ББК 65.04
UDK 338.9
L 85

L 85 **Local Production Systems and Regional Economic Development** /ed. by A.S. Novoselov and V.E. Seliverstov. – Novosibirsk, Sofia, Lodz, Ternopil, 2014. – 352 p.

This collection of papers contains the results of research carried out by the participants of the "International Project FOLPSEC № 295050 within the 7th EU Framework Program FP7-PEOPLE-2011 IRSES" "Functioning of the Local Production Systems in the Conditions of Economic Crisis (Comparative Analysis and Benchmarking for the EU and Beyond)".

The papers study the following problems: sustainable development of local production systems, business strategies of LPS, innovativeness of clusters, critical infrastructure protection, corporate social responsibility, environmental protection, local production system management, governance of local production systems in Bulgaria, Poland, Ukraine and Russia, policy guidelines with some measures of general application, aimed at problems observed in all LPS, and some specific measures differentiated according to a typology of local production systems.

ISBN 978-5-89665-277-9

ISBN 978-5-89665-277-9

PRODUCTIVE FORCES SHIFT TO THE EAST: EVALUATION OF HISTORICAL EXPERIENCE AND CHOICE OF THE DEVELOPMENT PATH FOR THE 21ST CENTURY

Vladimir Yu. Malov[1],
Albina I. Timoshenko[2]

APPROACH TO QUANTIFICATION OF HISTORICAL EXPERIENCE

Economic development forecasting is an indispensable component of management, from family and corporation budgeting to that of associations of states, like the UNO. Apparently, the scope of forecasting and the kind of problems handled using projections vary depending on the general historical situation and stage of the historical development of a specific state. Whatever the case, the results of these projections underlie the decisions taken, which shape the way of national development. We interpret "historical experience" as an element of the system analysis of decisions made in the past, whose results we can evaluate in the present. To ensure that the approach is system-oriented, it is of vital importance to consider the pros and cons adduced in the past with respect to the decision in question. Moreover, it is these arguments that should be studied in the first place. Only their thorough analysis, taking into account the specific features of the period when a specific decision was made, will allow us to apply "historical experience." According to Academician V. Alekseev, "In order for the science of history to answer the call of the times, it is necessary to switch, in the mass, from traditional descriptiveness to analyzing and forecasting; to learn to extract useful knowledge and apply it in social practice" (V.V. Alekseev, 2009, p. 113). In other words, historical experience should be applicable to the present-day decision-making, which shapes future development. In principle, reconstruction of historical events and virtual "playback" of hypothetical past events, when different from the decisions actually taken, are not rejected either (at least not by everyone).

The approach is not revolutionary. Back in 1960 in the USA, a new branch of knowledge – cliometrics – came into being. Basing on quantitative evaluation of historical events, it suggested building counterfactual models of historical facts. In 1993, the developers of this direction, Douglass C. North and Robert W. Fogel, were awarded the Nobel Prize in Economics. Especially popular with historians was hypothetical modeling of war conflict outcomes (Nekhamkin)[3]. Alternative economic development was not ignored either. For example, R.W. Fogel demonstrated that, contrary to the widely accepted view on the decisive role of the railways in the American economy, they were not absolutely necessary in explaining economic development in the late 19th c. and that their effect on the growth of GNP was less than three per cent.

---

[1] Prof. D.Sc., Head of Sector, Institute of Economics and Industrial Engineering, Siberian Branch, Russian Academy of Sciences (IEIE SB RAS), Novosibirsk, Russia.

[2] PhD, Leading Researcher, Institute of History, Siberian Branch, Russian Academy of Sciences, Novosibirsk, Russia.

[3] In his paper *Scenarios for hypothetical history: for and against*, V.A. Nekhamkin (*Vestnik Rossiiskoi Akademii Nauk*, Vol. 79, No 12, December 2009, p. 1099–1106) writes that it was Aristotle who raised the question, in its epistemological aspect, of appropriateness and limits of using "would have been" speculations in the science of history. The ancient Roman historian Titius Livius suggested the first description of a hypothetical war between Alexander of Macedonia and Ancient Rome, being interested primarily in the military specific aspect of actions and army preparation.

Analyzing hypothetical alternatives of national economic development proves to be helpful in learning the "lessons of the past." It goes without saying that an adequate comparison with the current situation requires drawing up a distinct outline of the past economic conditions, in which general, specific, and individual features are identified. Only then will we be able to achieve the pragmatic aim of the research, namely, to obtain additional arguments for or against today's decisions by referring to the lessons of the past. In natural sciences, construction of counterfactual alternatives is a well-established research technique; however, since economic history (the term "social history" sometimes seems more relevant) cannot be tested experimentally, the technique itself can be questionable with respect to providing proof. Retrospect forecasting is first done on the qualitative level, when researchers support their ideas using reasons taken from the past experience. The conditional mood allows them to identify the cause and effect relations that may have preserved their relevance to this day. In this way, they can separate realistic scenarios of the future from utopias, provide a better economic justification for their projects and practical recommendations for present-day decisions[1].

Identification of the key, historic periods and, to be more particular, of the key events allows finding additional arguments for or against the decisions taken today. Providing proof with respect to "historical experience" is of critical importance for supplying additional argumentation when choosing a specific and, as a rule, alternative decision on economy modernization. This is completely true of decisions on geographical allocation of investments, which predetermines the territorial structure of the national economy.

Among a variety of quantitative analysis methods (physical analogies, econometric techniques, role play, etc.) for alternative economic development, in our opinion, the input-output technique deserves special attention as the most consistent in reflecting the inner technological relationships between the economy actors. Time-consecutive changes in input coefficients are interpreted as technical progress. Besides, introduction of this technique into the spatial characteristic model of national economy[2], for some regions, allows assessing alternatives of Russia's "widening" economic growth. In other words, it is possible to appraise the expediency of pursuing the policy aimed at the development and settlement of the Asian part of Russia – Siberia and Russian Far East[3] – using historical analogies and geographical characteristics of an area under study.

Today, such a model for simulating the history of spatial economy of Russia/USSR/ Russia from 1889 to 2009 has been developed at the Institute of Economics and Industrial Engineering, Siberian Branch of the Russian Academy of Sciences. The model has been extended to cover the period until 2029 (with year 2019 taken as intermediate) and verified.

[1] As a rule, projects significant for regional (to say nothing of national) economies should not only "ripen" in the minds of the people who implement them but also "fit" the existing technical, economic, geopolitical, and other conditions. There are many examples in history of gigantic projects that have never been carried out: for instance, the railways from Siberia to Alaska with a tunnel under the Bering Strait and the Baltic-Pacific Great Water Way. The first attempt to build the Suez Canal was made by Napoleon; however, at the time the situation was not favorable, and the project was implemented 70 years later. It is unlikely that the waters of the Siberian rivers will be directed to the Sea of Aral or the Pechora River will flow into the Caspian Sea. In China, by contrast, the project of redirecting the river flows from the south to the north is likely to be carried out in the near decade. How can we know that the project is "ripe"? Today, technology allows us to build a tunnel under the Strait of Bering; however, the project requires additional substantiation in terms of economy and geopolitics.

[2] Here we mean the optimization inter-industry interregional model (OIIM) developed in the 1960s-1970s by a team headed by A.G. Granberg at the Institute of Economics and Industrial Engineering SB RAS.

[3] It is noteworthy that the above-mentioned V. Alekseev urges, in the same article, to apply more widely economic and mathematical tools for forecasting historical processes.

VERIFICATION OF THE RETROSPECT ECONOMIC DEVELOPMENT MODEL FOR RUSSIA/USSR/RUSSIA IN 1889–2009

As a model characterizing the development of Russian/Soviet/Russian economy within the period involved, we have taken the *multiperiod optimization inter-industry interregional model* in its statistic statement: all the balance terms are set for one year, the last in each of the periods at hand. However, as long as there is a number of these periods (each a decade long), this approach can imitate dynamic aspects, the more so that, in each period, some of the construction and machine-building capacities are intended for the projects that will pay back only in the subsequent period.

We have assumed the research results obtained by A.G. Aganbegyan and A.G. Granberg for 1959 (Aganbegyan A.G., Granberg A.G., 1968) as a "standard" inter-industry input-output model. The input-output model was constructed for the USSR as a whole, without breaking it into regions. The prices of the year were assumed not to vary throughout all the periods. Using these prices, the input-output models for the years 1889, 1899, etc., up to 2029 were made, with respect to three macro-regions of the USSR:

- European part of Russia/USSR;
- Asian part of Russia;
- other parts of Russia/USSR (Ukraine, Belarus, and other former USSR republics).

For each of the macro-regions, eight industries were considered: heavy industry, oil production, light and food industry, agriculture, construction, transport and communications, trade, and other industries. The first four industries were recognized as transportable.

We have made an assumption that throughout the period under study the same industries have preserved, naturally, with different coefficients of consumption and material, labor, and capital costs. If in the 19th century the bulk of the products consumed were those produced by agriculture, by the 21st century, consumption shifted towards heavy and light industry, construction, transport and communications. Assumptions were made concerning the hypothetical changes in the absolute terms of the equations: fixed allocations for the needs of the state combined with net exports/imports balance for certain industries.

The following criteria were adopted to compare the results of calculations done using the model and actual statistic data:

- Russia's/USSR's gross social product;
- Russia's industrial output;
- Russia's agricultural output;
- Russia's/USSR's gross domestic product.

The main source of information about a hundred years of Russian economy was the book by V.M. Simchera (Simchera, 2007[1]). Let us refer to this alternative as "historical," i.e. the one that took place in real life. Data for the period between 2019 and 2029 for the "historical" alternative were obtained with the help of an assumption of gradually slowing-down growth rates: from 6–7% in 2000–2009 to 5–6% in 2010–2019 and to 3–4% in the last decade.

The "basic" simulation alternative is the one that takes into account real historical events like construction of the Transsiberian Railways (TransSib) in the late 19th century, "shift to the East" that occurred in the 1920s and 1950s, construction of the Baikal-Amur Railways, and so on. Deviations of the "basic" alternative from the "historical" do not exceed 3% for each of the periods and comparison criteria. A somewhat larger deviation in capital investment is attributed to greater changes in construction estimate prices as compared with other industries and specific accounting techniques applied in construction facility accounting (partly owing to a large share of defense complex facilities). By and large, the contours of

[1] The book by V.M. Simchera contains data until 2004. Data for 2009 have been estimated basing on the average growth rate.

spatial allocation of both labor resources and industry capacities have been retained with respect of the three macro-regions of Russia/USSR. This suggests that the model has passed "verification" and gives an adequate reflection of the course of History. The calculation results are shown in Figures 1–3 and Tables 1–3.

Table 1

Gross social product of the Russian Empire/USSR; from 1999, of the Russian Federation alone (RUR billion, constant prices of the year 1959)

Year	Statistics[1] ("standard") Row 1	Results of decision taken Row 2	Deviation from "standard" data, %
1889	22.7	22.4	1.4
1899	27.6	28.1	–1.8
1909	32.1	32.4	–1.0
1919	22.9	22.9	0.0
1929	45.5	44.7	1.7
1939	102.8	104.0	–1.2
1949	167.5	161.1	3.8
1959	299.9	302.6	–0.9
1969	590.0	585.0	0.9
1979	998.8	969.7	2.9
1989	1408.9	1376.7	2.3
1999	491.0	476.1	3.0
2009	879.0	865.5	1.5
Forecast			
	Extrapolation on the basis of projected growth rates	**Results of decision taken**	
2019	1365.0	1361.5	0.3
2029	1925.0	1936.8	–0.6

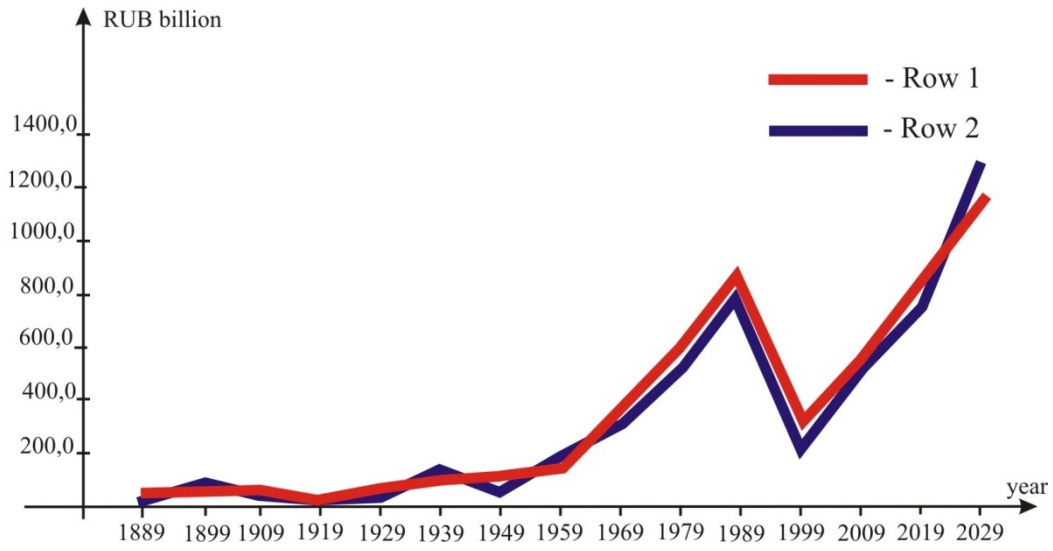

Fig. 1. Comparative changes in Russia's (within the present boundaries of Russian Federation) gross social product: "historical" and "basic" alternatives

[1] The missing years – 1889 and 1899 – have been calculated on the basis of average values for the period 1900–1909г. Numbers for 2019 and 2029 have been determined using expert data.

Table 2

Russia's (within the present boundaries of Russian Federation) gross industrial product (RUR billion, 1959 constant prices)

Year	Statistics ("standard") [1] Row 1	Results of decision taken Row 2	Deviation from "standard" data, %
1889	1.2	1.2	–2.1
1899	1.7	1.7	1.2
1909	2.3	2.3	1.5
1919	0.51	0.5	0.0
1929	5.1	5.1	1.5
1939	23.5	23.5	–0.1
1949	42.8	41.7	2.6
1959	124.0	124.0	0.0
1969	268.2	266.6	0.6
1979	479.9	471.7	1.7
1989	682.9	690.4	–1.1
1999	346.5	355.1	–2.5
2009	660.0	657.2	0.4
Forecast			
	Extrapolation on the basis of projected growth rates	**Results of decision taken**	
2019	1000.0	996.0	0.4
2029	1360.0	1398.5	–2.8

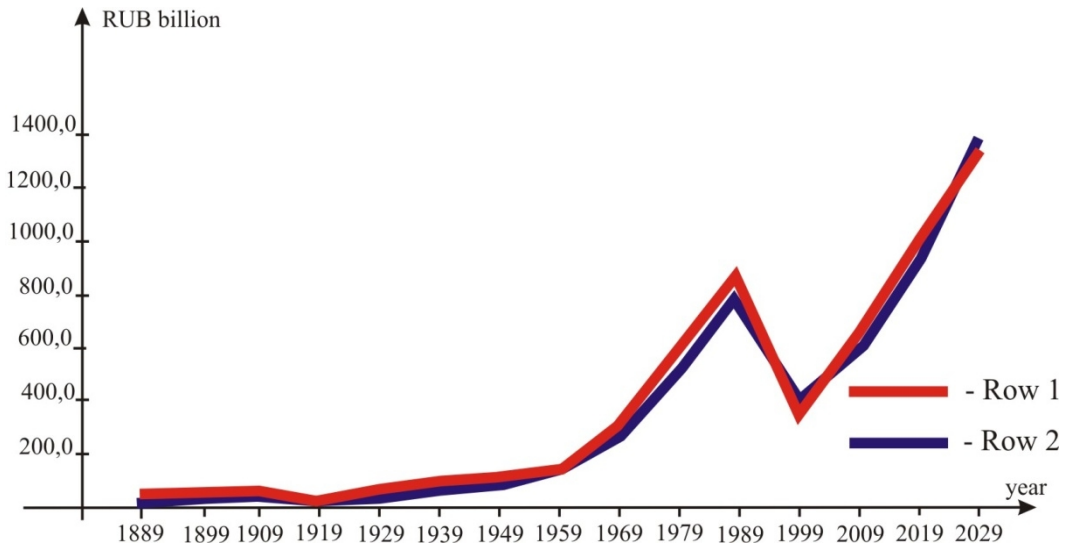

Fig. 2. Comparative changes in Russia's (within the present boundaries of Russian Federation) gross industrial product: "historical" and "basic" alternatives

[1] Here and in Table 2 "standard" stands for the data from V.M. Simchera's research, in the prices of 1959 prices.

Table 3

Russia's (within the present boundaries of Russian Federation) gross agricultural product (RUR billion, 1959 constant prices)

Year	Statistics ("standard") Row 1	Results of decision Row 2	Deviation from "standard" data, %
1889	11.3	11.1	1.5
1899	12.7	12.6	0.7
1909	14.3	14.3	–0.6
1919	6.3	6.3	0.0
1929	13.1	12.9	1.8
1939	18.5	18.0	2.9
1949	15.2	15.6	–2.9
1959	26.0	26.7	–2.8
1969	36.9	35.9	2.5
1979	50.8	51.2	–0.9
1989	59.1	59.0	0.2
1999	27.6	27.1	1.9
2009	31.1	30.9	0.8
Forecast			
	Extrapolation on the basis of projected growth rates	**Results of decision**	
2019	40.0	39.8	0.5
2029	51.0	51.9	–1.8

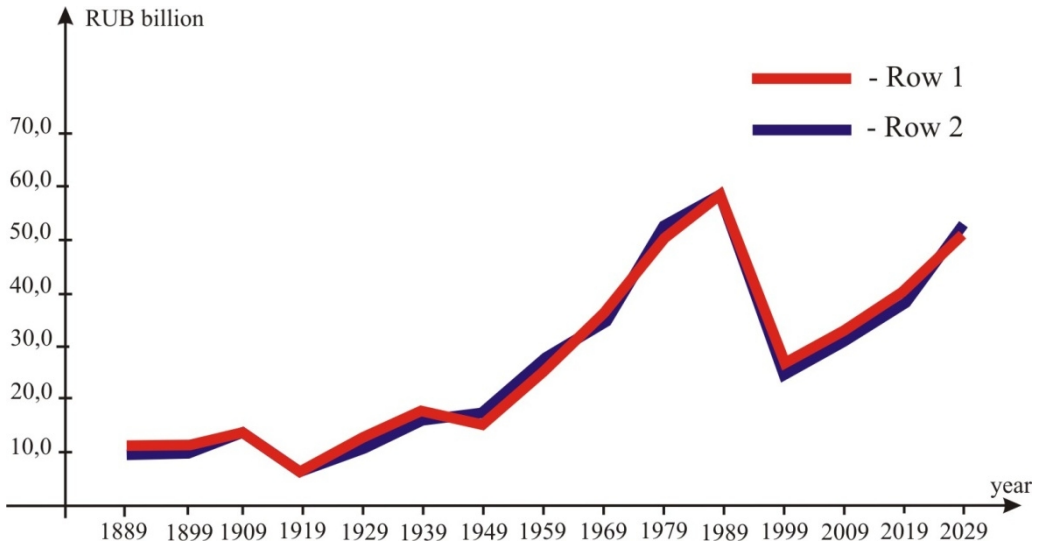

Fig. 3. Comparative changes in Russia's (within the present boundaries of Russian Federation) gross agricultural product: "historical" and "basic" alternatives

COUNTER-FACTUAL MODELING: DID WE NEED THE TRANSSIB AFTER ALL?

The first key period we set aside and, respectively, the first crucial decision (following in R. Fogel's footstep) was a transportation project – construction of the Trans-Siberian Railroad[1]. Below we can see the main results below (Figure 4).

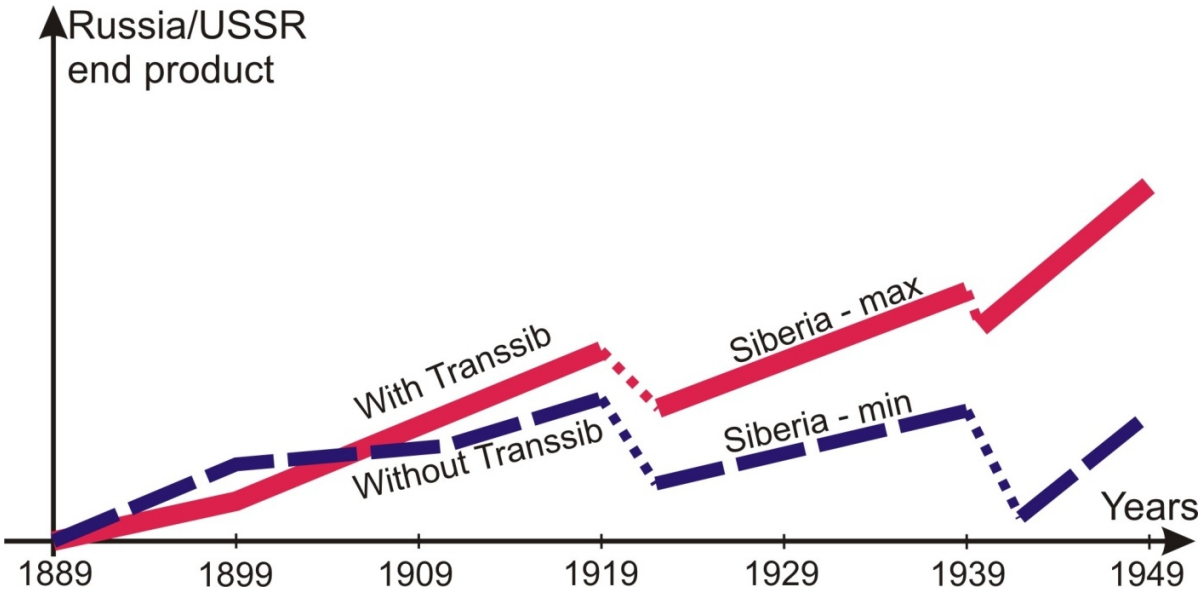

Fig. 4. Alternatives of Russia/ USSR development: late 19th to early 20th century

1. The "without TransSib" alternative leaves the Asian part of Russia underdeveloped for a long time, in need of import of most heavy industry and light industry goods. Export of agricultural products to the European part of Russia is negligible and shows only after the 1940s. The "with TransSib" alternative, on the contrary, demonstrates a strong demand for heavy industry goods in the Asian part, Urals and other regions of Russia/USSR.

2. In the initial period (1889–1899), the TransSib construction drew a lot of resources and labor from the development of other regions of the country, which shows in a somewhat lower final consumption.

3. From 1899 to 1909, the ongoing construction of the TransSib continues to slow down final consumption but the economy is able to develop faster, which is reflected in the aggregate volume of agricultural goods produced by all Russian regions. This increase is naturally attributed to the rapid growth in the Asian part. Industrial products are still predominantly supplied from the West to the East of the country.

4. The most noticeable gap in Russia's/USSR's development in the "without TransSib" alternative falls on 1919–1939. Here the danger of "individual," separate development of the European and Asian parts (decreased exchange of goods) is clearly seen. "Self-sustainable" economies are formed, though with a much lower (by 9%) final consumption. Siberian bread can no longer make up for bad harvests in Ukraine and Volga Region that occurred in the 1930s, which could have brought about additional (as compared with the actual) many millions starvation victims.

[1] The result of these calculations is given in detail in the article by V.V. Vorobiev, V.Yu. Malov, and B.V Melentiev *The use of economic-mathematical modeling in evaluating the historical experience of implementing large infrastructure projects* // Transformation of Russia's space: social-economic and natural-resource factors (full-scale analysis): [Proceedings of the XXV Annual Session of Economy and Geography Section, International Academy for Regional Development and Cooperation, Tikhvin, June 2008)] / [ed. by S.S. Artobolevsky and L.M. Sintserov]. – Moscow: Institute of Geography, Russian Academy of Sciences, 2008. – P. 118–129.

5. The danger of these tendencies going further is the most noticeable when we compare the two alternatives during the World War II and subsequent restoration period. If the same percentage of the production potential is assumed to be lost from 1941 to 1945 in different regions across the country (the regions are shown separately in the present statement), the result is evident. The loss is more dramatic in "other parts of the country" like Ukraine, Byelorussia, and Baltic Republics of the USSR. Siberian heavy industry, not developed sufficiently in the previous years, cannot compensate the losses suffered by the European part. Even though restoration of everything ravaged by the war requires a contribution of the Asian part, it is much smaller. If the restoration is assumed to go at the same pace as in the "with TransSib" (supposing it was constructed in 1945–1955) alternative, by 1989 final production would still be 30–35% lower.

Summing up, in contrast to R. Fogel's conclusion as to the importance of railroad construction in North America, we can state that for Russia/USSR railway construction (even limited to the example of the TransSib) was absolutely indispensible for successful economic development.

In a similar way, we could "reconstruct" hypothetical events for the situation when the Siberian Branch of Sciences was not established in industrially underdeveloped Siberia. In this case, it is highly unlikely that as many new oil and gas deposits would have been discovered in West Siberia and a chain of hydropower stations and power-consuming enterprises would have been started in the Angara-Yenisei region. Whether this would have been an advantage for the innovative development of the European part of Russia is open to further discussion and investigation.

The proposed approach to counterfactual simulation has been extended to include the period of 1949–2009, and projections for 2029 have been developed. The main premise is a much poorer (as compared with real life) development of the Russian Asian part but a quicker development of the European part and other Soviet Republics. The TransSib is assumed to have been constructed in the real time – early 20th century – and until 1949 the development went by the "laws of history." In this manner, the model shows a growth in all parts of the country that took place until 1949. Changes appear when the following counterfactual assumptions concerning the USSR economic development are made, beginning with 1949:

- The USA would have not attacked the USSR, even if the Asian part lagged behind dramatically in its development: the nuclear shield could have been put up in other parts of the USSR. In the East, the situation remained calm, even in terms of politics, despite the fact that industrial development did not go beyond the Urals.
- Oil would have been discovered in the European part of Russia and in other republics. However, its production is much lower than that achieved in West Siberia.
- Until the 1980s, heavy industry could have developed successfully in Russia's European part thanks to export of raw materials from abroad: Siberian resources were not in great need and environmental problems were not so urgent. Only after the 1980s this problem became critical, and the potential for the heavy industry growth in the European part became lower.
- In principle, the technologies are the same as in the case of accelerated development of the Asian part since these spatial shifts could hardly have affected technical progress and international cooperation. The lack of "big oil" would have hardly encouraged a faster progress in engineering and technologies, like a breakthrough in electronics that occurred, for example, in Japan and South Korea.
- Atomic power production domineers in the European part. The construction of hydropower stations and Kansk-Achinsk fuel and power complex is frozen.

– Capital output ratio of new construction in the USSR as a whole becomes slightly lower. Labor resources increase not in the Asian part but in the European part and other USSR republics.
– All additional oil export is accompanied by an equal import of other industries production, light industry and agriculture in the first place.
– Labor resources are redistributed: the manpower "lost" by the Asian part would have been "added" to the European part and other republics (ratio of 0.8:0.2).

This list can (and must) be extended. The main challenge is formalizing hypotheses in terms of the model chosen, OIIM, which is characterized by a very high level of index aggregation. The control variables in this model are the scale of the assumed (desirable) increase in the overall production of all industries in each of the three USSR/Russia's macroregions. The scale is restricted by the construction complex capacity (as a tool for material implementation of investment), set in the previous decade.

The main counterfactual modeling results for the period from 1949 to 2009 are shown in Figure 5.

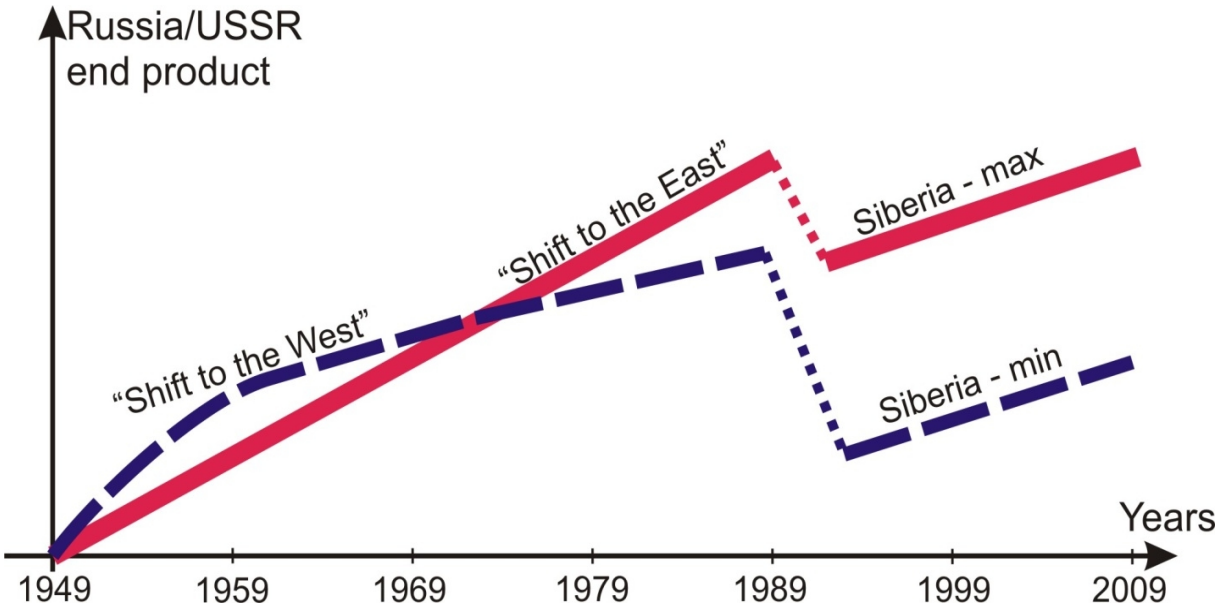

Fig. 5. Alternatives of the USSR/Russia development: the second half of the 20th century

CONCLUSIONS

- In 1949, an additional increase (by 1%) in final consumption could have been achieved – approximately RUR 1 billion in 1959 constant prices. The explanation is evident: it would not have been necessary to channel investment to "expensive" for construction regions of Siberia and Russian Far East.
- In 1959, the additional increase could have equaled 1% as well, though it would have been RUR 2 billion. Labor force is not transported to the Asian part as much as it was done in the "basic" alternative. Return in the European part is higher, and the USSR does not have any noticeable oil exports.

- Year 1969 would have been the most successful: the final consumption increase would have amounted to RUR 14 billion (2.5%). Less oil would have been exported than possible. On the other hand, light industry, food industry and agriculture would have developed faster in the European part and other USSR republics. Labor is the most significant factor restricting economic growth.
- In 1979, the final consumption loss would have added up to RUR 30 billion (4.5%). This is accounted by plummeting oil exports (as compared with the basic alternative) and, consequently, a respective decrease in light industry, agriculture, and machine building imports. Since labor intensity in oil production is lower than in light industry or machine building, the USSR would have been a loser in this international exchange. In other words, for the USSR it would make sense to employ a person in oil production rather than in light industry or machine building. These are general laws of international commerce; they work only ALL OTHER THINGS BEING EQUAL, which virtually never happens for geopolitical reasons (economic embargoes, pirates, strategic interests, etc.), among others.
- In 1989, the loss would have increased even further, to RUR 70 billion (9%).
- In 1999, the loss would have added up to "just" RUR 50 billion but this would amount to 20% of Russia's final consumption, primarily, because a major (larger than in the "historical" alternative) part of heavy industry, light industry, and agriculture happened to be OUTSIDE Russia, and to reconstruct them, construction industry would have had to grow very fast, which would not have been possible. The industry of the Asian part of Russia would not have been able to make up for the losses incurred as a result of a collapse of economic relations, and there would not have been enough oil to cover these losses. Labor would have been redundant in all of Russian regions as many facilities would have been inoperative (ruined physically).
- In 2009, the loss would have amounted to 10%, or about RUR 30 billion but the European part would have gradually resumed its growth. Oil export would have increased as well, including that from the Asian part. Heavy industry would have been on the rise in the Asian part too, though the absolute volume would have been insignificant because of the former slow development both of machine building and construction industry.
- Year 2019: The growth of all industries of the Asian part would have been curbed by a lack of labor resources, redundant in the European part. The migration would have been checked by the difficulty in creating favorable living conditions in the Asian part. The losses would have added up to 6–7% (compared with the basic alternative projections).
- Year 2029: Under the assumption of a rapid growth of labor resources in the Asian part (by 40% in ten year, though they are still scarce) loss in final consumption would have gone down to just 2.5 %, and the absolute production volumes in the Asian part approach these of the "historical alternative".

Dipping into the future and continuing the logic of the fifty-year long substantiation of strategic projects for the development of Siberia and Russian North (including the Arctic coast and waters), we can say the following:

1. Projects of this scale should not be assessed based on market criteria alone. History shows that "northern" and especially "Arctic" infrastructure projects can pay back in 20 or 30 years.

2. Shrinkage of Russia's economic space (as well as political, strategic, etc.) with an aim of achieving "transitory market effects" can turn in the future into heavy, maybe even irreparable, losses for the whole country.

3. The statesman (read economic) approach to megaprojects evaluation is a requisite for the steady development of all, especially remote and extreme regions of the country and for preserving the common economic space.

REFERENCES

1. **Alekseev V.V.** Historical projections: capabilities and restrictions. In: Prognoz i modelirovaniie krizisov i mirovoi dinamiki (Forecasting and modeling of crises and world dynamics). Moscow, Russia, 2009, p. 113.
2. **Nehamkin V.A.** Scenarios of would-have-been history: for and against. Vestnik Rossiiskoi Akamedii Nauk. – Vol. 79, № 12, December 2009, p. 1099–1106
3. **Aganbegyan A.G., Granberg A.G.** Economic-mathematic analysis of the USSR inter-industry input-output analysis. Moscow, Mysl', 1968.
4. **Simchera V.M.** Development of Russian economy in the last 100 years.1900–2000. Moscow, Ekonomika, 2007.