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## An Overview of Investigations Concerning Agglomerations in Regional Economy<sup>1</sup>

*The concentration of organisations in a city or region allows companies to receive benefits without additional costs and increase their productivity. It has been empirically proven that urbanisation and localisation effects of agglomerations contribute to economic growth and development, and therefore should be taken into account in regional and urban policies. The article considers the factors of agglomeration formation, their specific development and impact on the economy of regions and cities. The paper examines studies on the territorial distribution of companies and the population, including creative capital, showing the connection with innovative systems and knowledge capital. The research demonstrates how international trade, market competition, the transport system development and many other factors affect agglomerations. The study of agglomeration processes intersects with other fields of science, such as evolutionary economics, cluster organisation, specialisation and diversification, demography of firms. To cover the topic, works in the field of agglomeration processes were systematised by using time-domain, terminological and geographical analysis, as well by studying definitions and typology, based on data obtained from Google Scholar and Web of Science for 1959–2018. It is revealed that agglomerations are considered in such scientific fields as economics, geography, regional urban planning, urban studies, management and regional studies. The key terms are agglomeration economy (economics), localisation, urbanisation, agglomeration forces, agglomerative and deglomerative factors. These works are geographically distributed, and most of them are conducted in the USA (mainly at the University of California), Great Britain (London School of Economics and Law) and China (Chinese Academy of Sciences and Peking University). The presented research review will serve as a starting point for a more in-depth study of agglomeration processes in various fields of economics.*

**Keywords:** agglomeration, agglomeration effects, economic clusters, concentration of economic activities, regional and urban economics, urbanisation, total factors productivity, innovation systems

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### Обзор исследований агломерационных процессов в региональной экономике

*Сосредоточение компаний в городе или регионе позволяет получать преимущества без дополнительных затрат и повышать эффективность экономических процессов. Эмпирически доказано, что агломерации через эффекты урбанизации и локализации способствуют экономическому росту и развитию, а значит, должны приниматься во внимание при проведении региональной и городской политики. В статье рассмотрены факторы формирования агломерационных процессов, их специфика развития и влияние на экономику регионов и городов. Представлены исследования территориального распределения компаний и населения, в том числе креативного капитала, отражена связь с инновационными системами и капиталом знаний. Показано, как международная торговля, рыночная конкуренция, развитие транспортной системы и многие другие факторы влияют на агломерации. Исследование агломерационных процессов пересекается с другими областями науки — эволюционной экономикой, кластерной организацией деятельности, специализацией и диверсификацией, демографией фирм. Проведена систематизация работ в области агломерационных процессов с использованием временного, терминологического и географического анализа, а также путем изучения определений и типологии для полного раскрытия темы, на основе Google Scholar и Web of Science за 1959–2018 гг. Определено, что агломерации рассматриваются в таких научных сферах, как экономика, география, региональное городское планирование, урбанистика, менеджмент и регионоведение. Ключевыми терминами являются экономика агломерации (экономика), локализация, урбанизация, агломерационные силы, агломерационные и дегломеративные факторы. Эти работы географически распределены, и больше всего их выполняется в США (в основном в Калифорнийском университете), Великобритании (Лондонская школа экономики и права) и Китае (Китайская академия наук и Пекинский университет). Представленный обзор исследований послужит отправной точкой для более углубленного изучения агломерационных процессов в разных областях экономической науки.*

**Ключевые слова:** агломерация, агломерационные эффекты, экономические кластеры, концентрация экономической деятельности, региональная и городская экономика, урбанизация, совокупная производительность факторов, инновационные системы

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#### Introduction

Studies on agglomeration economy hold a prominent place in scientific investigations concerning productive forces distribution today. Concentration and dissemination of economic activities inside every country depends not on a pre-planned scenario, but on market and non-market forces. Thus, their examination facilitates better understanding of the processes under way and gives information for the pursuance of the economically substantiated policy.

Research on agglomerations is an integral part of the regional economy science; these studies belong to the section of productive forces distribution. In Russian literature, it is not yet time to consider the term «agglomerations» as established; agglomerations are associated with a term «town-suburb», scientists often replace it

with «concentration», which decreases the relevance of the Russian scientific works search for foreign colleagues and, therefore, affects the citation rate.

This scientific article presents an overview of investigations in the sphere of agglomerations starting from 1959 — the study of Isard and Schooler (1959) was published this year — when the agglomeration economy was mentioned for the first time. A more detailed analysis was carried out in 1991. This is the time when the article of Krugman (1991), the 2008 Nobel Prize winner, was published, in which the agglomeration economy is discussed and the interest in this trend arises.

The purpose of the review is to determine how the investigation of agglomerations in regional economy was developed, with which other branches of the economic science it intersected

and what main results of the investigations are obtained today.

To this end, three steps were followed:

1) to create the search algorithm for the systematic literature review in order to collect a representative set of publications — articles and monographs — about agglomerations by publication bases (a) Google Scholar, (b) Web of Science;

2) to store the selected subsets in the special database in order to summarise the literature review;

3) to perform quantitative and qualitative analysis of data and information on investigation development in the sphere of agglomerations.

The scientific novelty of the article consists in systematisation of works on agglomerations in the regional economic science, application of time-domain, terminology, geographic methods of analysis, analysis of definitions and typology for a full exploration of the topic.

The article is structured as follows. The first part presents methods and approaches, determines the information sources and proposes a plan of action. The obtained results of the time-domain analysis were reflected in the second section of the article. Terminology analysis demonstrated the main areas of agglomeration investigations (the third section of the study); definitions within the topic are represented in the fourth part. The main directions of investigations according to the typology analysis results are shown in the fifth section. The results of the geographical analysis by countries and universities, conducting the investigations on agglomeration, are shown in the sixth section of the article. In conclusion, the main inferences and recommendations are given.

### 1. Methods: Search Strategy for Preparation of Literature Review

While preparing the scientific review, the following scientific approaches were used:

1) time-domain analysis to determine the main trends of investigation development in the sphere of agglomerations and to define factors of interest intensification to the subject under investigation;

2) terminology analysis to develop the agglomeration investigation and examine trends of the economic science that are intersected;

3) analysis of definitions to select and compare the most frequently cited definitions of agglomeration, agglomeration economy, effects, etc.;

4) typology analysis to determine the main topics in the sphere of agglomeration investigations and understand in what way they fit, add and enrich the existing trends of regional economic studies;

5) geographical analysis to determine regions where the agglomerations are studied and their concentration by countries and regions of the world.

The general algorithm for reviewing the agglomeration investigation in regional economy is given in Figure 1.

### 2. Obtained Results: Time-Domain Analysis

Due to the fact that Google Scholar is the most general database that frequently duplicates publications, it was proposed to start the analysis in the Web of Science (WoS). In order to find publications in the Web of Science database, two key phrases «agglomeration economics» and «agglomeration economy» were used. In total, 3,695 studies were selected and then analysed.

The time-domain analysis shows the evolution of the agglomeration investigation in regional economy (Fig. 2).

34 studies were published in the period from 1959 to 1990 (2 per year on average); among them there are 12 works cited more than 100 times. The first study in this sphere is a publication of Isard and Shooler (1959) «Industrial complex analysis, agglomeration economies, and regional development». By extension of the Weberian agglomeration analysis, the authors suggested the term «agglomeration economy», namely, the economies of scale, localisation and urbanisation (Isard, Schooler, 1959, p. 27–28).

Marcus (1965) has already made reference to the Weber's (1956) and Isard's (1956) studies in his investigation of 1965. He distinguishes the following sources of the agglomeration economy: (1) effect of scale, (2) localisation of industry; (3) urbanisation. All three factors are possible sources of economy as a result of the industry concentration, though the form of such concentration varies. In the first case, the economy of scale is the economy depending on the enterprise size growth. The industry localisation economy, on the other hand, is connected with the industry growth due to the increase in the number of companies and the expansion of their functions. Finally, the urbanisation economy covers the industry depending on a level of economic activities in the region, and not on a scale of specific branches (Marcus, 1965, p. 280–281).

The analysis of citation rate has shown that recent studies have more references. This confirms the evolutionary character of investigation development in the sphere of agglomeration economy.

Due to the fact that in subsequent years a number of publications on the agglomeration economy was high, for further analysis, the studies cited more



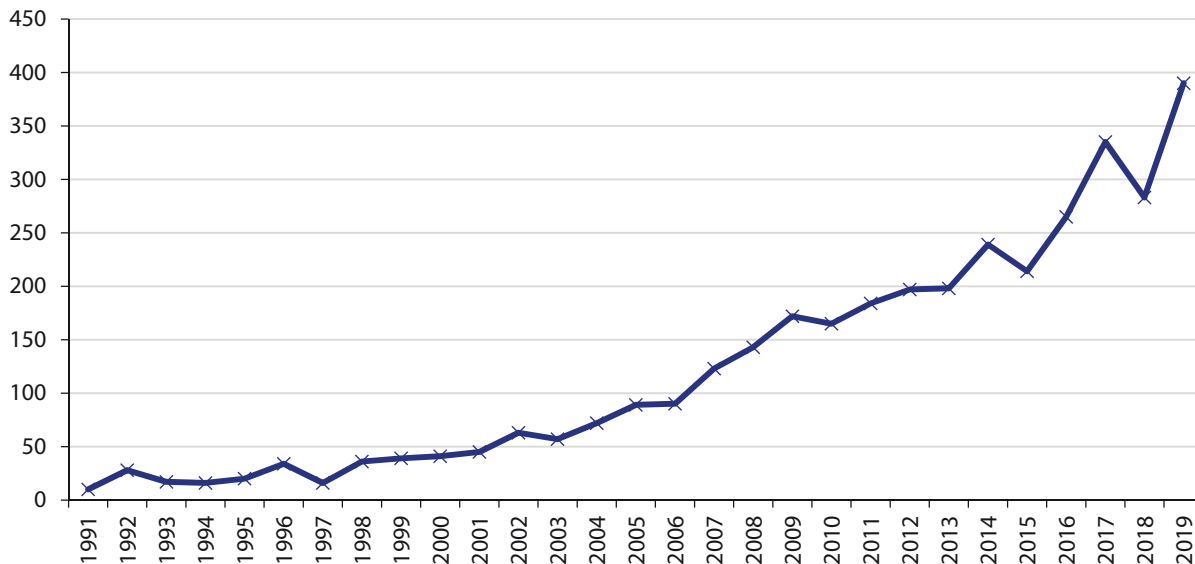


Fig. 2. Dynamics of a number of publications on agglomeration economy, 1991–2019 (Research calculations based on the WoS data)

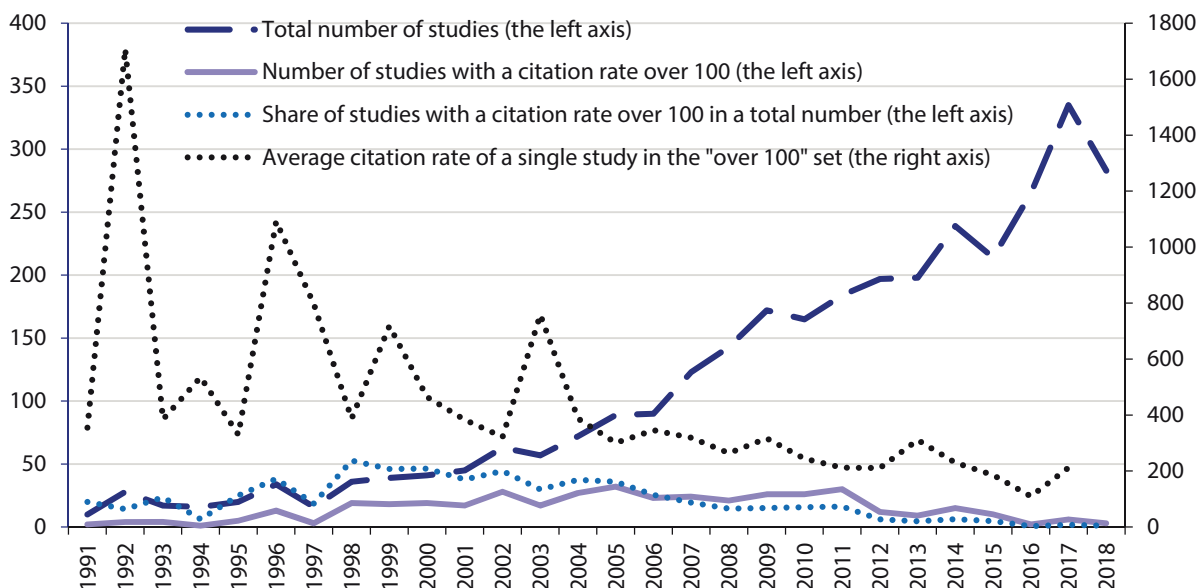


Fig. 3. Some indicators of citation rate of studies in the sphere of agglomeration economy in 1991–2018 (Research calculations based on the WoS and Google Scholar data)

### 3. Obtained Results: Terminology Analysis

The terminology analysis has shown that investigations of agglomerations in regional economy are attributed to one of six spheres: Economics, Geography, Regional and urban planning, Urban studies, Management and Area studies. After removing the publications from irrelevant areas, 2,882 works remained in the sample (Fig. 1). It should be noted that two or more spheres of investigation can intersect in the articles, and thus the summing up of studies by sections will exceed their total number. The development of these spheres was considered in dynamics (Fig. 4).

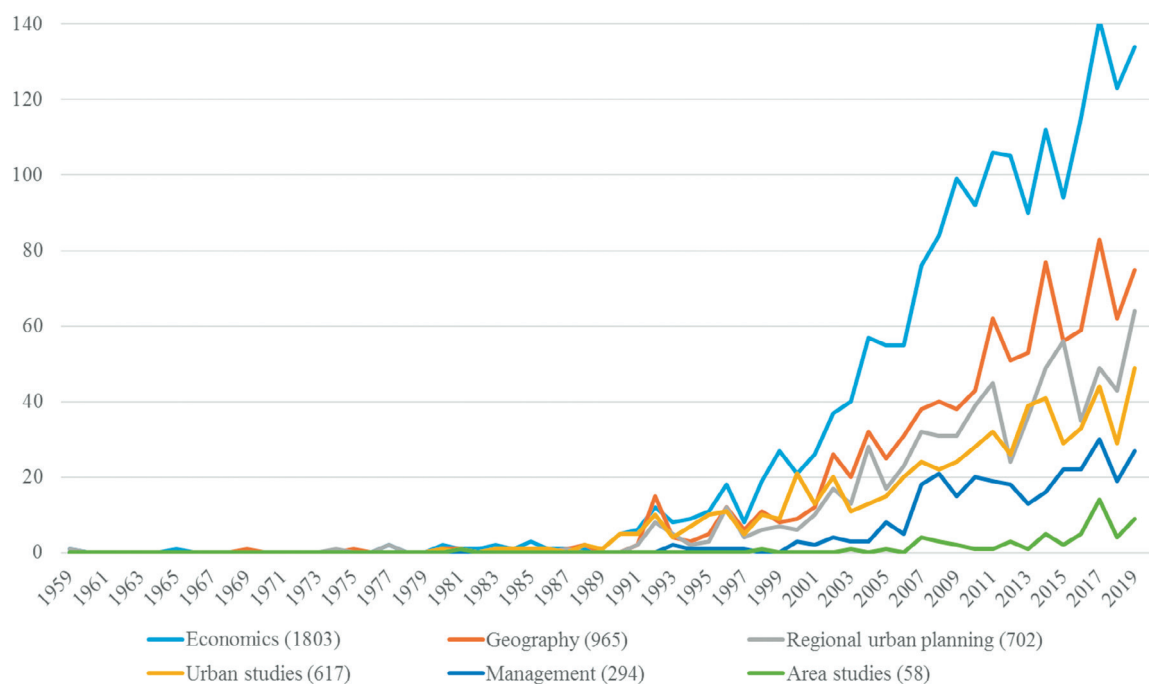
Publications in the Economics sphere appeared first in 1959. Ten articles were published by 1983.

In total, 1,803 publications can be attributed to the economic sphere.

Studies in the sphere of agglomerations were attributed to Regional and urban planning as well, however, the first ten were only composed later, by 1992. In total, 702 studies can be attributed to this trend over the period being analysed.

The first study in the Geography category appeared in 1969, and the first ten studies were accumulated by 1992. In total, 965 studies were published on Geography.

The latest studies on Management have appeared in the sphere of agglomeration investigations: two studies were published in 1993. Connection of agglomerations with the manage-



**Fig. 4.** Dynamics of publications on agglomeration by investigation spheres in 1959–2019, units (Research calculations based on the WoS data)

ment of companies were established over a longer period of time: the first ten studies were only published by 2002.

Notwithstanding that, the first Area study appeared in 1981; a total of 58 studies were published in this sphere.

#### 4. Obtained Results: Analysis of Definitions

The next stage of the scientific review is the analysis of definitions for key meanings in this sphere: agglomeration, economy, effects, etc. (Table). The term «agglomeration» was first introduced by Alfred Weber in 1905 to designate the mutual attraction of companies located in the same territory (Weber, 1905). At present, a clear separation of two types of agglomeration takes place in the economic literature (depending on the external effects arising) — location of enterprises of the same type of activity and different types of activities within the same territory (Rastvortseva, 2017, p. 47).

We see that the important categories are agglomeration and agglomeration economies, economy of localisation and urbanisation, agglomeration forces, agglomerative and deglomerative factors. Some terms were introduced at earlier stages of this trend development.

#### 5. Obtained Results: Typology Analysis

The typological analysis aims to separate different trends of the scientific idea development in agglomeration investigations. Thus, it is possible to understand on the basis of which doctrines the

ideas in this sphere occur and what independent fields of knowledge they form.

Before moving to the definition of key trends in investigation development, it should be noted that the most apparent trends of studies can be determined by the criterion of agglomeration effect manifestation: economy of agglomeration, urbanisation and localisation. The detailed analysis of empiric investigations of the agglomeration economy's impact on the social and economic development in the region with a division of MAR-effects (localisation) and Jacobs-effects (urbanisation) is given in the study (Kutsenko, 2012). We have mentioned earlier that Isard and Schooler (1959) and Marcus (1965, p. 280–281) has carried out such a division of agglomeration effects.

It is necessary to distinguish several trends of investigations concerning agglomerations in regional economy.

1) Works on evaluation of the agglomeration economy's impact on regional or urban development. On the one hand, the concentrated urbanisation gives strong support to the industrial development due to implementation of scale effect and agglomeration economy (Alonso, 1971). On the other hand, it creates serious social costs and is a result of historical and political forces, but not economic ones.

Glaeser and Gottlieb (2008) conclude in a review that «any government spatial policy is as likely to reduce as to increase welfare» (p. 155). Likewise, a recent analysis by the New York Times

Some definitions in the sphere of agglomeration economy investigation

Term	Definition	Authors, year
Agglomeration economy (economics)	Positive external effects obtained due to geographical location of companies. Potential source of competitive advantages	Porter, 1998
	Sign of agglomeration economics — localisation or spatial concentration of economic activity	Puga, 2010
	Appear from the common labour market smoothing down the shocks at companies' level, facilitating comparison or possibility to study the experience and innovations of the others	Combes et al., 2012
	Technological externalities occurring as a result of social interaction and training (Moretti, 2004a; Moretti, 2004b) or strong market effects (Marshall, 1890)	Kline, Moretti, 2014
	In conditions of agglomeration economy, the growth potential increases in proportion to economic activity increase	Glaeser et al., 1992
Agglomeration	Clustering of economic activity created and supported by the cyclic logic. Takes place at many levels — from the local trade areas servicing the surrounding residential districts inside cities to the specialised economic regions	Fujita, Krugman, Venables., 1999, p. 1
	One type of agglomeration occurs when companies selling similar products are grouped in the same district of the city. The other type can be observed in the existence of strong regional disproportions inside the country, in creation of cities of unequal size or in occurrence of industrial areas with strong technological and informational links	Fujita, Thisse, 1996
	The process of the activity concentration in the region supported by the cyclic logic at several levels with a separation of two types — «economy of localisation» and «economy of urbanisation»	Rastvortseva, 2018
Spatial agglomeration	Geographical concentration of employment inside the industrial clusters and urban labour market	Fullerton, Villemez, 2011
Economy of localisation	Endogenous effects conditioned by specialty and exogenous sources of additional benefit. Such agglomeration is evaluated empirically by the concentration indicators	Rastvortseva, 2017, p. 47
	Economy of scale at spatial concentration of activities inside the industry	Rosenthal, Strange, 2001, p. 192
Economy of urbanisation	Economy of scale increasing as the city grows	
	Enterprises of different types of economic activity prefer to be located on the same territory. Advantages of companies increase due to clustering and are connected with diversification	Rastvortseva, 2017, p. 47
Agglomeration forces	Industrial side effects between workers and companies	Kline, Moretti, 2014
Agglomerative factor	«...advantage» or cheapening of production or sale occurring as a result of production in the same place...»	Weber, 1956
Deglomerative factor	«...cheapening of production occurring as a result of production decentralisation»	Weber, 1956

describes such policies as a «zero sum game» among American communities<sup>1</sup>.

The agglomeration effects stimulate the development of cities (Batten, 1995). The network cities are formed, which add to each other, in functionality aiming for cooperation and achievement of sufficient economy to scale. This is possible with quick and reliable corridors of transport and communication infrastructure, which provides a high priority of knowledge-based activity (investigations, education and art). The cooperation mecha-

nisms of such network cities resemble the mechanisms of inter-firm networks (Batten, 1995).

Knowledge becomes a key factor to increase the companies' productivity. The effects will be received by the firms, which are able to create knowledge faster than their competitors. Closeness of firms plays an important part for direct training, creation and distribution of explicit and implicit knowledge, including that through institutional support (Maskell, Malmberg, 1999). The important factor of cities' development are non-material assets; a positive influence of ventures for innovation development was proven (Caragliu et al., 2016).

Urbanisation has an impact on the efficiency of economic development; the economic growth af-

<sup>1</sup> Story, L. (2012). As companies seek tax deals, governments pay high price. *New York Times*, 1. Retrieved from: <https://www.nytimes.com/2012/12/02/us/how-local-taxpayers-bank-roll-corporations.html> (Date of access: 20.04.2022)

fects the agglomeration model. Local information flows facilitate the creation of agglomerations; accumulation of human capital facilitates endogenous growth. Cities grow as human capital is accumulated and knowledge is disseminated (Black, Henderson, 1999).

The key factors of cities' growth are the quality of production factors, density of external relations and cooperation networks, general characteristics of city system and events being held (Camagni, Capello, Caragliu, 2017).

The national government policy and non-democratic institutions can facilitate the concentration of most of the population in one or two megacities (Henderson, 2003b). The optimum level of urbanisation and urban concentration is determined from the point of view of the maximisation of labour efficiency growth. It varies depending on the country size and development level. Excessive or insufficient concentration can be very expensive from the point of view of efficiency (Henderson, 2003b).

Cities and regions, being the active and interdependent elements of the economic growth formation, play an important part for the economic policy implementation aimed at the stimulation of the agglomeration economy in the poorer regions. This makes it possible to solve issues of interregional inequality due to the present globalisation (Scott, Storper, 2003).

Overall, agglomerations have a positive (and statistically valuable) influence on the technological changes at the country level and on labour efficiency (Acs, Varga, 2005).

Limitations of intra-branch and inter-branch migrations lead to insufficient agglomeration effects in the mobile and non-mobile economy sectors of the country (Au, Henderson, 2006).

2) Explanation of territorial allocation of companies and population. The agglomeration economy can occur in the absence of external effects due to scale, transport costs and the mobility of production factors (Krugman, 1993). The work of Krugman (1993) proposes an approach to the construction of a theoretical model of the city location from the perspective of industrial goods production in the metropolis to serve agricultural areas and its own residents. This research can be attributed to the directions of «Urban economics» and «Location theory». The main difference of this approach from the previous ones is that it does not make assumptions about the presence of external economies of scale and centripetal forces, but emphasises the connection between economies of scale at the enterprise level and transportation costs. The interest in

this paper was prompted by the suggestion of a model that could be used for empirical research. We think that it was a factor of increasing interest in research in this area.

The agglomeration of economic activities is facilitated by external effects under conditions of perfect competition, an increase in returns to scale under conditions of monopolistic competition, and spatial competition under conditions of strategic interaction (Fujita, Thisse, 1996).

The selection of company location is considered from a strategic point of view as well (Porter, 1996). Fear of competition sets companies apart from each other, but, on the contrary, the advantages of the complementary differences with dissimilar competitors and side agglomeration effects in regard to direct competitors brings them together. Companies select a location in order to be much the same as the competitors with one characteristic (e.g., price — this provides the agglomeration benefits to them), but differ by another characteristic (e.g., size — to avoid localised competition and creates additional differences) (Baum, Haveman, 1997). Similar investigations were conducted in regard to foreign companies as well. Besides the organisational factors, the institutional environment of the region is taken into consideration here (Meyer, Nguyen, 2005). Technology companies prefer locations with a higher academic level, but not industrial activity in order to keep a distance from competitors (Alcácer, Chung, 2007).

The analysis of agglomeration effects is traditionally based on the data on employment or total factor productivity (TFP). So, the industry specialisation and returns to scale have a positive impact on the efficiency growth, unlike the product diversification and the local competition level (Cingano, Schivardi, 2004). Advantages of the industry agglomeration (or spatial clustering) are taken into account, including total infrastructure, market of the qualified labour force, efficiency of transaction and knowledge spillovers (Malmberg, Maskell, 2002). Significant influence is exerted by the industrial organisation of territory, while the localisation economy has a short-term effect and quickly decreases (Rosenthal, Strange, 2003).

Attributed to this set of investigations can be the study by Henderson (2003a) who has evaluated the character and amount of local external effects according to the industry-specific scales (as per Marshall) depending on the agglomeration degree and mobility of branches between cities.

3) Specific character of agglomeration development. Considered in the study of Henderson is a mechanism being the basis for growth and dis-



tribution of large agglomerations of economic activities to determine how the cumulative processes of global integration and regional concentration can be regulated in the new world order (Henderson, 2003a). The spatial economic development can also be explained by the availability of transport nodes at the creation of large cities. In the article by Fujita and Mori (1996), the inconvertibility of such development is proven (e.g., prosperity of port cities in conditions of maritime traffic decreases).

The temporary deterioration of transport communication of peripheral regions with the central ones can occur as a protection of industrial spheres and will facilitate the accelerated economic development of peripheral regions (Fujita, Mori, 1996). In conditions of the agglomeration development, it is important to understand that companies not only derive benefit from external effects, but also make a return contribution. The difference in the derived benefits from agglomeration leads to heterogeneity. It can be explained by high-tech companies avoiding congestion and competitors; the technologically sound companies will increase their efficiency by creating linked and unlinked diversification (Shaver, Flyer, 2000). The former derives fewer benefits from the concentration on the geographical territory.

Development of agglomerations leads to the growth of income per worker in proportion to the city size increase (Au, Henderson, 2006); productivity will increase depending on the population density (Glaeser, Gottlieb, 2009). Clustering of companies aimed at decreasing costs for dislocation is no longer considered a key factor for the economic development of modern cities, depending largely on the movement intensity of ideas (Glaeser, Gottlieb, 2009).

4) Cluster organisation of economic activities. Investigation of the industrial clusters development answers the question: why are economic activities agglomerated in a small number of places? Clusters are determined as spatial agglomerations or centres of growth (Harrison, Kelley, Gant, 1996) and quickly growing geographical clusters of the competing companies – as “hot points” (Pouder, St. John, 1996). Frequently, the external effects of increase in returns to scale and spatial competition under conditions of strategic interaction are among the reasons for industrial clusters (Fujita, Thisse, 1996). Besides «new industrial areas», three additional types are proposed with different configurations of companies, internal and external orientations and structures of control. They are a nodal industrial area (economic activities which

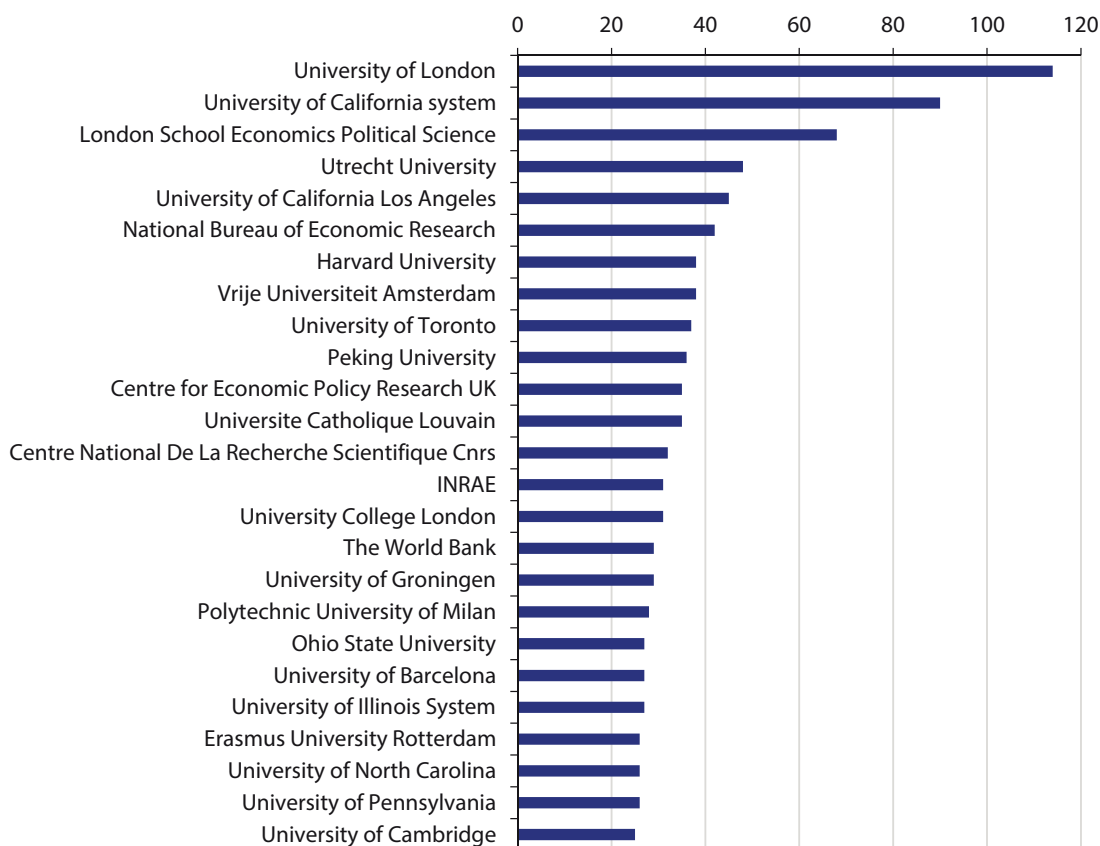
are centred around one or more dominating export companies), satellite platform (a complex of unlinked industry-specific enterprises oriented to external relations) and a state area (orientation to one or more establishments of the state sector) (Markusen, 1996). It was shown that the examination of industrial areas requires a wider institutional approach (Markusen, 1996).

The innovative environment within the cluster emerges at the expense of agglomeration economies and governance institutions. The macro-culture within the cluster does not stimulate innovation and reduces the competitiveness of cluster members (Pouder, St. John, 1996).

Integration of industrial and servicing enterprises inside clusters creates the localisation effect; integration of different economic and social institutions creates the urbanisation effect (Harrison, Kelley, Gant, 1996). It is recognised that urbanisation is more important than localisation in order to explain spatial models of the innovative and economic development (Harrison, Kelley, Gant, 1996). Urbanisation influences a probability that the companies’ managers will implement new technologies. The presence of companies in the industrial cluster enhances innovations (Bell, 2005). However, innovations are not always systematically connected with the cluster density (Harrison, Kelley, Gant, 1996).

A concept of industrial clusters is often used for efficient state support to the economy of the lagging cities of regions. The analysis of concentration and different forms of links inside clusters shows that the agglomeration effects play the prevailing part (Gordon, McCann, 2000).

A number of investigations shows that the importance of clusters in the economic development of a city or region can be overestimated (Turok, 2004). In other studies, it is proven that, vice versa, clusters have a positive impact on entrepreneurship. Therefore, decreases in returns to scale with specialisation at a regional or branch level can lead to convergence (Delgado, Porter, Stern, 2014), but the availability of the complementary economic activities in the cluster will create external effects, which strengthen motivation and decrease barriers for the creation of new enterprises. Thus, clustering is an important method for the provision of complementarities. Consequently, industry branches located in the regions with strong clusters are of certain importance for the creation of new enterprises and work places. Strong clusters motivate the appearance of new subdivisions in the already existing international companies and facilitate the survival of start-up firms (Delgado, Porter, Stern, 2010).



**Fig. 5.** Distribution of publications concerning the agglomeration investigation among the leading universities of the works, number of studies (research calculations based on the WoS data)

5) Factors of the concentration of economic activities. According to Krugman's opinion, the international trade is determined by comparative advantages and growing returns to scale, as well as external effects, which can be implemented to a greater extent at a local level (Martin, Sunley, 1996). Investigations in individual studies are a tendency of firms and workers to spatial agglomeration as the regions become more integrated (Ottaviano, Puga, 1998). Economic agglomeration can manifest itself at different levels, such as the lowest level (small-scale agglomeration) and the so-called field-specific industrial areas. Large agglomerations can intersect the borders of individual regions if not countries (Ottaviano, Puga, 1998). It was proven that the common labour market is a flashing factor of the agglomerations. It influences agglomerations at all levels. Factors of dependency on production and natural resources and an indicator of costs for transportation of intermediate goods become the key ones (Rosenthal, Strange, 2001).

Among other factors, urban agglomerations are explained by a need for the direct contact of economic entities. The «face-to-face» contact has positive characteristics: the efficient communication technology, a possibility to solve motivation problems, facilitation of socialisation and training

as well as psychological motivation. Each of these peculiarities facilitates the occurrence of the agglomeration effects and is a key feature of many types of creative activities (Storper, Venables, 2004).

Individual investigations show that firms with higher productivity tend to be located in the central regions or cities; those with a lower productivity tend to be located in peripheral regions. The dissimilarity of companies in agglomerations decreases the domestic market effects (Baldwin, Okubo, 2006).

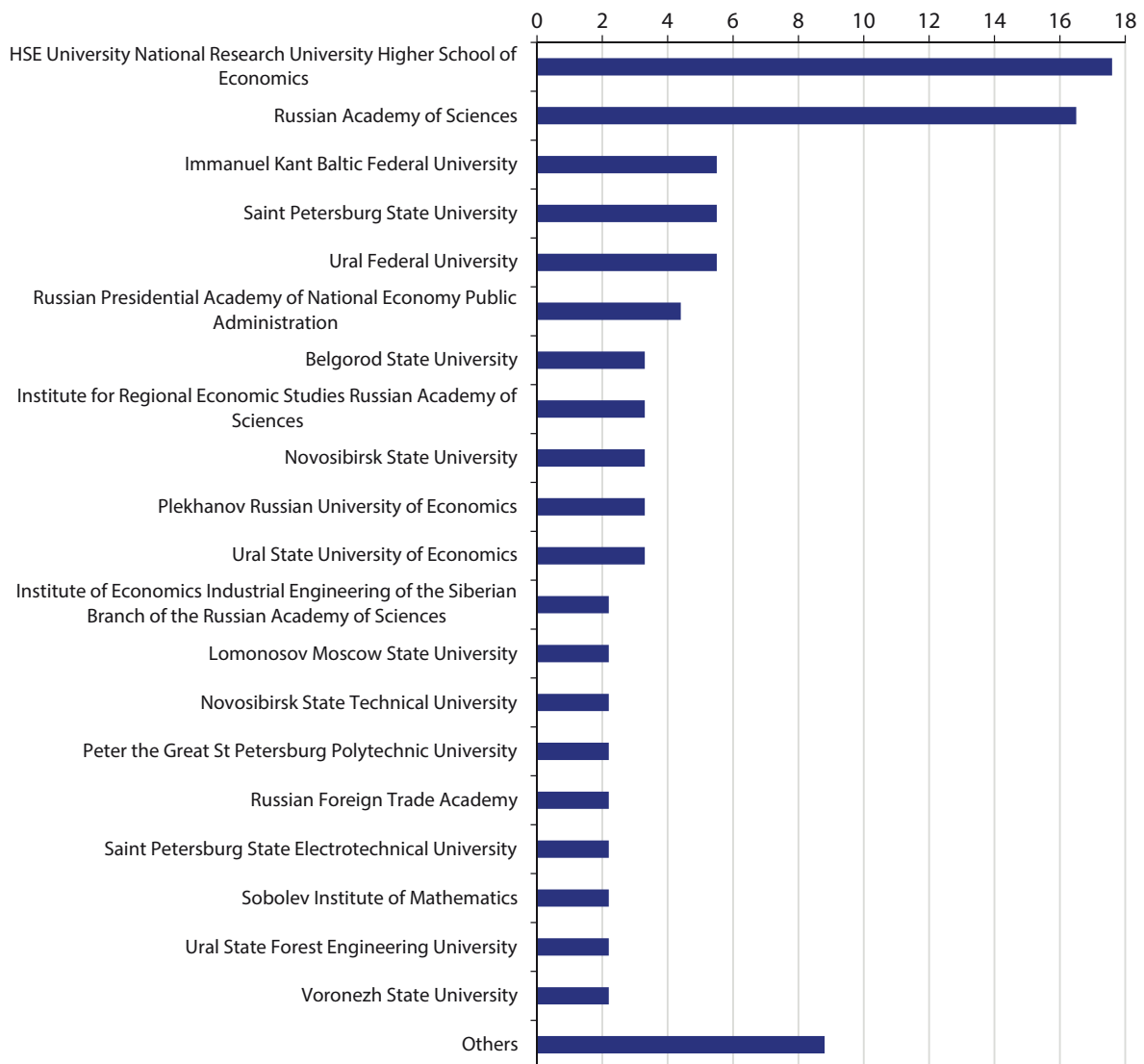
The geographic concentration of an industry branch can be explained by other factors as well. For example, in the study of Klepper (2007), it is shown that the district of Detroit owes its development to the first four successful participants.

In addition to the listed above trends in investigation of agglomerations in regional economy, the following can be distinguished:

6) agglomeration study in conjunction with the type and level of market competition (e.g., Porter, 1996; Turok, 2004; Baldwin, Okubo, 2006);

7) issues of the firm's demography (e.g., Keeble, Walker, 1994; Glaeser, Kerr);

8) connection with international and/or inter-regional trade (e.g., Martin, Sunley, 1996; Hanson, 1998; Markusen, Venables, 2000);



**Fig. 6.** Distribution of publications in the sphere of the agglomeration investigation among Russian educational and scientific institutions, % of the total number (research calculations based on the WoS data)

9) concentration of creative capital in cities, which forms the agglomeration forces (e.g., Glaeser, 1999; Scott, 2006);

10) urban transport system as a key factor of the agglomeration economy development (e.g., Quigley, 1998);

11) connection with the innovative systems and knowledge capital (e.g., Maskell, Malmberg, 1999; Feldman, Audretsch, 1999; Gertler, 2003);

12) investigation of diversification and specialisation (e.g., Feldman, Audretsch, 1999; Duranton, Puga, 2000; Frenken, Van Oort, Verburg, 2007);

13) connection with the evolutionary economics (e.g., Boschma, Wenting, 2007).

## 6. Obtained Results: Geographical Analysis

The geographical analysis of investigations concerning agglomerations in regional economy was conducted. The countries with the highest number of publications are the USA (829), Great

Britain (353), China (327), Spain (193), Japan (182), Italy (186), the Netherlands (169) and Germany (153). Note that the scientific centres and educational institutions that carry out investigations in this sphere are dispersed worldwide. Distribution of works in the sphere of agglomerations among the leading universities is given in Figure 5.

University of London and University of California are considered the leading universities in this sphere. Their total share amounts to 7.1 % or 11 % with the account of the London School of Economics and Political Science and the University of California in Los Angeles, which present themselves separately in publications.

In Russia, 91 studies were conducted on the topic of agglomerations<sup>1</sup>. A significant share of studies falls upon the Higher School of Economics (16) and establishments of the Russian Academy

<sup>1</sup> as per the WoS data.

of Sciences (15). Figure 6 shows the distribution of publications in more detail.

### Conclusion

Investigation of agglomerations in regional economic science is surging. At the first stage (from 1959 to 1990), 34 studies were published, then (later on up to 2018) 3.661 studies were presented. The time-domain analysis of studies on agglomerations demonstrated the evolutionary character of the development dynamics, increase in a number of frequently cited articles and the creation of new trends. The terminology analysis revealed the investigation development in six areas: economics, geography, regional and urban planning, urban studies, as well as management and area studies. The analysis of definitions specified the main terms, such as agglomeration economy (economics), agglomeration, urbanisation, localisation and others. The ty-

pological analysis determined a trend of investigations concerning agglomerations in regional economy. It was shown that many spheres closely resonate with each other and different spheres of other sciences. Geographical analysis has reflected the dispersion of investigation groups and individual authors by countries across the world. A significant number of studies fall upon the USA, Great Britain and China. Understanding of the agglomeration investigation development trends will contribute to regional economy as a science. The obtained results can be used in future in terms of understanding the evolution and current trends in the development of research on agglomerations, identifying key authors working in this area. Understanding in which areas of economic, geographical, and management science agglomeration processes are of interest will provide a basis for the development of new interdisciplinary research.

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