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The Country's Economic Growth Models and the Potential for Budgetary, Monetary and Private Financing of Gross Domestic Product Growth

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Abstract:

This article examines the financing of GDP growth within the framework of catch-up, evolutionary and dynamic models of economic development. Methods/statistical analysis: using the principles of the Solow model and the Cobb-Douglas function, an analysis of the nature of the models has been carried out, considering the processes of capital accumulation, the rate of growth of the workforce, and various aggregate factor productivities. With the help of historical logic and statistical evaluation, examples of countries relating to each of the models examined are reviewed.

Based on the analysis, the main ways of financing economic growth are noted: both the state ones, due to budgetary and monetary policy measures, and private ones. It has been proven that with the transition from catch-up to an evolutionary or dynamic model, the role of the state as a centralizing force is diminishing. At the same time, the specificity of a dynamic model is due to the country's objective ability to be among the technological leaders, which is predetermined by the high values of current GDP, per capita GDP, and population size. Countries with an evolutionary model of development are constrained in their ability to maintain a comparable pace of development only within separate "growth points".

The main result of the work is the assessment of Russia's potential from the viewpoint of one of the models considered, based on a comparative analysis of several capital indicators, as well as a logical analysis of data on the level of GDP and population with other countries. This makes it possible to make recommendations for financing the country's GDP growth in the medium to long term. Scope/Improvements: The findings can be used in the development of Russia's financial and economic strategy up to 2030.

Keywords: *Financial resources, financing GDP growth, catch-up model, evolutionary model, dynamic model.*

JEL Classification: *O10, E63.*

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1. Introduction

The specific nature of the economic growth financing in a country consists in carrying out systemic measures aimed at intensifying, first, capital accumulation, secondly, investing in the modernization of fixed assets and/or developing innovative technologies. The existence of a permanent mechanism in the national economy for the financing of modern and prospective industries is an important asset for any model of economic development. The essence of this mechanism is that the economic actors are prepared, without state participation, to accumulate financial resources, invest in the most attractive new technologies and production, create on this basis the external and domestic marketable goods and services, with a high value-added share, and make profit, followed by refinancing in the development and production of a new generation of products (Alekseev, 2012). Within the framework of the mechanism described, a defined role is assigned to the state as a supporting entity. However, if it is necessary to build it "from the zero cycle", its role becomes critical.

2. Concept

Several specific ways of GDP growth financing, corresponding to the three main economic development models, can be identified:

a) catch-up model;
b) evolutionary model;
c) dynamic model.

The catch-up model of economic development is applied in conditions of a significant gap in the levels of scientific and technological development of a specific country and leading countries.

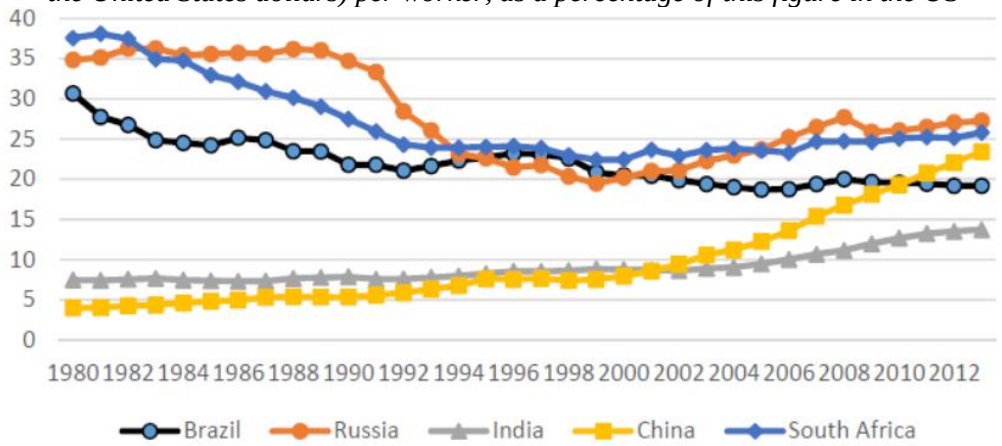
Catch-up development took place in the USSR, South Korea, China, Germany, and Japan. The ways of financing economic growth in these countries assumed the active role of the state. In the USSR, which used administrative-command mechanisms for managing the economy, centralized purchase of foreign equipment and technologies was carried out and their approbation in production, which was also created at the expense of the state. In China, the process was carried out through the involvement of Western companies in the national market (Akhmadeev *et al.,* 2016).

The advantages of such an approach were to reduce the cost of labor and to significantly save costs. In South Korea and Japan, the breakthrough became possible by the creation of large financial and industrial groups that introduced new technologies into their sectors of the economy. In Germany, in the aftermath of the Second World War, nationals, whom had been granted rights to the enterprises in which they worked (like the idea of Russian voucher privatization), were engaged in economic recovery. In so doing, the State actively financed the acquisition of new

technologies from the budget (Akhmadeev *et al.*, 2016). It should be noted that only in Germany the involvement of the population in economic recovery has been done through market-based incentive schemes.

Along with examples of successful catch-up modernizations (Bykanova *et al.*, 2017; Vevchenko *et al.*, 2016) there are many cases in which ambitious plans to create a modern economy have not been realized. This applies to many countries in Asia, Africa and Latin America (Figure 1). The reasons for the failure were the lack of financial resources, the shortage of skilled manpower, the poor quality of management and the low rate of national business activity.

Figure 1. *The gap in labour productivity in BRICS countries (1980-2012), GDP (in the United States dollars) per worker, as a percentage of this figure in the US*



Source: *The Conference Board Total Economy Database GGDC/University of Gronengen (https://www.conference-board.org/data/economydatabase/).*

In general, the features of catch-up development that directly affect the sources of its financing include:

a) The need for foreign currency for import purchases, including machinery, equipment and technologies;
b) Investment in fixed assets related to medium-and long-term financial sources;
c) Lack of broad domestic market;
d) Inadequate tax revenues to the budget system;
e) Low credit rating of the country;
f) Underdeveloped banking system;
g) Undeveloped stock market.

Foreign exchange requirements for imported purchases, including machinery, equipment and technologies, are usually met by export earnings and the devaluation of the national currency. But stimulating exports of traditional products and raw

materials through devaluation determines the cost of imports needed to create new production. Another aspect is that the sale of export earnings in the currency market leads to its acquisition by importers for the subsequent importation into the country of consumer goods not produced in the national economy or cheaper ones, as well as luxury goods. (Kosov, Sharov and Akhmadeyev, 2017; Danilina, Gaifutdinova & Kuznetsof, 2015; Thalassinos and Thalassinos, 2006).

To prevent this, the accumulation of export earnings in special funds and their subsequent use for the purchase of investment goods and intellectual property are generally used. In this regard, the structural adjustment of the economic system can be effectively addressed by centralizing the management of foreign exchange resources through state economic development programs (Varlamov, Kostin, Mamedov, Omarov, Belyaev, Danko and Sekerin, 2016; Pociovalisteanu *et al.,* 2010).

Large-scale investment in fixed assets as a feature of catch-up development determines the need for medium-and long-term financial resources. National industry tends to have limited quantities of such sources. In this context, joint ventures with foreign partners, the attraction of direct and portfolio foreign investment are widely used. In countries with natural resources but without the capacity to develop them independently, the form of concession contracts is also used. The experience of the Southeast Asian states shows that an important stimulus for the development of the national economy is the attraction of foreign capital in the form of assembly production, when the host country receives investments in the form of productive capital (Danko, Panova, Kazaryan, Kazaryan and Sekerin, 2017).

Portfolio investment, namely, the sale of shares of national companies to foreign investors, their placement on international exchanges, allows for a significant increase in equity capital, thus obtaining an important financial source of expansion production activities. One of the most important features of catch-up development is the establishment of modern infrastructure. The main financial sources for this are the issuance of government bonds, and bank loans. (Glaz'ev, 1993; Denisova, Rukina, Samoylova & Takmazyan, 2017).

Insufficient tax revenues in the budget system limit the state's ability to implement budgetary expenditures and to establish government-administered investment funds. The low credit rating of the country has resulted in high borrowing costs on the world financial market. As the experience of a few developing countries has shown, the extensive use of the expensive credit resources available on the world market is capable not only of significantly slowing but also of disrupting the modernization of the national economy. The underdeveloped banking system prejudges the scarcity and high cost of credit resources. However, the borrowing time is short-term, which makes it difficult to finance medium-and long-term projects. The undeveloped stock market also does not mobilize large amounts of equity capital and the receipt of bond loans. The evolutionary model of economic development means that the

country has sufficient capacity to perceive current trends in science and technology and to apply innovation created in other countries (Komarov, 2015).

The specificity of the dynamic model of economic development is in the availability of a mechanism to generate innovation and, consequently, continuous updating of the technological base and the product series. The framework is based on a well-developed base of basic and applied research and a system for bringing scientific discoveries, including around military development, to practical application in the corporate sector.

3. Methods

The difference between the catch-up, evolutionary and dynamic models, which predetermines the different role of the state in financing GDP growth, can be considered in the Solow model (Kosov, Akhmadeev, Bykanova, Osipov, Ekimova and Frumina, 2016; Ratnasih, 2017) in which the neoclassical production function *Y = F (K, L)* is represented as a Cobb-Douglas multiplicative function of the Cobb-Douglas function (Cobb, Douglas, 1928) which has the following form:

$Y = AK \quad L^{1-}$,

or in the log-linear form: $LnY = (1- \alpha)\, LnL + \alpha LnK + LnA$,

where Y–is the GDP level;
K is the accumulation of capital;
A is the aggregate factor productivity;
L is the magnitude of labor resources;
α is the coefficient of GDP elasticity by capital;
1-α is the coefficient of GDP elasticity by labor.

The main feature of the two-factor production function of Cobb-Douglas is that for it the factor $e^{g\alpha t}(A_0)^{\alpha}$ can be interpreted as: labor-saving (Harrod-neutral) technical progress; as a capital-saving (Solow-neutral) and as increasing aggregate factor productivity (hereinafter referred to as AFP) (Hicks-neutral) progress:

$$Y(t) = L(t)^{1-\alpha}(e^{gt}A_0K(t))^{\alpha} = (e^{\frac{g\alpha}{1-\alpha}t}A_0^{\frac{\alpha}{1-\alpha}}L(t))^{1-\alpha}K(t)^{\alpha} = e^{g\alpha t}A_0^{\alpha}\,L(t)^{1-\alpha}K(t)^{\alpha}$$

where: g is the rate of use of technological progress.

The catch-up model of economic development is applied in conditions of a significant gap in the levels of scientific and technological development of a specific country and leading countries. In accordance with the Solow model and the Cobb-Douglas function, in countries implementing the catch-up development model, there should be a significant increase in aggregate factor productivity (which implies an increase in the utility of the means of production due to technological changes, an increase in profitability), an increase in the share of capital in GDP, and the number of labor resources.

In this economic growth model, the focus of financing is directed at the substantial growth of AFP, and the Cobb-Douglas production function in this case looks like: $Y(t) = e^{g\alpha t} A_0^{\alpha}\ L(t)^{1-\alpha} K(t)^{\alpha}$

In most works on assessing the change in AFP, (A), in accordance with the catch-up development principle by developing countries of developed countries in the estimates [Goldman Sachs, 2003], the following equation is used:

$$\frac{A_t}{A_{t-1}} = 1.3\% - \beta \cdot \ln(\frac{Income\_per\_capita_{DC}}{Income\_per\_capita_{US}})$$

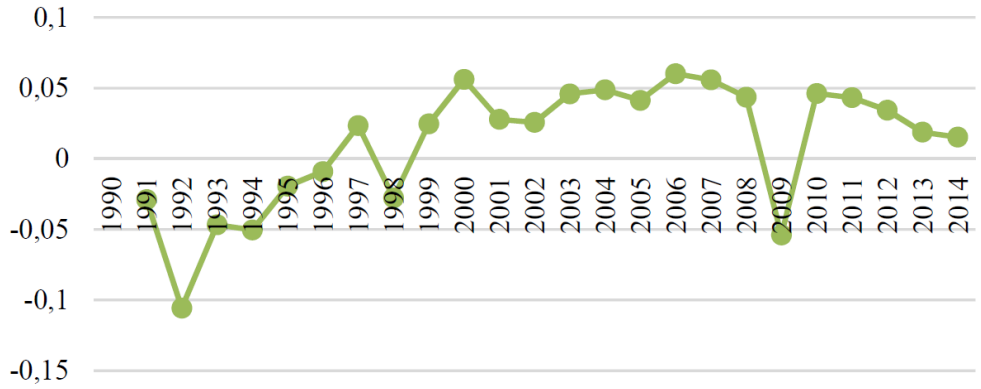
where

Income per capita DC – is the per capita income of developing countries,
Income per capita US – is the per capita income of developed countries,
Y is the GDP,
L is the labor (population in able-bodied age),
K is the capital stock,
A is the technical progress (or AFP),
δ is the depreciation rate,
I is the investments,
β is the convergence rate,
1.3% is an estimate of the long-term growth rate of US AFP, obtained as a result of empirical studies.

Figure 2 shows the dynamics of the rate of growth of the AFP in the Russian economy for the period from 1991 to 2014. The catch-up development took place in the USSR in the 1930s of the 20th century, in South Korea - in the 60-ies of the 20th century, in China - in the 80-ies of the 20th century. Here we can also include the German and Japanese "economic miracle" of the second half of the 20th century. Table 1 shows the data characterizing the success of countries in this respect (Kosov, Akhmadeev, Bykanova, Osipov, Ekimova and Frumina, 2016).

As can be seen from the table above, all countries analyzed were characterized by a significant GDP growth with an increasing population. The states considered in terms of initial characteristics were similar in size to GDP per capita-only in the case of West Germany, the level was above 2.000 dollars. Attention is drawn to the fact that the population differed markedly across countries, which shows the universality of the catch-up development model (Kitova, Kolmakov, Dyakonova, Grishina, Danko and Sekerin, 2016).

Figure 2. *The growth rate of AFP in the Russian economy (pp), 1991-2014.*



Sources: *Varlamov, Kostin, Mamedov, Omarov, Belyaev, Danko, Sekerin, 2016, calculations of authors according to Rosstat.*

Table 1. *Characteristics of gross domestic product per capita in countries, with catch-up development (Dudin, Sekerin, Gorohova, Bank and Danko, 2016; Maddison Project Database)*

Country	Years	GDP, bln. USD	GDP per capita, USD	Population, mln. people
USSR	1930-1950	1926 – 183.8 1955 – 648.3	1926 – 1.251 1956 – 3.566	1926 – 147 1956 – 198
Japan	1950-1970	1950 – 161.0 1973 – 1 243,9	1950 – 1.921 1973 – 11.434	1950 – 82 1973 – 108
FRG	1950-1970	1950 – 265.3 1978 – 801.9	1950 – 3.881 1973 – 13.455	1950 – 49 1978 – 60
South Korea	1960-1990	1965 – 41.6 1998 – 581.2	1965 – 1.436 1998 – 12.634	1965 – 29 1998 – 46
China	1980-2010	1985 – 1 591,9 2010 – 11 011,8	1985 – 1.519 2010 – 8.032	1985 – 1.048 2010 – 1.371

Notes: ** data on GDP in terms of 1990 prices are given*

4. Results

In terms of the Cobb-Douglas function, states that implement the evolutionary model for economic growth financing are characterized by a high level of capital accumulation, which is expressed in high per capita GDP, assets of the banking system and the stock market. At the same time, such countries are characterized by a lower level of use of labor resources, which predetermines lower intensity of general factor productivity, and the Cobb-Douglas function has the form: either

$$Y(t) = L(t)^{1-\alpha}(e^{gt}A_0K(t))^{\alpha} \quad \text{or} \quad Y(t) = (e^{\frac{g\alpha}{1-\alpha}t}A_0^{\frac{\alpha}{1-\alpha}}L(t))^{1-\alpha}K(t)^{\alpha}$$

that is, the impact of scientific and technological progress is either labor intensive or capital intensive one. The level of development of basic and applied research in such countries is lower than in the leading states in innovative technologies. Accordingly, in countries that carry out evolutionary modernization, although modern trends in technological development are not being formed, there is a further improvement and development of breakthrough technologies created in the technology leading states (Sharov, Kosov and Frumina, 2016). The evolutionary modernization is common to small countries in Europe, Australia, Canada, South Africa. Table 2 shows the statistics that characterize the state data in 1980-2014.

Table 2. *Characteristics of GDP per capita in countries, with evolutionary development*

Country	Years	GDP, bln. USD	GDP per capita, USD	Population, mln. people
Australia	1980-2014	1980 – 162.8 2014 – 1.442	1980 – 11.000 2014 – 61.062	1980 – 15 2014 – 23
Belgium	1980-2014	1980 – 124.3 2014 – 532.4	1980 – 12.596 2014 – 47.518	1980 – 10 2014 – 11
Canada	1980-2014	1980 – 273.0 2014 – 1 783,6	1980 – 11.155 2014 – 50.252	1980 – 24 2014 – 35
Norway	1980-2014	1980 – 64.4 2014 – 500.5	1980 – 15.748 2014 – 97.066	1980 – 4 2014 – 5
South Africa	1980-2014	1980 – 83.0 2014 – 350.1	1980 – 2.853 2014 – 6.483	1980 – 29 2014 – 54
Sweden	1980-2014	1980 – 138.1 2014 – 571.1	1980 – 16.612 2014 – 58.590	1980 – 8 2014 – 10

Source: *IMF*

For the analyzed group of countries, during the period under review, a slight increase in population was observed with a steady increase in GDP and GDP per capita. In South Africa alone, the number of nationals had almost doubled, leading to the fact that the growth of the gross product had not led to a qualitative improvement in the standard of living. It also draws attention to the fact that the level of GDP of more than USD 1 trillion was recorded in Canada, which allows us to refer also large economies to this group of states (Nevskij, 2015).

In these countries, there exist developed banking systems and large financial markets integrated into the global economy. Their corporations have wide access to financial sources of the world financial market. Therefore, an important prerequisite for the evolutionary model is the country's intensive involvement in global economic relations, the existence of significant own financial sources. In countries with evolutionary development, the ratio of budget revenues to GDP is also quite high. Proceeding from the above, it can be concluded that there is a significant potential for state financing of fundamental scientific research and R&D, education, and the implementation of infrastructure projects.

However, in practice, this potential is used locally, for the development of specific projects or expenditures acting as a "growth point" for the economy (Balikhina and Kosov, 2014). Most of the costs mentioned above are covered by corporations and households. This is due to the desire of governments to maintain a high standard of living in the country, forcing to abandon large-scale ambitious plans of economic development. In turn, large national companies, as well as highly skilled workers, often shift their activity vector towards the country's leading in technological development, which also weakens the innovative potential of the economy.

From the point of view of the Cobb-Douglas function, states with the dynamic model of economic development have high volume of accumulated capital, high general factor productivity and high growth rates of the economically active population. Currently, the model of dynamic development of the economy operates in the United States, Britain, Germany, France, South Korea, and Japan. It should be noted that, despite the demographic crisis in these countries, they are able to maintain their potential, as they are centers of attraction of the labor force, both highly skilled one and the force employed to perform labor-intensive functions. Countries with a dynamic model of economic development have a developed corporate sector with the significant export potential. Significant amounts of accumulated profits and depreciation allow companies to use technically advanced equipment, move on to the production of new types of innovative products, open subsidiaries abroad, and carry out international mergers and acquisitions. Table 3 shows the statistical data characterizing these states in 1980-2014.

Table 3. *Characteristics of gross domestic product per capita in countries with dynamic development*

Country	Years	GDP, bln. USD	GDP per capita, USD	Population, mln. people
USA	1980-2014	1980 – 2 862,5 2014 – 17 348,1	1980 – 12 576 2014 – 54.361	1980 – 228 2014 – 319
Great Britain	1980-2014	1980 – 565.0 2014 – 2 991,7	1980 – 10.030 2014 – 46.313	1980 – 56 2014 – 65
Germany	1980-2014	1980 – 850.6 2014 – 3 847,4	1980 – 10.028 2014 – 47.716	1980 – 77 2014 – 82
France	1980-2014	1980 – 704.5 2014 – 2 833,7	1980 – 13.112 2014 – 44.289	1980 – 54 2014 – 64
Japan	1980-2014	1980 – 1 086,9 2014 – 4 596,2	1980 – 9.308 2014 – 36.156	1980 – 117 2014 – 127

Source: *IMF*

The group of countries analyzed is marked by high gross product levels, population. GDP per capita may be slightly lower than in some countries with an evolutionary model. In our view, this is predetermined by the direction of economic growth towards the maintenance of technological leadership, which requires a high degree of financial resources and manpower (Slepov and Volkov, 2016).

Investment and venture funds, business angels, are also very active in countries with a dynamic model of economic development and are focusing on the business environment in the search for innovative ideas with high potential for money investments. The resources of the banking system and/or the stock market are also the most important sources of development. It should be noted that the investment ranking of companies in countries with dynamic development models is high, with the result that companies have broad access to financial sources of the world financial market, including segments such as the stock, investment, credit, currency, and derivatives market.

In fact, the countries in question are characterized by the desire of the private sector to find innovative ways to intensify business activities with minimal involvement of the state. The latter, however, has the potential to concentrate financial flows on the development of the fundamental areas of science.

5. Discussion

The economic development model places severe constraints on the country's ability to finance economic growth. In the catch-up model, the achievement of a positive result implies the need for centralization of financial resources obtained either from exports or from the accumulation of monetary assets by borrowing on the international market during the creation of large financial and industrial groups (Danko, Petrikova and Petrikova, 2010). Within the evolutionary model framework, the state, large business and the population have monetary resources. However, their use is more aimed at maintaining a high standard of living, and as a result, the country's technological capacity is limited by individual "growth points". In countries with a dynamic model, qualitative changes in the structure of the economy are systematically supported, financed at the expense of the economic agents themselves, with the guiding role of the state (Han, Kalirajan and Singh, 2001).

In that connection, the definition of the Russian specificity of financing for economic growth was of the utmost importance. In Table 4, many empirical data have been analyzed showing the average share of investment in GDP, the rate of gross fixed capital formation and the creation of added value.

Table 4 shows the data for countries with catching up, evolutionary and dynamic models of development. Attention is drawn to the fact that Russian figures lag noticeably behind the Chinese but are at the level of the rest of the world. At an average rate of gross fixed capital formation, Russia is inferior only to China, at an average rate of the added value creation it is inferior to China and Australia, although the gap between the countries going behind is not so significant. In turn, the average share of investment in GDP and the number of companies in the top 500 of the largest market capitalization in Russia are at the level of most countries with an evolutionary development model (Maddison *2007;* Mirgorodskaya, Andreeva, Sugarova and Sichev, 2017*)*.

Table 4. *Comparison of the share of investment with GDP, the rate of gross capital formation, the creation of added value in a number of countries*

Country	Period	Average share of investment to GDP	Average rate of gross fixed capital formation	Average rates of creation of added value	Number of companies in FT-Global 500 (2015)
Australia	1980-2014	26.44%	7.16%	6.97%	10
Belgium	1980-2014	22.68%	4.95%	4.98%	2
Canada	1980-2014	21.75%	6.97%	5.84%	19
China	1980-2014	39.05%	12.76%	11.46%	37
Japan	1980-2014	26.03%	3.93%	4.91%	35
Norway	1980-2014	25,38%	6.90%	6.57%	3
Russia	1990-2014	22.40%	8.56%	6.81%	5
South Africa	1980-2014	20.40%	4.52%	5.08%	3
Great Britain	1980-2014	19.82%	5.31%	5.24%	32
USA	1980-2014	21.73%	5.20%	5.48%	209

Sources: *compiled from the IMF data, Financial times*

We believe that, based on the figures given, it can be concluded that, at this stage of development, our country is more characterized by an evolutionary model of economic development. Despite the fact that according to the criterion of capital accumulation, namely per capita GDP, capacity of the domestic market, volume of the stock and banking sector, Russia lags behind most of the states of this group, high GDP, low population growth rates, and enough high overall factor productivity, expressed in the gradual introduction of new saving and high-precision technologies while maintaining the production potential of a number of complex and high-precision spheres, allow it to be attributed precisely to the named category of countries (Osipov, Bykanova, Akhmadeev, Kosov, Bogoviz and Smirnov, 2017). To classify Russia as a catch- up development state, conditions such as rapid population growth are not being met (as is predicted by the Rosstat, the population may be 142-152 million at the level of 146 million in 2015), and the technological inferiority. Nor can Russia be classified as a dynamic development country because it is not a technology leader (Kosov, 2014).

In this regard, it seems to us that, in the medium and long term, the main emphasis in financing the economic development of Russia should be placed on separate "growth points", reflecting the objective capacity of the state to preserve and enhance global competitiveness.

6. Conclusion

Thus, it is justified in this article that the role of the state as the centralizing force of the process controlling financial sources of growth is weakened by the country's transition from the catching-up development to evolutionary or dynamic. It is emphasized that attribution to a dynamic model is due to the capacity of the state to play the role of technology leader, which requires the innovative activity of the business, the substantial cost of financial resources and the labor force, while countries with an evolutionary model are characterized by a desire to achieve a higher standard of living while maintaining the competitiveness of individual "growth points". It is substantiated that in Russia now the features of the evolutionary model are observed, which makes it necessary to focus on certain "growth points" and reflects the objective financial possibilities for the development of the national economy.

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