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Railway Network Development and the «Big Economic Breakthrough» in Russia

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ABSTRACT

Rail transport has a very significant impact on development of the economy and society. The objective of the study described in the article is to identify, using the methods of historical and statistical analysis, the relationship between development of the Russian railway network and the «big economic breakthrough» that took place from 1885 to 1914 and brought the country to a fundamentally higher level of development.

The analysis begins with a review of the previous period of 1861–1884, during which cardinal institutional changes were carried out and a large-scale railway network was created that connected all the main economic regions of the European part of Russia. Due to this, even then high rates of industrial growth were ensured, but the growth was very volatile.

It has been revealed that during the period of the «big economic breakthrough» it was possible not only to accelerate, but also to increase sustainability of economic development. These results were based on a significant level of availability of railway infrastructure for population already reached by the beginning of the «big economic breakthrough», allowing continuing dynamic development of railway transport and achieving growing intensity of employment of the railway network. The synergy of institutional and transport infrastructure development was of great importance. Due to this, the Russian economy during the period of the «big economic breakthrough» became the world record holder in terms of growth in industrial production and labour productivity, while a significant increase in the human development index was also achieved.

Thus, the study of the relationship between development of the railway network and the «big economic breakthrough» in Russia at the end of 19th – the beginning of 20th century has shown the importance of the synergy of institutional and infrastructural and transport development for successful economic and social modernisation and demonstrated the key role that railway transport in this process.

Keywords: railways, «big economic breakthrough», institutional transformations, industrial growth, infrastructural development, modernisation, population mobility, history and transport economics.

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INTRODUCTION

185 years ago, the first railway, namely Tsarskoselskaya, was opened in Russia. Small in length (about 27 km), it, of course, could not significantly change the transport accessibility for a huge country. However, its construction and the start of operation was the first, fundamentally important, step towards creation of a network of Russian railways, «that type of transport communications, in an inseparable unity with which the Russian economy and culture were formed» [1, P. 163] that will happen during next, now almost two, centuries.

Tsarskoselskaya railway «in many respects determined the prospects for development and establishment of the traditions of railways in Russia… Its construction proved that the climate of northern Russia cannot interfere with the regular operation of railways» [2, P. 118]. This can be called the main result of construction and operation of the railway, but it is far from the only one. It should also be noted such important results as:

• Acquisition of operating experience of the first steam locomotives.

• Solution of several engineering issues necessary for construction of railways in various regions of Russia.

• Use of crushed stone ballast.

• Development of instruments for financing construction of railways and alienation of land required for this construction.

• Introduction of turnouts and signalling.

• And, finally, «a peculiar, incomparable railway service architecture was born» [2, P. 121].

At that time, construction of railways was a key factor in industrial development, and, in general, socio-economic modernisation, as emphasised by several researchers [3–9]. And for Russia, considering the vast expanses of the country, development of railways was especially important [10, P. 322].

Various aspects of the influence of railway transport on development of the economy and society in our country are reflected in many studies, in particular [10–16]. In this paper, attention will be focused on the relationship between development of the Russian railway network and the «big economic breakthrough» [17, P. 469], which took place from 1885 to 1914 and brought the country to a fundamentally higher level of development. *Methods* of historical and statistical analysis were used to identify and evaluate this relationship.

RESULTS

Institutional Changes and Creation of the Railway Network, Preceding the «Big Economic Breakthrough»

Consideration of the stated topic should start with the previous period of 1861–1884, during which cardinal institutional transformations had been carried out (in Russian historiography they were called the «Great Reforms» of Alexander II [18, P. 435]), and a large-scale railway network had been created that had connected all the main economic regions of the European part of Russia among themselves and with seaports, which made it possible «to begin a decisive transition from extensive methods and forms of natural economy to intensive methods of capitalist production on a large scale» [19, P. 67].

The most important institutional transformations carried out in the 1860s–1870s were the peasant, zemstvo, judicial and military reforms. In addition, financial reforms, reforms in the field of education and urban management were carried out [18, pp. 435–436]. In addition to the fact that the reforms carried out created conditions for a radical modernisation of the economy and public life, they were of fundamental importance for development of railways. In particular, one of the results of financial reforms was the transformation of the Ministry of Finance into the sole manager of all state revenues and expenditures, which played an important role in financing railway construction. And the local authorities created as a result of the zemstvo reform at the provincial and district levels played an active, although often ambiguous role in railway construction [20].

To ensure high rates of railway construction, formation of a special institution of railway concessions was important, i.e., a mechanism of a kind of public-private partnership, which made it possible to attract private capital, including from the world market, under government guarantees [20; 21].

Due to these institutional transformations, in the period 1861–1884, high rates of industrial development were ensured (Table 1) and large-scale railway construction was launched. If at the end of 1860 the entire Russian railway network was about 1,6 thousand km, then during this period almost 1 thousand km railways were put into operation annually (Table 2). In general,

Table 1

Indicators of the dynamics of industrial production in the Russian Empire, 1861–1914

Periods		Industrial production index in the year preceding the beginning of the period, %	Average annual growth rate of industrial production, %	Indicators of variation in the dynamics of industrial production, percentage points	
				Variation span	Average linear deviation
The period of institutional transformation preceding the «big economic breakthrough» (1861–1884)		100	4,7	61,6	9,3
The period of the «big economic breakthrough» (1885–1914)		300,6	5,9	16,9	2,7
Including:	I stage (1885–1900 years)	300,6	7,4	9,1	2,6
	Stagnation (1901–1905 years)	939,5	1,15	11,1	3,0
	II stage (1906–1914 years)	994,5	6,0	5,2	1,4

Source: calculated by the author based on data [22].

during the period under review, industrial production increased more than three times, and the length of the railway network by 15,5 times.

Of course, given the low starting positions, the country needed further and even faster industrial development. The growth of the length of the railway network ahead of the dynamics of industrial production created an infrastructural basis for such an acceleration, which is a clear manifestation of the law of the advancing development of transport infrastructure [24]. It should be noted that, with a very high average annual increase in industrial production in 1861–1884, the variation indicators [25, P. 106] of its dynamics testified to volatility of industrial growth. The range of variation in annual industrial growth rates exceeded 60 percentage points, and their average deviation from the average annual growth rate, taken in absolute terms, was almost twice as high (Table 1). Undoubtedly, it was desirable not only to accelerate, but also to increase sustainability of

Table 2

Indicators of development of the railway network in the Russian Empire, 1861–1914

Periods		The length of the railway network in the year, preceding the beginning of the period, thousand km	Average annual commissioning of railways, km	Average annual growth rate of the length of the railway network, %	Indicators of variations in commissioning of railways, km	
					Variation span	Average linear deviation
The period of institutional transformation preceding the «big economic breakthrough» (1861–1884)		1,6	967	12,15	2856	642
The period of the «big economic breakthrough» (1885–1914)		24,8	1521	3,5	5171	857
Including:	I stage (1885–1900 years)	24,8	1762	4,9	5171	1006
	Stagnation (1901–1905 years)	53,0	1571	2,8	2417	646
	II stage (1906–1914 years)	60,8	1064	1,6	2333	635

Source: calculated by the author based on data [23].

industrial growth, which was achieved during the period of the «big economic breakthrough».

Industrial Growth and Development of Railways during the Years of the «Big Economic Breakthrough»

By the beginning of the «big economic breakthrough» in Russia, a railway network with a total length of almost 25 thousand km had been created, and the level of transport accessibility for the population exceeding 2 km/10 thousand inhabitants was reached, which, as established in [15; 26], was a critically important value for cardinal economic and social modernisation.

During the «big economic breakthrough», industrial production growth rates increased significantly, while their volatility drastically decreased (Table 1), i.e., sustainability of economic development has qualitatively increased. At the same time, this period was not homogeneous: it distinguishes two stages of dynamic growth and the period of stagnation of 1901–1905 that separates them [17, P. 467].

As for the first stage of the «big economic breakthrough» (1885–1900), not only its beginning was largely due to the previous creation of a significant railway network, but its entire further course is closely connected with development of the railway industry. The average annual commissioning of railway lines compared with the period of 1861–1884 increased by 1,8 times, and in 1899 over 5 thousand km of railway lines were put into operation [23, P. 35], which is a record figure in the history of the country. As a result, the total length of the railway network more than doubled during the first phase of the «big breakthrough». At the same time, not only did the density of railways increase in the European part of the country, but active railway construction began in Siberia, Transbaikalia, and Central Asia [27, pp. 90–102].

Providing reliable interconnections between various, including very remote, regions of Russia, railway transport has become the main factor in the intensive process of «forming a single system of the national economy of the country, based on the stable specialisation of individual regions and the division of labour between them» [28, P. 275]. The marketability and specialisation of agricultural production increased [10; 29], the domestic market developed rapidly, and the rate of urbanisation increased sharply [26; 28]. In addition, supply orders related to construction and increasingly intensive operation of railways directly stimulated development of industry, and, above all, the most important industries of that era: coal and oil mining, ferrous metallurgy, and engineering. If «in the mid-1860s there was practically no rail production in Russia, steam locomotives were made by a sole Aleksandrovsky plant (several pieces a year), …almost all Russian railways were built from foreign materials» [10, P. 274], then already during the first stage of the «big breakthrough», a completely different picture was observed. The Russian steam locomotive building «almost completely satisfied the enormously increased needs of railway transport», and «the Russian car building fully covered the increased domestic demand for railway cars»

[28, pp. 279, 282]. The production of steam locomotives, which was less than 10 units in 1865, increased to 1005 by 1900, production of cargo cars, over the same period, grew from 201 to 30596 units, of passenger cars – from 10 to 1284 units [28, P. 306]. In the 1890s, railway transport «consumed from 54 to 65 % of the total iron and steel production of Russian metallurgy» [28, P. 277], which, responding to the growing demand from the railways, developed dynamically. Thus, steel production from 1865 to 1900 increased by 562 times, cast iron – by 9,8 times, and the production of rails – by more than 21,5 times [28, P. 305].

Such a significant role of railway supply in stimulating industrial production gives grounds for the conclusion that stagnation that began in 1901 «apparently was largely associated with completion of the main work on construction of the Trans-Siberian Railway, which had stimulated economic growth in previous years» [30, P. 141]. Indeed, after the record commissioning of railway lines noted above in 1899, it subsequently decreased, however, in 1900 and 1901 it was very significant – over three thousand km per year. Economic stagnation, of course, was associated with the global financial crisis caused by credit expansion at an underestimated interest rate, which led to inefficient investments [29, P. 230]. The decrease in the volume of railway supply provisions probably served as an additional impetus to the completion of the first stage of the «big breakthrough», however, sooner or later, the cancellation of the «fictitious capital» formed due to speculative growth, accompanied by a decline in the sectors of the real sector of the economy, was inevitable [31–33]. However, even during the years of stagnation, the average annual growth rate of industrial production remained positive (see Table 1), and the average annual commissioning of railways only slightly decreased compared to the level of the first stage of the «big breakthrough», still exceeding 1,5 thousand km (see Table 2). It is noteworthy that during this period, the average annual growth rate of the length of the railway network again, as in the years preceding the «big breakthrough», was about 2,5 times faster than the growth rate of industrial production, due to which, by the end of economic stagnation, the length of the railway network exceeded 60 thousand km. This is yet another example of operation of the law of accelerated development of transport infrastructure: in the context of a slowdown in economic growth, ensuring high dynamics of infrastructure development creates the basis for a new rise.

Therefore, agreeing with the opinion that the rise achieved at the first stage of the «big breakthrough» «allowed to seriously increase the volume of the country's fixed capital», which laid the «foundation for successful functioning of Russian industry at the second stage of the economic breakthrough, in the period from 1906 to 1914» [17, pp. 468–469], it should be supplemented. It was the development of railway transport, which continued dynamically even during the years of stagnation, and the capital invested in it that played a key role in shaping the conditions for the second stage of the «economic breakthrough».

Table 3

Dynamics of cargo turnover and cargo intensity on the railway network of the Russian Empire during the years of the «big economic breakthrough» and in the previous period

Years	Cargo turnover		Cargo intensity	
	mln t•km	growth index	thous. t•km/km	growth index
1865	571	1	151	1
1885	11236	19,7	435	2,9
1900	36662	64,2	692	4,6
1907	42932	75,2	659	4,4
1913	65670	115,0	951	6,3

Source: calculated by the author based on data [23; 28; 35].

This conclusion, of course, in no way diminishes the significance of the institutional changes that led to implementation of the second stage of the «big breakthrough». «The most important event carried out in the field of economics was the Stolypin reform», which gave the peasants the opportunity to obtain land ownership, as well as «the right to sell their land and use the proceeds for urban development» [17, P. 167]. It was also possible to settle down on the lands of Siberia and the Far East, which had great potential for economic development and manifestation of private initiative. But the possibility of relatively easy resettlement both in the city (not necessarily in the nearest one, but in the one where the prospects seemed to be the best), and beyond the Urals was due to the presence of «an extensive network of railways, including… the Trans-Siberian Railway» [34, P. 95], i.e., there is a synergy of institutional and transport-infrastructural development.

During the second stage of the «great economic breakthrough», the dynamics of industrial production was, although somewhat lower than in the first stage, but much more stable – volatility of its rates decreased significantly (see Table 1). The pace of construction of new railways has significantly decreased (see Table 2), however, on average, more than 1 thousand km of railway lines were commissioned per year. At the same time, the average annual increase in cargo turnover was about 7 %, i.e., it was higher than the dynamics of industrial production. In other words, railway transport continued to develop rapidly, but to a greater extent not due to the expansion of the network, but due to its more intensive use, an increase in cargo intensity (Table 3).

It is important to note that, for all the importance of railway transportation of grain cargo, both for export and for the domestic market, industrial goods dominated the cargo turnover. At the same time, the share of coal, the most important type of energy and industrial raw material in that era [36], increased from about 10 % of the total cargo turnover at the beginning of the period of the «big economic breakthrough» to 20 % by its end [35].

The long-term growth in cargo turnover outpaced the increase in cargo volumes due to the increase in the distance of transportation. If in 1870 the average distance of cargo transportation was about 300 km [28; 29], then at the second stage of the «big breakthrough» it was about 500 km [35]. This means that the trend of a long-term increase in the average transportation distance, characteristic of the largest railway systems over the past century and, above all, during periods of stable economic development [37, pp. 148–149], and which is important for economic growth, appeared on Russian railways already in the second half of 19th and early 20th centuries.

Passenger turnover, in turn, grew much faster than the population (which, by the way, had very high dynamics [38]), which indicated an increase in population mobility, one of the key factors of economic growth [26] and an indicator of social modernisation [14]. The indicator of population mobility most relevant to this process, defined as the ratio of passenger turnover to the total population of the country, showed more than a fourfold increase during the period of the «big economic breakthrough» (Table 4).

It should be noted that the increase in the mobility of the population was due not only to the development of the railway network and an

Table 4

Dynamics of passenger turnover of railways and mobility of the population of the Russian Empire during the years of the «big economic breakthrough»

Years	Passenger turnover		Population mobility when travelling by rail	
	mln pass•km	growth index	pass•km/person	growth index
1885	3,3	1	30,3	1
1900	9,7	2,9	72,9	2,4
1907	13,9	4,2	93,3	3,1
1913	22,3	6,8	130,4	4,3

Source: compiled and calculated by the author based on data [26; 35].

increase in well-being, but also to the introduction of differentiated passenger tariffs and the reform of passport legislation in 1894, as well as to creation in 1896 of special tariffs for short-distance traffic, which were one third lower than for the long-distance one [14].

A very good general description of the role of railways in social and economic development during the second stage of the «big economic breakthrough» is given in [10, P. 823]: «The growth of cities and industry was helped by… the correct setting of the railway economy. Railways served the interests of the population perfectly and at the same time did not burden the treasury. Cheap differential fares for passengers and goods have greatly helped rapid economic and educational growth».

During the years of the second stage of the «big economic breakthrough», «the final formation of the traditions of national railway transportation took place. The established powerful capitalist economy… determined the nature of the commodity movement along the Russian railways. In general, the Russian railways before the First World War certainly satisfied the needs for transportation of goods» [2, pp. 476, 478].

CONCLUSION

During the period of the «big economic breakthrough», the Russian economy was «the absolute record holder both in terms of industrial output growth and labour productivity growth» [39, P. 488]. Due to this, it took the fifth place in the world in terms of industrial production, while becoming one of the leaders in terms of the engineering level of industry; fourth place in the world in production of cars

and the size of the national income; third place – in terms of national wealth [40, P. 361]. But not only purely economic indicators improved, human potential grew which is the main wealth of modern society. The human development index, which considers the average per capita GDP, the level of education and average life expectancy, increased over this period by about 1,5 times [39, P. 337].

According to modern researchers, with continuation of established development trends, «Russia was separated by only a few decades from becoming a prosperous economy in all respects» [41, P. 248].

At the same time, the country had the second longest railway network in the world [35], which continued to expand dynamically and was very intensively used: cargo intensity was comparable to the railways of the USA and Great Britain and significantly exceeded the railways of France, Italy, and Japan [42].

The high level of railway development was a key factor in socio-economic results achieved. The «big economic breakthrough» of Russia at the end of 19th and beginning of 20th century shows the importance of the synergy of institutional and infrastructural and transport development for successful economic and social modernisation, the country's transition to a qualitatively higher level of socio-economic development, demonstrating the key role played by Russian railways.

In 20th century, when rail transport entered the stage of innovative renaissance [43], the socio-economic significance of its development again increases, provided on an innovative basis, considering synergy and convergence with fundamentally new transport systems and technologies [44–46].

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