

Artículo de investigación

Characteristics of global automotive industry as a sector with high levels of production internationalization

Características de la industria automotriz global como sector con altos niveles de internacionalización de la producción

Características da indústria automotiva global como um setor com altos níveis de internacionalização de produção

Recibido: 20 de abril de 2018. Aceptado: 10 de mayo de 2018

Written by:

Elena V. Krasova¹

¹Candidate of Economic Sciences (PhD in Economics)

Vladivostok State University of Economics and Service

Associate Professor at the Department of Economics & Management

41 Gogol Street, Vladivostok, Russia, 690014

E-mail: elena_krasova@rambler.ru

Телефон: 8(908)993-65-45

Abstract

Research on the matter of large capital incentive sectors, which affect economy in a multiplier way, is a key component of modern economics. Global automotive industry represents a perfect example of fast-growing sector with high levels of production internationalization. Thus, it sets the pace for a lot of processes in modern global economy. The principle objective of this article is to characterize automotive industry as a leading global economic sector, which incorporates extensive geographical, organizational and technological structure. In order to achieve the objective author defines the place and role of global automotive industry in modern global economy, outlines the main features concerning nowadays sector development, specifies the conditions and factors for development of global automotive industry, examines capacity distribution of automotive industry production processes among regions of the world. During the research process authors come to a conclusion that economic growth of many developing countries is largely contingent on the development of automotive manufacturing. Geographical structure of automotive manufacturing is shifting towards Pacific Asia with China playing the leading role since 2010s. The growing demand for automobiles in developing countries, sophisticated technology employed in

Resumen

La investigación sobre el tema de los grandes sectores de incentivos de capital, que afectan a la economía de manera multiplicadora, es un componente clave de la economía moderna. La industria automotriz global representa un ejemplo perfecto de un sector de rápido crecimiento con altos niveles de internacionalización de la producción. Por lo tanto, marca el ritmo de muchos procesos en la economía global moderna. El objetivo principal de este artículo es caracterizar a la industria automotriz como un sector económico global líder, que incorpora una amplia estructura geográfica, organizativa y tecnológica. Para lograr el objetivo, el autor define el lugar y el papel de la industria automotriz global en la economía global moderna, describe las principales características del desarrollo del sector actual, especifica las condiciones y los factores para el desarrollo de la industria automotriz global, examina la distribución de la capacidad de los procesos de producción de la industria automotriz. entre las regiones del mundo. Durante el proceso de investigación, los autores llegan a la conclusión de que el crecimiento económico de muchos países en desarrollo depende en gran medida del desarrollo de la manufactura automotriz. La estructura geográfica de la manufactura

manufacturing and so far adequate rate of return are the main factors inducing sector development.

Keywords: Automotive manufacturing, automotive market, concentration of production, demand for automobiles, global industry structure, multinational corporations, production internationalization.

automotriz se está desplazando hacia el Pacífico de Asia, con China jugando el papel principal desde la década de 2010. La creciente demanda de automóviles en los países en desarrollo, la tecnología sofisticada empleada en la manufactura y hasta ahora una tasa de retorno adecuada son los principales factores que inducen el desarrollo del sector.

Palabras claves: Fabricación automotriz, mercado automotriz, concentración de producción, demanda de automóviles, estructura industrial global, corporaciones multinacionales, internacionalización de la producción.

Resumo

Pesquisas sobre os grandes setores de incentivo ao capital, que afetam a economia de forma multiplicadora, são um componente-chave da economia moderna. A indústria automotiva global representa um exemplo perfeito do setor de rápido crescimento, com altos níveis de internacionalização da produção. Assim, define o ritmo de muitos processos na economia global moderna. O objetivo principal deste artigo é caracterizar a indústria automotiva como um dos principais setores econômicos globais, que incorpora uma extensa estrutura geográfica, organizacional e tecnológica. A fim de alcançar o objetivo autor define o lugar e papel da indústria automotiva global na economia global moderna, descreve as principais características relativas ao desenvolvimento do setor hoje, especifica as condições e fatores para o desenvolvimento da indústria automotiva global, examina a capacidade de distribuição dos processos de produção da indústria automotiva entre as regiões do mundo. Durante o processo de pesquisa, os autores chegam à conclusão de que o crescimento econômico de muitos países em desenvolvimento depende, em grande parte, do desenvolvimento da fabricação de automóveis. A estrutura geográfica da produção automotiva está mudando para a Ásia do Pacífico, com a China desempenhando o papel principal desde 2010. A crescente demanda por automóveis nos países em desenvolvimento, a sofisticada tecnologia empregada na fabricação e, até o momento, a taxa adequada de retorno são os principais fatores que induzem o desenvolvimento do setor.

Palavras-chave: Fabricação automotiva, mercado automotivo, concentração de produção, demanda por automóveis, estrutura global da indústria, corporações multinacionais, internacionalização da produção.

Introduction

Broadly specialized production in various sectors constitutes the basis for development of modern global economy. Capital intensive high-tech economic sectors, which introduce the latest achievements of technological progress to the world and meet the essential human needs, appear to be the most dynamic. Global automotive industry is a perfect example of global economic sector, as the defining features on the one hand are principles of its organization, on the other – the scale of activities and the key role it plays in both economies of some states and in global economy at large.

Thus, scientific research on the factors of automotive sector development is considered to

be highly relevant. Various publications explore the matters of automotive sector development within the following frameworks.

1. The general trends of sector development and its role in value added of some states and world at large. Researchers study countries and companies – the main manufacturers of automobiles, the influence economic crises have on sector dynamics, analyze sector compensatory mechanisms and multiplier effect it exerts on economy (Agethen, Gaisbauer, Otto & Rukzio, 2018; Held, Weidmann, Kammerl, Hollauer & Lindemann, 2018; Kurilov, 2012;

Pasko, 2014; Shirokov, Kirilovsky & Bashkaev, 2011).

2. Economic and social efficiency of the transnational automotive business. Currently, experts are talking not only about internationalization, but about the globalization of the automotive industry, which has a huge, ambiguous impact on national and regional markets, as well as on the social sphere of producing and consumer countries (Liu, 2018; Sandu, 2015; Shinkle, Spencer, 2012).

3. Analytic investigation of global and national demand for motor vehicles. In this, subjects being examined are quality of life of the population, the automobilization rate, market demand factors (Gary, Amos & Tehseen, 2018; Tian, Zhang, Feng, Jia & Li, 2017). According to studies, motor vehicle is a superior good, demand for which grows faster than income does.

4. Innovation factor of automotive sector development. Scientists and practitioners formulate general methodologically rigorous selection criteria of technological solutions and innovative projects, as well as investment decisions assessment algorithms (Bartnik, Wilhelm & Fujimoto, 2018; Tian, Chu, Hu & Li, 2014).

Despite significant advances in technological development and consumer demand satisfaction many theoretical and practical issues are to be further examined aided by newly developed approaches. The objective of current research is to characterize global automotive industry as a sector with one of the highest levels of production internationalization in the world.

Theoretical basis and methods

The theoretical and methodological basis of the article is the general provisions of modern economic science, in particular: modern macroeconomic theory, the theory of the world economy development, the concept of innovative development, the theory of industry pulses, general theory of adaptation, applied through the system analysis. The research is based on the methods of economic and institutional analysis, comparative studies, expert

assessments, structural and statistical analysis, socio-economic forecasting, as well as on the approaches, applied in world practice of making managerial decisions.

The use of system approach allows considering the specifics of the research object. The investigation is based on the classical conceptual apparatus, developed by the world science, which allows studying the automotive industry specific features from the viewpoint of world economy internationalization.

It is necessary to identify the main economic categories used in this article. Automotive industry is an industry engaged in the production of trackless vehicles (for example, cars, motorcycles and carts), mainly with internal combustion engines. The industry deals with production and sale of cars and trucks of different brands for different areas of the state and for the global market.

Internationalization is a process of formation and development of common features and properties, leading to the deepening of the national economic systems economic interdependence, which are subjects of the world reproduction process. The internationalization processes take place in a continuum, one pole of which is independence, the other is dependence; somewhere in the middle is interdependence.

Results of the research and discussion

Place and role of global automotive industry in modern global economy

Cumulative world production of automotive vehicles including motor cars, commercial vehicles and buses reached the level of 95 million items in 2016. Sector's total turnover exceeded 3.5 trillion US dollars, tax revenue exceeded 8 billion US dollars, and investment annually made by automotive manufacturers and their suppliers into research and development projects amounts to over 100 billion US dollars. Around 9.5 million people are employed in automotive industry, which accounts for 5% from the number of those occupied in manufacturing sectors. The share of passenger cars according to value amounts to 10% of total exports in industrialized countries and 17% of export of machinery and equipment (OICA, 2017). The sector's relative globalization level (value of transnationalization index) had grown from 0.41 in 2000 to 0.55 in

2016, which means more than a half of production and marketing activities of automotive multinational corporations was relocated outside home countries. In addition, the volume of multinational corporations' external assets and sales is close to 1.5 trillion US dollars, and automotive manufacturing in foreign affiliates runs up to 42 million units (OICA, 2017).

However, rather than sector's absolute figures institutional multiplier effect is what is important, which its development exerts on economic growth on both national and global scale. Automotive industry, being the largest consumer of products from a wide range of industries, is a powerful factor of their development: one job in automotive sector creates 8-10 job opportunities in supporting industries: metallurgical, petrochemical, electrotechnical, textile, machine tool industry and others. For example, in United States automotive industry consumes up to 15% of steel, 46% of malleable iron, 70% of natural and synthetic rubber, one third of machine tool production. Notably, more than 55% of industrial robots and manipulators are employed in this sector (OICA, 2017). Historically, the automotive industry acted as the locomotive that pulled the US economy out of the Great Depression, fully "participated" in the Second World War, and then it "drove" the economy of post-war Europe and, in particular, Germany. Shortly thereafter, the automotive industry became the foundation for the development of Japanese and South Korean economies, bringing about the so-called "economic miracle". Today, the economic growth of many developing countries – China, India, Brazil and others – is largely contingent on the development of automotive manufacturing mainly as part of the multinational automotive corporations' activities.

The main features of global automotive industry at the present stage

In describing the current state of the global automotive industry the following major features can be specified.

1. The sector's core product is a passenger car. Up to 90% of the global motor vehicles production is made up of passenger cars (UNECE, 2016), which is not surprising taking into account the crucial role a car plays in modern society, which becomes increasingly more mobile and dynamic.

2. Global form of competition. Key regional and national automotive markets are largely integrated into the global automotive market, where the largest multinational automotive corporations act. In addition, nowadays competition becomes transnational.
3. Industry life cycle – maturity. Currently the global automotive industry operates in conditions of oversupply and excess production capacity, which increases the intensity of competition and causes a gradual decrease in companies' profit rates (OICA, 2017).
4. Industry stakeholders are large multi-brand multinational corporations. Today there are about 30 automotive manufacturing companies, the largest and strategically important of which are American multinational corporations – General Motors, Ford, Chrysler; European – Volkswagen, PSA Peugeot-Citroen, Renault-Nissan, Fiat Group, BMW; Japanese – Toyota, Honda, Suzuki, Mitsubishi, Mazda, Fuji Heavy Industries (Subaru); and Korean – Hyundai, KIA, Daewoo (Hertenstein, Williamson, 2018; OICA, 2017).
5. The consolidation level industry stakeholders is high. Over 70% of production is concentrated in the 7 largest companies (Toyota, GM, Ford, Renault-Nissan, Volkswagen, Hyundai, Honda) (Liu, 2018; OICA, 2017).
6. The main critical determinants of competitiveness in the industry are: resource intensity, first of all, in terms of the expenditures connected with components (up to 40% in the structure of cumulative expenditures for manufacturing and merchandising), with labour force (up to 20%), marketing (up to 20%); technological leadership (R&D spending is up to 8% of sales); product quality and brand reputation (Hertenstein, Williamson, 2018; OICA, 2017).
7. Dependency on external factors and

overall economic conditions is high. The reason for it is a ramified structure of intrasectoral and intersectoral linkages in automotive industry and the deep integration of manufacturing and merchandising into a single interdependent system. Besides, a motor vehicle is not an article of prime necessity, and therefore the demand for automobiles is largely dependent on consumers' level of income and the overall socio-economic situation in consumer countries.

Close correlation between sector's production and marketing fields primarily due to the specificities of distribution channels, namely, their minimum length with a fairly large width is an important industry characteristic. All major automotive manufacturers directly control the merchandising process of their products to the final consumer via an extensive network of dealerships, which are either directly included into corporate structure, or are bound with strict dealer agreements with the parent companies. As a result, the automotive industry is in fact not influenced by intermediary institutions, and that, on the one hand, allows direct pricing regulation and, accordingly, direct sales management. On the other hand, such situation leads to a tough, without an intermediary buffer, feedback from the market, where in fact "the seller is equal to the manufacturer". In the light of that circumstance, the market development is the most important factor in manufacturing development. The opposite is correct as well: the functioning of automotive sector is possible only in combination of its production and marketing fields, acting as a whole.

The factors of global automotive industry development at the present stage

The main factors for the development of automotive industry are as follows:

- 1) requirements of world population motor vehicles continue to grow steadily, even despite the unstable conditions of the global market.
- 2) industry is high-technology and knowledge-intensive. First that fact contributes to the growth of related sectors. Second, the application of innovations in automotive sector stimulates innovative development of related industries, therefore, due to the large number of those industries, the automotive sector is able to give impetus to the growth of not only industrial production, but also economy in general;
 - automotive sector in developed countries is one of the most profitable industries.
 - automobile manufacturing is a strategically important industry, the development of which shows a country has achieved high level of economic security.

Transformation of global economy structure in favor of high-tech industries is a defining factor in automotive industry development. It is reflected in the cheapening and expansion of products' model range and allows designing the production of goods for densely populated developing countries with rather modest living standards.

Changes in demand for motor vehicles are caused, firstly, by the transition of industry life cycle in developed countries to the saturation stage, when supply begins to exceed demand; secondly, by the economic success of developing countries, where the huge unmet need for passenger cars turns into effective demand, as national economies grow and incomes increase. Indeed, over the past 10 years, per capita GDP in developing countries, particularly in China, has more than doubled. If development dynamics of the largest automotive markets and the number of cars per 1000 population of respective countries and regions are compared, it turns out that less saturated areas show a higher sales increase (Figure 1, Table 1) (FSSS, 2018; OICA, 2017; UNECE, 2016).

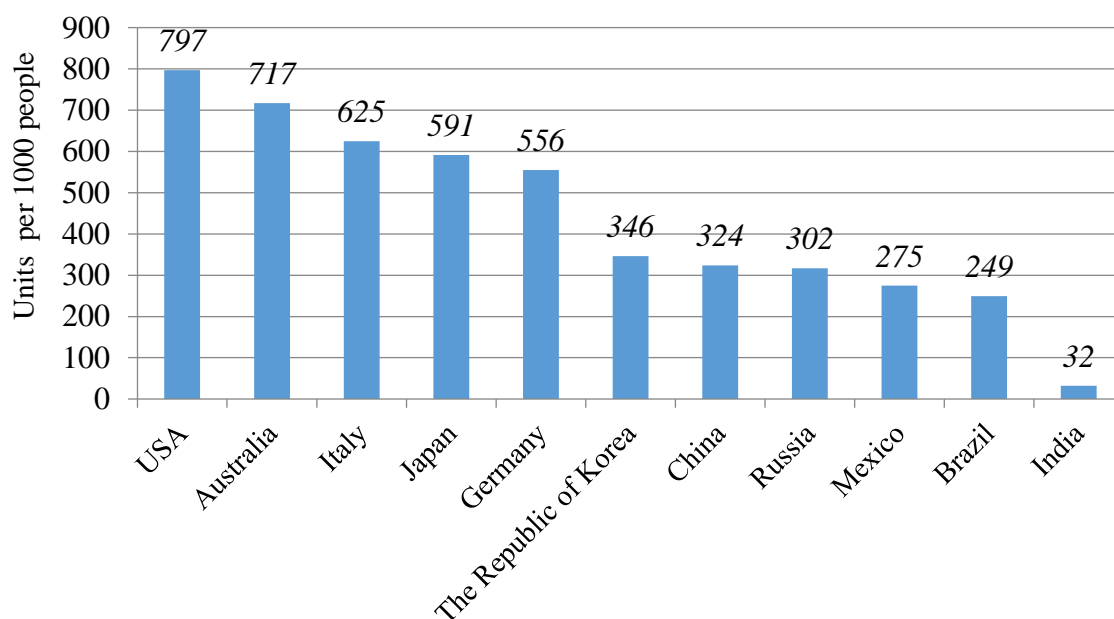


Figure 1 – Automobiliation per 1000 population in several countries in 2016

Table 1 – Sales dynamics of new passenger and commercial vehicles, 2005-2016, thousand units.

Countries	2005	2010	2012	2014	2015	2016	Structure in 2016, %
The world	65924	74972	82129	88338	89685	93856	100
Europe	21063	18809	18663	18588	19036	20135	21,5
Russia, Turkey	2877	3144	4305	3592	2582	2566	2,7
North America	20243	14204	17527	19910	21175	21497	22,9
including the United States	17444	11772	14786	16843	17846	17866	19,0
Central and South America	3096	5516	6144	5565	4514	4052	4,3
Asia, Oceania, Middle East	20409	35192	38226	42557	43411	46858	49,9
including China	5758	18062	19306	23499	24662	28028	29,9
The world	1113	1251	1569	1718	1550	1314	1,4

The best dynamics in recent years have been demonstrated by Russia and China, where vehicle fleet and automobiliation had been not as much developed as in Western countries. That gap can serve as a particular indicator of further

market growth potential, given the effect of quick start. It is evident that in densely populated and actively developing China and India, the number of citizens willing to purchase a motor vehicle will be a lot greater than in the USA or

Europe, where every second person has a car.
The distribution of production capacity in automotive industry among the regions of the world

Currently, there is a tendency of increased concentration of automotive manufacturing in

Pacific Asia and a slight weakening in positions of North America and Europe in percentage terms. Figure 2 shows the distribution of global automotive industry production capacity among the regions in 2015 and a projection for 2022 (OICA, 2017; UNECE, 2016).

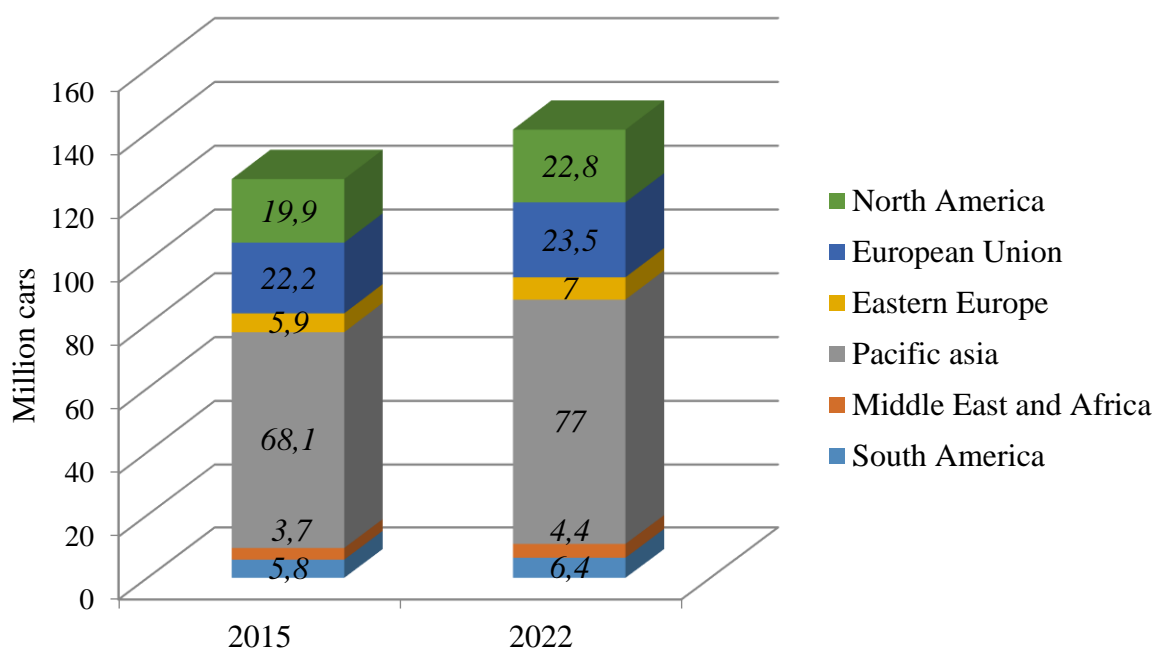


Figure 2 – The distribution of production capacity in automotive industry among the regions of the world (current and projected), million motor vehicles.

As can be seen on Figure 2, by 2022 despite the sector's maturity the production of motor vehicles will increase by 12%, however 55% of

all vehicles will be manufactured in Asia. Table 2 shows global automotive manufacturing figures by leading countries from 2000 to 2016.

Table 2 – Global automotive manufacturing (passenger and commercial) by leading countries, in millions of units.

Manufacturing countries	2000	2005	2010	2012	2014	2016
Total in the world	58,37	66,72	77,58	84,24	89,75	94,98
China	2,07	5,72	18,26	19,27	23,72	28,12
United States	12,80	11,95	7,74	10,34	11,66	12,20
Japan	10,14	10,80	9,63	9,94	9,77	9,20
Germany	5,53	5,76	5,91	5,65	5,91	6,06

South Korea	3,11	3,70	4,27	4,56	4,52	4,22
China's share	3,5%	8,6%	23,5%	22,9%	26,4%	29,6%
PRC's place in the world	8	4				

The engine of global automotive sector growth, both among developing countries and globally, is China. The volume of motor vehicles production in this country increased more than 55 times from 1998 to 2016 - from 0.51 million to 28.12 million units. For the period from 2000 to 2016, output growth is 13.6 times.

China's orientation on the capture of global automotive market is manifested in the speed of Chinese automotive industry development. Figure 3 gives a comparative description of the growth rate of global automotive manufacturing and automotive manufacturing in China (FSSS, 2018; OICA, 2017).

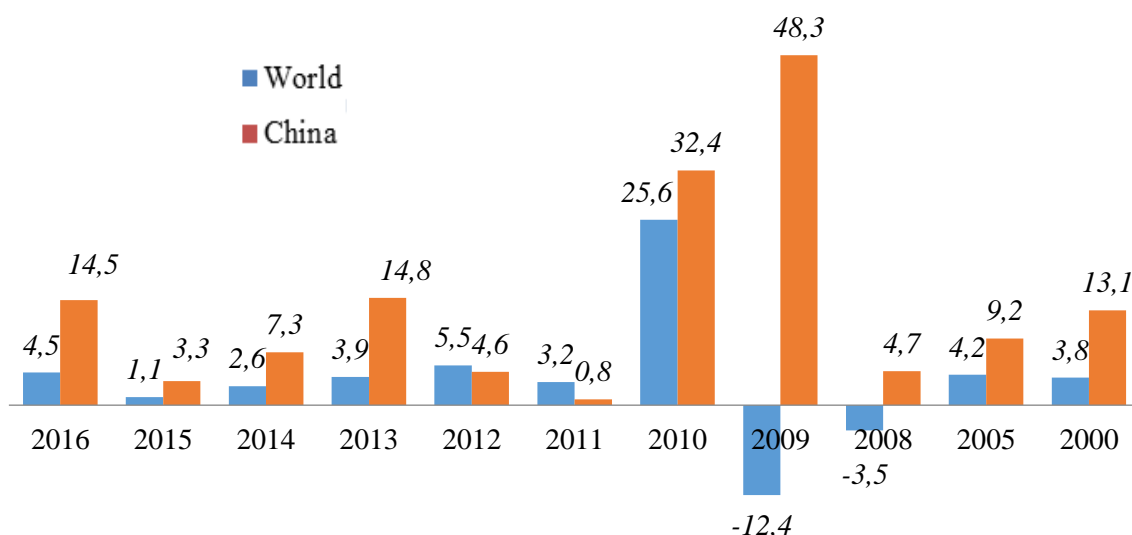


Figure 3 – The growth rate of global automotive manufacturing and automotive manufacturing in China, in percentages, 2000-2016.

As can be seen on Figure 3, the growth rate of automotive manufacturing in the world is highly uneven. During 2008-2009 economic crisis the decline in production was recorded in many countries, while the deepest decline was marked in the United States and Japan. At the same time, China recorded a record growth of 48.4%. After 2009, the Chinese automotive industry began to decline, down to the minimum value in 2011 – 0.8%. Finally, 2016 was the year of growth recovery to 14.5%. Despite the uneven dynamics of production and the lack of a clear trend, the Chinese automotive industry is demonstrating deliberately higher growth rates compared to the world as a whole.

China's significant progress in this area has been possible due to a capacious, fast-growing national market and cheap resources that have attracted the largest multinational automotive corporations to the country. It is important to note China's sensible industrial policy aimed at stimulation of multinational corporations within the frameworks of administrative and economic regulation. China's current national policy is designed not just to facilitate manufacturing activities throughout the country, but to their integration into the national economic system. Increasing the level of localization of automotive manufacturing, expanding cooperation, as well as establishment of joint ventures and attraction of foreign capital are the main integration

instruments. China has managed to seamlessly integrate its automotive industry into a modern system of global automotive production and marketing, fully appreciating the advantages of global market in the form of access to technology, resources, first-class worldwide automotive industry management experience. As a result, the country is not only gradually meeting the needs of its citizens in modern passenger transport as a product, but also laying another important brick into the foundation of national economy – the high-tech automotive industry, which is a powerful generator of economic growth.

Brazil, India and other developing countries in Asia, Central and Eastern Europe have taken a similar path. Those countries are trying to expand their presence in the global automotive sector and employ for this purpose both a passive (as consumers) and active (as manufacturers and stakeholders of global economy) ways.

Conclusions

Thus, the development of global automotive industry can be represented in a spiral way. On the one hand, economic growth and the unmet need for motor vehicles in developing countries create there an effective demand; on the other hand, the saturation of the markets in developed countries leads to sales stagnation there. As a result, there is a change in the structure of global demand, which, in turn, causes structural shifts in the geography of global market. Multinational automotive corporations adjust the organizational and spatial architecture of their international production as part of adaptation to these structural shifts. And this means that the process again returns to the framework of national economies, since the elements of this architecture are located on the territories of independent states. In many respects, it depends on the effectiveness of national economic policy of each country whether the next impetus to the economic growth of the automotive industry will result in the development of technologies and active integration into the global industry production system. Today, the effective functioning of self-efficient, nationally isolated industries, including automotive, focused on the domestic market and living under a protectionist umbrella, is simply impossible: it contradicts the emerging system of cross-border economic interaction, which is confirmed by global practice.

Bibliography:

- Agethen, P., Gaisbauer, F., Otto, M. & Rukzio, E. (2018). Interactive simulation for walk path planning within the automotive industry. *Procedia CIRP*, Vol. 72. Pp. 285-290.
- Bartnik, R., Wilhelm, M. & Fujimoto, T. (2018). Introduction to innovation in the East Asian automotive industry: Exploring the interplay between product architectures, firm strategies, and national innovation systems. *Technovation*, Vol. 70-71. Pp. 1-6.
- FSSS 2018. Russia and countries of the world 2016. Federal State Statistics Service of Russia Federation. Available at: http://www.gks.ru/bgd/regl/b16_39/Main.htm.
- Gary, L., Amos, H.C. & Tehseen, A. (2018). Towards strategic development of maintenance and its effects on production performance by using system dynamics in the automotive industry. *International Journal of Production Economics*, Vol. 200. Pp. 151-169.
- Held, M., Weidmann, D., Kammerl, D., Hollauer, C. & Lindemann, U. (2018). Current challenges for sustainable product development in the German automotive sector: A survey based status assessment. *Journal of Cleaner Production*, Vol. 195. Pp. 869-889.
- Hertenstein, P., Williamson, P.J. (2018). The role of suppliers in enabling differing innovation strategies of competing multinationals from emerging and advanced economies: German and Chinese automotive firms compared. *Technovation*, Vol. 70-71. Pp. 46-58.
- Kurilov, K.Yu. (2012). Formation of long-term prognosis of global automotive industry, based on fundamental factors // *Corporate Finance*, Vol. 6. No. 2 (22). Pp. 80-94.
- Liu, Y. (2018). The processes of new product development recentralization towards a transnational emphasis in multinational corporations. *Journal of International Management*, In press, corrected proof, Available online at: <https://www.sciencedirect.com/science/article/pii/S1075425317301369>.
- Liu, Y., Liu, Y. & Chen, J. (2015). The impact of the Chinese automotive industry: scenarios based on the national environmental goals. *Journal of Cleaner Production*, Vol. 96. Pp. 102-109.
- OICA 2017. Production statistics. Internationale des Constructeurs d'Automobiles (International Organization of Motor Vehicle Manufacturers). Available at: <http://www.oica.net/category/production-statistics/2017-statistics/>.

Pasko, A.V. (2014). Parameters and factors of global mechanical engineering development in the beginning of the XXI century // *Modern Trends in Economics and Management: a New Look*, Vol. 27. Pp. 27-34.

Sandu, M.C. (2015). Reputation – an important element for automotive industry profit? *Procedia Economics and Finance*, Vol. 32. Pp. 1035-1041.

Shinkle, G.A., Spencer, J.W. (2012). The social construction of global corporate citizenship: sustainability reports of automotive corporations. *Journal of World Business*, Vol. 47 (1). Pp. 123-133.

Shirokov, S.V., Kirilovsky, A.N. & Bashkaev, D.V. (2011). Current trends and innovative ways of development of world and national automotive

industry // *Automotive Industry*, Vol. 9. Pp. 1-4.
Tian, G., Chu, J., Hu, H. & Li, H. (2014). Technology innovation system and its integrated structure for automotive components remanufacturing industry development in China. *Journal of Cleaner Production*, Vol. 85. Pp. 419-432.

Tian, G., Zhang, H., Feng, Y., Jia, H. & Li, P. (2017). Operation patterns analysis of automotive components remanufacturing industry development in China. *Journal of Cleaner Production*, Vol. 164. Pp. 1363-1375.

UNECE 2016. Number of passenger cars per 1000 inhabitants, year 2016. The United Nations Economic Commission for Europe (UNECE). Available at: <https://w3.unece.org/PXWeb/en/CountryRanking?IndicatorCode=44>.