economy, made up of the private firms and banks, tests new methods of provisioning the great investments risky knowledge intensive projects, and supports competition for quality in the introduction of scientific inventions into every sphere of activity.

<sup>4</sup> In 2005 Russian companies realized 15 milliard dollars of direct and portfolio investments in national, innovative industrial sectors, but gross outflow of capital was equal to 72 milliard dollars (Pukhov (2006)) .

Priority directions for science, technologies, and technical development were defined in 2002. Since that year 12 mega-projects in 7 main domains of concern have been carried out. Among these are development of new materials and chemical technologies, production technologies and technologies economizing energy, computer science and telecommunication technologies, electronics, new transportation technologies, technologies for living systems, ecology and rational use of natural resources.

The mega-projects will also be instrumental in helping the country escape a demographic crisis, and for the creation of a social security system «historically and psychologically traditional for Russia ». Significant high-tech projects have an immediate positive effect because they employ the highly qualified workforce that exists in Russia and they have a long run effect by increasing the demand for education, for new competences and qualifications, and for health.

Besides mega-projects the state finances, with the help of other financial facilities, some projects within the framework of 14 so called «critical technologies». The volume of the federal budget contribution to each project cannot exceed 50% of its expenditures.

The list of «critical» technologies includes diagnostics and gene therapy, monitoring of the environment, technologies for the protection of nature, processing and utilization of technogeny, the synthesis of medications and food additives, life-support systems, bio-engineering technology, technologies for immune system correction, and the forecasting of biological and mineral resources. The tonality of these projects is rather different than that of mega projects financed directly by the public funds of investment. They support especially the innovations related to life sciences, corresponding to the objectives of human healthy development.

Within the framework of projects with mixed funding a complete innovative cycle is assumed including the applied scientific research, experimental creation, technological developments and control of production. It was assumed (says Poliakov (2005)) that in 3 years, the annual increase of sales of innovative products due to the use of newly developed technologies, will surpass 5 times the investments from the federal budget. Therefore, the money taken from a budget, through taxes, in 3 years must be returned to the budget. In our view, scientifically revolutionary projects cannot be carried out within the framework of such short time lines, nor within the current state of the scientific potential of Russia<sup>5</sup>.

#### **4. The knowledge-based financial sector in the restructuring of the economy**

In this section I propose another model of development with restructuring, which would compensate that resting on state management of public Investment and Stabilization Funds.

Theoretical background of my proposal is based on the relationship between firm defaults and general economic dynamics that has been advocated for a long time in economic literature. During a recession period, firms have more difficulty to selling their products, which can damage their balance sheet; their probability of failure increases, as well as the credit rate offered by prospective lenders. Conversely, if the probability of failure of a firm increases, it has more difficulty in finding credit at a low rate, which can increase the amount of regular reimbursements and reacts negatively on the firm's situation. This creates an

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<sup>5</sup> Probably the authorities take account of these constrains, because as the situation has developed, for example, under the Federal law «On a 2005 federal budget » some programs specifically in the domains of applied research, rather than “critical” technologies, are listed for financing: two devoted to education, three to health protection, and three others to ecology. Their financing could not be considered as capital risk, they are not “crucial” scientific problems.

accelerated movement towards default, with the usual consequences on employment, growth, and R&D.

At macro level, when the balance sheets of the companies in their large majority are surplus and support the too fast growth of production compared to the demand, Regulator can slow down the racing and accept targeted bankruptcies of companies with low innovation intensity.

To conclude such a policy of development with reorganization it is essential to detect the innovating companies and the companies with various degrees of defaulting risk.

In the studies of defaulting risks related to the venture capital in innovating companies one can use the empirical data which contain information on the frequency of the innovation and on the particular aspects of innovation process. This information comes, for example, from surveys on the subject of innovation in the companies, regularly carried out in Russia (Bousyguine & Levine (1999)), and it informs about the expenditure of innovation (concerning the products and the processes), the sources of information and forms of collaboration used by firm, the factors slowing down the innovation and the degree of achievement of the objectives related to the innovation (share in firms' sales turnover).

These data must be added to those used to calculate the scores of the companies reflecting their performances and quality of management, like those published in "the Russian Economic Barometer"<sup>6</sup>: a ratio of the exploitation cycle, profitability, solvency, rate of debt, leaves the stockholders' equity, structure of the assessment, treasury, liquidity, importance of doubtful debts.

The whole of these data must be used to constitute the score of the companies, then to detect the homogeneous classes of them compared to the bankruptcy risk. Such empirical analysis would be important for detecting the average characteristics of the companies by class.

The rating agencies can also report estimated summaries and histories of the risk evolution in the form of matrices of passage, ensuring information about the probability of the shift of one class of risk to another for different dates and for a certain collection of sectors of the economy. Such matrices of migration, having Markovian properties (Gagliardini & Gourieroux (2005)), can be used for a certain number of very important dynamic macroeconomic analyses: the assessment of bankruptcy risks as precursory indicators of reversal in the business cycles; the estimation of the systemic defaulting risk, i.e. simultaneous migrations of the companies with various degrees of risk in the same direction.

In our papers (Bousyguine & Peaucelle (2004), Peaucelle (2005)) we explained the statistical methods of constituting the homogeneous classes of default risk, and procedures to analyse risk migration, using French data (see annex).

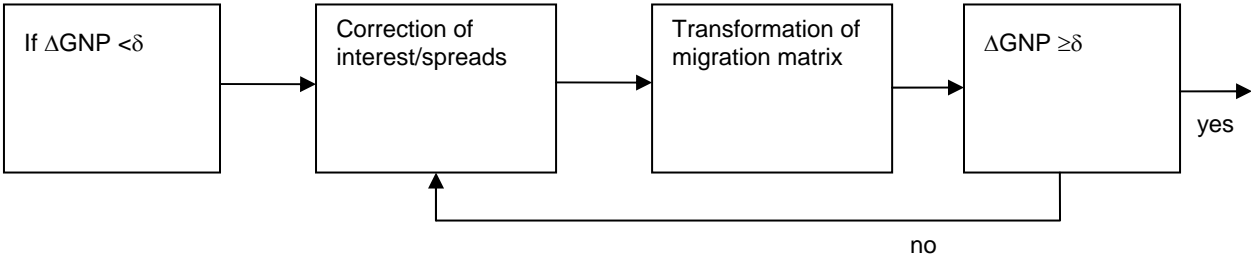
Indeed, the revelation of causality bonds between the time series of bankruptcy risks for each class of risks and the time series of credit spreads for the same classes makes it possible to indicate the elements of the matrix of credit migration the most sensitive to the variations of the conditions of credit granting.

These empirical studies guide me in my consideration of the stabilisation of complex innovation-production-financial system through the feedback management. The aim is not to find the most effective means to achieve the goal, but rather to explore the principal possibilities of its achievement and to analyse the class of potential movements of the system under control.

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<sup>6</sup> the Russian Economic Barometer; RAS, Institut of World Economy and International Relations

Migration matrices characterise the “health” of the financial and the real economy (as a system). The pressures on them can be used to provide feedback on the components of whole output of the system<sup>7</sup>. I propose the regulation consisting in credit policy addressed to firms regarding the correlated trend of risk of default, or regarding the general rate of economic growth. For example, in the case of growth-promoting industrial policy, the pressures, through credit, can be done using the model presented in the following schema.



The output gap  $\Delta\text{GNP}$  is the difference between the considered necessary economy’s output and the level of production it can achieve with existing financial facilities. The gap is positive when actual output exceeds the economy’s potential and negative when actual output is below potential output. A positive output gap is also referred to as excess demand and a negative output gap is referred to as excess supply.

The Regulator is concerned about both too much and too little output in the economy when either puts sustained up-grade or down-grade pressure on risk default flight of firms. The transmission of Regulators’ policy occurs as changes in monetary conditions that affect the demand for credit. Lower interest rates tend to increase industrial activity. Conversely, higher interest rates tend to curb firms’ spending. Strong demand for goods and services puts down-grade pressure on interest rates if it exceeds the economy’s output. Thus, when the output gap is thought to be small and demand is seen to be increasing faster than potential output, the Regulator will act to tighten monetary conditions to promote production by modifying interest rates for firms belonging to certain classes of risk, revealed as sensitive by statistical analysis. Conversely, if the economy must be kept from over-heating, then the Regulator will be less likely to intervene, and monetary conditions will be modified later to control default trends.

Typically it is the Central Bank that carries out monetary policy. It does so by influencing short-term interest rates, i.e., by raising and lowering the target for the one-day rate. The one-day rate is the interest rate at which major financial institutions borrow and lend funds among themselves. The Central Bank sets a target level for that rate, called the key policy rate. Change in the target for the one-day rate influences other interest rates, including prime rates charged by commercial banks. When interest rates go down, firms are encouraged to borrow and produce more. But if the economy grows too fast, the Central Bank can then raise interest rates to slow down borrowing. This increases the probability of bankruptcy in low quality firms, and promotes restructuring.

I consider that banks are autonomous economic agents, satisfying the rules of Basle 2, which means they credit the companies according to the degree of their bankruptcy risks, taking account of the discount rates of the Central Bank and pursuing the macro-economic

<sup>7</sup> often analysed by backward-looking Markov switching model (Peaucelle (1982))

purposes employment, growth, and inflation. Following these rules banks can help resolve the problem of risky investment and/or to fight against the financial crises.

The model I propose here is not applicable in short-term in Russia because the financial sector remains weak in comparison, for example, with France and United States. Indeed, its parameters are (International Financial Statistics. IMF.2004):

- Assets of banks represented 38 % of GNP, (France 183% of GNP, USA 94% of GNP)
- Credits of banks were 23 % of GNP (France 95% of GNP, USA 76% of GNP)
- Capitalization of stock market was 45 % of GNP (France 142% of GNP, USA 137% of GNP)
- Liquidity of stock market (ratio of annual turnover toward market capitalization) was 18% of GNP (France 110% of GNP, USA 128% of GNP).

Presently the large Russian banks are controlled by the state. Local authorities interfere in the affairs of local banks, hindering the development of competition and the entry of new banks.

Nevertheless, today in Russia (as in France and USA), new rules controlling the risks of banks and firms have been introduced, in particular, the rule of the determination of the volume of capital required for the reduction of the credit risk. Because of this requirement it becomes possible to calculate the risks of default of firms empirically, and to analyze their assumed dynamic, necessary for model proposed in this section.

### **Concluding remarks**

Recent years have seen important economic growth in Russia, and a number of adjustments among industrial sectors, technological priorities, and in health and education areas. However, international competitiveness has remained concentrated in natural resource based sectors.

The indicators of human development, health status and knowledge bases of production continued to stagnate.

I suggest that the natural resource rent has to be used for the mega project of long run health and biology improvement, and for the construction of knowledge-based financial systems able to control the restructuring of production.

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## Annexes

### Annexe 1

The synthetic indicators for measuring the quality of life and health are developed, on the one hand, by the program of the United Nations for Development (HDI - «Human Development Indicator») and, on the other hand, by the World Health Organization [Health system performance» with its component - DALE (Disability-Adjusted Life Expectancy)]. Their methodologies are at the same time well tested and contestable. The notations and evaluations are based on principles imposing concrete theoretical paradigms, causing problems of feasibility when it comes to gathering information. To make the information comparable, various conventions in regard to assessment are necessary. The outclassing of one standard of living or of one status of health by another depends on the way one evaluates. Each evaluation poses, in turn, such problems as: choice of criteria, weighting of criteria, evaluation according to each criterion, and consensus between the various appraisers concerning their evaluations in the various categories of criteria. For example, what is the impact of health status on professional attainments or on personal income? What are the important elements of social security reform? Indeed, to ensure good health and high quality of life to the whole population, it is necessary to enforce laws and regulations, i.e. favourable legal framing, transparency and acceptance of procedures of evaluation.

The composite indicator of UNDP has been calculated since 1975 for more than 100 countries (175 countries since 2003). It comprises three elements: lifespan, educational level and standard of living, measured according to the GDP per capita. To calculate this indicator, UNDP uses the sources of more than twenty different organizations and more than sixty databases.

The composite indicator of WHO is calculated for 191 countries. This indicator is a weighted average of five components: health, health inequality (life expectancy corrected for incapacity), capacity of the system of health to meet the requirements of the population (responsiveness level), distribution of the responsiveness of the existing system (responsiveness distribution), and equity of the financial contribution (fair financing). Overall, some hundreds of criteria are retained, and hundreds of partners supply the data.

The approaches of WHO and UNDP pose the following problems:

- selection of valuable characteristics and their aggregation;
- selection of weighting;
- heterogeneity of areas covered by the data;
- logical reciprocity between "quality of life and health" and "good statistics".

The pre-arrangements of the investigated countries are not very precise, because the sizes of the confidence intervals are considerably different for the various countries (territories). This means that often one cannot compare the quality of life and health of the countries for which estimations are close. As to the evolution of the indicators over time, they can reflect not only objective changes of investigated objects, but also changes of perception by a source, changes in weightings assigned to the various sources or change in the sets of sources.

### Annexe 2

The data collected by the French Central Bank (BdF) include the balance sheets of about 185 000 French firms per year, 85% of workforces and 90% of distributed bank credits. In the French Central Bank definition, the contribution of economic ratios on the indicator of a firm financial situation depends on the sector. For example, for Industry eight economic ratios contribute to the score value. The score indicates the health of firms in report with the management ratios, such as: provider deadline, tax and social security creditor; rate of return and return on sales: rate of added value; solvency: burden of financial charges; debt: leasing liabilities, capital-debt ratio; and current liabilities: liquidity, bad or doubtful debt. The information included in the balance sheet is transformed into a quantitative score representing the risk level of defaulting.<sup>8</sup> Then the scores are discretized to

get qualitative ratings with eleven classes of risk (average probability of default at the horizon of three years), noted D, 1, ..., 10. The alternative "D" corresponds to default and the alternative "10" indicates a safe financial situation. The default in the French Central Bank rating signifies that the enterprise is under bankruptcy procedure. Thus, in 2001 among industrial firms in France 20.4% of firms had a high probability of default, 8.4% of firms were neutral, and 71.2% were healthy firms. Example of transition matrix reported by the Banque de France is given below.

Migration probabilities "Industry", between 1999 and 2000 (in %)

	10	9	8	7	6	5	4	3	2	1	D	NS
10	72,38	15,91	1,34	1,51	0,46	0,17	0,41	0,24	0,05	0	0,05	7,49
9	12,47	57,58	13,56	5,75	0,92	0,59	0,72	0,98	0,1	0,06	0,09	7,17
8	1,28	26,67	35,74	23,35	1,77	0,66	1,12	2,04	0,43	0,05	0,17	6,72
7	0,39	4,88	16,16	50,57	8,71	2,94	2,13	4,21	1,21	0,54	0,48	7,79
6	0,26	1,9	3,01	33,61	23,3	10	6,96	6,76	2,24	1,42	1,45	9,09
5	0,26	1,94	2,51	17,21	20,92	16,16	14,07	9,94	3,71	1,94	1,78	9,57
4	0,25	2,04	3,05	12,98	12,53	12,83	17,52	14,56	4,68	4,18	2,85	12,53
3	0,08	1,62	3,05	13,64	9,3	5,89	11,61	21,11	7,11	6,21	4,34	16,04
2	0,11	0,78	1,56	8,16	8,6	5,81	10,61	16,54	12,74	9,5	7,37	18,21
1	0	0,24	0,82	2,83	4,59	3,53	6,48	12,96	8,48	24,5	15,31	20,26

A lot of migration probabilities are rather small. The significant values are mainly around the main diagonal, which represents the proportions of firms keeping their previous class of default probability, and for column "D" default as absorbing state. The risk of default changes in time, and the score of any firm can maintain it in the same class of risk or switch it into another class. The structure of migrations among the classes allows us to analyse the risk dynamics. In France the data have been collected since 1992, which provides 13 years of transition matrices.

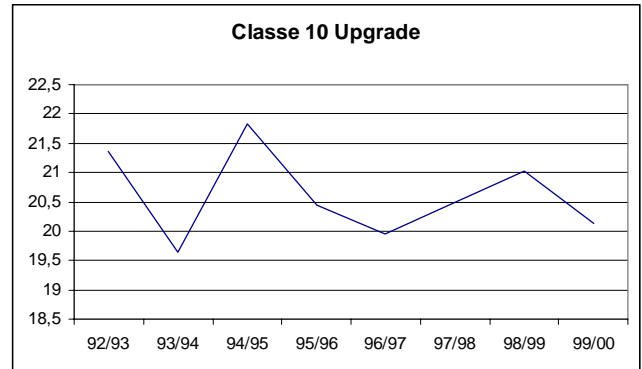
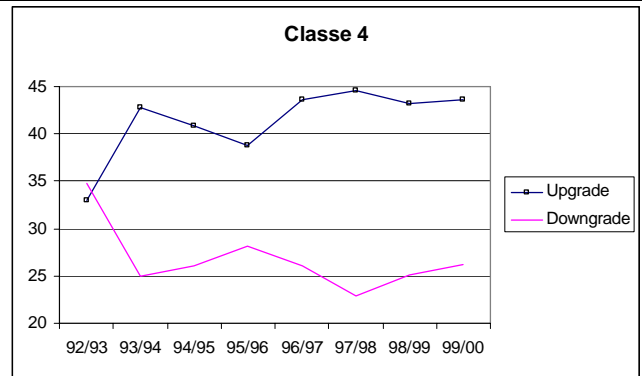
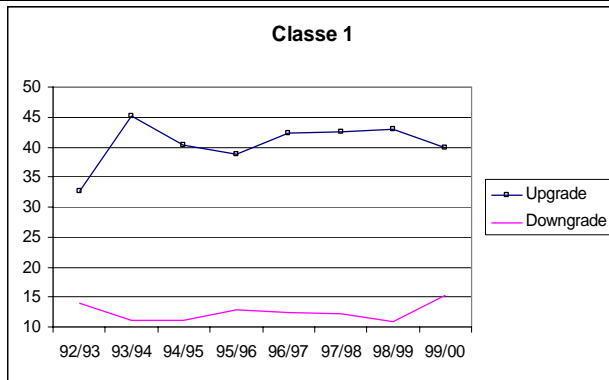
The matrices of yearly migration probabilities can be summarized by considering the probabilities of a down-grade [respectively of an up-grade]. One can extract directly the information concerning the firms of class  $k$  that, with certain probability, can change their score. Let define for each year the percentage of firms of class  $k$  down-grading [respectively, up-grading] their scores  $\pi_{k,t}^d$  ( $\pi_{k,t}^u$ ), as:

$$\pi_{k,t}^d = \sum_{h < k} \pi_{kh,t}$$

$$\pi_{k,t}^u = \sum_{h > k} \pi_{kh,t}$$

Since we have a set of matrices of transition corresponding to different years, we can deduce the sets of  $\{\pi_{k,t}^d\}$  and of  $\{\pi_{k,t}^u\}$  for each class of risk  $k = 1 \dots 10$ . The graphs of evolution of these sets give us the picture of dynamic evolution of firms' scores. Example for four classes of French industrial firms, from 1992 to 2001, is given in Graph 1.

Graph 1. Evolution of probabilities to upgrade and downgrade the score



The evaluation of migration probabilities of firms in France shows clearly some common feature, with at most two underlying patterns: 1) the evolutions for up-grade are in the inverse directions of the evolutions for down-grade, the up-upgrades have an ascending trend in each class of risk on the period between 1992-2001, and the down-upgrades feature has inverse declining general trend (except the class 1 of high default risk); 2) the evolutions of class of risk on the period between 1992-2001 in France for three sectors: industry (presented here), wholesale and retail trade (Gagliardini & Gourieroux (2005)) are very similar.

I use the sets of up-grading risk of default in French industrial sector, looking to dynamic correlation with GDP grows trend and I perform a causality analysis of the dynamic linear link between them.

For analysed French industrial sectors the test of causality indicates that, on the one hand, for the classes of low risk the GDP is a leading indicator of the down-grade risk migration, but on the other hand, the ordering between both measures is reversed for the very risky classes. For these classes the down-grade probabilities can be considered as leading indicator of the economic growth with a lead of two and three years. Besides, the down-grade tendency is more reactive than the up-grade one to GNP modification.

#### Study of causal relations between GNP and $\tilde{\pi}_{k,t}^d$ and $\tilde{\pi}_{k,t}^u$

Classe	10	9	8	7	6	5	4	3	2	1
GNP $\rightarrow \pi_{k,t}^d$	7,60	4,72	13,12	11,91	7,45	9,29	25,66	12,09	10,71	3,05
$\pi_{k,t}^d \rightarrow$ GNP	14,26	19,92	23,16	22,86	15,07	17,26	39,76	21,00	14,64	14,71
GNP $\rightarrow \pi_{k,t}^u$		5,78	21,51	13,18	7,54	7,36	11,33	2,08	3,67	3,61
$\pi_{k,t}^u \rightarrow$ GNP		14,41	31,96	20,87	15,96	15,72	19,86	17,99	16,42	13,26

The firms' scoring determines the class of risk to which it belongs and consequently the condition of credit (amount and term) it can count on. In any case the "health" of operating firm depends on quality of credit it gets.

Interest represents the amount that lenders charge borrowers for use of the lenders' money over a period of time. Interest is paid in two principal ways: simple interest is expressed as a percentage of the principal over a

year; compound interest occurs when calculations of interest are made on the principal plus accumulated interest. Banks do not necessarily determine the general level of interest rates. As intermediaries between lenders and borrowers, they reflect the relative intensity of the supply of and demand for creditable funds.

Time has an important influence on the level of interest rates. Short-term interest rates usually apply to money lent for a period of less than one year. As the term of the credit increases, interest rates can be either higher or lower than short-term rates. They reflect the expected level of short-term interest rates in the future plus a premium to compensate for uncertainty. Term spreads are long-term minus short-term interest rates.

In Boussyguine & Peaucelle (2004) the causal relation between the trends of upgrade and downgrade in French industrial sector and the spreads evolution, as well as with evolution of treasury bonds are analysed. It is shown that the rate of bonds remuneration is an advanced indicator for downgrade movement in one risky class (2nd class) and in neutral risky classes (6, 7, 8, 9). It is also leading indicator for upgrade movement in relatively neutral to risk classes (4, 5, 6 and 7). The causal impact of spread is observed only for two classes of risk (5 and 7) and it is statistically significant for upgrade trend as well as for downgrades.

Study of causal relations between spreads, treasury bonds, taa, and  $\tilde{\pi}_{k,t}^d$  and  $\tilde{\pi}_{k,t}^u$

	10	9	8	7	6	5	4	3	2	1
taa $\rightarrow \pi_{k,t}^d$	3,43	4,08	4,61	4,92	7,16	1,64	1,87	1,38	3,98	1,22
spread $\rightarrow \pi_{k,t}^d$	0,07	2,62	2,25	4,00	2,85	4,72	1,15	1,50	2,64	0,29

	9	8	7	6	5	4	3	2	1
taa $\rightarrow \pi_{k,t}^u$	1,07	1,53	8,91	9,85	10,19	7,75	2,85	2,95	1,65
spread $\rightarrow \pi_{k,t}^u$	3,48	2,26	4,95	1,28	4,22	0,87	2,24	1,05	0,82

The performed causal statistical analyses show, that, contrary to theory, the variability in credit spreads can cause only a fraction of the changing default expectations. For the highest quality firms, where the probability of default is low, this factor explains relatively little of the variation of risk migration. In future empirical works it will be important to decompose credit spreads into credit and non-credit risk components, because, as we could observed, credit risk is not the only factor that affects firm yield spreads. More strong results in the analysis on the impact of financial tools on real default risk are necessary if one hopes to use them in credit policy.