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Location of national manufacturing in international context (the case of U.S.)

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Location of national manufacturing in international context (the case of U.S.)

1. Introduction

Intensity of interaction of location of manufacturing in individual country and evolution of the global economy in recent decades has greatly increased due to profound changes in the global economy. The second wave of globalization since 1970 has included not only the integration of markets for goods and factors of production, but also the internationalization of production (including rise of trade in tasks, offshoring, intraindustry trade etc.). Changing location of the manufacturing, in turn, influences the country's position in international division of labor (IDL), as the country takes part in IDL not as a point, but as a set of spatial systems of different hierarchical levels.

The purpose of this article is twofold: on the one hand, to investigate the nature (intensity, structure, trends, consequences) of the interaction of the location of U.S. manufacturing and the transformation of the global economy, and on the other, to use the case of the U.S. to test some analytical approaches applicable to other countries. U.S. domestic market potential causes relatively low involvement of this country in the international division of labor. If the impact of global economic processes is essential for the location of American manufacturing, the more it is true for countries most actively involved in IDL.

The interaction of the location of manufacturing in individual country and the global economy rarely became the subject of special study. Geographic research tends to focus on the spatial differences within one country, excluding external processes. In classic American industrial geography, i.e., in works of J. Hamilton, M. Greenhut, E. Hoover, A. Scott, D. Smith, M. Storper, A. Saxenian, A. Markusen¹, global economic processes also had not received much attention. The new industrial geography, developed by A. Scott, M. Storper, T. Sturgeon², argued that the transition to postfordist organization of production had led to deepening of IDL. "Network paradigm", emerging in the 2000s and partly integrating institutional approaches³, evolution models⁴ and new industrial

¹ See, for example: Saxenian A. *The New Argonauts: Regional Advantage in a Global Economy*, Cambridge, MA: Harvard University Press, 2006. Scott A.J. *Regions and the Global Economy: The Coming Shape of Global Production, Competition and Political Order*, Oxford University Press, 1998. Storper M. *The Regional Global: Territorial Development in a Global Economy*, New York: Guilford Press, 1997. *Greenhut M. L. Plant Location in Theory and Practice*. Chapel Hill : University of North Carolina Press, 1956. *Hamilton I. The international division of labour and paradigm debates on the location of economic activity*. London : 1985. *Hoover E. M. The Location of Economic Activity*. New York : McGraw-Hill, 1948. *Smith D. M. Industrial location: an economic geographical analysis*. Wiley, 1971. *Stafford H. A. Industrial Geography in the United States, the past half century // Industrial Geographer*. 2003. Vol. 1. Is. 1.

² See, for example: *Scott A.J. Regions and the World Economy: The Coming Shape of Global Production, Competition and Political Order*, Oxford University Press, 1998. *Storper M., Walker R. The capitalist imperative: Territory, technology and industrial growth*. Oxford : Basil Blackwell, 1989. Sturgeon T.J. *Modular production networks: a new American model of industrial organization // Industrial and Corporate Change/*. 2002. Vol.11(3). P.451-496. *Sturgeon T.J. What really goes on in Silicon Valley? Spatial clustering and dispersal in modular production networks // Journal of Economic Geography*. 2003. Vol.3(2). P.199-225.

³ MacKinnon D. et al. *Evolution in economic geography: institutions, political economy, and adaptation // Economic Geography*. – 2009. – T. 85. – №. 2. – C. 129-150. Boschma R., Frenken K. *Some notes on institutions in evolutionary economic geography // Economic Geography*. – 2009. – T. 85. – №. 2. – P.. 151-158.

geography, disclosed the growing strength of the interaction of the local level of the spatial organization of production (clusters) and global factors (production networks and supply chains)⁵. But these works mostly concentrate the attention on separate countries and sectors and rarely consider broader perspective regarding manufacturing as a whole. An example of empirical studies on the location of U.S. manufacturing in the context of global economy is a collective work «Trading industries, Trading regions...», edited by H. Nojonen, J. Graham and A. Markusen⁶. Describing a retrospective of location in the U.S. and in developing countries for several industries, such as steel, automobiles, machine tools, pharmaceuticals, as well as U. S. foreign trade, the authors note the coincidence in spatial shifts in the country with changes in foreign trade. But the thesis of their interdependence remains insignificantly proven. Qualitative geographic analysis works well in researches of separate industry where the characteristic number of enterprises is the tens or hundreds. But the U.S. manufacturing in 2010 included 331 000 companies, 13 mln employees, 459 industries, 1647 billion dollars of added value. It is impossible to examine all the relevant industries. However, case studies present a risk of incorrect generalizations, since the location of industries varies greatly.

Econometric works on the impact of the global economic environment on the location of the U.S. manufacturing, according to my knowledge, are devoted to three main problems: 1) dependence of the dynamics of firms on foreign competition, and 2) the impact of trade on U.S. local labor markets, and 3) the impact of foreign trade on the dynamics of agglomeration effect.

Dynamics of firms depends on the intensity of foreign competition from low-income countries (about 50 countries, including China, with per capita GDP by official exchange rate less than 5 % of the U.S. level): the birth of new firms is negatively correlated, the closure of existing enterprises is positively correlated, as shown econometrically by E. Bernard, J. Jensen and P. Schott⁷. Competition risks are especially high for small, young, less capital-intensive and less productive U.S. enterprises. Enterprises are migrating to more capital-intensive industries with higher requirements to competence and dominance of imports from countries with higher per capita GDP.

⁴ *Elgar E. Applied evolutionary economics and economic geography / Frenken K., Ed. Cheltenham : UK. 2007. Boschma R., Martin R. Eds. The Handbook of Evolutionary Economic Geography. Cheltenham : Edward Elgar, 2011.*

⁵ See, for example: *Dicken P., Kelly P., Olds K. et al. Chains and networks, territories and scales: towards an analytical framework for the global economy // Global Networks. 2001. Vol.1(2). P. 89-112. Humphrey J., Schmitz H. How does insertion in global value chains affect upgrading in industrial clusters? // Regional Studies. 2002. Vol.36(9). P.1017-27. Saxenian A. The New Argonauts: Regional Advantage in a Global Economy, Cambridge, MA : Harvard University Press, 2006. Wolfe D.A., Gertler M.S. Clusters from the inside and out: local dynamics and global linkages // Urban Studies. 2004. Vol.41(5/6). P.1071-1093.*

⁶ *Trading industries, Trading regions: International trade, American manufacturing, and regional economic development. / Nojonen H., Graham J., Markusen A.R., Eds. New York: Guilford Press, 1993.*

⁷ *Bernard A.B., Jensen J.B., Schott P.K. Survival of the Best Fit: Exposure to Low-Wage Countries and the (Uneven) Growth of U.S. Manufacturing Plants, 2005.*

Autor, Dorn and Hanson⁸ examine the impact of Chinese imports on local labor markets in 722 commuting zones in continental U.S. in 1990-2007 for 397 industries. For each zone the authors estimate Chinese imports per employee according to weighted sectoral structure of employment. Increase in imports from China over the years 1990-2007 by state varies from \$120 to \$2,700 per employee. Control variables include numerous characteristics of qualifications, demographic structure, employment, etc. Regressions show that competition with China has a significant negative impact on the dynamics of employment and wages, leading to increase in federal social transfers. Growth of imports from China had caused in the 1990s decline in employment in the manufacturing by 0.68 percentage points per year, and in 2000-2007 by 1.57 percentage points (33 % and 57 % of the total decline, respectively).

Impact of imports from other low-income countries (Mexico and Central America) is much smaller (in 1990-2007 they accounted for only 8 % of the increase of imports from countries with low wages, and China accounted for 92 %). This conclusion is confirmed by McLaren and Hakobyan.⁹ According to their estimates, trade liberalization under NAFTA in 1990-2000 had little effect on the local labor markets by 543 U.S. Census Bureau economic areas. Affected industries are concentrated in the U.S. South (North and South Carolina, Georgia, Alabama, Mississippi, Tennessee) and in some areas of Great Lake region. Minimal impact of foreign competition is observed in most of the states of the Mountains, Pacific, East South and West North Center. Impact of trade with NAFTA countries in selected industries is quite large, especially for low-skill workers. By contrast, trade with China has had a negative impact on the local labor market as a whole.

This conclusion is confirmed by Kondo¹⁰. He considers statistics of employee assistance provided by a special federal program US Trade Adjustment Assistance (TAA). The number of workers receiving assistance under TAA is very different by U.S. The median value by states is 0.043 % of the workforce, in the South - up to 0.15% in the West - usually less than 0.04%, in the Northeast and Midwest dominate intermediate. Regressions shows that an increase of 1 percentage point in the share of workers receiving assistance under TAA leads to an increase of unemployment by 1.4 pp. Intensity of destruction of jobs is rising by 1.8 pp, duration of unemployment - by 0.5 pp, federal transfers - by 17.5 pp. The intensity of the creation of new jobs falls by 1.3 hh.

The impact of foreign trade on the dynamics of agglomeration effect is investigated in the work of Khan¹¹. Khan discusses the impact of the three main components of agglomeration effect

⁸ Autor D.H., Dorn D., Hanson G.H. The China Syndrome: Local Labor Market Effects of Import Competition in the United States. *American Economic Review*, vol. 103(6). Pp. 2121-2168.

⁹ McLaren J., Hakobyan S. Looking for Local Labor Market Effects of NAFTA. NBER Working Paper 16535, 2010.

¹⁰ Kondo I.O. Trade Reforms, Foreign Competition, and Labor Market Adjustments in the U.S. University of Minnesota, 2012.

¹¹ Khan A.M., Rider M. The Impact of Globalization on Agglomeration: The Case of U.S. Manufacturing Employment from 1988 to 2003. Georgia State University. Research Paper Series Working Paper 10-07, 2010.

(common pool of employees, common pool of suppliers, exchange of ideas) on the level of agglomeration for the 76 SIC 3-digit subsectors by state for 1988-2003. Khan believes that by 1995 WTO Uruguay Round, the creation of NAFTA, and information revolution had dramatically accelerated globalization and had changed role of the three main components of agglomeration effect. Key variables, reflecting the role of the exchange of ideas, common pool of employees, and common pool of suppliers, are included in regression twice - separately and in pair with special variable T(95), which takes the value 1 after 1995 and 0 before. Differences of signs and significance of the parameters in regression before and after 1995 should reflect the effect of globalization. Khan concludes that trade liberalization has increased positive impact of common pool of workers on the level of agglomeration. The role of exchange of ideas and common suppliers has not changed. However, the analysis of Khan does not include any explicit variable reflecting dynamics of globalization.

Methodological problems of studying the interaction of the location of the U.S. manufacturing and global economic processes are clearly visible on the example of the works considered. It is difficult to find parameters characterizing U.S. involvement in global economy and to identify parameters characterizing the location of the U.S. manufacturing. The location of the manufacturing depends not only on global economic processes, but also on internal factors. Global and U.S. trends are intertwined, complicating the selection of adequate parameters. Complicated calculations do not compensate for conceptual limitations of econometric approach.

Models of regional economics tend to focus on the spatial differences within one country, excluding external processes. They regard the state as a closed system and usually do not contain any detailed description of global economic processes. The research in the field of globalization and models of international economics, such as models of new trade theory by Dixit and Krugman¹² or the theory of “trade in tasks” by G. Grossman and E. Rossi-Hansberg¹³, have the opposite major drawback. They mostly focus on economic cooperation between the countries, regarded as points without taking into account their internal spatial structure. Among the theoretical approaches, only new economic geography (NEG), initially developed by Krugman¹⁴ in the form of core-periphery model, takes into account the spatial dimension seriously. Since 1991 models of other classes have been developed, i.e., footloose capital, footloose entrepreneur, linear, constructed capital, global and

¹² *Krugman P.R.* Increasing returns, monopolistic competition and international trade // *Journal of International Economics* .1979. 9:469-79.

¹³ *Grossman G., Rossi-Hansberg E.* Trading Tasks: A Simple Theory of Offshoring // *American Economic Review*. 2008. 98 (5).

¹⁴ *Krugman P.R.* *Geography and Trade*. Cambridge, Mass : MIT Press, 1991. *Krugman P.R.* *The Self-Organizing Economy*. Oxford: Blackwell, 1996.

local spillover, vertical linkages models¹⁵. Important new step was the creation of models of new economic geography and growth (NEGG)¹⁶.

Under NEG framework, the link between location of manufacturing and foreign trade was investigated both theoretically and empirically. An example of theoretical studies is the work of the IMF¹⁷. The model focuses on three regions, two of which are in the same country, so between them the tariff barriers are absent and population is mobile. The third region is another country, separated by customs tariff and a ban on migration. If the level of transport costs is not too high, the reduction of trade barriers and the growth of international trade help to reduce the unevenness in the distribution of population between the two regions.¹⁸ However, theoretical work are marked by very simple spatial structure, making impossible meaningful theoretical predictions. An example of empirical research under NEG framework is the work of Hanson¹⁹, where he show that trade liberalization in Mexico and its accession to NAFTA had led to a shift of the manufacturing to the border with the U.S., and the role of the capital region had decreased. However, this case should be considered rather as the exception than the rule, because of unique intensity of U.S. influence as the largest market in the world, separated from Mexico by high customs barriers up to 1985. Empirical studies covering 5 cities in 84 countries²⁰ show that due to the growth of foreign trade and economic openness share of first city is still declining, while the share of the second-sixth city is growing. Open economy reduces the home market effect and the effect of the cost of living in the capital compared to other regions, whereas the effect of competition is maintained. As a result, the incentive to concentration is weakened²¹. However, the effect of deconcentration due to trade liberalization may not realize in case of sharp disparities in income between the first and second region of the country²² or the presence of economies of scale in the transport sector²³.

Models of the new economic geography seem to contain all the necessary prerequisites for the analysis of the location of the manufacturing in the global economic context. They include a

¹⁵ Baldwin R., Forslid R. Martin P. Economic Geography and Public Policy. Princeton University Press, 2011.

¹⁶ Baldwin R.E., Martin P., Ottaviano G. Global income divergence, trade and industrialization: the geography of growth take-off // Journal of Economic Growth. 2001. № 6. Mureddu F. Essays in New Economic Geography. A Thesis submitted for the degree of Doctor of Philosophy. University of Cagliari, 2009.

¹⁷ Moncarz P., Bleaney M. Trade liberalization and the spatial distribution of economic activity within a country. University of Nottingham. Research paper series. Theory and Methods. 07/23, 2007.

¹⁸ Similar results were obtained in: Grajeda M.R., Arias A.L. Spatial implications of international trade under the new economic geography approach. University Library of Munich, Germany. MPRA Paper 18076, 2009.

¹⁹ Hanson G.H. Increasing Returns, Trade, and the Regional Structure of Wages // Economic Journal. 1997.

²⁰ Grajeda M.R., Sheldon I. Trade openness and city interaction. University Library of Munich, Germany. MPRA Paper 18029, 2009.

²¹ Krugman P.R., Elizondo L.R. Trade Policy and The Third World Metropolis // Journal of Development Economics. 1996. 49 (1).

²² Ades A.F., Glaeser E.L. Trade and Circuses: Explaining Urban Giants // MIT Press. The Quarterly Journal of Economics. 1995. Vol. 110(1). Alonso-Villar O. Large Metropolises in the Third World: An Explanation // Urban Studies. 2001. № 38 (8).

²³ Mansori K.S. The Geographic Effects of Trade Liberalization with Increasing Returns in Transportation // Journal of Regional Science. 2003. 43(2).

number of regions, linked by commodities and factor markets, allowing to analyze the relationship of convergence, integration and industrial development. However, the spatial structure of NEG models is oversimplified, and their dependence on the modelling techniques is too large. Development of NEG models has not yet led to overcoming these challenges.

So, numerous case studies of the transformation of individual industries, cities and regions in global economic context were made under the new industrial, network, institutional and evolutionary paradigms in economic geography. However, integrated approach to the problem of the location of manufacturing in global economic context is not yet developed. In this paper, as a solution of this problem, a conceptual model is proposed that describes the role of global economic processes in the location of the U.S. manufacturing.

2. Conceptual model of location of national manufacturing in international context

The conceptual model reflects the evolution of the location of manufacturing, global and national (within the U.S.) economic space (conditions for location), the territorial division of labor at the international and national levels (factors of location). Factors of location include technical and economic properties of the production determining the dependence of its location on external conditions. Conditions for location include spatially differentiated properties of the external environment that are important to production²⁴. The conceptual model extends Gorkin - Smirnyagin approach to the problem of the conditions and factors of location in two ways: 1) distinguishes between international and national levels and takes into account their interaction, and 2) considers the conditions and factors not in static but in dynamic terms.

Economic space for location decisions relevant for U.S. manufacturing development includes both U.S. regions of various hierarchical level and other countries with differing levels of economic development. U.S. regions and other countries do participate in several national and global markets, characterized by different levels of integration. Global economy is part of the conditions for the U.S. manufacturing location, along with the national ones. Two key parameters of conditions for the U.S. manufacturing location, according to the conceptual model, are the convergence (or divergence) of the level of development and the structure of the economy of U.S. regions of different countries, as well as the integration and disintegration of global and national markets for goods and services, factors of production and technology. These parameters are applied to the national and international levels.

Transformation of factors of location of U.S. manufacturing includes as a key element the deepening of national and international division of labor, including the shift from intersectoral to intrasectoral, intraindustry and intracompany division of labor. Intersectoral division of labor at the

²⁴ Gorkin A.P. Geography of postindustrial manufacturing (methodology and results of research, 1973-2012). Smolensk: Ojkumena, 2012. Pp. 35- 45

level of the classical factors of production (labor, land and capital) prevailed until the mid-twentieth century. Since 1960th intraindustry division of labor has developed based on increasing returns to scale, as described in the new trade theory by Dixit and Krugman.²⁵ In last 20 years division of labor shifted to intracompany level, including rise of trade in tasks and offshoring. At the national level the formation of "post-industrial manufacturing"²⁶ has led to vertical disintegration of value chains. Object of optimization for multinational companies (MNCs) are separate manufacturing operations that can be performed in different countries.

U.S. national economic space includes interregional aspects and core-periphery aspect. Interregional aspect reflects the distribution of manufacturing between U.S. regions. Core-periphery aspect reflects the distribution among cities of different population size classes, as well as their cores and peripheries aspects. Uneven distribution of manufacturing in the interregional aspect, i.e., spatial polarization, includes the localization of industries and specialization of regions. Dynamics of spatial polarization is primarily determined by the evolution of the economic space, as mechanisms of formation of industrial regions (comparative advantages) work at relatively large distances. Unlike spatial polarization, agglomeration of manufacturing suggests not only the concentration, but also the interaction of enterprises. This stronger form of spatial non-uniformity is typically realized at the local level (within metropolitan statistical areas - MSAs) and is expressed primarily in the core-periphery aspect of national economic space.

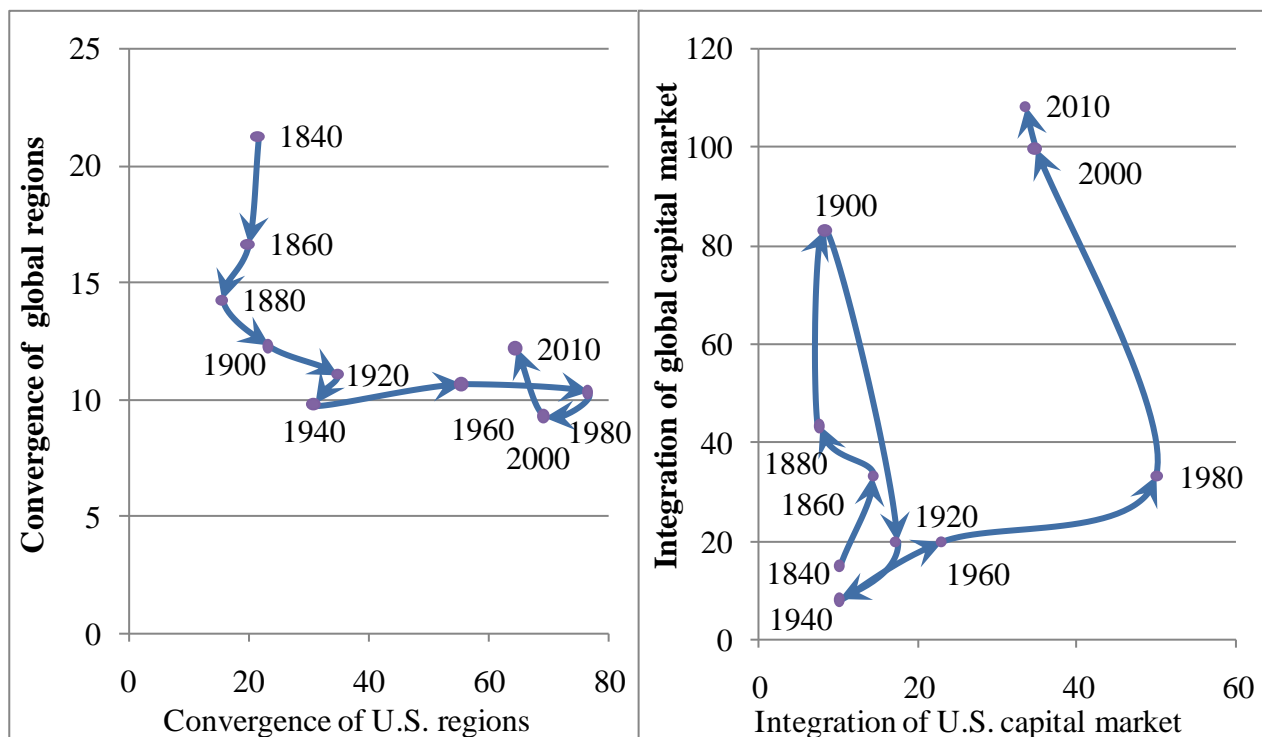
Convergence and integration of the global and national economic space is changing at different times and rates, forming a special combination of global economic and national conditions and affecting the location of the manufacturing (Fig. 1). The general trend in the evolution of the economic space is connected with growing integration and parabolic dynamics of convergence (Fig. 1, left). In developed countries the maximum interregional inequality was passed in the mid-twentieth century, and later convergence was dominating, despite possible secondary divergence trend at the postindustrial stage.²⁷ At the global level in the 1800-2000 divergence dominated, only in the 2000s turning point to convergence was passed. In developed countries, maximum interregional inequality passed earlier than at the global level. For developing countries, on the contrary,

²⁵ Krugman P.R. *The Self-Organizing Economy*. Oxford: Blackwell, 1996.

²⁶ See, for example: Whitford J. *The new old economy: Networks, institutions, and the organizational transformation of American manufacturing*. – Oxford, 2005. Gorkin A.P. *Geography of postindustrial manufacturing (methodology and results of research, 1973-2012)*. Smolensk: Ojkumena, 2012. Pp. 221 -230.

²⁷ See, for example: *Abramovitz M. Catching up, forging ahead, and falling behind // Journal of Economic History*. 1986. № 46. *Baldwin R.E., Martin P., Ottaviano G. Global income divergence, trade and industrialization: the geography of growth take-off // Journal of Economic Growth*. 2001. № 6. *O'Rourke K. Globalization and Inequality: Historical trends*. NBER Working Paper 8339, 2001. *Pritchett L. Divergence, big time // Journal of Economic Perspectives*. 1997. 11 (3). *Rodrik D. The Future of Economic Convergence*. NBER Working Paper 17400, 2011.

maximum interregional inequality at the national level coincides with peak of inequality on global level, leading to the higher spatial polarization of manufacturing.²⁸



Note: Convergence of U.S. regions - the inverse of the variance of nominal per capita income by Census Bureau regions; convergence of global regions - the inverse of the variance of per capita GDP in 10 regions; integration of the U.S. capital market - the inverse of the variance of interest rates; integration of global capital market - Obstfeld -Taylor index of international capital mobility.

Fig. 1. Evolution of U.S. national and global economic space, 1840-2010²⁹

Integration of markets is oscillating between endogenous (with advancing integration of national markets) and exogenous (with advancing integration into IDL) models (Fig. 1, right). Stage of initiation of economic growth is usually marked with advancing integration in IDL, slower integration of national markets, growing interregional inequality, and sharp increase of spatial polarization of manufacturing. Exogenous development model generates contradictions that require reorienting the economy on the development of national economic space. Endogenous development model promotes a lower level spatial polarization of manufacturing, as well as rapid development of inter-

²⁸ These trends are partially described in: Kanbur, R., & Zhang, X. (2005). Fifty years of regional inequality in China: a journey through central planning, reform, and openness. *Review of Development Economics*, 9(1), 87-106. Lu, J., & Tao, Z. (2009). Trends and determinants of China's industrial agglomeration. *Journal of Urban Economics*, 65(2), 167-180. Lall S. V., Chakravorty S. Industrial location and spatial inequality: Theory and evidence from India. *Review of Development Economics*, 2005, 9(1), 47-68.

²⁹ Compiled according to: Kim S. Economic Integration and Convergence: U.S. Regions, 1840-1987 // *The Journal of Economic History*. 1998. Vol. 58. No. 3. Pp. 659-683. Landon-Lane J., Rockoff H. Monetary Policy and Regional Interest Rates in the United States, 1880-2002. NBER Working Papers 10924, 2004. Maddison A. *The Global Economy: Historical Statistics*. Paris: OECD, 2003. Obstfeld M., Taylor A.M. *Global Capital Markets: Integration, Crisis, Growth*. Cambridge: Cambridge University Press, 2004. Calculates according to: Regional Economic Accounts, Bureau of Economic Analysis, 2012: <http://www.bea.gov/regional>.

nal continental regions, which, in turn, creates the preconditions for a new wave of integration into IDL. Integration of markets usually occurs in two stages. At the first step, a basic transport and communications infrastructure is created and markets for basic goods are integrated. In the second stage, after the demolition of institutional barriers, the integration of factor markets grows.

The conceptual model allows to distinguish the stage of spatial development of the country in the global economic context (Table 2). Developed countries, including the U.S., are at the fifth stage; developing countries are on the second or early third. Since fourth stage, the role of the internationalization for the country's participation in the IDL and the role of agglomeration for the location of the manufacturing begin to grow. Later start of modern economic growth in the country leads to lagging of the convergence of regions and market integration at the national level behind the same processes at the global level. The result is stronger export orientation of manufacturing in developing countries and higher spatial polarization.

Table 2. Stages of a country spatial development in the global economy context

Stage	Location of manufacturing and evolution of economic space
Pre-industrial stage	Low market integration at the international and national levels, low inter-regional inequality, low spatial polarization of manufacturing
Initiation of growth	Advancing integration in IDL; slower integration of national markets; growing interregional inequality; sharp increase of spatial polarization of manufacturing
Growth take-off	Advancing integration of national markets, especially for commodity markets; a sharp slowdown in integration in IDL; stabilization of interregional inequality and spatial polarization of manufacturing
Maturity stage	Continued integration at the international and national levels, particularly for the factor markets; declining interregional inequality and spatial polarization of manufacturing
Post-industrial stage	Advancing integration in IDL; slowing integration of national markets; stabilization (or slight growth) of interregional inequality and spatial polarization of manufacturing; growing role of the internationalization and agglomeration for manufacturing

Compiled by the author.

Based on the conceptual model, several hypotheses may be put forward and supported by empirical data:

- 1) the integration of global markets and the strengthening of U.S. involvement in the IDL lead, *ceteris paribus*, to an increase of spatial polarization of U.S. manufacturing;
- 2) integration of national markets for goods entails growth of spatial polarization of manufacturing, the integration of factor markets causes its decline;
- 3) convergence of U.S. regions reduces the potential of interregional economic shifts and is combined with decreased spatial polarization of manufacturing;

4) internationalization on the late stages of economic development strengthens the role of agglomeration for manufacturing.

3. U.S. integration into the IDL and spatial polarization of U.S. manufacturing

Let us start checking these hypotheses by examining the link between general trends of U.S. involvement into IDL and spatial polarization of manufacturing. Complex calculations based on various data for the last 150 years show that intensity of U.S. involvement in global economy by set of indicators is characterized by peaks in gold standard era (1870-1914) and under floating exchange rates (1970-2000s), as well as minimum after the Second World War (Fig. 2). During the gold standard era comparative advantage and integration of markets for goods, capital and labor within the Atlantic economy played a crucial role for the U.S. involvement into IDL. In 1914-1945 political and strategic processes came to the forefront. In 1970-2000s the internationalization with the active participation of developing countries became the key factor. According to the U.S. Department of Commerce, by 2010 36 % of employees of American MNCs were outside of the U.S. In 1958-2010 (mainly from 1980) the share of imports on domestic manufacturing market in the U.S. has increased from 3.0 to 27.3 %, varying in 2010 from 2.9 % for petroleum and coal products to 92.4 % in apparel and leather³⁰. The share of exports in total U.S. manufacturing sales increased from 5.0 to 20.0 %, varying in 2010 from 0.5 % in the food industry to 44.8 % in machinery.

Complex calculations based on various data shows that spatial polarization of U.S. manufacturing declined in 1860-1890, rocketed by 1914, stabilized until 1940, then began to decline rapidly, and since 1980s has slightly grown again (Fig. 3, the coefficients of specialization and localization). Role of the old industrial belt of the North first increased sharply (up to 1920), then stabilized (up to 1940), and by 1960 has fallen sharply.

Comparison of two datasets shows that increasing intensity of U.S. involvement in global economy leads, with a certain time lag, to the growth of spatial polarization. The central point to the explanation of first group of stylized facts is that growing opportunities of location decisions for U.S. companies in other countries leads to the removal of least efficient producers. As a result of uneven efficiency by industry and region, spatial polarization is growing. In contrast, the country's isolation from the global market, usually due to the political and strategic decisions, involves in industrial production less effective part of national factors of production.

³⁰ Calculated according to: Foreign Trade Statistics, U.S. Census Bureau, 2012: <http://www.census.gov/foreign-trade/>. Schott's International Economics Resource Page: http://faculty.som.yale.edu/peterschott/sub_international.html. Becker R., Gray W. Manufacturing Database. NBER and U.S. Census Bureau Center for Economic Studies, 2009.

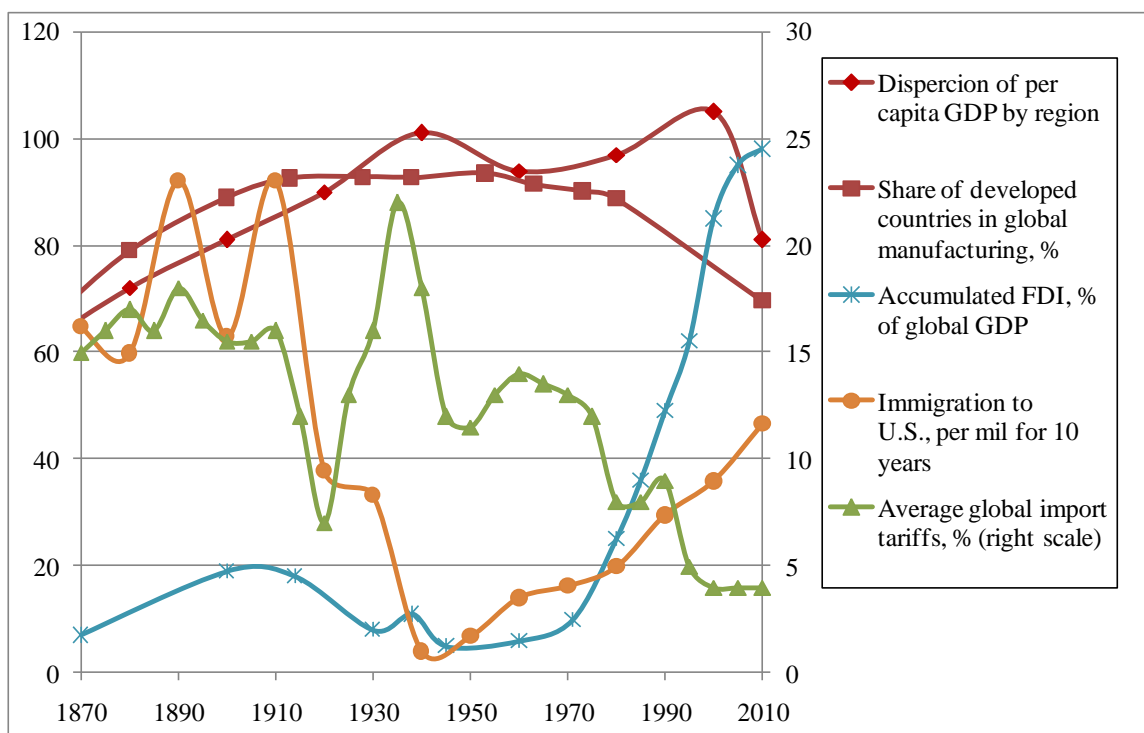


Fig. 2. Dynamics of U.S. involvement in the global economy³¹

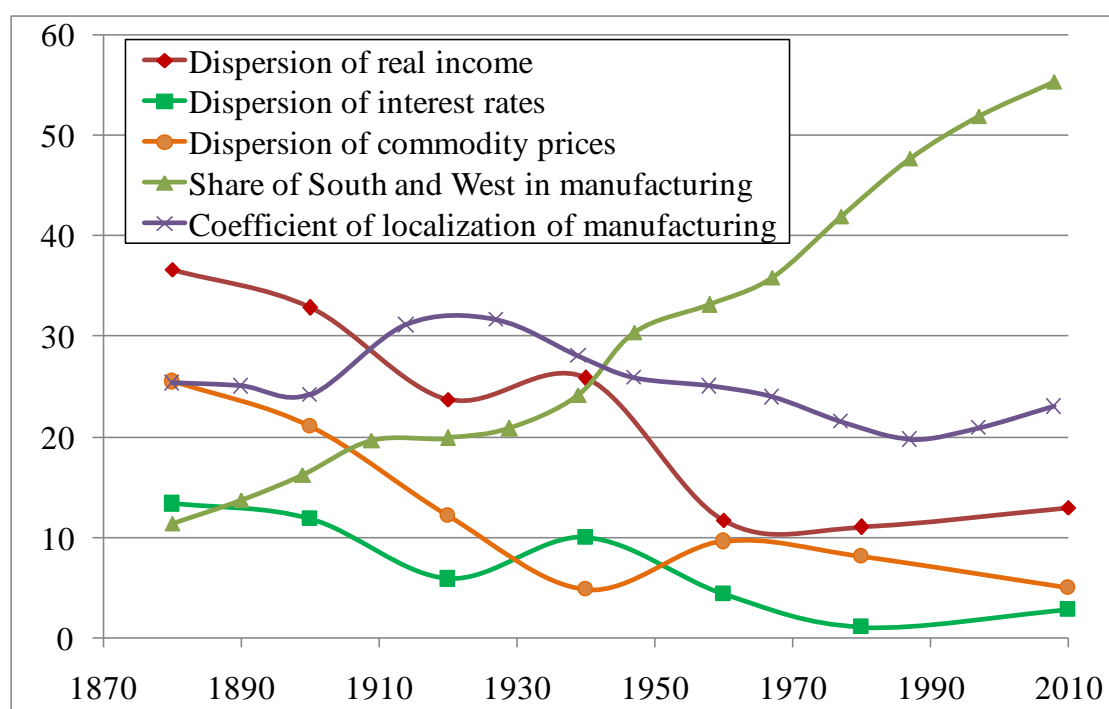


Fig. 3. Evolution of national economic space and spatial polarization of U.S. manufacturing³²

³¹ Compiled from: Bairoch P. International Industrialization Levels from 1750 to 1980 // Journal of European Economic History, № 11, 1982. Pp.269-333. Bordo M.D. Exchange Rate Regime Choice in Historical Perspective. NBER Working Papers 9654, 2003. Chiswick B.R., Hatton T.J. International Migration and the Integration of Labor Markets. IZA Discussion Paper 559, 2002. O'Rourke K. Globalization and Inequality: Historical trends. NBER Working Paper 8339, 2001. Obstfeld M., Taylor A.M. Global Capital Markets: Integration, Crisis, Growth. Cambridge: Cambridge University Press, 2004. Williamson J.G. The Evolution of Global Labor Markets since 1830: Background Evidence and Hypotheses, Explorations in Economic History // Elsevier, 1995. Vol. 32(2). Pp.141-196. Calculations based on: Maddison A. The Global Economy: Historical Statistics. Paris: OECD, 2003. UNIDO, INDSTAT4: <http://www.unido.org/resources/statistics/>. WTO Statistics database: <http://stat.wto.org/>.

The author's calculations and systematization of the results of studies of the evolution of the national economic space of United States show that the less is interregional inequality in U.S. and the more integrated are national markets for goods and factors of production, the smaller are interregional shifts of manufacturing under changing global economic conditions. The first stage of the integration of markets fell at the end of the 19th century, touched mainly commodity markets and was accompanied by intensive construction of railways (Fig. 3, the dispersion of prices for goods and factors of production). The second stage took place in the mid-twentieth century and was characterized by demolition of the institutional isolation of the South, affecting primarily factor markets. Over the last 150 years, especially in the 1900-1914 and 1940-1960, convergence trend of income by U.S. regions prevailed.

The link between general trends of U.S. involvement into IDL and spatial polarization of manufacturing is different at stages of the development of U.S. manufacturing. At the stage of rapid industrialization (in the United States - 1870-1914) strengthening the country's participation in the IDL on the basis of comparative advantage, mass immigration³³, a combination of open export markets and protectionism contributed to the primary integration of national markets for goods and the formation of the Industrial Belt of the North. This is one of the most important events of the American economic history, but a full explanation of this process has not still been developed. Some authors assign major role of natural advantages of the Northeast and Midwest - significant forest resources and hydropower in the Northeast, deposits of coal and iron ore in Great Lakes region, rich agricultural resources in the Midwest.³⁴ However, this explanation is not consistent with the actual dynamics of spatial polarization of industries. Another explanation³⁵ focuses on the institutional features of labor markets and the land of the North (free farming) and the South (slavery). A third view emphasizes the importance of the demand-side rather than supply-side causes, described in the

³² Compiled from: Cecchetti S.G., Mark N.C., Sonora R.J. Price Level Convergence Among United States Cities: Lessons for the European Central Bank. NBER Working Papers 7681, 2000. Kim S. Expansion of Markets and the Geographic Distribution of Economic Activities: The Trends in U. S. Regional Manufacturing Structure, 1860-1987. Quarterly Journal of Economics, 1995. Vol. 110. Pp. 881-908. Kim S. Economic Integration and Convergence: U.S. Regions, 1840-1987 // The Journal of Economic History. 1998. Vol. 58. No. 3. Pp. 659-683. Landon-Lane J., Rockoff H. Monetary Policy and Regional Interest Rates in the United States, 1880-2002. NBER Working Papers 10924, 2004. Mitchener K.J., McLean I.W. The Productivity of U.S. States Since 1880. School of Economics, Working Papers 2001-2008, University of Adelaide, 2001.

Calculated according to: Regional Economic Accounts, Bureau of Economic Analysis: <http://www.bea.gov/regional>

³³ Chiswick B.R., Hatton T.J. International Migration and the Integration of Labor Markets. IZA Discussion Paper 559, 2002. Williamson J.G. The Evolution of Global Labor Markets since 1830: Background Evidence and Hypotheses, Explorations in Economic History // Elsevier. 1995. Vol. 32(2). Pp.141-196.

³⁴ Kim S. Expansion of Markets and the Geographic Distribution of Economic Activities: The Trends in U. S. Regional Manufacturing Structure, 1860-1987. Quarterly Journal of Economics, 1995. Vol. 110. Pp. 881-908. Kim S. Economic Integration and Convergence: U.S. Regions, 1840-1987 // The Journal of Economic History. 1998. Vol. 58. No. 3. Pp. 659-683.

³⁵ Wright G. Old South, New South: Revolutions in the Southern Economy Since the Civil War. Baton Rouge: Louisiana State University Press, 1996.

new economic geography models.³⁶ Econometric analysis³⁷ of the factors for the formation of Industrial Belt in 1880-1920 shows that the natural advantages were important only for limited number of industries. In contrast, the access to the market and the size of enterprises, backward and forward linkages with customers and suppliers played a crucial role for the majority of sectors of American manufacturing.

Global economic factors strongly influenced the formation of the Industrial Belt of North. Railway construction, funded by 40 % by British capital³⁸, made the entire national market available to enterprises of the North. Urbanization and industrialization in the U.S. was fed by immigration aimed at industrial cities of the North.³⁹ Because of agglomeration effects in the industrial belt and incomplete integration of capital markets and labor markets, as well as institutional isolation of the South, spatial polarization of manufacturing rose sharply. Its growth in 1890-1920th was also associated with the second industrial revolution - the complex technological and organizational innovations, complicating the industrial production and increasing its efficiency.

By contrast, in 1914-1970 weakening of U.S. involvement in the IDL and the growing role of the state in the economy resulted in advanced integration of national economic space. Restricted immigration and tightened control over the movement of capital weakened drivers of spatial polarization growth, acting in the preceding period, and since 1920 spatial polarization had stabilized. During the Second World War, the industrial skeleton of the economy of South was created, stimulated by investments of the federal government during the Great Depression and the government military orders in 1940-1945. The impact of the Second World War made a significant contribution to the demolition of an institutional trap that had developed in the preceding period in the South. These forces, although of lesser scale, were also working during the Korean and Vietnam wars, encouraging industrial growth of the South and West in high-tech industries.

The prerequisites of spatial polarization decline formed in 1914-1945 were implemented in the Bretton Woods period 1945-1971, when the recovery of global trade was combined with severe restrictions on the movement of capital and international migration. Demolition of institutional barriers in the South⁴⁰, integration of U.S. national labor and capital markets led to lower levels of spatial polarization in the manufacturing and the formation of new industrial areas. New industrial belt developed in the South was based on low- and medium-tech industries interspersed with several

³⁶ Krugman P.R. *The Self-Organizing Economy*. Oxford: Blackwell, 1996.

³⁷ Klein A., Crafts N. *Making Sense of the Manufacturing Belt: Determinants of U.S. Industrial Location, 1880-1920*. CAGE Online Working Paper Series 04, 2010.

³⁸ Drummond D.K. *Sustained British Investment in Overseas Railways, 1830–1914: The Imperial Dream, Engineers Assurances or an Investment Hungry Public?* University of Leeds, United Kingdom, 2000.

³⁹ Kim S. *Urban Development in the United States, 1690-1990* // *Southern Economic Journal*. 2000. Vol. 66. № 4. Pp.855-860.

⁴⁰ *Hornbeck R., Naidu S. When the Levee Breaks: Labor Mobility and Economic Development in the American South*. Mimeo, 2012.

high-tech industries.⁴¹ For U.S. West a different model of industrialization was typical: outrunning growth of high-tech industries with high role of the military-industrial complex.

Floating exchange rates in 1980-2000s with tight international migration restrictions, but relatively free movement of capital and the reduction of tariff barriers in global trade, have created the conditions for the internationalization of production. The share of intra-industry trade in the 1962-2006 increased from 11-25 % (depending on the classification of industries) to 27-44 %.⁴² Competition from countries with cheap labor increased. Share of developed countries in global industrial production fell in 1980-2010 from 88.8 % to 65.5 %. Share of intra-firm trade in U.S. imports reached 48 %, in exports 30 %. Spatial polarization of manufacturing began to grow again. U.S. manufacturing shift from the Northeast and Midwest to the South and West with simultaneous restructuring of manufacturing in these regions was well seen in the 1950s-1990s. But after the recession of 2008-2009 trend has reversed - proactive industrial recovery was observed in the Midwest, not the South.⁴³ Scale of interregional shifts of manufacturing are estimated to be smaller than in the 1940-1960 's, and they gradually had been fading away to the 2000s.

Growing opportunities of location decisions for U.S. companies in other countries leads to spatial polarization due to uneven efficiency in different industries and regions. Global integration of the late 20th century had reduced incentives for deeper use of the U.S. national economic space, while interregional competition had intensified. But by the beginning of the second wave of global integration (1970) United States came as a more homogeneous national economy, and this situation is fundamentally different early 20th century: the proximity of the level of development of different regions of the United States made incentives for interregional shift of manufacturing limited.

4. Internationalization and agglomeration in the U.S. manufacturing

In modern conditions to the fore instead of interregional shifts come shifts in the core-periphery aspect of U.S. national economic space. The second group of stylized facts is the shift of U.S. manufacturing from relatively evenly distribution across MSAs of different size classes in 1900 to the concentration of manufacturing in MSAs with population of 250-1500 thousand people in 1950 and to the concentration primarily in small and medium MSAs by 2010.

In early 20th century, the U.S. business services and manufacturing were relatively evenly distributed across cities of different size classes⁴⁴. By 1950, the backbone of the American manufac-

⁴¹ Gorkin A.P. Geography of postindustrial manufacturing (methodology and results of research, 1973-2012). Smolensk: Ojkumena, 2012. Pp. 267-289.

⁴² Brulhart M. An Account of Global Intra-Manufacturing Trade, 1962-2006 // Global Economy. Vol. 32(3). Pp. 401-459.

⁴³ Helper S., Krueger T. and Wial H. Locating American Manufacturing: Trends in the Geography of Production. Metropolitan Policy Program at Brookings, 2012.

⁴⁴ Kim S. Urban Development in the United States, 1690-1990 // Southern Economic Journal. 2000. Vol. 66. № 4. Pp.855-860.

turing had become mid-size cities. Assessment of Duranton and Puga⁴⁵ shows that in 1950 the share of managers in employment in MSA with a population of more than 5 million people was 10.2 % higher than the U.S. average, but in MSAs with a population less than 75,000 people it was 4.0 % lower than the U.S. average. By 1990, these values were +39.0 % and -49.5 %, respectively. So, functional specialization increased sharply instead of specialization by industry. By 2010 there was a further strengthening of these trends.

By the end of the 20th century business services were concentrated in large cities, and manufacturing - in small and medium.⁴⁶ The share of manufacturing in employment decreases with increasing population size. In 1980-2010, MSA share in total industrial employment in the U.S. fell from 82 % to 79 %, but in the high-tech industries it rose from 87 % to 95 %.⁴⁷ U.S. manufacturing was moving from cores of largest agglomeration, however, high-tech industries faced the opposite trend. In 2010 the share of the top 100 MSA in total industrial employment and employment in high-tech manufacturing sectors accounted for 58.5 % and 79.5 %, respectively. 58.9 % of total employment in the U.S. economy and 94.3 % of employment in high-tech industries are located at the cores of MSAs. Moreover, in the 2000s downward trend in the share of industrial production in the MSAs reversed, reflecting the strengthening of agglomeration effect.

However, calculations (Fig. 3) show that the level of localization and agglomeration is increasing in most industries. In 1972-1987, level of agglomeration in the manufacturing declined in all respects, but since 1987 it started to increase for employment in new firms, and since the beginning of the 1990s for total employment at the state and MSA level.⁴⁸

The central point to the explanation of shifts in the core-periphery aspect of U.S. national economic space is a different character of agglomeration effect in manufacturing and business services. Systematization of the results of regression analysis of the level of agglomeration by industries of parameters reflecting the agglomeration effect components allows us to construct indices of the importance of components of agglomeration effect at different spatial levels (Fig. 4). Results vary depending on the specification of the model, but the overall picture is very similar (Fig. 5, left). Among components of agglomeration effect in industry, exchange of knowledge and technology is the most important at county and postcode level, common pool of labor – at MSA level, common pool of suppliers – at the level of regions. In the sector of services, as the analysis of

⁴⁵ Duranton G., Puga, D. Diversity and specialization in cities: Why, where and when does it matter? // *Urban Studies*. 2000. 37(3).Pp. 533–555.

⁴⁶ Kolko J. Agglomeration and Co-Agglomeration of Services Industries. MPRA Paper 3362, University Library of Munich, Germany, 2007.

⁴⁷ Helper S., Krueger T. and Wial H. Locating American Manufacturing: Trends in the Geography of Production. Metropolitan Policy Program at Brookings, 2012.

⁴⁸ Dumais G., Ellison G., Glaeser E.L. Geographic Concentration as a Dynamic Process. *The Review of Economics and Statistics*, MIT Press. Vol. 84(2). Pp. 193-204. Ellison G., Glaeser E.L. The Determinants of Geographic Concentration // *American Economic Review*. 1999. 89(2).Pp. 311-316.

Kolko shows, the picture is fundamentally different (Fig. 5, right). All components of agglomeration effect in the sector of services act primarily at the level of postcodes and to a lesser extent counties - in the immediate vicinity, and for the manufacturing - within a larger regional economic systems. Local character of agglomeration effect in fast-growing sector of business services leads to displacement of manufacturing from cores of large MSAs.

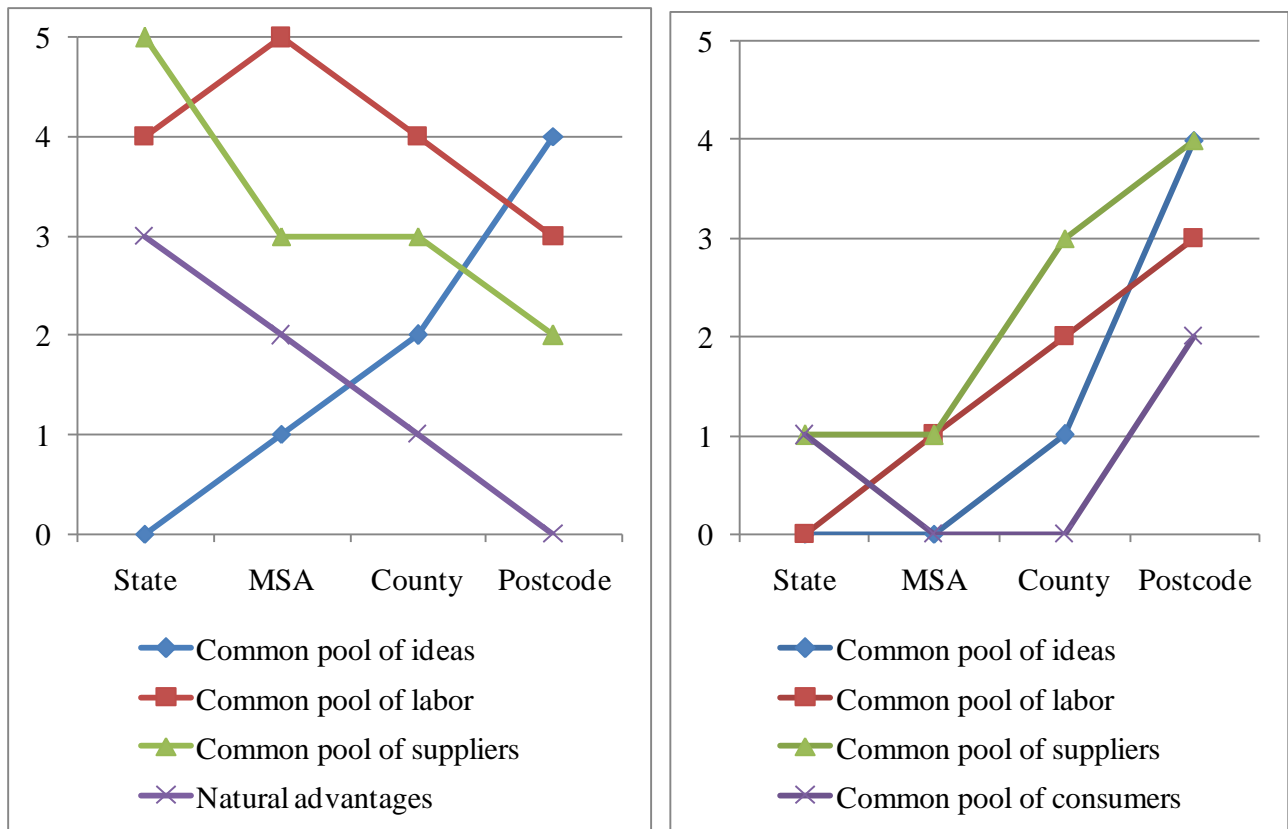


Fig. 4. Components of agglomeration effect in manufacturing (left) and services (right) in the U.S. at different spatial levels (the author's estimate in marks)⁴⁹

Internationalization makes a significant contribution to the paradoxical combination of more even distribution of manufacturing (its shift from the cores of the largest MSA) and more unequal distribution of individual industries, i.e., growing level of agglomeration. In the mid-2000s, American multinational corporations accounted for 32 % of the workforce and 48 % of production in the United States, enterprises of foreign MNCs – 9 % and 15 %, respectively⁵⁰.

⁴⁹ Compiled by the author on the base of: Ellison G., Glaeser E.L. The Determinants of Geographic Concentration // American Economic Review. 1999. 89(2).Pp. 311-316. Ellison G., Glaeser E.L., Kerr W. What Causes Manufacturing Agglomeration? Evidence from Coagglomeration Patterns. NBER working papers 13068, 2007. Kolko J. Agglomeration and Co-Agglomeration of Services Industries. MPRA Paper 3362, University Library of Munich, Germany, 2007. Rosenthal S.S., Strange W.C. Geography, industrial organization, and agglomeration // Review of Economics and Statistics. 2003. 85 (2). Pp.377-393. Rosenthal S.S., Strange W.C. The determinants of agglomeration // Journal of Urban Economics. 2001. Vol. 50 (2). Pp. 191–229.

⁵⁰ Bernard A.B., Jensen J.B., Schott P.K. Survival of the Best Fit: Exposure to Low-Wage Countries and the (Uneven) Growth of U.S. Manufacturing Plants. Journal of International Economics, 2006, Vol. 68, pp. 219-37.

First, rising international competition (including rise of trade in operations, offshoring, intraindustry trade etc.) enhances selection of enterprises and, because of strong link between productivity of an individual firm and concentration around its location, promotes agglomeration.⁵¹ Development of transport and logistics systems has reduced the role of the common pool of suppliers and, respectively, industrial regions. Only 20 % of the location of SIC 4-digit industries by U.S. states can be explained by natural advantages.⁵² Their role is even lower at the level of MSAs, counties and postcodes. Rise of the share of developing countries with low labor costs in global industrial production (only China by 2010 accounted for 20%) increases the role of access to sources of innovation. Growing competition increases role of innovation for U.S. manufacturing, reinforcing importance of local clusters and MSAs in comparison with industrial regions.

Meanwhile, innovative industries are highly concentrated in the largest cities and a number of specialized university centers. Interaction of agents within the innovation process is localized even stronger than suggested by the level of concentration of R&D.⁵³ Local innovation centers significantly stimulate the development of technologically similar industries.⁵⁴ On the other hand, the generation of technological innovation requires the active cooperation of R&D with production facilities.⁵⁵ As a consequence, high concentration of innovations leads to the increasing level of agglomeration of U.S. manufacturing as many industries are growing faster near the few centers of innovation. A number of studies has shown that a variety of economic activity in large cities stimulates innovations, but increases the cost of land and labor.⁵⁶ The innovation process itself is concentrated in the cores of the largest MSA, but after standardization of the product the removal of activity in small and medium-sized cities with lower costs becomes efficient.

Secondly, internationalization enhances selection of companies as MNCs optimize their operations globally. In the 2000s American MNCs have reduced the number of jobs in the U.S. by 2.9 million, while overseas they increased it by 2.4 million. New businesses are distributed more evenly across the USA than the existing enterprise⁵⁷, and it is the main force reducing agglomeration. Closure of the plants, by contrast, is the main force of growing agglomeration as the frequency of clo-

⁵¹ Ibarro-Caton M. Foreign Direct Investment Relationship and Plant Exit: Evidence from the United States. BEA Working Paper 2012-1, 2012. Dumais G., Ellison G., Glaeser E.L. Geographic Concentration as a Dynamic Process. *The Review of Economics and Statistics*, MIT Press. Vol. 84(2). Pp. 193-204.

⁵² Ellison G., Glaeser E.L. The Determinants of Geographic Concentration // *American Economic Review*. 1999. 89(2).Pp. 311-316.

⁵³ Saxenian A. *The New Argonauts: Regional Advantage in a Global Economy*, Cambridge, MA: Harvard University Press, 2006.

⁵⁴ Delgado M., Porter M.E., Stern S. Clusters, Convergence, and Economic Performance. NBER Working Paper No. 18250. 2012.

⁵⁵ Tecu I. *The Location of Industrial Innovation: Does Manufacturing Matter?* Brown University, 2011

⁵⁶ Duranton G., Puga, D. Diversity and specialization in cities: Why, where and when does it matter? // *Urban Studies*. 2000. 37(3).Pp. 533-555.

⁵⁷ Dumais G., Ellison G., Glaeser E.L. Geographic Concentration as a Dynamic Process. *The Review of Economics and Statistics*, MIT Press. Vol. 84(2). Pp. 193-204.

tures is significantly higher in regions where the industry is represented poorly. Numerous studies⁵⁸ show the presence of strong link between the productivity of the individual firm and the concentration of firms in their location, especially under cross-sectoral clusters. The stronger is foreign competition (especially from countries with low wages) and the higher is share of MNCs in the sectoral structure of employment (especially American MNCs), the more intensive is selection of the most competitive enterprises⁵⁹, promoting the tendency to agglomerate.

Third, internationalization has led to a sharp increase in the demand for business services. U.S. provide up to 40 % of global production and 14 % of exports of business services. According to the Survey of Current Business of Bureau of Economic Analysis, in 2011 the export of services in the United States amounted to 606.0 billion (30 % of total exports), while the surplus in trade in services amounted to U.S. \$182.6 billion, compared with a deficit of merchandise trade of \$738.4 billion. Rise of business services strengthens intersectoral competition for labor and land in large U.S. cities. Finally, highly localized agglomeration effect in fast-growing sector of business services leads to displacement of manufacturing from cores of large MSAs.

5. Conclusion

The case study of United States shows that global economic processes significantly influence location of manufacturing, including both inter-regional shifts and its redistribution between different size classes of MSAs.

Analysis of multidimensional data covering 1860-2010 shows several stylized facts. These changes are largely explained by evolution of economic space and the transformation of the division of labor at the international and national levels.

Intensity of U.S. involvement in global economy by set of indicators is characterized by peaks in gold standard era (1870-1914) and under floating exchange rates (1970-2000s). Complex calculations show that spatial polarization of U.S. manufacturing declined in 1860-1890, rocketed by 1914, stabilized until 1940, then began to decline rapidly, and since 1980s has slightly grown again. Comparison of two datasets shows that increasing intensity of U.S. involvement in global economy leads with a certain time lag to the growth of spatial polarization. The less is interregional inequality in U.S. and the more integrated are national markets for goods and factors of production, the smaller are interregional shifts of manufacturing under changing global economic conditions.

⁵⁸ Delgado M., Porter M.E., Stern S. Clusters, Convergence, and Economic Performance. NBER Working Paper No. 18250. 2012. Rosenthal S.S., Strange W.C. Geography, industrial organization, and agglomeration // *Review of Economics and Statistics*. 2003. 85 (2). Pp.377-393. Rosenthal S.S., Strange W.C. The determinants of agglomeration // *Journal of Urban Economics*. 2001. Vol. 50 (2). Pp. 191–229.

⁵⁹ Behrens K. and Robert-Nicoud F. Survival of the fittest in cities: Agglomeration, polarization, and income inequality. CIRPEE Discussion paper 09-19, 2009. Bernard A.B., Jensen J.B., Schott P.K. Survival of the Best Fit: Exposure to Low-Wage Countries and the (Uneven) Growth of U.S. Manufacturing Plants. *Journal of International Economics*, 2006, Vol. 68, pp. 219-37.

The central point to the explanation of first group of stylized facts is that growing opportunities of location decisions for U.S. companies in other countries leads to the removal of least efficient producers. Due to uneven efficiency in different industries and regions, spatial polarization is growing.

The second group of stylized facts is the shift of U.S. manufacturing to the concentration primarily in small and medium MSAs in last 50 years. U.S. manufacturing is moving from cores of largest agglomeration, however, high-tech industries face the opposite trend. Simultaneously, level of agglomeration has been growing since mid-1980s. The central point to the explanation of second group of stylized facts is the role of agglomeration effects. Rising international competition enhances selection of enterprises and, because of strong link between productivity of an individual firm and concentration around its location, promotes agglomeration. Among components of agglomeration effect in industry, exchange of knowledge and technology is the most important at county and postcode level, common pool of labor – at MSA level, common pool of suppliers – at the level of regions. High concentration of innovations leads to the increasing level of agglomeration of U.S. manufacturing, reinforcing importance of local clusters and MSAs in comparison with industrial regions. Finally, highly localized agglomeration effect in fast-growing sector of business services leads to displacement of manufacturing from cores of large MSAs.

There are some reasons to assume that in other large countries relationship of location of manufacturing and country's participation in global economy is close to U.S. trends. In developing countries, probably the tendencies specific to the United States in the first half of the 20th century prevail now. Testing this hypothesis is beyond the scope of this paper: it can be strictly justified only by comparative analysis. Particularly relevant is similar study on the manufacturing of Russia, taking into account the fundamental change in the nature of its participation in international division of labor in post-Soviet period and significance of location for industrial competitiveness.