

Article

Role of Advanced Producer Services Shaping Globalization Processes in a Post-Industrial Region: The Case of the Górnślasko-Zagłębiowska Metropolis

Elżbieta Zuzańska-Żyśko 

Faculty of Natural Sciences, University of Silesia in Katowice, Bedzińska 60, 41-200 Sosnowiec, Poland; elzbieta.zuzanska-zyisko@us.edu.pl; Tel.: +48-323689484

Abstract: The paper discusses the emergence of a new regional network of connectivities in the area of advanced producer services in a formerly industrial region in southern Poland. Changes in the region's job market and the influx of foreign firm centers suggest the presence of globalization processes in the economy. Advanced producer service companies tend to cluster around the regional capital of Katowice and use the city as a gateway to other parts of the studied region. This process leads to the replacement of jobs characterized by lower qualifications with jobs requiring more advanced knowledge, new technologies, and a variety of forms of innovation. International economic networks play an increasingly large role in the entrenchment of economic globalization in the Górnślasko-Zagłębiowska Metropolis, which has helped the city join other Polish cities in the classification of the World Cities Research Network.

Keywords: advanced producer services; large metropolitan area; polycentric region; post-industrial area



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1. Introduction

Present-day globalization processes and factors related to the emergence of major metropolitan areas across the world are triggering a reconfiguration of the urban system, while the global economy is becoming a key criterion of the modern settlement system. Cities have become command and control sites for the world economy and serve as nodes in the global network of linkages. Globalization is increasing the significance of some cities, helping them become so-called world cities [1] or global cities [2,3].

The international urban system is concentrated on anchor cities in the global economy [4]. These cities enjoy the benefits of development, given a privileged position in international networks of capital, information, and human capital [2,5–10]. Thus, anchor cities acquire certain competitive advantages provided to them by each network that yields unique benefits and privileges [11–14]. Global cities serve as strategic nodes in a network of economic linkages [15] that grow thanks to innovation and the exchange of knowledge. Networks of cities are a space where labor can flow back and forth, and this includes highly educated members of the labor force [16]. The flux of professionals is normally facilitated by global companies and smaller firms that serve global companies. Networks of linkages are elastic structures [17] that include information flows, different levels of knowledge, organizational links, and ownership links. Advanced producer services are characterized by a very complex network of connectivities and superimpose themselves upon other flows [18]. They also depend upon the functional type of each given urban region [19] and its place in the urban hierarchy.

Research has shown that even smaller urban centers, for example, in Central Europe, are now attempting to join this network of international linkages [20,21]. Most of these newcomers possess limited capabilities to become world cities in the sense of Hall [22] and Friedmann [1]. However, when considering current economic processes in the context of so-called global cities [2], it is possible to observe that many cities are attempting to

increase the potential of their international network of economic linkages via what are known as advanced producer services (APS).

The development of new technologies, especially the Internet and other grassroots-type infrastructural resources [5], has helped cities with quite weak global linkages to potentially become new economic nodes in emerging regional growth corridors. This includes some cities in Central and Eastern Europe [20,23], as shown by the latest rankings of intercity connectivities. In this context, not globally well-known Polish cities such as Wrocław, Poznań, Katowice, and Łódź are experiencing various types of network effects. In light of the emergence of the international connectivities of some Polish cities [24] and the increasing importance of their control and command function [25,26], the purpose of this paper is to discuss the formation of a new regional network of linkages among the advanced producer service centers of the GZM Metropolis in southern Poland. The study examines the advanced producer service labor market as well as the number of foreign business centers and their proliferation in the studied area. Currently, there exists a gap in the body of knowledge on the international linkages of Polish cities. The research results contribute to the literature on the issue of economic globalization in a post-socialist country characterized by the emergence of a subsystem of smaller cities connected together via a network of advanced business services. In addition, there does not exist a comprehensive study in this area of inquiry on a regional level.

2. Advanced Producer Services and Their Role in Urban Development

In the modern world economy, the ranking of cities is a function of the location of international companies and the presence of their network linkages. Friedmann's world city [1] and Sassen's global city [2] theories as well as Castells' theory of flows [15] and Taylor's world city networks [8] all demonstrate that traditional urban functions are now becoming subject to the influence of global companies faster than ever before. The political power of regional cores is in fact spatially organized around centers of control via the use of locally available resources. In light of this fact, world systems analysis holds that cores do not necessarily consist of powerful countries, but hierarchies of larger and smaller world cities whose diffuse impacts produce large areas of influence [4]. S. Sassen suggests that the notion of the functional centrality of cities be examined through the lens of the global economy and its associated processes. Large cities attract sought after advanced world production services based on knowledge and provide highly specialized technology personnel. Services targeting manufacturers and other global companies serve as the foundation of the global city, which is a locality where global capital is serviced—a center of manufacturing services. Over the last several decades, the gross of business activity has shifted to centers of world finance and highly specialized services [2].

The basis for this reconfiguration in the world city system is advanced producer services. One key characteristic is the form of outsourcing, whose customers are firms that choose to not perform certain services or produce certain materials themselves in favor of purchasing these services or products from external vendors. Initially, outsourcing was an idea in the automotive industry that focused on parts used in auto manufacturing. Over time, the idea has found uses in other areas of industry and in areas known as shared services or cleaning and maintenance as well as office and factory building security.

Business services such as accounting, legal consulting, and marketing did not join the outsourcing market for quite a long time due to high transaction costs. However, the emergence of information technology in the late 1970s made it possible to significantly lower these costs, in effect allowing for the establishment of companies providing these services to other firms [27]. In the mid-1990s, the liberalization of global trade and creation of the Internet made it possible for advanced business service centers to move to developing countries on a larger scale. This shift became known as offshoring and the main relocation targets were India and China. Many countries in Central and Eastern Europe including Poland became part of this new process following their entry into the European Union in 2004 and 2007 [28].

Advanced producer services are defined as higher order business services [19]. According to Sassen [2], it is the presence of advanced producer services that serves as a hallmark of modern global cities, and focuses on four key service sectors: accountancy, advertising, banking, and law. The presence of these types of services was examined in the context of the servicing of world markets and via the identification of leading cities providing corporate services [29]. In most literature sources, they usually include services such as insurance as well as a host of other services including management, consulting, design, architecture, engineering, information technology, research, and often also in development. In some cases, a sector approach is used, whereby all the employees of a company (entire teams or office locations) provide services to larger companies by using a variety of practical skills, creative potential, theoretical knowledge, and the ability to help coordinate processes to control business processes. This multidimensional approach to outsourcing is practiced, in most cases, by larger outsourcing providers. Halbert [30] further considers logistics, cleaning, and maintenance services as well as services related to human development such as health care, education, and culture to be forms of business services. Business services represent one of the youngest sectors of the economy, having become a separate field of business only in the mid-1990s.

The development of information technologies and the Internet has produced a novel sector of the economy that provides a variety of services to other businesses. Analysis of the services and creative industries in Europe showed that they play an exceptionally vital role in the economic development of, and wealth generation in, select regions [31]. Services and creative industries need to be supported by regional decision-makers because of their linkages with advanced technological knowledge [32]. In terms of existing sectors responsible for the growth of metropolitan areas and globalization, researchers have identified what is known as the FIRE subsector [33,34] as well as select professions, science, technology, IT services, programming, telecommunications, administrative services, and services associated with culture, entertainment, and recreation.

Advanced business services may be classified based on seven groups identified by the OECD [27]:

- 1— services associated with customer care, most often call center work based on the use of the telephone;
- 2— financial and legal services for commercial entities, especially accounting ledgers, tax and legal consulting, financial services and insurance, audits, and legal protection;
- 3— advertising and marketing including the design and implementation of advertising campaigns, performance of marketing research, and company public relations work;
- 4— information technology services: creation and sale of programming code, website design, network administration, computer hardware maintenance, IT services, server and document management;
- 5— human resources management, especially the hiring of employees and payroll, and matching employees with positions based on qualifications and overall compatibility;
- 6— research and development, especially clinical drug trials, technical and engineering analysis, design and implementation of innovations, expert analysis, and innovative solutions;
- 7— shared services including cleaning and security of office and production facilities, and logistical services.

Analysis of the plant location strategies of leading global service firms in multiple cities across the world has shown that major metropolitan areas are affected by a certain flux. This issue is examined on an ongoing basis by the Globalization and World Cities (GaWC) network at the Geography Department at Loughborough University in the United Kingdom. A main focus of research at this institution concerns the external relationships of world cities. The GaWC network examines a variety of different types of advanced producer services. The result takes the form of a system of classification of leading cities found around the world. Cities are classified based on their extent of connectivity with other leading cities using the following types: Alpha++, Alpha+, Alpha, Alpha−, Beta+,

Beta, Beta−, Gamma+, Gamma, Gamma−, High Sufficiency, Sufficiency. An assessment system for the network of world cities is discussed by Beaverstock, Smith and Taylor [29,35].

The latest research (The World According to GaWC 2020) has shown that Polish cities are becoming increasingly connected economically to other cities. The capital of Poland, Warsaw, is ranked highest in this respect, with a rating of Alpha−. This designation means that it is a city that plays an important role in network flows and is integrated with the global economy. A Polish study by Śleszyński [36] showed that Warsaw is outpacing other Polish cities by a large margin in terms of the command and control function and capital linkages of the largest Polish companies, and this pattern of growth is increasing. Warsaw is also boosting its role in Central Europe as a whole. According to research by Csomós [20], Warsaw will become even more important in this region by 2025. In recent years, other, smaller Polish cities have also begun to create network linkages with the international community of capitalist investors. New investment and global flows are now reconfiguring the urban hierarchy in Poland. Smaller cities are attempting to take advantage of economic networks by joining key international economic networks [37]. In 2008, another city in Poland joined the GaWC ranking, Kraków. In 2010, Poznań joined the GaWC list, as did Wrocław in 2012. Two other major Polish cities became cities ranked by GaWC in 2016, Katowice and Łódź (Figure 1). Hence, a very slow but consistent rise in the ranking of Polish cities was observed by 2020. This rise has occurred at various levels in the international network of connectivities. Association of Business Service Leaders—ABSL (2020), an entity that examines the business services market, hypothesizes that Poland is approaching the GBS model (Global Business Services), and service centers in all Polish cities, taken together, may transform in the future into a global IT hub.

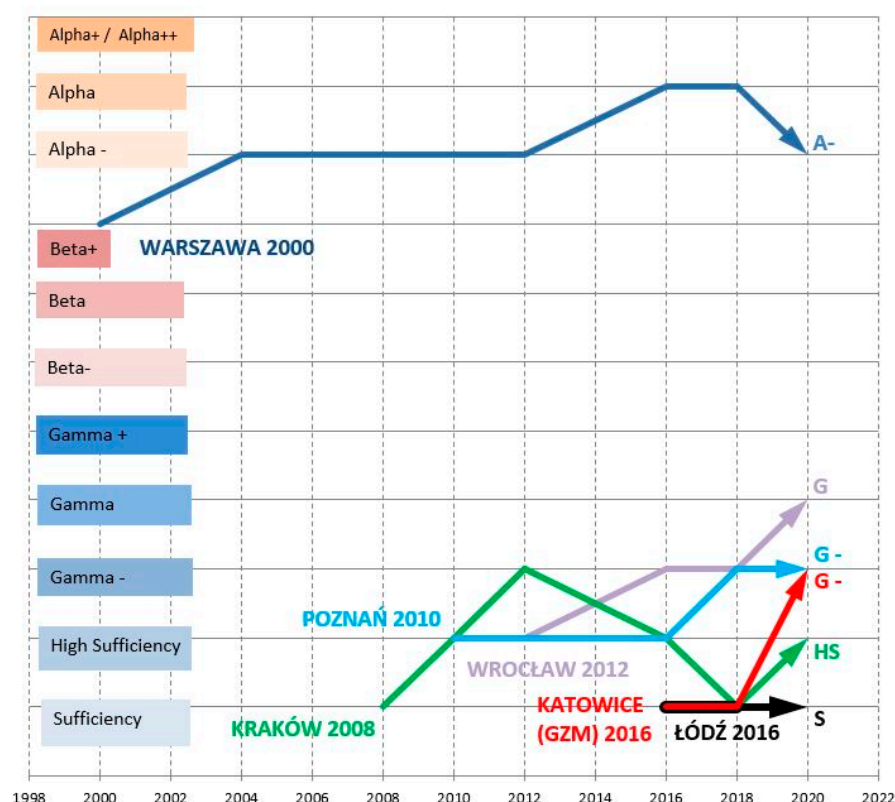


Figure 1. Ranking of Polish cities by Globalization and World Cities (GaWC) in 2020. Source: Author's own work based on: <https://www.lboro.ac.uk/gawc/world2020.html>.

The main driver of network transformation is the advanced producer sector, which may now be considered as a leading branch of Poland's economy [38]. The sector is not only characterized by economic linkages, but also by a high degree of innovativeness

and knowledge transfer. According to an ABSL report, the total number of domestic and foreign business service centers in the country stood at 1500 in the first quarter of 2020. This included Business Process Outsourcing (BPO), Shared Services Center (SSC), Information Technology (IT) and Research and Development (R&D)—type services. This sector employed 338,000 people in Poland in 2020. Cities may be grouped into types based on the degree to which APSs are developed. This classification takes into account the number of service centers and the potential of their job markets. The first group of “business service cities” in Poland consists of Kraków, Warsaw, and Wrocław, while the second group includes the so-called Tri-City of Poland (i.e., Gdańsk, Gdynia, Sopot), GZM Metropolis, Łódź, and Poznań. The aforementioned cities are scattered across the country and separated by distances of 80 to about 400 km. Polish cities are becoming nodes of new, smaller networks thanks to these centers of advanced producer services. Globalization was a niche idea in Poland in the years before 1989 and the country only had 19 business service centers at the time. The number of these centers increased in the first phase of Poland’s transition from a largely communist economy to a largely capitalist economy. A total of 77 business service centers were established between 1990 and 1999. This number increased by 475 in the period 2000–2010, and further increased by 789 in the years 2011–2020 [38]. Globalization processes occurring in post-industrial areas follow a variety of patterns and are characterized by a variable degree of progress, especially in European polycentric urban regions that include the Rhine-Ruhr region in Germany, Randstad region in the Netherlands [39], and the Górnośląsko-Zagłębiowska Metropolis in southern Poland, as described in the present paper. Hoyler [40] used the network model and data on the organizational structure of leading service firms to show how German cities including post-industrial cities have joined the world network of cities and what role they play in the global network of advanced producer services. Research has shown that in the polycentric urban region of the Rhine-Ruhr, a region whose functional and spatial structure resembles that of the GZM, the key node for firms in the advanced producer services sector is the city of Duesseldorf. Two other cities in this region also play relevant roles in creating network linkages—Essen and Dortmund. On the other hand, cities in the Dutch region of Randstad tend to possess gateway-type functions. Rozenblat and Pumain [41,42] and Ducruet, Ietri, and Rozenblat [14] argue that city infrastructural linkages such as the airport in Amsterdam and seaport in Rotterdam contribute to the servicing of global markets and accelerate the growth of major metropolitan areas. However, post-industrial areas face multiple development challenges. This includes the post-mining region of Nord-Pas-De-Calais in France. In such regions, the level of foreign investment is lower than expected due to a variety of complex social and economic factors associated with a long restructuring of such regions [43].

3. Study Area, Source Materials and Methods

The study area examined for the purpose of this paper is called the Górnośląsko-Zagłębiowska Metropolis (GZM), a large and complex geographic area, which is described using different names in different studies. This complex urban system in the Silesian Province of southern Poland is sometimes called the Upper Silesian Conurbation [44,45], Katowice Conurbation [46,47], Katowice Agglomeration [48], or Silesian Metropolitan Region or Upper Silesian Metropolitan Area [49]. As an organization, the GZM was established to manage a large, polycentric urban region in the south of Poland in 2017 (Journal of Laws, 2017 Item 730 on the metropolitan area union in Silesian Province). It officially began to function as an organization on 1 January 2018. The Polish name, Górnośląsko-Zagłębiowska Metropolia (GZM for short), does not have an equivalent name in the English language and is translated in a variety of different ways. When interacting with foreign contacts, the leadership of the GZM uses the name “GZM Metropolis”. In domestic interactions the full name of the organization is used and sometimes the shortened form, GZM, is also used. The last designation is in fact significant, as this region is currently the first in Poland to be officially designated as a union of cities in a major metropolitan area. The

acronym GZM is used in the paper, sometimes interchangeably with the name Katowice, which is the name used in [50] as the classification by the Globalization and World Cities organization.

The GZM Metropolis appears to be an interesting case for a case study for at least two reasons. First, it is a region that has experienced a transition from an area based primarily on coal mining and heavy industry to a post-industrial area. The GZM has entered upon a new path of development [51] rooted in the emergence of a large but cohesive, large metropolitan area [49]. Second, it is a conurbation [46]. This makes the GZM unique in Poland. The GZM has a population of 2.2 million and consists of 41 gminas (i.e., townships). The region is characterized by a multipolar urban pattern formed by 13 cities designated as independent counties (Figure 2). Cities in this complex urban system are independent entities that possess certain complementary functions. The near-urban areas of GZM cities overlap with one another, yielding what may be termed “network cities” [52]. These overlaps and linkages help GZM cities “borrow size” from one another. The magnitude of the borrowing effect depends on the size of the city and the extent of its network [53]. In addition, polycentric urban regions represent some of the most complex human settlement structures, and are characterized by the presence of numerous functional urban areas (FUAs) as well as functional urban regions (FURs), as noted by Hall and Pain [19]. Polycentric urban regions are considered by contemporary economic development policymakers to be zones of increased economic activity [54,55]. This is very important because decades ago, the area was known as the Upper Silesian Industrial Region [56] and served as the principal industrial and mining region of Poland during the communist era. By the late 1990s, the restructuring of the region’s economy, its largely outdated industrial base, industrial, and mining monoculture as well as environmental degradation and strong air pollution had become liabilities to the extent that the entire region was now considered a problem area [50]. It was affected by a variety of problems such as an outdated employment structure [57] as well as social problems [58–61] and depopulation [47]. The economic transformation of the region was made difficult by a polycentric system of independent urban counties governed via a variety of different management strategies.

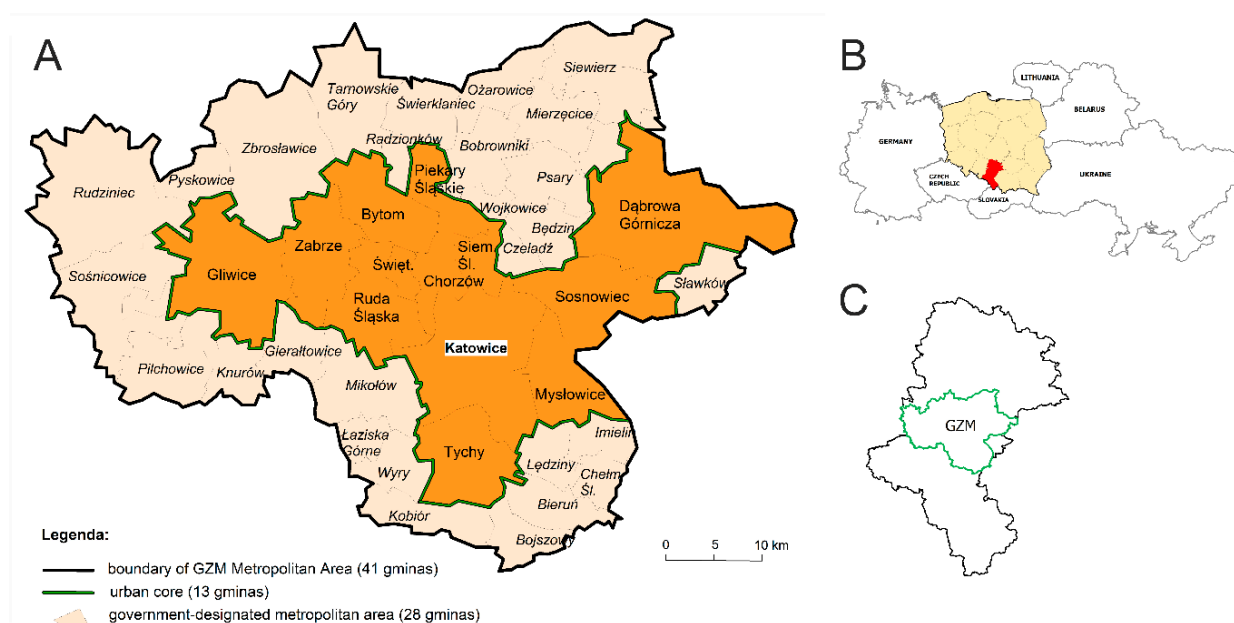


Figure 2. Górnśląsko-Zagłębiowska Metropolis (A) and its location in Poland and that relative to neighboring countries (B) and the Silesian Province in Poland (C).

The number of companies listed in the sector of advanced business services and related number of employees were obtained from reports published by ABSL or the Association of Business Service Leaders: (1) “Advanced business services sector in Poland 2020”; (2) “Advanced business services sector in Katowice and the Upper Silesian Metropolitan Area”; (3) “Advanced business services sector in the Katowice Metro Area”; and (4) “Advanced business services sector in Katowice” [62–64]. The ABSL reports cover all cities in Poland that are home to APS companies. In effect, they cover the best developed major metropolitan areas in Poland, which are also part of the report published by the “Globalization and World Cities 2020” research organization in the UK. Employment data for both 2010 and 2018 were obtained from unpublished reports from the Central Statistical Office of Poland (Polish acronym: GUS). Employment data for companies with fewer than 10 employees were estimated by doubling the number of companies operating in 2018 using data from the so-called Local Database managed by Statistics Poland [65]. The resulting data were collected for 41 gminas (Figure 2). In Poland, advanced producer services are viewed as equivalent to advanced business services.

The following categories of the Polish Business Classification System (Polish acronym: PKD) cover advanced producer services: information and telecommunications (J 58, 62, 63.1), real estate (L 68), independent professions, scientific research, and technology (M (69, 70.2, 71, 73, 74) as well as administrative services and support (N 78, 80, 81, 82). Source data in this area can be found at Polish Classification of Activities [66]. As highly detailed data are not available, the paper was based on the number of employees and number of companies per category (J, M, N). The dataset was expanded herein in line with available research literature [27]: finance (K), public administration (O), and culture, entertainment, recreation (R).

The impact of a given city in the advanced producer services sector is illustrated using the centrality index for the FIRE sector (F—finance (Polish category K), I—insurance (Polish category K), RE—real estate (Polish category L), and for categories J, M, N, O, and R of the Polish Business Classification System (Polish acronym: PKD). The centrality index was examined as a function of the number of employees in each PKD category and Poland’s population in 2018 [65]. An overrepresentation in each category occurs when $C > 1$. The index is defined as follows:

$$C_A = \sum_{i=1}^k (U_{iA} - U_A) \quad (1)$$

C_A —index of centrality for gmina A.

U_{iA} —percentage share of employees in the i -th category in gmina A in the total number of employees in this category in the GZM.

U_A —percentage share of the population of gmina A in the total population of the GZM.

k —number of categories (categories K, L, J, M, N, O, R, respectively).

The cartographic method of interpolation, in ArcGIS software, was used to illustrate the diffusion of advanced producer services and their spatial proliferation in the studied area. A grid of squares was created and centroids were marked. Each centroid was assigned a value corresponding to the number of advanced business service centers. This yielded isolines with the values 1, 5, and 15, which delineated the approximate extent of the spatial proliferation of advanced producer services in the first quarter of 2020.

4. Results

4.1. Role of Services in the Labor Market in the Górnośląsko-Zagłębiowska Metropolis (GZM)

In 2018, the GZM was home to 1.1 million working individuals and the structure of its job market was very complex. The urban core of the GZM consisted of 13 cities with a total of 919,000 workers (81% of all GZM workers), and the number of workers has increased substantially since 2010. The largest and best developed job market in the studied area was Katowice—245,000 workers (21.7% in GZM, 26.7% in the GZM urban core). The remaining 12 cities in the GZM urban core had 673,000 workers (60% in GZM, 73.3% in the GZM

urban core). The significance of heavy industry declined in the period 2010–2018 from 38% to 31%, although it remains rather important, relative to other major metropolitan areas in Poland and in Europe. In light of economic base theory, the size of the exogenic sector, especially the service sector, reflects the position of a city relative to its surrounding area. The share of services in the study area was 68.4% (i.e., 772,000 workers). This number of workers in the service sector has increased by 162,000 (26.6%) since 2010. The shift toward service jobs may be considered an exceptional transformation in the study area, which had been dominated in the past by heavy industry, with a very small service sector.

Advanced producer services represent an important factor of urban development in the age of globalization and growth of major metropolitan areas. In Poland, these services are called advanced business services [38,67]. In the GZM, this sector had a total of 320,000 employees in 2018 or 28.4% of the worker total in the studied region. Most of these workers were employed in the GZM urban core: 28,000 (87.3%). The vast majority worked in larger cities in the GZM and a third of the job market was found in the city of Katowice (Table 1).

Table 1. Employment structure for advanced producer services in the Górnośląsko-Zagłębiowska Metropolis (GZM) (2018).

APS	GZM	Core Total	Katowice Including	Other Core Area Cities	Non-Core Area Cities
	%				
Total	100.0	87.3	32.3	55.0	12.7
FIRE services (K + L)	27.4	24.1	7.8	16.3	3.3
Information and telecommunications J	12.7	11.4	5.6	5.8	1.3
Independent professions, scientific research, technology M	24.2	20.5	7.1	13.4	3.7
Administrative services and support N	18.4	16.8	6.2	10.6	1.6
Public administration and national defense O	11.5	9.8	3.9	5.9	1.8
Culture, entertainment, and recreation R	5.8	4.7	1.6	3.1	1.1
APS [number of workers]	320,489	279,798	103,611	176,187	40,691

Finance, insurance and real estate (FIRE) services represent an important indicator of the size of the APS sector. FIRE companies play a key role in the advanced services sector in the studied metropolitan area and interact with other companies involved with higher order services. In 2018 the GZM had 88,000 workers in the FIRE services sector whose constituent firms were scattered across the 13 cities of the GZM urban core. The finance and insurance sector is strong in Katowice, whose index of centrality equaled 28.7 in 2018. This value was 10 times larger than that of the next largest city in the GZM urban core. This sector was strongly centralized and illustrates the size of flows in the network of connectivities. It employed 14,800 workers, with a share of 42% in the GZM (Table 1). On the other hand, the city of Tychy had a low centrality index at 3.0 and was home to a total of 3100 workers in the field of finance. The remaining cities in the GZM urban core were not home to large numbers of workers in the finance and insurance sector. A larger number of cities had an excess of workers in real estate (Figure 3). The index of centrality in this area ranged from a small excess at 0.1 to 6.6 in four cities of the core (Katowice: 6.6, Gliwice: 6.3, Zabrze: 5.3, Bytom: 3.7) and four smaller cities outside the GZM core.

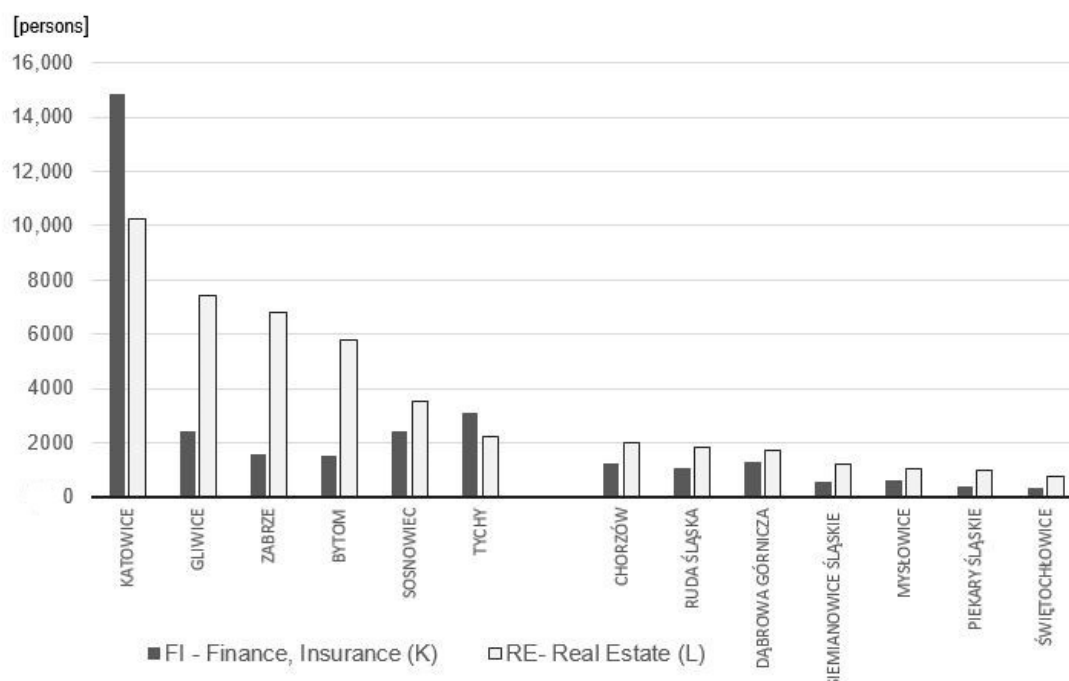


Figure 3. FIRE (finance, insurance and real estate) sector employment in GZM core cities in 2018.

FIRE sector firms are most often small; 63% had nine or fewer employees. However, both small and large firms play an important role in the finance and insurance area, with 54% of companies employing more than nine people. On the other hand, small firms tend to dominate the real estate job market, with 75% employing fewer than 10 workers.

An analysis of FIRE services also revealed interesting relationships, as taken together, they show an overrepresentation only in Katowice and Tychy; however, when considered as separate categories, they yielded a diversified market. The services employment structure for firms operating in the GZM urban core is as follows:

- independent professions, scientific research, and technology (category M): 65,700 workers; an increase of 18,500 workers (39%) relative to 2010. After the FIRE sector, this was the largest job market in advanced producer services. It consists of mostly small firms with fewer than 10 employees (69%) involved in areas such as legal consulting, accounting, business consulting, and business analysis as well as research, technology, design, architecture, and management.
- information and telecommunications (category J): 36,700 workers (19,500 more workers (114%) than in 2010). Includes information and telecommunications, IT services, internet portals, publishing.
- administrative services and support (category N): 53,800 workers (19,700 more workers (58%) than in 2010).

On the other hand, the public administration job market (category O) was dominated for the most part by large and midsize companies and included 37,000 workers in the GZM. This market decreased in size between 2010 and 2018. The same was true of the culture, entertainment, and recreation job market, which declined to 18,400 jobs in 2018. This particular job market was broadly scattered across the 13 cities of the GZM urban core.

The study area is unique in that it is polycentric, which means that service sector jobs are often widely scattered across a number of cities. This differentiates the GZM from other major metropolitan areas in Poland. At the same time, the dominance of Katowice is noted in the study area. The city is a regional leader in services, higher order institutions, and advanced producer services. This makes Katowice the focal point for innovation as well as the diffusion of new economic processes, cultural trends, modern office space, and social initiatives. Many cities in the GZM began as industrial centers and did not evolve in any

sort of planned manner, which makes the concentration of services less likely (e.g., Ruda Śląska, Piekary Śląskie, Świętochłowice, Zabrze, Sosnowiec). Hence, the major problem in the study area is finding shared spaces characterized by an appropriately high level of innovation in a region exemplified by scattered development, both at the city level and city district level. While Katowice is characterized in some ways by a concentration of service facilities, their spatial pattern does reflect some features of dispersion. For example, the location of lawyers' offices in Katowice is characterized by a set of three clusters due to the geographic structure of the city and a spatial barrier in the form of railroad tracks that divide the city in two. A fairly large concentration of advanced producer services and institutions associated with this sector may be found in cities with a well-defined city center (e.g., Gliwice), and in those that made the decision to abandon their old path of economic development to follow a path of post-industrial development associated with innovation and knowledge-based business activity.

In 2010, the polycentric GZM core was home to more than 3300 higher order institutions including 1700 law firms; 19 courts of law and prosecutors' offices, legal consulting and notarial offices; 34 insurance companies and their local affiliates; 526 travel agencies and other tourism-related businesses; 189 research institutions and related institutions; 74 cultural institutions; 720 mass media entities and related businesses (radio, television, press office, printing facilities); and 59 inspectors' offices associated with various sorts of control services [49]. The greatest concentration of institutions along with their specialized employment market are found in Katowice—with more than 1000 higher order institutions of various sorts—followed by Gliwice (over 400) and Sosnowiec, Tychy, Bytom, Chorzów, and Zabrze (170 to 250 each).

4.2. Diffusion of Innovation—Advanced Producer Services in the GZM

The strong transformation of the job market in the study area over the last couple of decades was accompanied by a slow but systematic influx of advanced producer service centers. Their very presence serves as proof of the deeper economic transformation of the region and its new role in the global economy. Most of these new APS centers are found in Katowice, which is the most important city in the region. Its well-developed administrative and economic base makes the city a key node in the network of functional and spatial connectivities and the site of some of the first locations of APS facilities in Poland. This pattern of growth was facilitated by well-developed office infrastructure, good transportation options, network of public transportation vehicles, large number of educational institutions, and supply of human capital. The city is home to 16 institutions of higher education and about 50,000 students, as of 2019. The first APS firms in the region began to operate here in the 1990s. In 2009, there were 56 APS entities in the GZM, with 39 (70%) in Katowice.

The second largest site for APS firms is Gliwice (15%). Other cities in the study area were less attractive to investors and only some APS firms made the decision to establish offices in other GZM cities. The process of the dispersion of international economic connectivity has been slow. By 2009, between one and three firms had made the decision to open a facility in other GZM cities such as Dąbrowa Górnicza (three firms), Sosnowiec (two firms), Chorzów (two firms), Ruda Śląska (one firm), Bytom (one firm). A quick review of two time periods (prior to 2009 versus 2010–2019) revealed that the APS sector grew systematically in the GZM during this stretch of time. A total of 56 firms established facilities prior to 2009 (54% of current number) and another 46 firms (46%) arrived in the period 2010–2019, which yielded 5.4 firms per year. According to ABSL (2020) data, the number of APS firms in the GZM in 2018 was 100, which may be considered a threshold value for the region, with 102 in 2019 and 110 in 2020. The most popular city for APS firms was Katowice, which is now home to more than 70 APS firms, or 75% of the GZM total. The city with the second largest number of APS firms was Gliwice, an important center of economic activity in the western part of the GZM. The city is now home to 13 APS firms (13%) and is also an important center of higher education, producing a very large number

of engineering graduates who fill job vacancies in Silesia and across southern Poland. In 2019, the Silesian Polytechnic had more than 18,000 students learning programming and other varieties of information technology, automation, robotics, advanced manufacturing management, machine construction and control, and architecture. This particular school plays a major role in the education of young workers for the ITO sector. Its graduates are known for their high level of competence and advanced skills in various specializations. The spatial growth of the APS sector in the GZM may be explained using the concept of the diffusion of innovation. This diffusion of advanced producer services occurs from the most important site—Katowice—toward smaller cities such as Gliwice and even smaller cities such as Chorzów, Sosnowiec, Ruda Śląska, Bytom, Dąbrowa Górnicza, and Tychy. The competitive advantage of Katowice is built upon its economy, infrastructure, culture, and many other elements. This has then led to it becoming a center of advanced producer services and a springboard for these services toward other areas in the GZM. In effect, some companies first established offices or other facilities in Katowice and then similar ones diffused into other areas in the GZM to cities that served as smaller nodes in the regional economic system. APS expansion outside of Katowice occurred slowly, but other cities in the region did eventually join the process of economic modernization and begin to build linkages to the network of international connectivities. The diffusion of the APS sector first began in the 1990s and concentrated on the capital of the GZM—Katowice (Figure 4). The next city to be selected by APS firms was Ruda Śląska in 1999. However, this did not lead to the arrival of other APS entities in the city. Other APS investors sought out locations in neighboring cities such as Sosnowiec and Chorzów, and in more distant cities such as Gliwice, Dąbrowa Górnicza, and Bytom. The dispersion process began to follow a concentric model, and subsequently, a polycentric model associated with the spatial arrangement of cities in the study area.

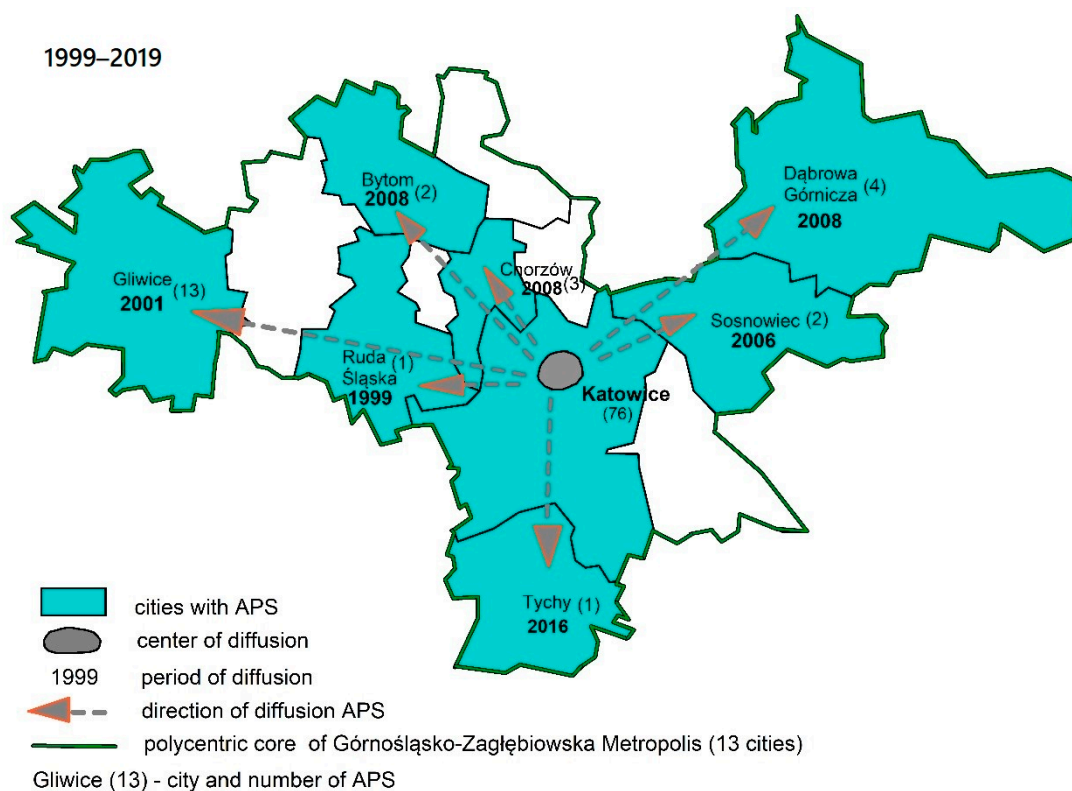


Figure 4. Directions of diffusion of advanced producer services in the GZM urban core.

The spatial extent of APS diffusion illustrates the economic impact of these firms. It is clear that Katowice by far outpaced the remaining major cities of the GZM urban

core. The city of Katowice was the dominant player in the internationalization of the economy of the GZM in the first quarter of 2020, even though eight cities in the region were part of the process (Figure 5). Cities that do not possess any APS facilities are in fact excluded from new models of management based on knowledge and are not part of major international networks of connectivities, both at the European level and global level. It may be hypothesized that in fact they are losers in the political and economic transformation of Poland in the last 30 years. It may be further argued that these cities will be relegated to second-class status in future stages of metropolitan area development in the GZM. APS firms located in Katowice produce a large amount of value added based on knowledge rooted in professional expertise. This then creates a competitive advantage for the city, whose economy is largely based on knowledge and innovation, as opposed to low costs of labor. Given the organizational profile and international connectivity of APS firms in the GZM, it must be noted that such firms previously had never existed in the study area. The origin of GZM cities lies in old-type industrial development strongly associated with the early 20th century and late 19th century. The manufacturing base of the region relied on various technologies that were outdated and organizational systems that were no longer efficient. In the early 1990s, cities in the GZM represented old-time industry, while their service sectors were vastly underdeveloped. Thus, the restructuring of the region [44] produced a certain type of economic niche. Old industrial plants and mines were mostly closed down, while some were privatized based on foreign capital. Other facilities were restructured with variable degrees of success. Changes in the ownership and capital structure in Poland after 1989 triggered a variety of economic transformation processes in the manufacturing sector and subsequently led to a slow expansion of the services sector supporting production facilities. A new stage of economic development has emerged in the last 30 years in Poland. The establishment of new companies in the GZM region via its gateway of Katowice is creating linkages with the network of international connectivities, which is needed by innovative firms that are part of the APS sector.

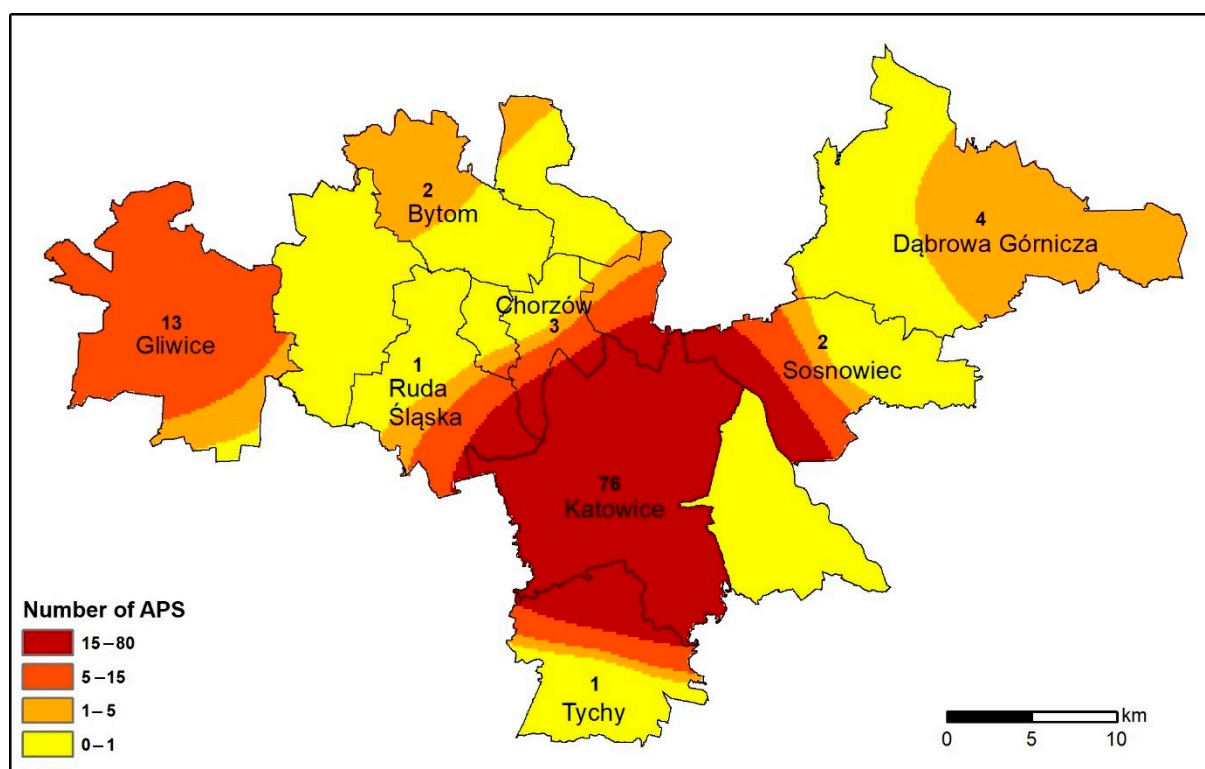


Figure 5. Diffusion of advanced producer services in the GZM urban core in 2019.

Advanced producer service centers situated in the GZM employed 7.7% of all workers in this sector in Poland, which was 25,800 workers (Figure 6). The region is ranked sixth in Poland, with Kraków at 23%, Warsaw at 19%, Wrocław at 15.4%, the Tri-City at 8.3%, and Łódź at 7.7% [38]. The APS firms in the GZM fall into several categories of specialization: IT at 45% of total employment, BPO 12.5%, SSC 30.9%, R&D 3.7%, and hybrid firms 8% (data for 2020). Katowice was home to more than 19,000 APS workers (about 75%) in the GZM. The rate of employment growth at advanced producer service centers was rapid during the study period. The number of APS workers in the GZM has increased 322% (17,800 workers) since 2012 [38]. More than 60% of the APS centers in 2018 were foreign firms. American, German, and French capital covered 40% of the market (ABSL, 2018). The APS centers in the GZM rendered the largest number of services for business entities located in Germany, Great Britain, and Poland.

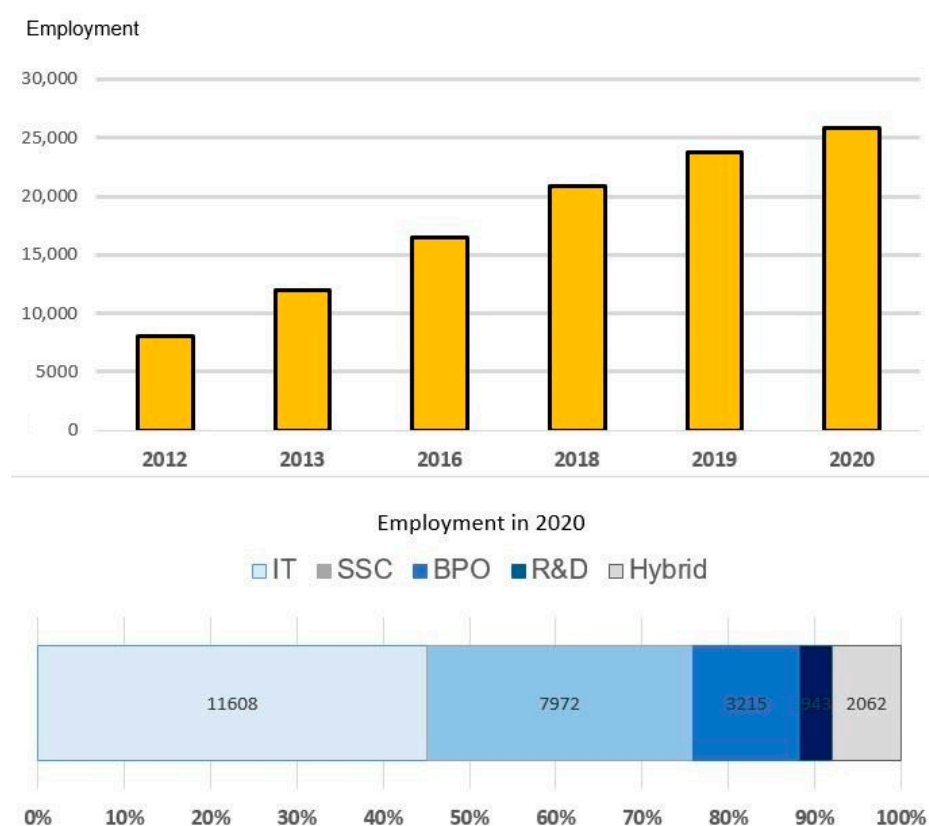


Figure 6. Employment at domestic and foreign centers in the GZM, operating in the sector of advanced producer services, and structure of services rendered.

Service centers provide services for production companies in many different branches of industry including home construction, energy, aircraft production, national defense, food production, electronics, and pharmaceuticals. Consumer services employed 13% of APS workers in 2014 and were related to retail sales, mass media, entertainment, and tourism. APS centers focused on banking, finance, and insurance employed 11% [62]; however, the most important component of APS in the GZM was IT services, which employed 39% of all APS workers in the region, with an increase to 51% in 2018. The IT sector included workers associated with computer programming, application systems, maintenance, tech support, and infrastructure. The average number of workers per IT/R&D firm was 207. As much as 69% of the employees at APS centers were less than 35 years old [64], thus it is very much a new generation of residents in the GZM who are an integral part of the process of globalization and adoption of new technologies leading to a digital society. In 2018, the GZM had a total population of 2.2 million including 295,000 residents in the

city of Katowice. The working age population of the region stood at 1.3 million including 0.8 million workers who may be described as highly mobile individuals (age group: 18–44).

5. Discussion

The present research results provide insight into a variety of issues. First, the GZM job market is undergoing a structural transformation. It has already completed several stages of such a major transformation in the last three decades, which saw a very deep transformation. Recent investment in the region revealed a trend of technological advancement [51,68]. The share of heavy industry in the region's labor market has declined to some extent, but the sector continued to employ about 1/3 of the workforce. A comparison with the Rhein-Main urban region of western Germany, which includes Frankfurt, showed employment levels in heavy industry ranging from 16% to 39% [69]. In Japan, analogical employment stands at around 20%, for example, in Kyoto of 21% [34].

However, the share of the service sector in the GZM increased in the study period, which may be treated as a positive sign in terms of economic change, while the presence of advanced producer service centers signals the formation of global connectivities. These types of services are considered as key elements of the command and control function of cities in the modern economic age [5] and represent a criterion for ranking world and global cities [12,17]. Advanced producer services play an important role in the evolution of metropolitan growth processes, internationalization of cities, and globalization overall [70]. They are also a fundamental element of the "geography of flows" [15], as they help integrate urban economies in the relatively little known, polycentric GZM region of Europe with global connectivity networks. Thanks to APS centers, the city of Katowice and the GZM, in general, are slowly becoming a small node in the global urban network, despite being only rated as High Sufficiency by the GaWC (2020). The GZM has transformed from a mining and industrial region [44,57] to a region with an economy based on advanced knowledge and innovation.

An examination of the study area in the context of financial services, insurance, and real estate shows that FIRE services have strongly increased their presence in the GZM and this sector is attempting to catch up to other major metropolitan areas in Poland. It must be noted that Katowice is at this point oversaturated with FIRE services, while some FIRE services are also available in the remaining 12 cities of the GZM urban core, and it is important to also note their contributions. Polycentricity is a characteristic feature of the GZM. The spatial dissipation of services tends to be an illusion, as this is a very large region, and urban impact zones exist for each of its constituent cities. However, there is a fairly readily observable hierarchy of cities in the region. Katowice is the leading city and is characterized by the highest index of centrality of the APS labor market at 199, which is more than 10 times higher than for other major cities in the GZM urban core.

At the same time, significant variances may be observed in the different categories of FIRE services. Financial services tend to concentrate in the economically strongest cities as well as entire metropolitan areas around the world [12]. Financial flows are made possible, which is strongly associated with decision making nodes and control centers. Katowice is characterized by a larger share of the financial and insurance sector, while other cities in the GZM urban core tend to experience a deficit in this area, but do possess excess resources in the area of real estate [71]. Similar trends may be noted in flow networks in other cities around the world. Wall and Knapp [33] studied global cities and found that the financial sector in Brussels is underrepresented, but the insurance sector is overrepresented. The opposite pattern was noted for the Swiss city of Zurich.

In light of the GaWC classification (2020), the GZM represents the High Sufficiency category of connectivity, which means that it is a poorly developed integration market in terms of advanced producer services. It is also quite apparent that the APS labor market in the GZM is largely created by small companies. This is especially true of real estate, where the market is dominated by firms employing nine workers or fewer. However, in other areas, the same pattern holds true—small firms control 26% to 48% of the market.

These findings are consistent with British research [72]. For example, small business service companies employing fewer than 10 workers also play an important role in the market, especially in the area of human resources, public relations, market research and architecture projects, engineering consulting, general consulting, and services linked with general computing. The generally small size of business service firms partly reflects the labor intensive nature of specialized work in their respective fields of business. This is readily apparent in the field of design in the study area, where the sector is dominated by firms with nine or fewer employees. The opposite is true of foreign APS centers, which are some of the largest employers in the city of Katowice.

In 2020, the GZM is home to more than 100 APS centers, which ranks sixth in Poland [38]. The main hub for flows is Katowice, with Gliwice ranked second. At the same time, one may observe a spatial diffusion of innovative business centers across the studied region. This reflects the views of S. Sassen [5], who argued that a central district may stretch across a metropolitan area in the form of so-called nodes or hubs of intensive business activity. It is clear the overrepresentation of APS firms in the capital of the GZM increases its level of competitiveness in the region. Katowice has become a key anchor for foreign investors in the region. Its impact is substantial enough that it forms a new network of regional connectivities in the larger corridor of domestic and European flows. This finding has been confirmed by other researchers studying the command and control function of cities [23,25].

As globalization progresses, one may put forth the argument that the regional level has become more important than the national level in terms of the promotion and deeper understanding of innovation as well as economic growth [73,74]. Andersson and Karlsson [75] argued that the effectiveness of regional innovation largely depends on the ease of information exchange in a region and the speed at which new knowledge from other regions is introduced. The establishment of APS centers in Katowice is also associated with the first signs of what is termed metropolitan area functional integration [76,77]. In addition to the presence of command and control functions, one may observe the emergence of symbolic functions in the region [49]. The entire region is experiencing a sort of modernization in terms of public spaces reflective of major, integrated metropolitan areas, which includes spaces devoted to culture, business tourism, and post-industrial tourism [78–81]. All of this makes Katowice an important hub in the regional labor market, with a large number of commuters working in the city (133,000 individuals) [82]. In addition, the total number of individuals working in the city has increased by 30,000 in the last 10 years [83].

Institutions of higher education play an important role in a globalizing city. In a general sense, advanced producer services are strongly associated with universities and colleges across Poland [84]. It is noteworthy that in 2002, the number of students in the GZM surpassed the number of miners, and this trend continues up to this day. However, it is still the case that the colleges and universities located in the GZM attract fewer students than their stronger counterparts in Kraków and Wrocław. However, the many APS companies in the studied region benefit from the availability of highly qualified graduates who have a variety of practical skills including fluency in multiple foreign languages [85]. The vast majority of advanced producer services are performed in the English language (92%). At the same time, APS workers may use other languages including German (60%), French (44%), and Italian (36%) [62]. In addition to helping to build an economy based on knowledge, institutions of higher education in the GZM create a base framework for the emergence of a so-called creative sector.

An economy based on knowledge accelerates technological change and helps facilitate the formation of large teams of specialized personnel. Both companies and their employees benefit from the transfer of knowledge between neighboring production sites associated with similar areas of industry, where knowledge is accumulated and then dissipated via direct interactions [86]. The most characteristic part of the APS sector in the GZM is the IT subsector. Its overrepresentation in the study area may be due to a large supply of human capital produced by colleges and universities in the GZM. Other reasons for this

overrepresentation include the strong engineering programs in Gliwice, deep roots of high technologies in the study area dating back to communist times [87], regional specialization in computer programming for industrial automation work, electronics, and medicine [51] as well as the polycentricity of GZM cities that lie close enough to one another that knowledge transfers are fast and easy. As S. Sassen [5] notes, firms in the IT subsector are associated with strategic hubs characterized by good infrastructure.

K. Gwosdz [51] describes the relationship between the emergence of business service centers and the processing industry, which has been developing quite rapidly over the last few years, especially in the Katowice Special Economic Zone [88,89]. New foreign investment in the GZM driven by restructuring and reindustrialization in the region has certainly attracted advanced producer service firms. Both APS firms and production companies, especially those with foreign capital, are part of the international network of connectivities. However, it is rather difficult to assess the cause and effect relationships as well as interactions between the various sectors and their scale due to a lack of research in the GZM. This subject area remains to be examined in future research studies. However network connectivities may be observed in the medical services sector. Their quality is some of the best in Poland including cardiology, heart surgery, transplants as well as biotechnology. The latter was linked with research institutions such as the Tissue Bank in Katowice, Polymer Chemistry Center in Gliwice, Cell and Tissue Culture Laboratory and Tissue Bank in the city of Siemianowice Śląskie as well as the Center for Burn Medicine in the same city and the Medical Technology and Apparatus Institute [28].

6. Conclusions

While the studied region is not a leader in terms of the number of APS centers and the number of APS workers in Poland, it is a former industrial region regaining its footing in the national economy via an influx of new APS entities. This is an important stage in the area's economic development and may be described as a societal transformation from a society built upon human capital with few advanced skills to one with a multiplicity of advanced skills related to new technologies and innovations. In the view of Kunzmann [90], the GZM may be treated as a restructured industrial complex in the context of a host of interregional networks in divided European spaces.

The number of advanced producer service centers and their rate of establishment as well as the increase in their employment numbers all show that the GZM is now part of domestic, European, and global economic connectivity networks, with Katowice being ranked a high sufficiency city by GaWC (2020). The diffusion of innovation is helping the studied region establish a regional corridor of economic flows. According to the literature, the city of Katowice may serve as a gateway city to other cities in the GZM [14,91]. The example of Katowice shows that other post-industrial cities in the region of Central and Eastern Europe or in other parts of the world may also transition to new economic functions and join international connectivity networks thanks to a certain number of social and economic factors present in a given geographic area.

Finally, it is noteworthy that the subject of global cities and network flows is now a standard theme in the global research literature, but remains largely unknown in Poland. This may be due to the fact that advanced business services in Poland are only found in a few cities and represent a new economic phenomenon in many post-communist states. It appears that globalization processes and the role of advanced producer services in urban development represent a new challenge for geographers in Poland. The present study is an attempt at making a contribution to this new field of research in Central and Eastern Europe in light of current flow trends making their presence known in the region.

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