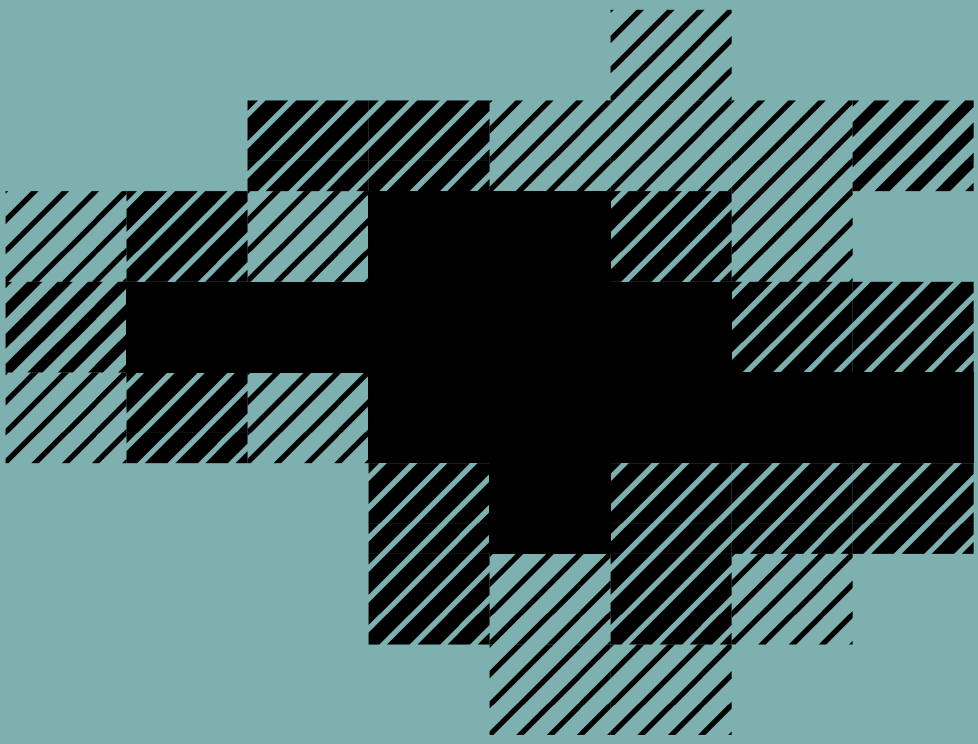
Current economic development in the GZ Metropolitan Area: trends and mechanisms



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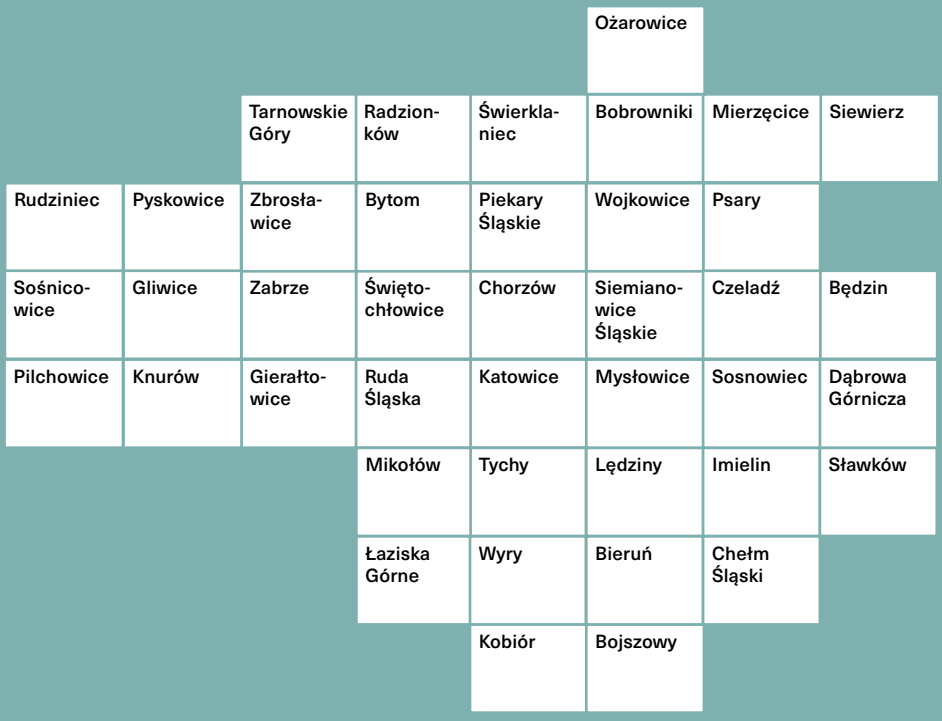
Ministry of Economic Development
and Technology

Table of contents

chapter 1 **Introduction**



Nowadays, one of the leading processes behind the development of civilisation is **metropolisation,** i.e. an increasing concentration of economic potential in large urban centres and their functional regions (see e.g. Markowski and Marszał 2006, Glaeser 2012, Zuzańska-Żyśko 2016). Its position within the network of national, European and global metropolitan areas is one of the critical dimensions determining the development opportunities of a territory. Metropolitan areas are areas that manage capital and knowledge flows (as places where the headquarters of supra-regional corporations and public institutions are concentrated), and through the symbolic capital they possess and produce as zones where creative sectors and creative environments are concentrated, are incubators of social, economic and cultural innovations. A diverse labour market and a high level of social and cultural infrastructure make them particularly attractive to new residents, attracting and retaining active and creative people – the most valuable resource in a knowledge-based economy – helping them to strengthen their position in the settlement network.

While for the great European cities with traditions dating back several hundred years (and sometimes longer, i.e. in the case of Italian cities) in terms of developing supra-regional urban functions the acquisition of new metropolitan specialisations was somehow natural, the agglomerations of mining and industrial origin established in the 19th century had to build that position practically from scratch during the last few decades and in conditions of strong competition from mature metropolitan cities. Therefore – as an introduction to the analysis of the economic condition and development dynamics of the GZ Metropolitan Area (GZM)[1] – we should look for an answer to the question**: *what makes metropolitan areas of industrial origin, and especially mining and industrial origin, different from other metropolitan areas?*** There is no doubt that the past of cities determines the range of possible development options, the limits of which we are testing in the present.[2]

1
Górnośląsko-Zagłębiowska Metropolia (GZM) in Polish language.

2
The specific developmental conditions of urban agglomerations with mining and industrial origins in the metropolising European and global space are discussed by, among others, J. Runge (2009, 2020), Ch. Zöpel (2011), J. Bogumil et al. (2012), K. Gwosdz (2016), R. Krzysztofik et al. (2016), R. Krzysztofik (2021), E. Zuzańska-Żyśko and S. Sitek (2018).

The authors of the inspiring report *Path Dependence and Innovation in UK City Regions* (Simmie et al., 2008) propose that contemporary city region economies be defined as interactive systems that are shaped by three elements: past **development paths** (the economic, social and institutional histories of city economies that led them to where they are today), **knowledge resources,** and **local innovation systems.** These elements in turn determine the **capacity to create new economic activities (new development paths)**. Indeed, as Jane Jacobs first noted,[3] stagnation is not experienced by those cities which continually generate new economic activity. It is not important whether this happens by private or public initiative. The **process** itself is far more important than the prevailing balance of power and source of capital (cited by J. Jacobs 2016: 173).

Specific to the development path of metropolitan areas with mining-industrial origins is, as Christoph Zöpel (2011: 12) brilliantly put it in its simplicity, the 'rationality' of development that resulted from mining coal and using it in the process of producing steel. This 'rationality' shaped the entire regional system socio-economically and spatially. It was characterised by a low degree of diversification of the local economy, a very strong position of large industrial companies and a dominant culture of contract work, as a result of which there was little incentive to start one's own business, the predominance of specialised employee skills over general competencies and, finally, limited opportunities on the labour market for women. In the spatial sphere, the following elements were characteristic: fragmentation and polycentrism (numerous, de facto self-sufficient settlements), a large proportion of industrial areas, poor internal integration of cities and a non-uniform urban structure, often chaotic in nature, which generally resulted from the chronological priority of industrial investment over city-forming processes (Matyja, 2021). In the process of structural changes (and simultaneously forging the foundations of metropolitan functions), these features had to be forgotten or transformed to become development assets rather than liabilities. At the same time, it was not always obvious ex ante which of these resources were opportunities and which were barriers.

3
Jacobs J., Spontaneous urban development. Speech delivered at the Royal Institute of British Architects, London, 7 February 1967, cited in: J. Jacobs (2016).

As a result, some of them were irreversibly degraded before their value as a resource for future development was realised.

A significant difference between metropolitan areas of mining and industrial origin and 'old' metropolitan areas are knowledge assets and features of regional and local innovation systems. The knowledge-intensive assets of the former (apart from specialised resources in the traditional complex of mining, metallurgy and energy industries, including scientific and research institutes and design offices)[4] are relatively recent. The technical colleges and universities in the GZ Metropolitan Area, as in the Ruhr area, for example, can be traced back at most to the end of the inter-war period in the 20th century (University of Economics – 1937,[5] Silesian University of Technology – 1945, University of Silesia – 1968). The leading institutions creating structural change are much younger (Upper Silesian Fund 1995, Katowice Special Economic Zone 1996). In general, the nesting of metropolitan functions (decision-making, control, modern services) is a recent process in the large mining and industrial cities.[6]

It is also worth remembering that metropolitan areas with mining and industrial origins created the foundations of their metropolisation during a process of profound and painful structural change which determined completely different population dynamics (depopulation!) than is found in established metropolitan areas.

4
For example, after 1945, in addition to the Silesian University of Technology, 9 research institutes and 19 design offices were located in Gliwice (Domański and Murzyn-Kupisz, 2021). It is worth noting that one of the important sources of scientific and research competence in the areas of traditional industry is found in those that were created to solve problems generated by industry. In the Katowice conurbation, an example of such an institution is the Institute for Ecology of Industrial Areas, established in 1992 on the basis of the Centre for Environmental Protection, which itself was founded in 1972. Similar examples can be found in the Ruhr area (see Bogumil et al., 2012).

5
They were established on the basis of the private Higher School of Social and Economic Sciences, formally established in December 1936, first included in the official lists of higher education in 1937/38 (Statystyka Polski, Seria C, Zeszyt 101, Statystyka Szkolnictwa 1937/38: 74), Central Statistical Office, 1939, Warsaw, p. 74. In the interwar period, efforts were made to establish a university-type higher education institution in Upper Silesia – a polytechnic or a mining academy (see, among others, Bajerski, 2016: 84).

6
For the distribution of metropolitan functions in the GZM see E. Zuzańska-Żyśko (2012).

This in turn had a fundamental impact on the formation of human capital. Studies of demographic shrinkage processes in Ruhr cities have shown that depopulation was accompanied by an increase in segregation and a polarisation of the living standards of local residents (Bogumil et al., 2012). The (post)industrial metropolitan area of the GZM is dealing with depopulation, selective suburbanisation and the maintenance of areas of multiple deprivation[7] mainly related to former factory estates.[8] Moreover, the general regularity of the transformation of polycentric mining and metallurgical regions into a post-industrial, polycentric metropolitan area is characterised by the **fundamentally different internal dynamics and mosaic character** of economic development processes in its space (see Gwosdz et al. 2018). This raises particular challenges in terms of managing such a complex structure and creating activities that foster coherent and equitable development of the territory.

1.1 Purpose and scope of work

The main objective of this book is to present a **multidimensional analysis and evaluation of the economic development processes** in the GZ Metropolitan Area. The authors' ambition is to go beyond the analytical formula of short-term monitoring of the economic situation of the metropolitan area based on generally available statistical data. Thanks to the initiatives of the Central Statistical Office (GUS), the Association of Polish Cities (ZMP) and the GZM,[9] free access database portals are available which enable multiple analyses to be undertaken and the monitoring of, for example, spatial differentiation of the level of economic development. It would be pointless to duplicate this information. The existing analyses are usually limited to

7 An area of multiple deprivation is a place where the inhabitants, as a result of economic and non-economic factors, cannot satisfy at an adequate level a number of important needs, e.g. decent work, quality educational institutions, health care, security.

8 An extensive analysis of the shrinkage process based on the examples of Bytom and Sosnowiec was conducted by R. Krzysztofik et al. (2011a).

9 See STRATEG (https://strateg.stat.gov.pl/) and Geostatistical Portal (https://geo.stat.gov.pl/); Local Government Analysis System (https://www.systemanaliz.pl/) and Local Development Monitor (https://monitorrozwoju.pl/) and InfoGZM (https://infogzm.metropoliagzm.pl/).

the current (temporary) state of the ongoing economic development processes, while they much less frequently focus on the regularities and mechanisms generating such a result. Relatively rarely (apart from rather hermetic academic analyses) are attempts made to embed the processes observed in classical (but still up-to-date!) as well as new (and much of interest is happening here) concepts and theories of regional development and the economics of cities and regions. Finally, there are areas that are poorly recognised or not recognised due to a lack of systematic monitoring.

Analysis of the economic development processes requires consideration of both the components that make up this concept: quantitative (economic growth and the economic condition of the inhabitants, companies and local governments) and qualitative – related to the process of transforming the sectoral structure of the economy. The book begins with an analysis of the economic growth trajectory of the GZM in the last two decades followed by a systematic discussion of the economic potential of the metropolitan area based on indicators from the area of the labour market, entrepreneurship (especially in knowledge-intensive sectors) and the presence of dynamic companies, as well as measures of the well-being of residents, companies and local governments. Since we fully agree with the remark made a decade ago by Christoph Zöpel (2011: 32) that metropolitan functions and positive economic development are closely linked [...] and that a basic condition is the emergence of innovation functions, the next part of the book includes an analysis of the development of innovation functions. We examine these primarily on the basis of the aggregation of industries by level of technological advancement proposed by the EU statistical office (EUROSTAT) and the action taken by firms to secure financing for innovation from EU funds.

In this book we devote particular attention to analysing the processes involved in creating new industrial development paths in the metropolitan area and internal spatial variations in this respect. We discuss these mechanisms on the basis of aggregated data for activities that have developed in the GZM after 1989. One of the key determinants of the ability to create development and at the same time the resilience and ability to absorb shocks is the degree of diversity of the local and regional economy. Therefore, indicators of functional structure, diversification and specialisation are given due attention in this study.

The city and city region are dynamic economic systems that have the capacity, as Deyan Sudjic (2017: 42) writes in the excellent *The Language of Cities*, to multiply wealth and make the poor more affluent. The input for such a system is provided by the resources of the city economy (human, infrastructure, capital, etc.), while the output is provided by the products and services offered by firms, leading to certain financial and innovative outcomes. Since nowadays, in the knowledge economy, it is people who are the largest 'input' resource, information on human and creative capital has also found an appropriate place in this paper.

We are of the opinion that research investigating the dynamics and state of the economy, besides analysing the indicators of economic condition, should try to determine the position of cities and regions in networks and hierarchies of economic relations on a supra-local scale (i.e. **their place in the spatial division of labour**). This position is reflected in the size and structure of their economic base, with central, decision-making and controlling functions. The first two dimensions refer to classical concepts interpreting the mechanisms of city development – the economic base and Christaller's Central Place Theory. Analyses of the magnitude and direction of knowledge flows (Micek 2017), especially labour flows, may also allow an assessment of the position of a given economy in comparison with other centres. The culmination of the empirical analyses conducted is the distinction of growth poles in the GZM. Wider conclusions resulting from the research conducted are included in the last part of the paper.

1.2 Research area and time horizon

The study concerns the GZ Metropolitan Area, established on the basis of the *Act on the metropolitan association in the Silesian Voivodeship* (Journal of Laws No. 69/2017, item 730), which includes 41 cities and municipalities located in the central part of the Silesian Voivodeship. The total area of the GZ Metropolitan Area is 2.5 thousand km² with 2.3 million inhabitants. The GZM is the first in Poland to have a legal foundation and it has performed its statutory tasks since 1 January 2018.[10] The GZM comprises 13 cities and towns with powiat rights,

10 For readers interested in models of local government for metropolitan areas, we recommend the studies by J.H. Szlachetka (2020, 2021).

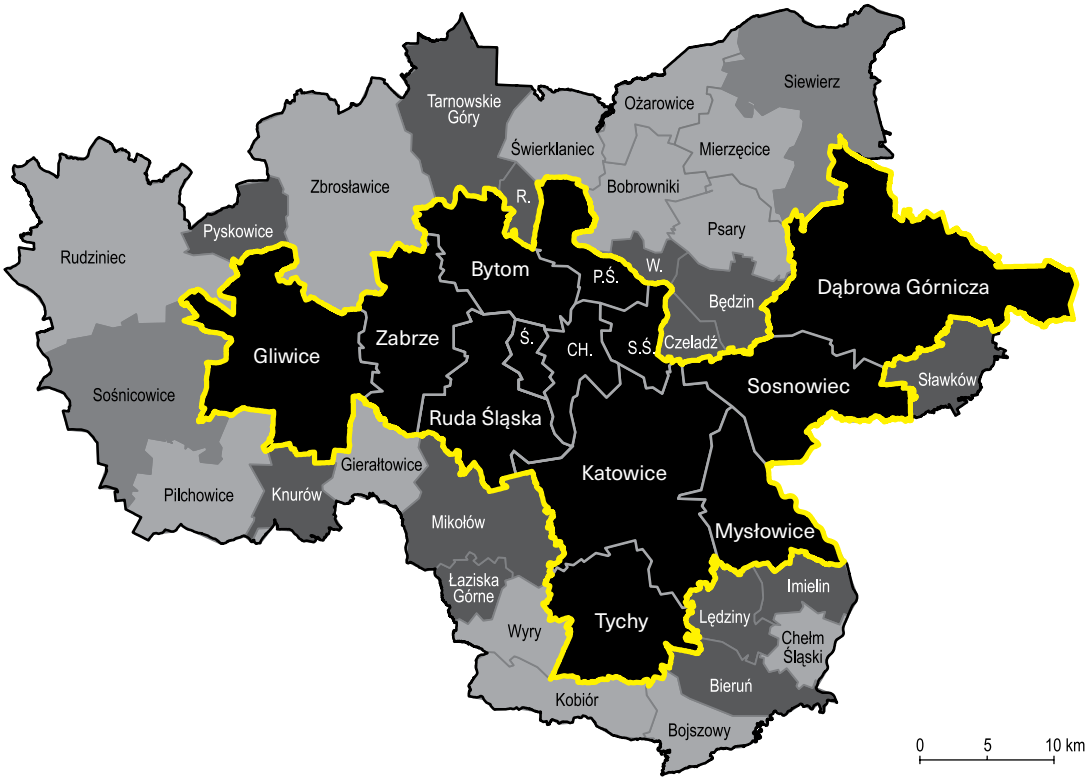


Fig. 1. Municipalities forming the GZM
Source: own work based on InfoGZM data.

which constitute the core of the metropolitan area, as well as 13 urban, 13 rural and 2 urban-rural municipalities (fig. 1).

The GZM is a new territorial body operating since 2018, whose forerunner was the Upper Silesian Metropolitan Union (2007–2017). This was an optional inter-municipal association that included 14 cities with powiat rights (all of which, except Jaworzno, joined the GZM) which provided the core of the Katowice conurbation (see Krzysztofik et al. 2011b).

In functional and spatial terms, the GZM is a unique settlement form in Poland with the characteristics of a conurbation. The complexity of the settlements and the specificity of the historical heritage meant that the area has been referred to in various ways in the academic literature and journalism; after 2000, the term 'Katowice conurbation' gained popularity, promoted by geographers from the University of Silesia (Krzysztofik et al. 2011b). Apart from the functional division of the GZM into a core zone, formed by 13 municipalities with powiat rights, and an external zone, it is worth pointing out two historical divisions, whose heritage still influences the diversity of social and economic processes. These are the divisions into Upper Silesia and Lesser Poland (Zagłębie), which were almost uninterruptedly located in different state bodies from the 14th century until 1922, and the division of the conurbation into Eastern (Polish) and Western (German), which functioned between 1922 and 1939.

In this study, the term 'GZ Metropolitan Area' will be used interchangeably with the terms 'GZM' and 'metropolitan area'.

The comparison of the GZM with the largest national metropolitan areas – i.e. Warsaw, Tricity, Kraków, Poznań, Wrocław or Łódź – was based, in the case of the GZM, on formally defined boundaries, while the definition provided by P. Śleszyński (2013) was used for the remaining metropolitan areas.

The time horizon of this study mainly covers the last two decades, especially in the descriptive part. Many trend analyses were conducted for the last decade for which data were made available (usually 2009–2019). Sometimes the scope of the analysis extends to more recent data (2020 or even 2021).


673
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1.3. Data sources and methods of analysis

> *decisions caeasure affects what we do;*
> *and if our measurements are wrong,*
> *decisions can be distorted*
> J. Stiglitz, A. Sen and J.-P. Fitoussi (2017: 7)

The analyses presented in this study are based on a variety of data sources, mainly in the form of so-called found data – i.e. information previously collected by various institutions (see Michalski 2020). Due to, inter alia, limitations in the scope of the data (collected or made available) by the Central Statistical Office (GUS), it was necessary – in order to analyse the processes examined comprehensively, accurately and reliably – to explore many alternative sources providing information, and in some cases to develop our own databases for further analyses on the basis of existing (but dispersed) source data.

A particularly acute problem in Poland is the unavailability of reliable and disaggregated (e.g. when it comes to the sections of NACE classification) data from the area of the labour market at local level (municipalities and powiats). The accessible GUS data do not take into account, inter alia, employment in entities with up to nine employees (so-called microenterprises) and additional disaggregated data – e.g. concerning single sections of the NACE – are unavailable due to statistical secrecy (Article 10 and Article 38 of the Act of 29 June 1995 on public statistics). For 2018, a reliable estimate of the number employed, including in microenterprises and the commuting network for all municipalities in Poland, was made by P. Śleszyński and K. Wiedermann (2020), and the database provided by these authors is a very valuable source for further in-depth analyses.

Data on entrepreneurship were collected from the Local Data Bank of GUS and the National Court Register (KRS). A source of information on rapidly growing small and medium-sized companies was the Business Gazelles ranking of enterprises compiled by Coface Poland and published in the economic daily *Puls Biznesu*. The number of companies included in this ranking is large enough to show the diversity of this phenomenon for aggregated long-term sequences for towns and municipalities.

The possibility of a fairly comprehensive analysis of the income of residents and businesses locally is possible thanks to the MRL

Photo 1. Office buildings located on Chorzowska Street, home to one of the largest banks in Poland. The Upper Silesian-Zagłębie Metropolis hosts the most management boards of large companies in Poland after Warsaw. Author: Aleksander Małachowski, Hashtagalek

entrepreneurship portal, prepared by the Association of Polish Cities in 2021. Data sources include sets made available by the Ministry of Finance and POLTAX resources, data from the Social Insurance Institution (ZUS) and the Agricultural Social Insurance Fund (KRUS) (available for 2015–2019)[11] available for the period 2015–2019). Although there are still data gaps in the MRL entrepreneurship portal and several basic indicators are unavailable (e.g. median income and income of residents), this database is nevertheless ground-breaking in terms of the possibility of analysing the financial health of residents and businesses at the level of the basic territorial division of Poland, i.e. municipalities.[12]

When it comes to towns and cities, the availability of indicators concerning expenditure on innovation or the results of innovative activities is very limited. We have assumed that how diverse the innovative potential of the towns and cities is can be determined by the number of companies, and their dynamics of establishment in sectors of the economy which are classified by the European Bureau of Statistics as ones of at least medium-technology (in the industrial sector), as well as in knowledge-intensive and high-tech knowledge-intensive services. In addition, indicators based on the activity of beneficiaries from the GZM in obtaining funds for innovation financed from EU funds and data made available by the Katowice Special Economic Zone were used.

In assessing the financial condition of local governments, we used the rankings of the *Wspólnota* periodical, mainly particular editions of the 'Financial Resources of Local Governments' and 'Net Operating Surplus' rankings. Information available in the Panorama Firm search engine was used to construct scalar centrality indicators, and information on examination results made available by the District Examination Commission in Jaworzno was used to construct human capital indicators. Quantitative information for the case study analyses of selected industries (hard coal mining) were collected by the

11
The search was completed on 27.07.2021.

12
Previously, such attempts were made for selected voivodeships or smaller territories, but they were usually exceptional and transient. Noteworthy are the analyses of municipalities in the Małopolskie Voivodeship (Binda 2016) and the cities of the Katowice conurbation (Kaleta et al. 2014).

authors directly from company websites, specialised industry portals and the e-krs system maintained by the Ministry of Justice.

This study primarily uses the indicator method. It assumes a realist approach in the light of which even cognitive constructs that are not directly observable (e.g. the entrepreneurship of inhabitants) can be described by observable empirical or empirical-inferential indicators (e.g. the number of companies established by the inhabitants). In addition to analyses of single measures or indicators, conclusions were constructed based on indicators and analytical tools well-established in the scientific literature, such as, for example, the location quotient (LQ) and the Amemiya diversification coefficient. The interpretation of these indicators is discussed in every instance where they occur in the study. Some areas have been subjected to more advanced statistical analysis, including the correlation index, suitability analysis and geostatistical analysis. The work contains numerous statistical maps, mainly based on the cartogram and carto-diagram method. These maps were made via ArcGisPro software.

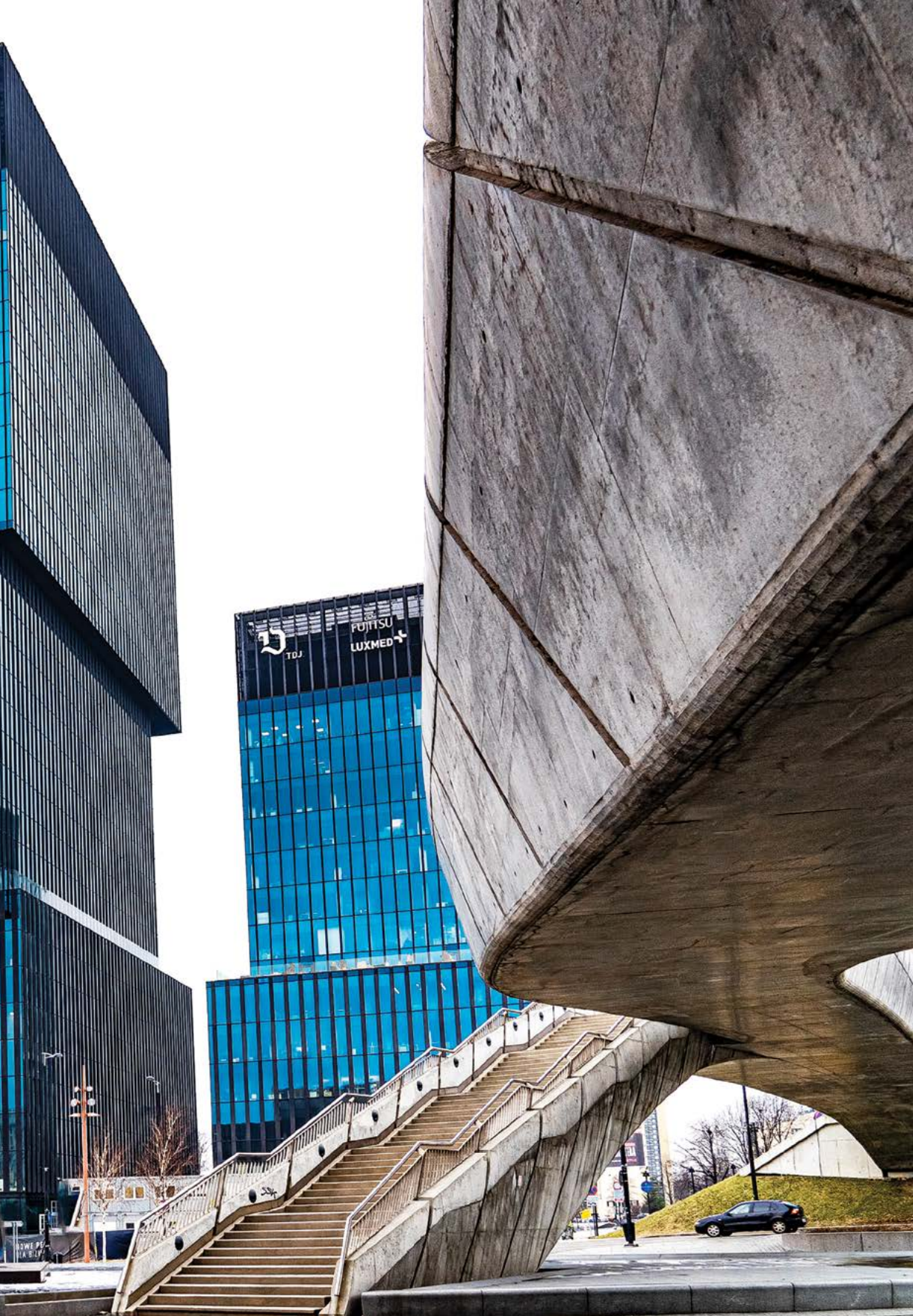
Pages 18–25:

Photo 2. Katowice city center.
Author: Wojciech Mateusiak

Photo 3. Power Plant in Łaziska Górne. Traditional branches of the region's economy remain a visible element of the economic landscape of the GZM.
Author: Wojciech Mateusiak

Photo 4. Katowice – business and innovation.
Author: Krzysztof Malinowski

Photo 5. Gliwice – Motorway Junction in Sośnica. Accessibility in road transport is one of the key factors of the GZM's investment appeal.
Author: Radosław Kaźmierczak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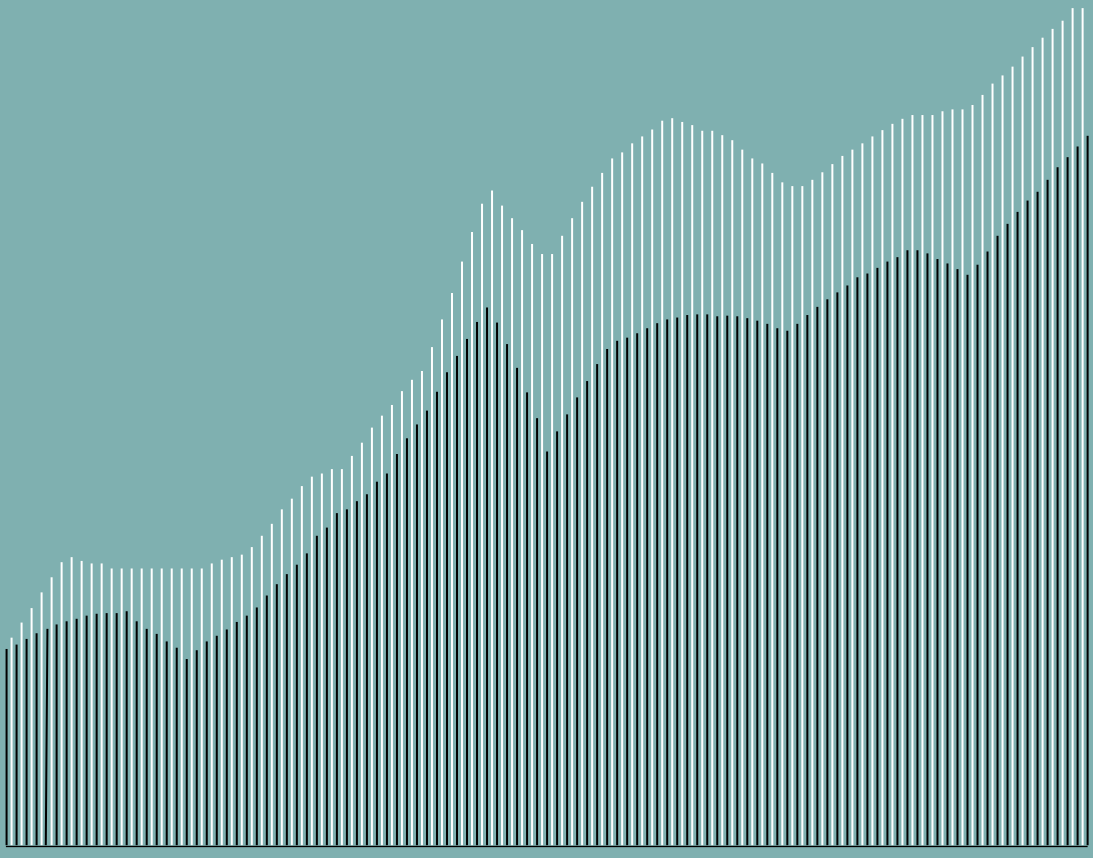
chapter 2

The Economic Growth Trajectory of the GZM after 2000



The starting point for in-depth analyses of the level of economic development of the GZ Metropolitan Area is an analysis of the trajectory of economic growth over the last two decades. Empirically, this picture can be well expressed using a classic measure of the level of economic development, which is GDP. Due to the way GDP is spatially aggregated, analyses are only possible for statistical sub-regions (NUTS 3). The metropolitan area covers five sub-regions of the Silesian Voivodeship: Bytom, Gliwice, Katowice, Sosnowiec and Tychy.

The GDP generated in the metropolitan area (or more precisely: the five sub-regions mentioned above) increased in nominal terms by more than two and a half times between 2000 and 2018. This absolute growth was slightly lower than the rate for the country as a whole. As a result, the share of the GZM in Poland's GDP decreased from 8.7% in 2000 to 7.9% in 2018. However, the role of the GZM in the Polish economy measured by the share of GDP is greater than that expressed by the number of employed people (6.0%). **The GZM grew economically (in absolute terms) despite its continuously decreasing demographic potential**. In the period 2000–2018, the number of inhabitants of the GZM shrank by more than 200,000 people, which resulted in a decrease in the metropolitan area's percentage share in Poland's population from 6.4 to 5.9.

The level of economic development of the individual areas making up the metropolitan area was and remains clearly differentiated. In 2000, the income gap (measured in nominal terms) between the sub-region with the lowest GDP (Bytom) and the highest (Katowice) was as much as 3:1, and it was a similar case in 2018. The three sub-regions of Gliwice, Tychy and Katowice have a level of economic development that is significantly higher than the Polish average. The eastern and northern parts of the metropolitan area (the Sosnowiec and Bytom sub-regions), on the other hand, have a lower GDP per capita than Poland overall, and while in the case of the Sosnowiec sub-region the difference is minor (and in some years there was no difference), the Bytom sub-region consistently remains a significantly less prosperous area (Fig. 2). In the last two decades, the western part of the metropolitan area (i.e. the Gliwice sub-region) has clearly had the highest GDP growth dynamics, which has significantly reduced the difference from the leading, in terms of GDP value, central area of the metropolitan area (i.e. the Katowice sub-region).

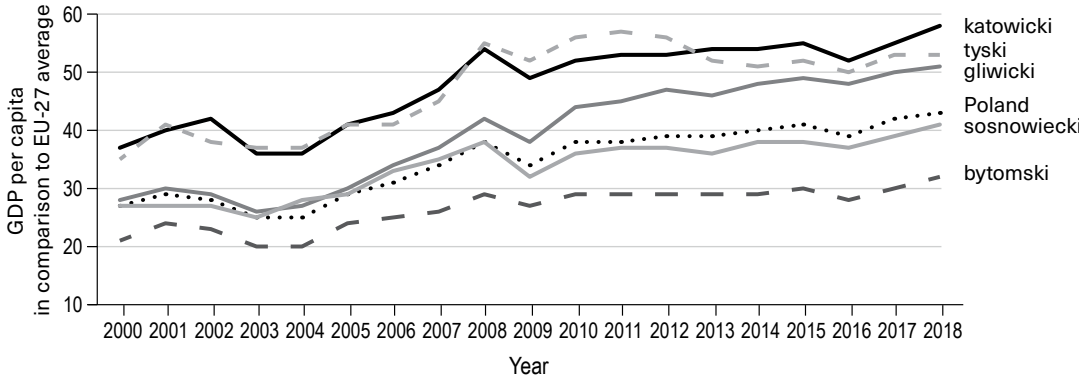


Fig. 2. The dynamics of nominal GDP per capita in the sub-regions [NUTS 3] comprising the GZM between 2000–2018 in comparison with the average for the economies of the European Union (EU-27)
Note: The sub-regions [NUTS 3]: Bytomski [PL228], Gliwicki [PL229], Katowicki [PL22A], Sosnowiecki [PL22B], Tyski [PL22C].
Source: own analysis based on Eurostat data.

Interesting conclusions can be drawn by observing the pace of economic development in the GZM in the last two decades based on changes in the level of GDP in relation to the average for the European Union (UE27), the dynamics of nominal GDP (taking 2000 as 100) and the unemployment rate in relation to the average for Poland. From the country's accession to the European Community (2004) to the global financial crisis (2008), the GZM economy recorded high growth dynamics. This was by far the best period for the metropolitan area in the last two decades. After a clear slump in the growth rate in 2008–2009, the GZM economy returned to the growth cycle until 2016, but with significantly slower dynamics than in the pre-crisis period. On the other hand, prosperity, on a scale comparable to 2004–2008 was achieved in subsequent years and lasted until the first year of the COVID-19 pandemic (2020), which caused the second pronounced economic decline in the last two decades. The nature of the course of the GZM's business cycles – particularly in the years 2004–2015 indicates a **significant degree of linkage between the GZM and external markets – i.e. a high degree of internationalisation expressed by the role of the export sector (mainly manufacturing)**. The reaction to two shocks: the first of a demand-driven nature (2008–2009 crisis) and the second of a supply-driven nature, **also reveals at most a moderate resilience** of the metropolitan area's economy.

In terms of local GZM economies (towns with powiat rights and powiats), diverse individual development trajectories are visible. When considering the unemployment rate, it should be noted that Katowice was the most strongly associated with the trajectory of the GZM trend, followed by GZM municipalities from the bieruńsko-lędziński powiat, Gliwice, Chorzów and GZM municipalities

from the Gliwice powiat. The biggest positive change after 2004 took place in Chorzów, Katowice, Siemianowice Śląskie, Tychy, Gliwice and the GZM region from the bieruńsko-lędziński powiat. While **the metropolitan area as a whole clearly improved its relative position** – as measured by the registered unemployment rate over the last 16 years in relation to the national average – unfortunately four metropolitan areas presented an opposite trend. These were: Bytom, Mysłowice, Piekary Śląskie and the GZM municipalities from the tarnogórski powiat. Of course, **the absolute unemployment rate in all the municipalities of the GZM is now clearly lower than in the first half of the first decade of the 21st century.** One should also emphasise the presence of relative stagnation in two other large municipalities at the core of the metropolitan area: Zabrze and Sosnowiec, as well as in the Będzin powiat. It is also worth noting the municipalities which were the least connected with the labour market trend in the entire GZM: Bytom, Mysłowice, Piekary Śląskie, and also Siemianowice Śląskie and Ruda Śląska. There were various reasons for this – from a clear sub-industrialisation shock (Bytom), through the continuing dominance of the mining sector in the city's economy (Ruda Śląska), the deindustrialisation that took place in the study period (Mysłowice, Piekary Śląskie), to the spread of the positive effects of the metropolitan growth pole (Siemianowice Śląskie ▸ Chapter 8).

A distinctive feature of the GZ Metropolitan Area is the large share of the industrial sector in the gross value added (GVA) structure. It is particularly significant in the Tychy and Gliwice subregions, and relatively minor in the Katowice subregion (fig. 3). Manufacturing, through its multiplier effects,[13] stimulates the business services sector and is one of the main mechanisms within the economic development of the metropolitan area while also guaranteeing its competitiveness. The role of the industrial sector has not changed significantly in the last two decades, and the GZM is one of the most important reindustrialisation areas in Poland (▸ Chapter 6). The service sector, which

Photo 6. 'Nowe Gliwice' Business and Education Centre. A flagship example of the structural change that has taken place in the region's economy and the successful regeneration of post-industrial areas. Author: Aleksander Małachowski, Hashtagalek

13
Multiplier effects include the growth of income and employment of enterprises and tax revenues caused by the creation of new economic activity or the development of existing economic activity in a given area. There are two basic types of multiplier effects: supply effects, resulting from demand reported by new or expanding activities, and income effects, resulting from an increase in the volume of money through employee wages (Domański and Gwosdz 2010).

in the GZM generates 59% of GVA, plays the main role in the central part of the metropolis. In the Katowice sub-region, which acts as the main service centre of the metropolitan area (▸ Chapter 8), services had a 70% share in the creation of GVA in the period analysed.

In the period under study the western and southern parts of the conurbation (Gliwice and Tychy subregions) had an above-average growth of added value in relation to the entire area of the GZM in both the manufacturing and service sectors. The so-called parallel hypothesis of F.J. Bade (1994) is empirically confirmed in these areas: the existence of a strong relationship between growth in manufacturing and the development of market services. On the other hand, the central part of the metropolitan area (Katowice subregion) had a faster than average growth rate of GVA in services, and at the same time the weakest growth dynamics of this indicator in the manufacturing sector. As a result, the role of services has clearly increased in the central part of the metropolitan area, and this metropolitan area, in terms of function, is increasingly becoming a central business district (CBD) on at least a regional scale. The opposite occurred in the east of the conurbation (the Sosnowiec subregion) where an above-average rate of GVA growth in the industrial sector was accompanied by the lowest rate of GVA growth in services in the GZM. One of the main reasons for this may be the strong connection of this subregion with the central part of the metropolitan area, which attracts some of the service sector as a result of location advantages and stronger concentration effects (this process is clearly visible in modern business services ▸ Chapter 6). The north of the metropolitan area (the Bytom subregion) had a slower growth rate in relation to the entire GZM, both in the industrial and service sectors.

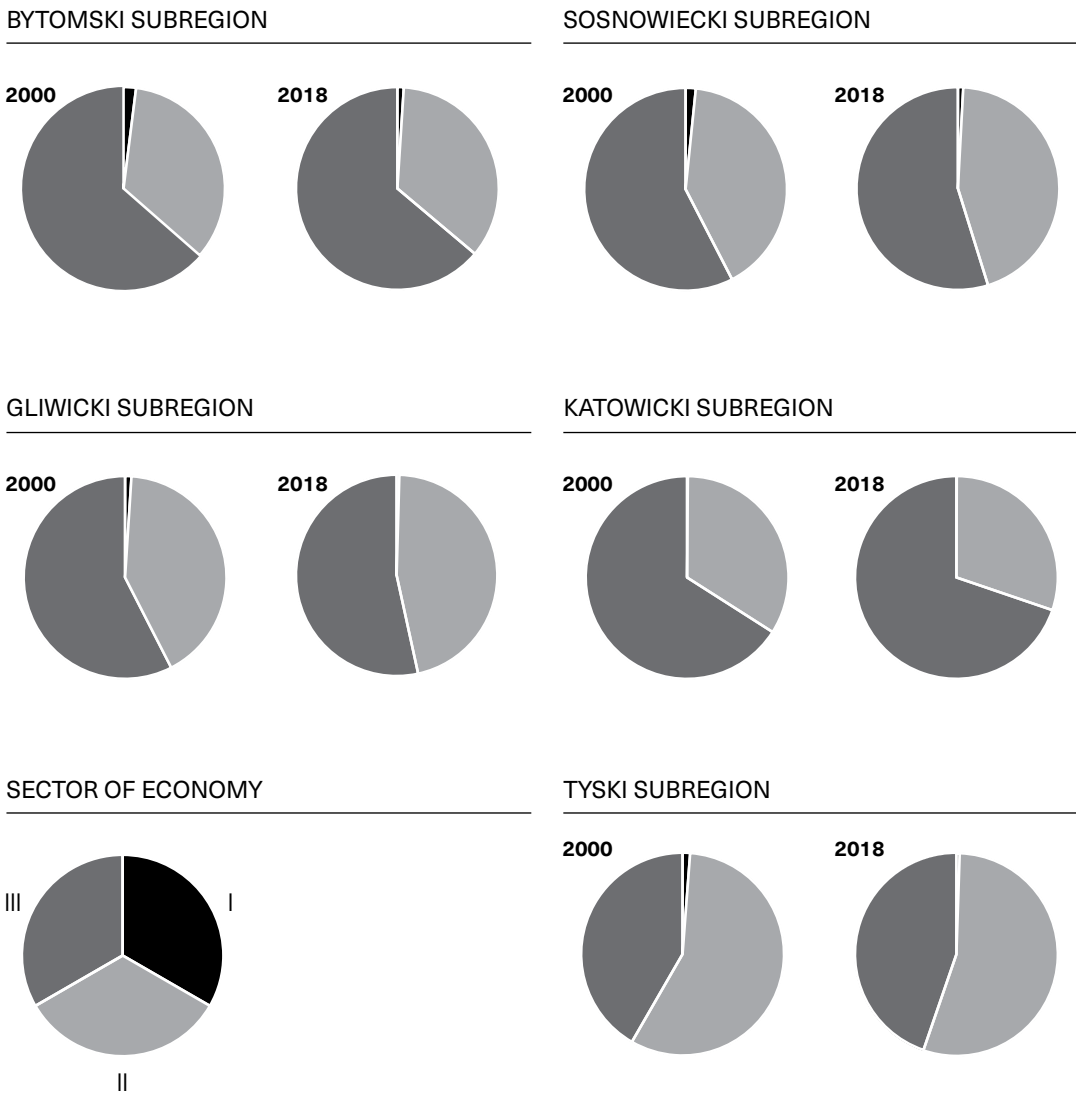
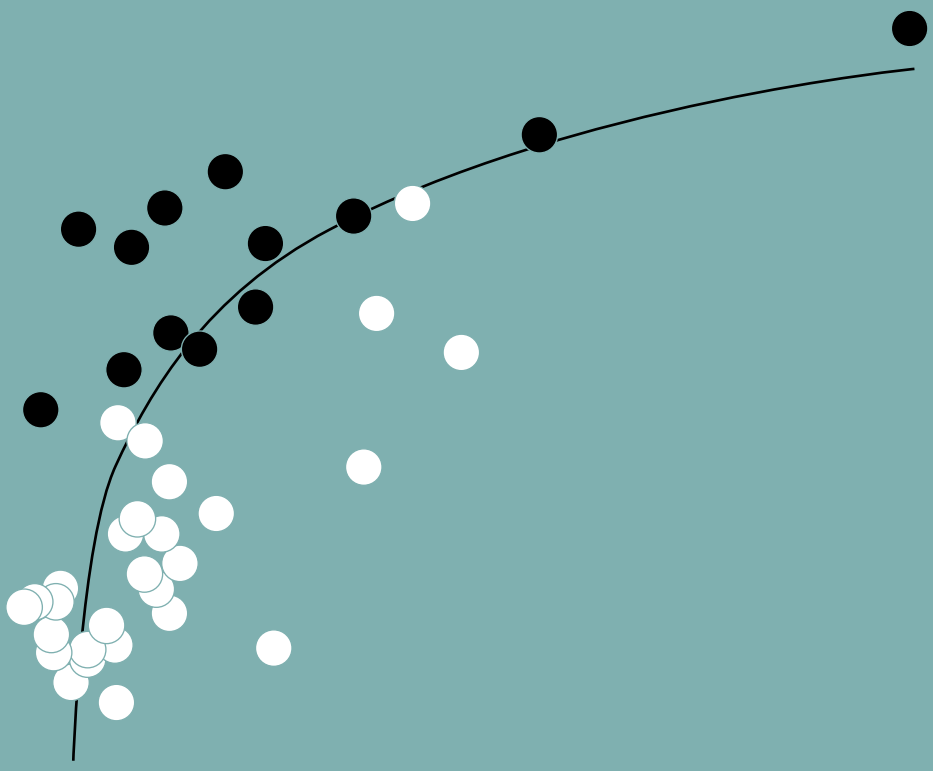


Fig. 3. Gross value added by economic sector in the sub-regions [NUTS 3] comprising the GZM in the years 2000 and 2018
Note: The sub-regions [NUTS 3]:
Bytomski [PL228], Gliwicki [PL229], Katowicki [PL22A], Sosnowiecki [PL22B], Tyski [PL22C]
Source: own work based on GUS data.

chapter 3

The Economic Potential of the Metropolitan Area and its Internal Variation

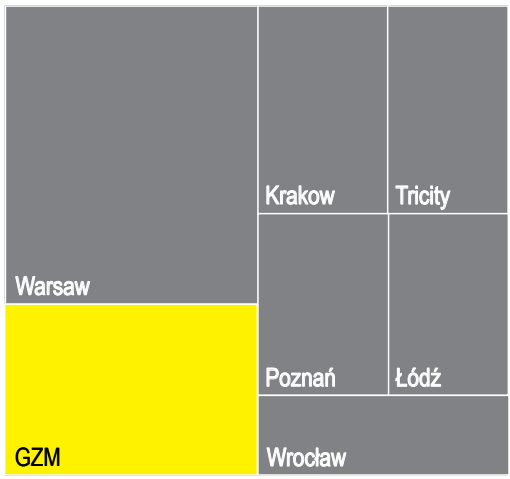


3.1. Employees

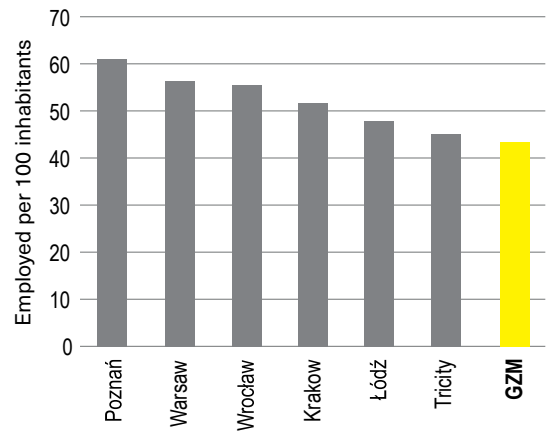
The number of employed people in a city relative to the population is a very useful indicator of the health of a city's economy. Changes in the number of employed people, preferably analysed in an industry breakdown as detailed as possible, are considered one of the leading indicators of economic trends (see e.g. 2018 Silicon Valley Index 2019).

The economic potential of the GZ Metropolitan Area, measured by the number of people working in the cities of the metropolitan area, is close to one million (981,000 in 2018). The role of the GZM in Poland, measured by the number of employed people, is slightly more than the metropolitan area's share in Poland's population – 6.0% and 5.9% respectively. After Warsaw, the GZM is the largest metropolitan labour market in Poland, whose size significantly exceeds the number of employed in other, supra-regional national metropolitan area (known as Kraków MA, Łódź MA, Poznań MA, Wrocław MA and Tricity MA), where it ranges from 450,000 to 620,000 people. What distinguishes the GZM from other leading metropolitan areas in Poland is the still significantly lower number of people employed relative to the population (fig. 4). This difference results from lower professional activity of the inhabitants of the GZM, but also proves the attractiveness of the metropolitan area, which is influenced by both the appeal of the metropolitan area itself as well as its characteristics – in particular its size and the mobility of its inhabitants.

It is worth noting the following fact – **in comparison to 1989, the number of jobs in the metropolitan area decreased by approximately 74,000 and the number of inhabitants by as many as 340,000.** This statistic alone testifies to the depth of changes in the labour market of the GZM and the **significant increase in the professional activity of its inhabitants**. At present, apart from the occupational group of men over 50 (beneficiaries of mining pensions), the economic activity indicators of the inhabitants do not differ significantly from the national average. **A significant change in relation to the pre-transformation period is the large increase in the economic activity of women, which indicates a systematic breaking of the traditional Silesian family model with a non-working** mother (Swadźba 2012, Sitek et al. 2013). At the same time, profound changes in the economic structure have taken place in the GZ Metropolitan Area. The number of people working in traditional industrial sectors – mining, metallurgy and energy – has



Number of employed in 2018



Metropolitan Area

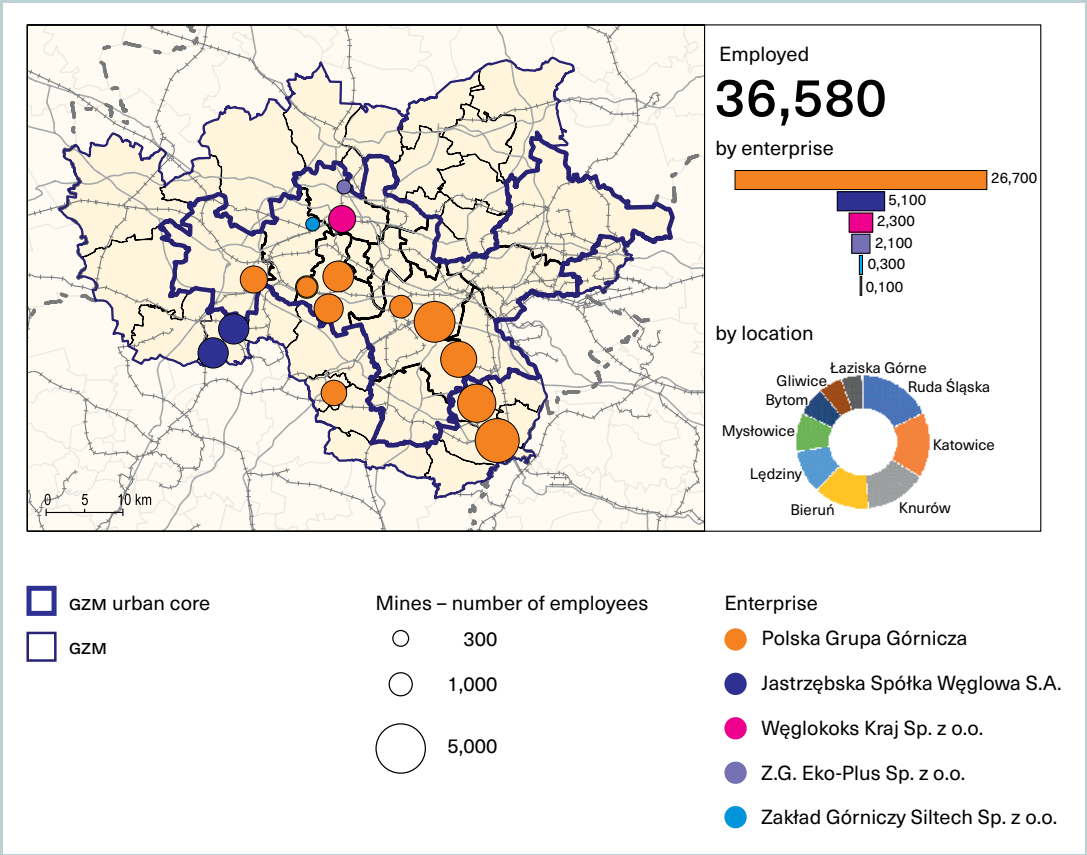
decreased dramatically, while the role of other manufacturing industries and, above all, service activities has increased (▸ Chapter 6). Currently, they play the largest role in the professional structure of the working population in the metropolitan area (approximately 70%). The industrial sector remains an important source of work for metropolitan residents (29.8% in 2018), and its role is several percentage points higher than the national average (Poland = 26.3%). According to some experts, such a large share of industry can be considered an asset in the context of economic recovery from the COVID-19 pandemic (Wójcik 2021). In contrast, mining alone accounts for about 4% of the occupational structure is (see: hard coal mining – phasing out the industry).

Fig. 4. Total employed and per 100 inhabitants in the GZM and other major Polish metropolitan areas in 2018
Source: own elaboration based on GUS data and P. Śleszyński and K. Wiedermann (2020).

Hard coal mining – phasing out the industry

One of the leading trends in the transformation of the GZM economy after 1989 was the progressive reduction of the role of hard coal mining. This process took place at varying tempos, but the changes were nevertheless very profound. The percentage of workers employed in mining is currently only 4% (in 1990 it was over 25%), while the total number of people working in active coal mines in the metropolitan area at the beginning of 2021 amounted to 37,000 miners, which is about 10 times less than at the beginning of the transformation. Currently, coal is mined in the metropolitan area by 13 large plants belonging to companies controlled by the State Treasury, mainly the Polish Mining Group (individual mines belong to Węglokoks and Jastrzębska Spółka Węglowa), plus two private micro-mines (ZG Eko-Plus and ZG Siltech). Also of local importance on the labour market are liquidated mines and auxiliary plants, which are managed by the Bytom-based Mine Restructuring Company.

Almost all large, active mines are located – with the exception of KWK Bobrek – in the southern part of the metropolitan area (fig. 5). Municipalities where mining remains a significant employer (in terms of absolute employment) are Ruda Śląska (6,400), Katowice (5,600), Knurów (5,100), Bieruń (4,700), Lędziny (3,600), Mysłowice (3,200), Bytom (2,900), Gliwice (2,000) and Łaziska Górne (1,700). The role of mining in the employment structure in those cities varies greatly – from a minor role in Katowice and Gliwice (less than 2.5%), a significant one in Mysłowice, Ruda Śląska and Łaziska Górne (between 10% and 22%), to a dominant one in Bieruń, Knurów (>40%) and Lędziny (as many as ⅔ of those employed). The share of mining in the local labour market and other features indicating the resilience of the city's economy (e.g. entrepreneurship, investment attractiveness and location in relation to growth poles) will be factors that influence the adaptation capabilities of particular metropolitan cities in the face of challenges related to energy transformation. In the light of the *Index of Sensitivity of Mining Regions* constructed by the Polish Economic Institute (Juszczak and Szponar 2020), the scale of shock caused by the closure of the mining industry may be the highest in Ruda Śląska and Bytom, followed by the cities of the bieruńsko-lędziński powiat, Mysłowice and Zabrze. At the same time, the Fair Transformation Fund provides a great opportunity for systemic economic renewal in



areas struggling with the effects of restructuring the traditional economic industries of the metropolitan area (see Drobniak et al. 2021).

The legacy of hard coal – both positive and negative – will affect the metropolitan area long after the last ton of thermal coal comes to the surface, which is due to happen in 2041 – in light of the agreement defining the principles and pace of the gradual liquidation of thermal coal mining and the mechanisms for supporting Silesia's transformation.

Fig. 5. Distribution of hard coal mines in the GZM in 2021
Source: own compilation based on data provided by companies [as of 1.01.2021].

The polycentric metropolitan area of the GZM is strongly differentiated internally in terms of the number of employed people. This differentiation is much stronger than in the case of population. Katowice and Gliwice, by far the largest labour markets in the GZM, together account for ⅓ of everyone employed in the metropolitan area (⅔ of that number in Katowice alone). Four other cities – Sosnowiec, Tychy, Zabrze and Dąbrowa Górnicza (with the number of working people ranging between 55,000 and 77,000) together comprise ¼ of all employed, while three other large labour markets (each with at least 40,000 people) are formed by Bytom, Ruda Śląska and Chorzów. Ten more metropolitan cities have a number of employees between 10,000 and 30,000, in this group the largest number of people work in Mysłowice and Tarnowskie Góry, followed by Siemianowice Śląskie, Będzin and Mikołów.

Apart from the absolute size of the local employment markets, the indicators of the 'depth' of these markets also provide interesting information. They are expressed in the number of the employees relative to the number of the municipality residents and by a comparison of a given local government unit share in the employment market with its share in the number of metropolitan area residents. The deeper the local job market, the bigger potential 'surplus' employee participation, which highlights the city's role as a strong, supralocal employment market.

Only seven of the GZM cities are characterised by more workplaces than population: Katowice, Gliwice, Mikołów, Tychy, Tarnowskie Góry, Bieruń and Dąbrowa Górnicza. Hence, this group includes three out of four biggest cities with regard to the number of employed GZM centres, multifunctional powiat centres, and cities with a strong industrial sector.

Worthy of note is the relatively shallow employment market in four large cities of the metropolitan area: Sosnowiec, Zabrze, Ruda Śląska and Bytom. These employment markets are currently more marked by emigration than by immigration. The values of the analysed indicators are even lower for Świętochłowice, even less than for rural municipalities of the metropolitan area that are mainly residential, such as Chełm Śląski, Bobrowniki, Pilchowice or Wyry.

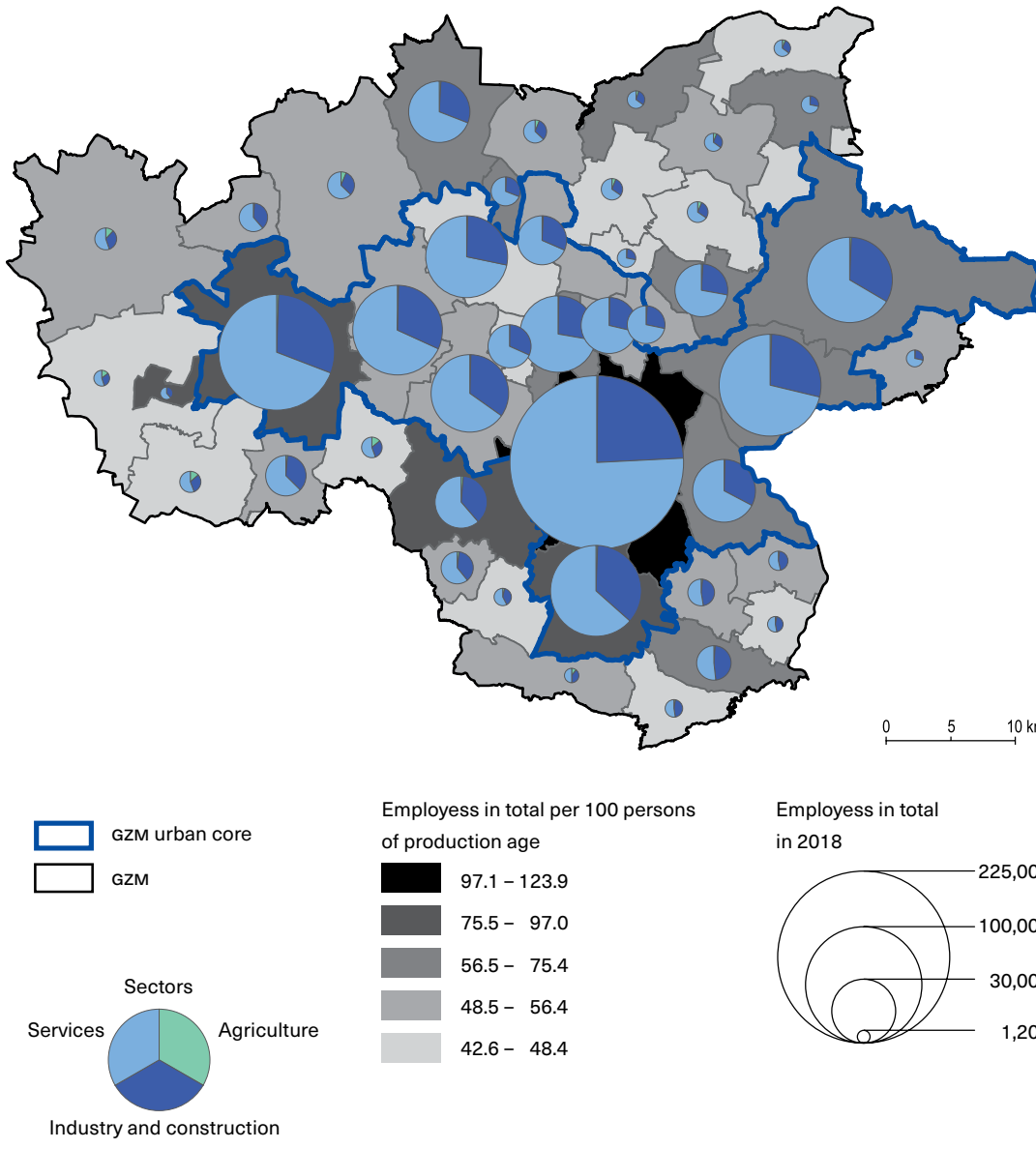


Fig. 6. Employees according to the economic and localisation sectors in the GZM in 2018
Source: author's own elaboration based on data from GUS and P. Śleszyński, K. Wiedermann (2020).

3.2. Entrepreneurship and economic entities

Entrepreneurship indicators are commonly considered in research on territorial differentiation of urban economic development and competitiveness. Their significance, among others, is related to the fact that appreciation of the entrepreneurs' role is increasing in the economic theory (Pawłowski 2007, Taleb 2013). Enterprises, especially small and medium-sized companies financed by local capital, are a key internal resource for endogenic (internal) development, among others, as a source creating new economic branches (*indigenous creations* ▸ Chapter 6) and an important resilience factor (*resilience*) of the economy in case of shock events (see Drobniak 2015, 2017).

One of the characteristic features of mature regions dominated by a large industry and '*a hegemonic culture of a wage labour*' (Hudson, 1989: 2) was weak development of the small and medium-sized company sector. Within the GZ Metropolitan Area, this was further exacerbated by the differences between the level of residents' entrepreneurship in its Upper Silesian and Zagłębie regions. The establishment and reinforcement of the entrepreneurship culture in the post-industrial metropolitan area required a reorientation of attitudes and a strong institutional support provided by business-oriented institutions.

After the three decades of transformation, the GZM is generally still characterised by lower entrepreneurship indicators than Poland as a whole, which only results from a lower saturation by the smallest economic entities, so called 'micro firms' (tab. 1). In the remaining size classes of the economic entities, the GZM is characterized by the more firms per capita than in Poland as a whole. Historically developed differentiation within the metropolitan area is still strongly visible and reproduced in the GZ Metropolitan Area. Definitely the lowest entrepreneurship (measured, for instance, in the number of firms belonging to natural persons relative to the number of residents) is demonstrated by the residents in the Upper Silesian part of the metropolitan area, where – currently or historically – a local employment market was strongly dependent on big industrial companies, especially coal mains (fig. 7). In contrast, the strongest

Tab. 1. Economic entities according to size class per 10,000 residents of working age in 2019
Source: GUS Local Data Bank.

Territorial unit	Total	0 – 9	10 – 49	50 – 249	250 and more
GZ Metropolitan Area (GZM)	1,894.2	1,808.1	69.1	14.5	2.4
POLAND	1,958.6	1,885.4	59.3	12.0	1.9

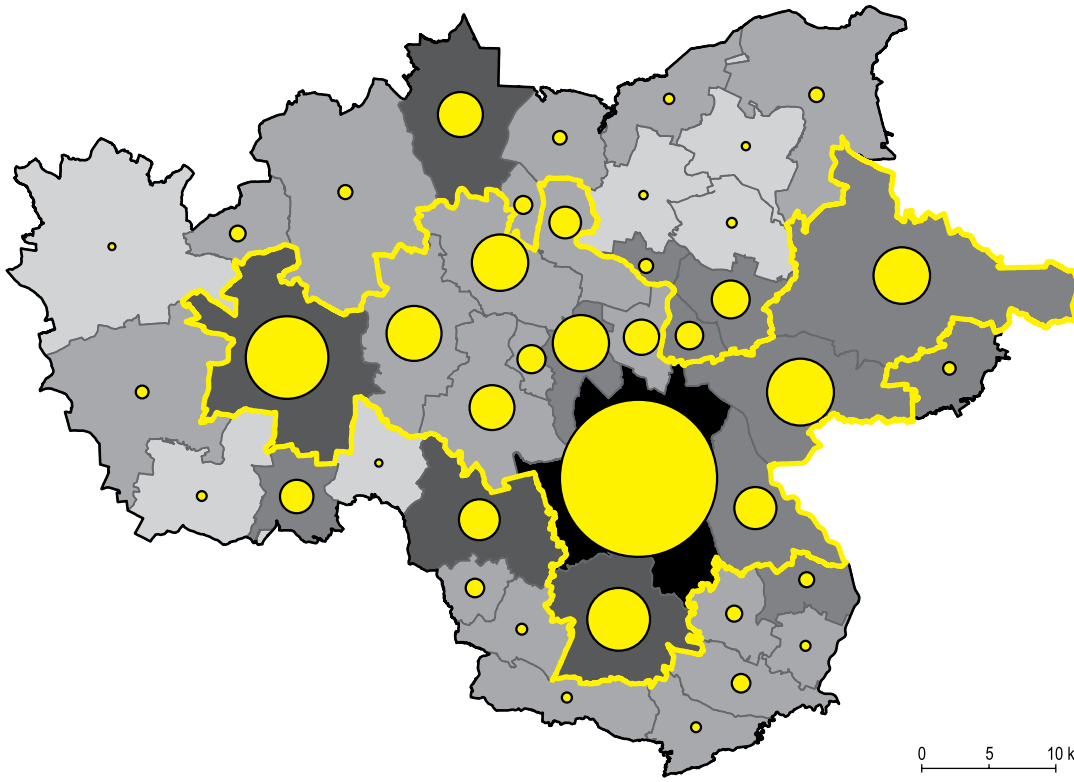


Fig. 7. The number of active economic entities registered in KRS per 10,000 residents in the GZM in 2021
Source: author's own elaboration based on the KRS data published by ePaństwo Foundation [as of 1.06.2021].

entrepreneurship is found in the northeast municipalities of the metropolitan area (especially Świerklaniec, Psary, Ożarowice), some rural municipalities on the South (Kobiór, Wyry) and multifunctional powiat centres – Tarnowskie Góry, Mikołów and Będzin as well as the main GZM economic centres, e.g. Katowice and Gliwice.

A simple indicator of entrepreneurship involves collating the number of registered firms in general (REGON) relative to the number of residents imposes many interpretative limitations since it fails to take into account a fundamental difference between people who became entrepreneurs due to opportunity (*opportunity entrepreneurship*) from these who followed this path due to the necessity (*necessity entrepreneurship*). Secondly, in a general business structure where usually over 95% of enterprises are made up of the smallest economic entities, it overestimates the position of cities and counties where many micro firms are registered, even though the often have a low potential for growth and in sectors of the economy that are not very knowledge-based. Hence, to present a full picture, three areas need to be analysed in depth: the activity of financially and organisationally stronger entities, the presence of dynamic SMEs and the structure of technological advancement at the branch level.

The number of active firms registered in the National Court Register (KRS)[14] is a good indicator of the presence of strong economic entities in a given territory. The GZM comprises 5.6% of all businesses subject to mandatory registration (⅔ of them are limited liability companies). The location of such entities within the conurbation is very clear. The highest density (measured by the number of companies to the number of inhabitants) is characteristic for the compact area of the three neighbouring cities of Katowice, Tychy and Mikołów, and separately for Gliwice and Tarnowskie Góry. There is also a clearly visible belt of increased activity to the north-east of Katowice, which includes the cities of the Zagłębie powiat of the SMA. Fewer businesses are registered in the remaining cities of the Upper Silesian part of the GZM (except for Mysłowice and Chorzów), with the fewest in the north-eastern and western parts of the metropolitan area. Organisationally and financially robust entities are concentrated mostly in the biggest and strongest centres of urban conurbations, additionally leading to the synergy of potentials.

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The catalogue of entities obliged to register can be found in Article 36 of the Act of 20 August 1997 on the National Court Register (KRS).

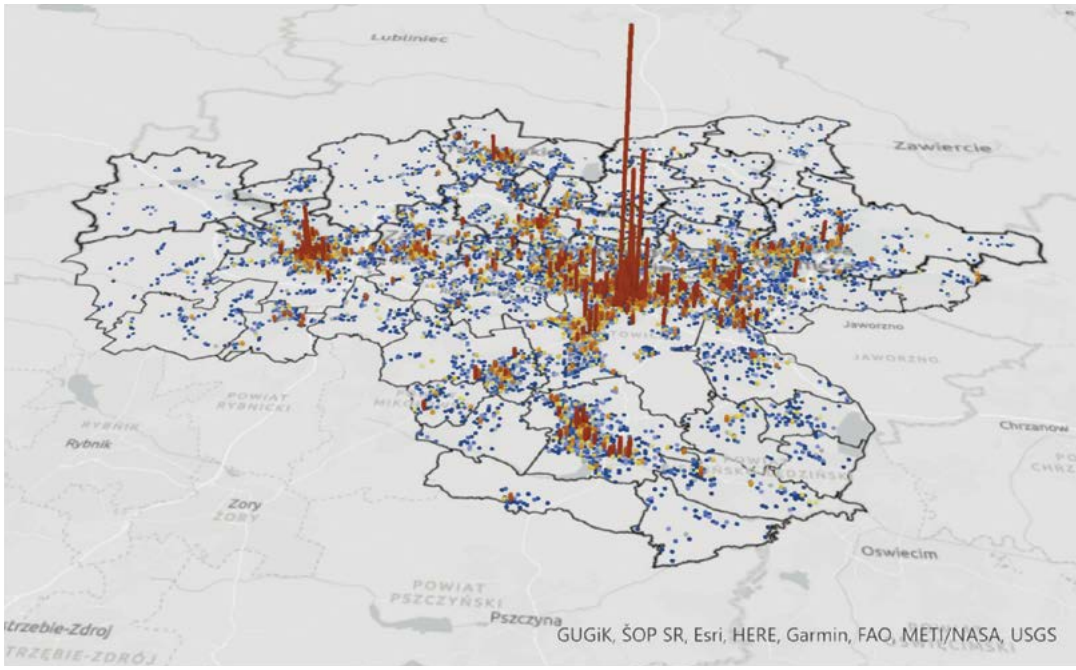


Fig. 8. The number of active economic entities registered with the KRS according to location in the GZM in 2021
Source: author's own elaboration based on the KRS data published by ePaństwo Foundation [as of 1.06.2021].

A spectacular image depicting the economic landscape of the metropolitan area shows the distribution of firms registered in the KRS in terms of their actual location. Katowice stands out as a kind of 'central business district' of the metropolitan area (incorporating over 35% of the entities), with Gliwice in second place (10% of the entities) (fig. 8). The distribution of businesses in the remaining centres of large cities within the metropolitan area shows less concentration, although their overall share is significant and ranges from 2.9% (Ruda Śląska) to 6.4% (Sosnowiec) throughout the remaining large centres with more than 100,000 inhabitants.

3.3. Firms with high growth dynamics

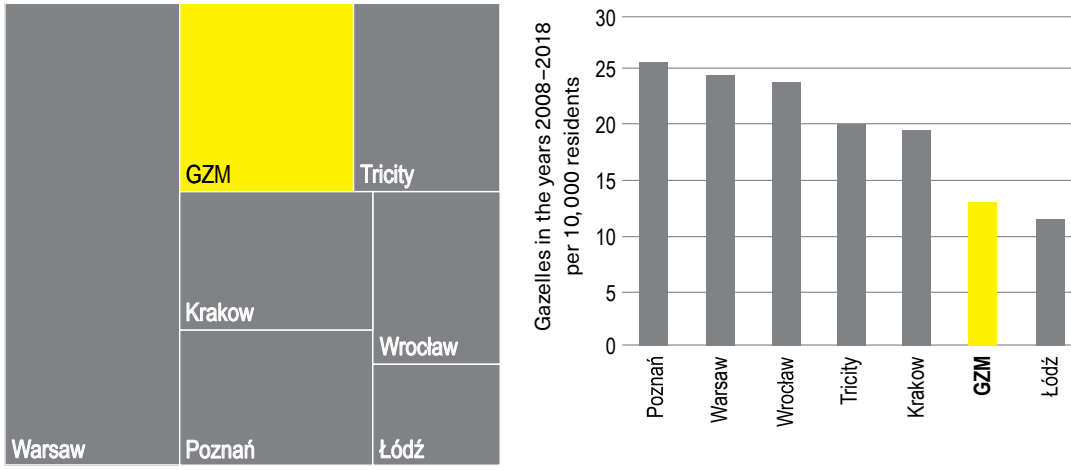
Since the publication of the well-discussed book by D.L. Birch (1981), who noticed that young, micro- or small firms with high income dynamics were the main source of the increase in the number of workplaces in the USA economy, firms that achieve a large turnover and create jobs have been analysed. Following Birch's terminology, they are called 'gazelle companies', as well as 'firms with high growth dynamics' (e.g. Eckhardt, Shane 2011), fast growing companies (Barringer, Jones and Neubaum 2005), firms with a high impact (Acs, Parsons and

Tracy 2008). Newly established enterprises in technological sectors have been of a particular interest to researchers in recent years. **A large representation of small and middle-sized companies distinguishing themselves with increasing revenue and profitability is a good indicator of the condition of a local economy and is strongly correlated with other desired measures of socio-economic growth** – e.g. an increase in the number of workplaces (Birch 1981) or diversification of the local employment market (Gwosdz 2014). At the same time, their spatial diversification may indicate 'the centre of growth' role played by a given city (Sobala-Gwosdz 2016a, 2016b).

Since disaggregated statistical data on the development of small and middle-sized firms on the territorial level of powiats (counties) are not publicly available in Poland, an attempt to identify businesses with high growth dynamics necessitates a search for different information sources. In this study, to establish the scale of differentiation among the GZM cities, we used the Gazele Biznesu ranking made by Coface Poland and published in the economic journal Puls Biznesu. The 'gazelle' is a small or medium company that, in the three years preceding the ranking for a given year, recorded an increase in sales revenues and generated profits.

In terms of the number of gazelle companies, the GZM ranks second nationwide, after the Warsaw metropolitan area (fig. 9). The GZM's advantage over the remaining metropolitan area is not as significant as in case of number of residents or general number of working adults. The normalisation of the number of gazelle companies by the size of the population potential reveals that the Poznań metropolitan area is characterized by the highest density of gazelles, followed by the Warsaw and Wrocław metropolitan areas. The rank of Poznań is not surprising, considering the strong historically rooted traditions and the general high level of entrepreneurship in the Greater Poland Voivodeship, in both rural and urban areas. On the other hand, the low position of two other post-industrial metropolitan areas – the GZM and Łódź – also mirrors their economic trajectories. These are regions with relatively less entrepreneurship, further hindered by the numerous areas within them that are in stagnation or feature weak development dynamics. We shall discuss this in more detail while elaborating on factors differentiating the level of gazelle company development within the GZM.

The number of dynamic small and middle-sized enterprises indicates a significant differentiation of the rank of the GZM cities. The position of Katowice is unquestionable – the role of this city as a cluster of



Number of gazelles in the years 2008–2018

Metropolitan Area

Fig. 9. Gazelles of business in the major polish metropolitan areas in years 2008–2018
Source: author's own elaboration based on the *Gazele Biznesu* ranking in years 2009–2019.

thriving SME is nearly twice as high as its significance measured by its percentage share of residents. Among the cities with the lowest rank, three centres have a strong position: Gliwice, Tychy and Sosnowiec. The role of the two first of these cities as a cluster of rapidly developing SME is also greater than their demographic potential and the number of all registered companies in the city. Mikołów and Mysłowice are also characterized by a surplus of gazelle companies relative to the number of residents and the total number of companies in the city. There is a clear shortage of gazelle companies among the main economic and population centres in the metropolitan areas – relative to both the number of residents and the number of firms – in Sosnowiec, Bytom, Zabrze, and Ruda Śląska. In contrast, the position of Chorzów and Dąbrowa Górnicza in terms of the number of gazelle companies is commensurate to their demographic and economic potential. The higher the general entrepreneurship rate in a given location (χ=0,52) and the diversification of the local economy (χ=0,52),[15] the higher the density of dynamic firms. In contrast, it is negatively, and quite clearly,

15
The correlation coefficient between the number of business gazelles and the degree of diversification of the local economy (as measured by the Amemiya coefficient) was calculated for the 16 GZM cities for which disaggregated employment data were available to calculate measures of the economic base.

correlated with the level of unemployment (χ=–0,31) and the major share of coal mining in the structure of the employed (χ=–0,11).[16]

The spatial distribution of business gazelles within the GZM reveals a dense concentration in the ring around the core cities of the metropolitan area, which is related to the suburbanisation processes taking place within its area, especially in the southern (Mikołów, Kobiór) and north-western region (fig. 10). The weakest links in this ring are the municipalities in the north-eastern part of the metropolitan area. In the latter subregion, the relatively high rate of local entrepreneurship, expressed by the number of firms owned by natural persons is not accompanied by an adequate development of strong and dynamically growing firms. Potential development overspill from the economically strongest cities of the metropolitan area – Katowice and Gliwice – are very clearly visible in the case of Katowice, whose surroundings include smaller cities characterised by high saturation of dynamic small and medium enterprises, and to a lesser extent in the case of Gliwice (fig. 10).

3.4. Innovative activity of economic entities in the GZM cities

Ch. Zöpel (2011) rightly pointed out a decade ago that *it is crucial for the further development of all four metropolitan functions (decision-making and control, innovation and competitiveness, gateway and symbolic) of Upper Silesia and Zagłębie* ***to strengthen innovation***. GZM has undoubtedly been a region of knowledge for at least 250 years, when the processes of the first industrial revolution were initiated in the area. The store of knowledge accumulated over more than two centuries encompassed not only historically dominant branches of the economy, such as mining, zinc and iron metallurgy, and later power engineering, but also urban planning, architecture, and infrastructure engineering. The economic processes that began in 1989 required a significant transformation of this traditional innovation system, especially the development of new competencies. An excellent model account of metropolitan innovation ecosystems functioning in the middle of the second decade was proposed by M. Baron (2016a: 86–87). In his

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The strength of this correlation would be much higher if the historical values of the share of coal mining in the labour force were taken into account (see Gwosdz 2014).

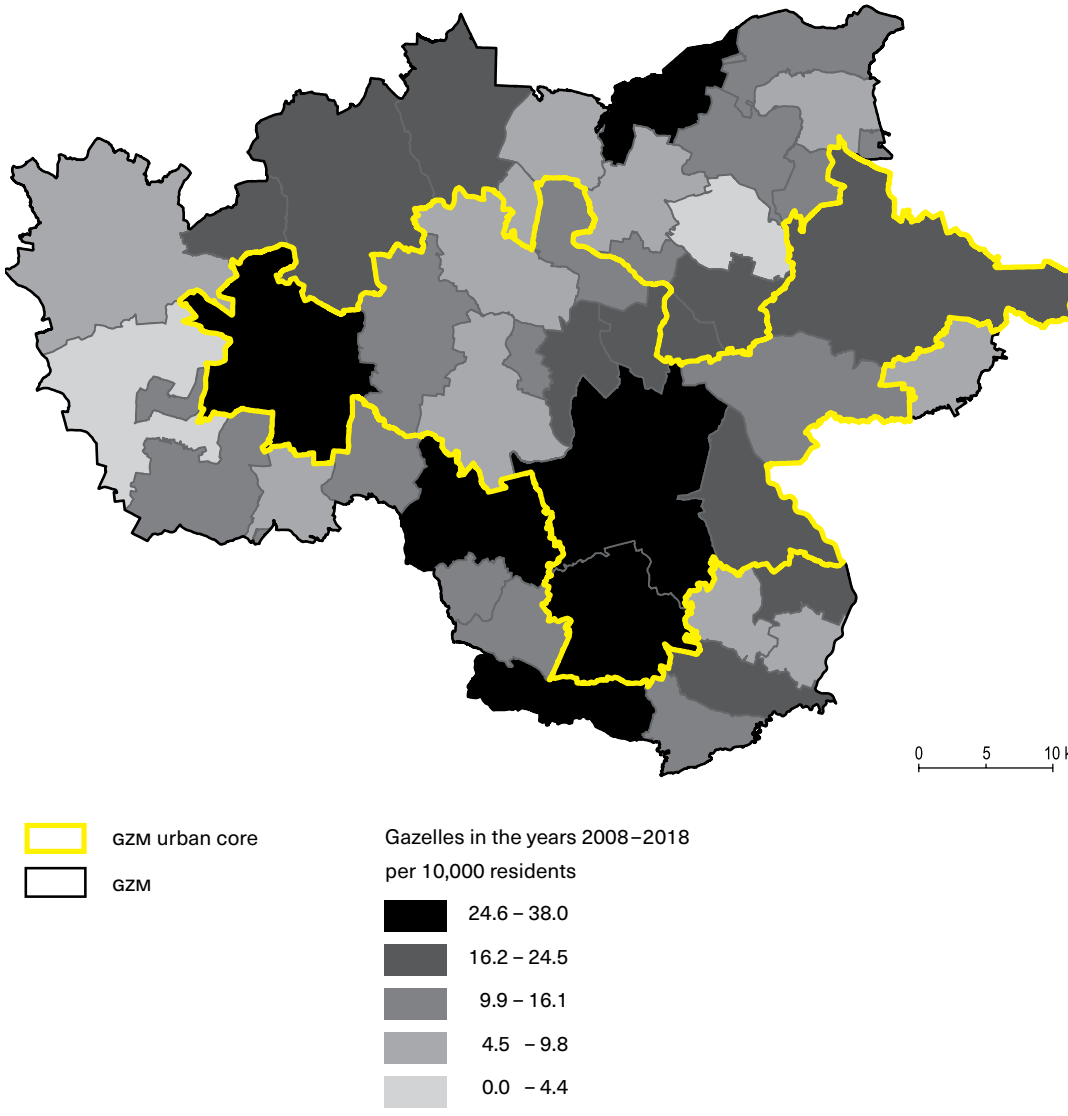


Fig. 10. Dynamic small and medium-sized firms in the GZM counties in years 2008–2018
Source: author's own elaboration based on Gazele Biznesu ranking in years 2009–2019 and the data from Statistical Council Office of Poland.

opinion, three model innovation ecosystems can be distinguished in the area of the Silesian Voievodship:

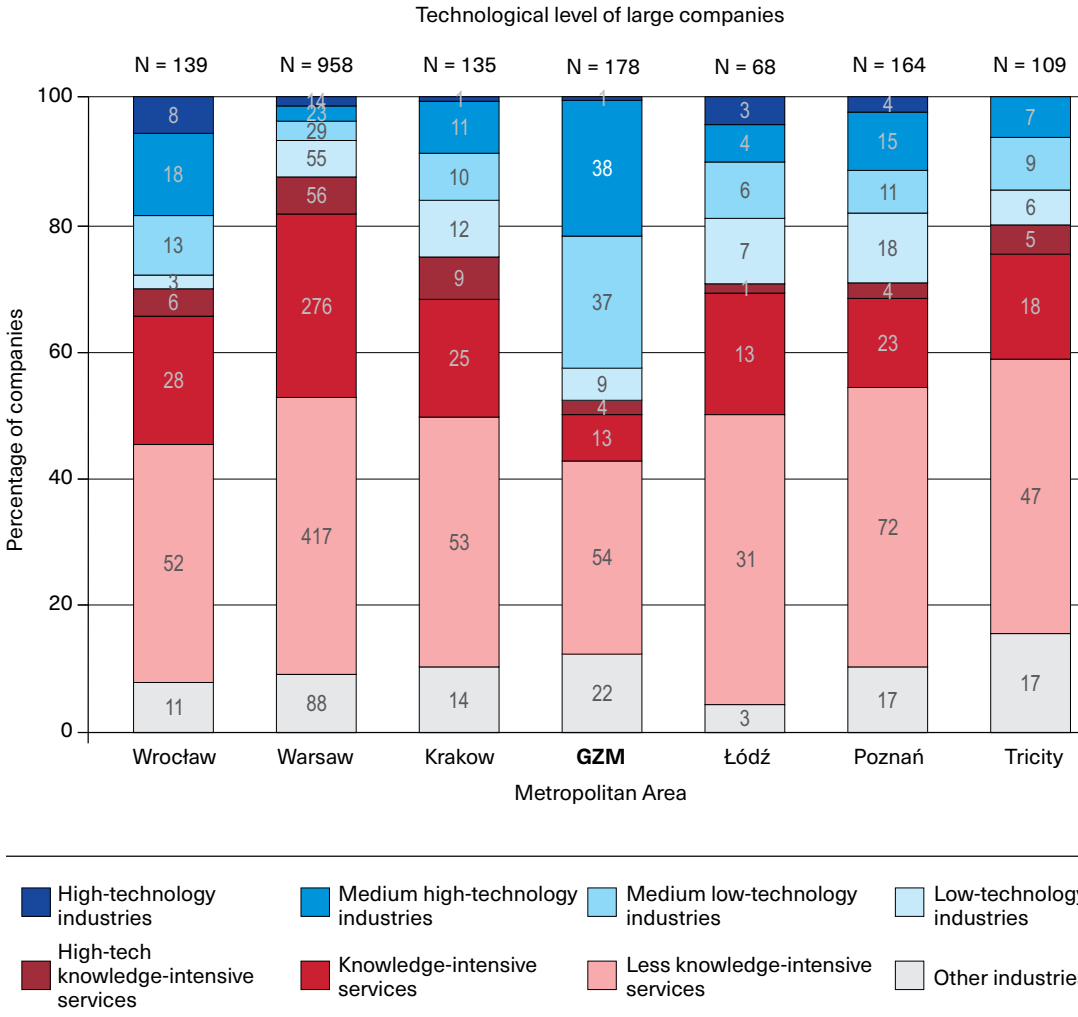
1. Closed ecosystems of traditional industries (mining, energy and partly metal production).
2. Opening ecosystems of advanced manufacturing (chemical, construction, machinery, industrial automation, automobile manufacturing and parts).
3. Open ecosystems of new industries (IT, medical engineering and medicine).

A quantitative presentation against a comparative background of the innovation potential which, following P. Siłka (2010: 185), is defined *as a set of features of a given territorial system which are conducive to innovative activities undertaken by economic entities in this system*, is difficult because no accurate and up-to-date indicators exist at a sub-national level. While the situation is relatively workable in terms of potential measures of expenditure on innovation, there are practically no indicators measuring its actual effects. Naturally, analysis must be limited to the former. We shall use two main measures: the state, dynamics and structure of high-tech activities, as well as the funds acquired by economic entities for innovation.

Product or business process innovations are most often initiated by large enterprises, among whom the degree of innovativeness is the highest.[17] Moreover, innovative activity is strongly correlated with business type. Therefore, an accurate approximation of the potential innovativeness of a territory can be provided by information on the activity of large enterprises in industries classified as knowledge-intensive (Eurostat NACE Aggregation)[18]. The list of taxpayers whose revenue exceeded the equivalent of EUR 50 million

17
According to the definition of the Central Statistical Office (GUS), an innovation-active enterprise is one which in the audited period introduced at least one product or business process innovation, or implemented at least one innovative project in this period, which was interrupted or abandoned during the audited period (not successfully completed) or was not completed by the end of the period (i.e. is continued). [cited after. Innovative activity of enterprises in 2017–2019, CSO, Warsaw, p. 27].

18
Annex 3 – High-tech aggregation by NACE Rev. 2



in 2019, made available by the Ministry of Finance, was used as the basis for the analysis.

The list includes 2,802 entities,[19] of which 1,751 (62%) are located in the seven largest Polish metropolitan areas (► Chapter 5).

In comparison with other leading Polish metropolitan areas, the GZM is in the middle in terms of the percentage of technologically advanced industries within the total number of large companies

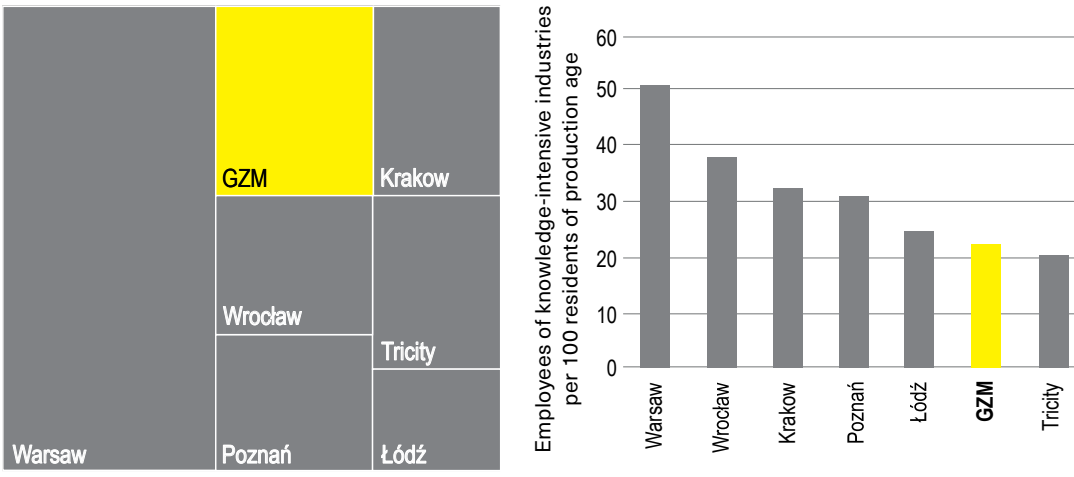
Fig. 11. Technology sophistication of Poland's 2,802 largest companies by revenue in super-regional metropolitan areas in 2019
Note: N – number of companies.
Source: author's own elaboration based on Ministry of Finance data.

19 Version of 1.08.2020.

based in the metropolitan area (31.5%) (fig. 11). In terms of structure, the most innovative metropolitan area is Wrocław, where as many as 43.5% of enterprises represent knowledge-intensive sectors, followed by Warsaw and Kraków (38.5% and 34.1% respectively). The Łódź, Poznań and Tricity metropolitan areas feature a lower share of technologically advanced entities than in the GZM. What distinguishes the GZM from other metropolitan areas in Poland is the large proportion of medium-high technology industrial companies (21.3%) – almost twice as high as in the next metropolitan areas (Wrocław and Poznań). The situation is different in high-tech industries, especially in knowledge-intensive high technology services, where the GZM ranks low (fig. 11). In general, **the widespread specialisation of the GZM in manufacturing**, with a relatively low specialisation in services (▸ Chapter 4) is its characteristic functional feature in comparison with other metropolitan structures.

The number of employees in knowledge-intensive services in the metropolitan area (in entities >9 persons) ranks the GZM, similarly as in the case of other indicators, second in Poland, after the Warsaw metropolitan area (fig. 12). However, the GZM has far fewer jobs in knowledge-intensive sectors than other Polish metropolitan areas (except for the Tricity). Katowice, Gliwice and Tychy are

Fig. 12. employees in knowledge-intensive industries in super-regional metropolitan areas in 2019
Source: author's own elaboration based on data purchased from GUS.



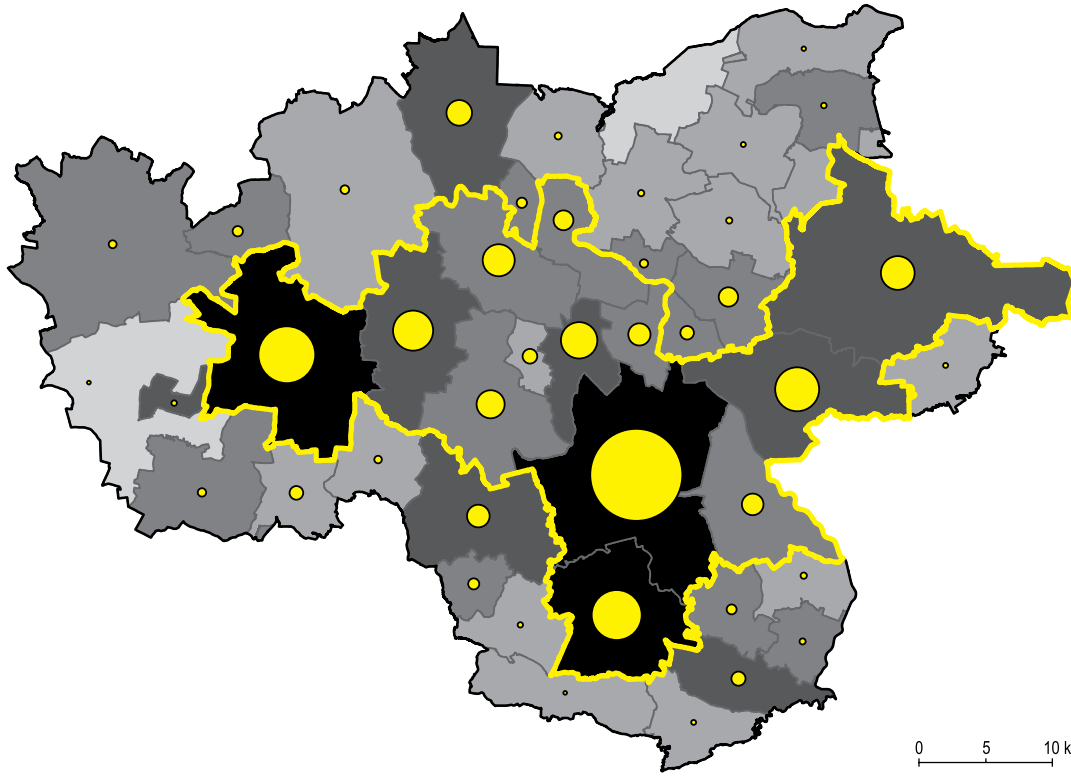
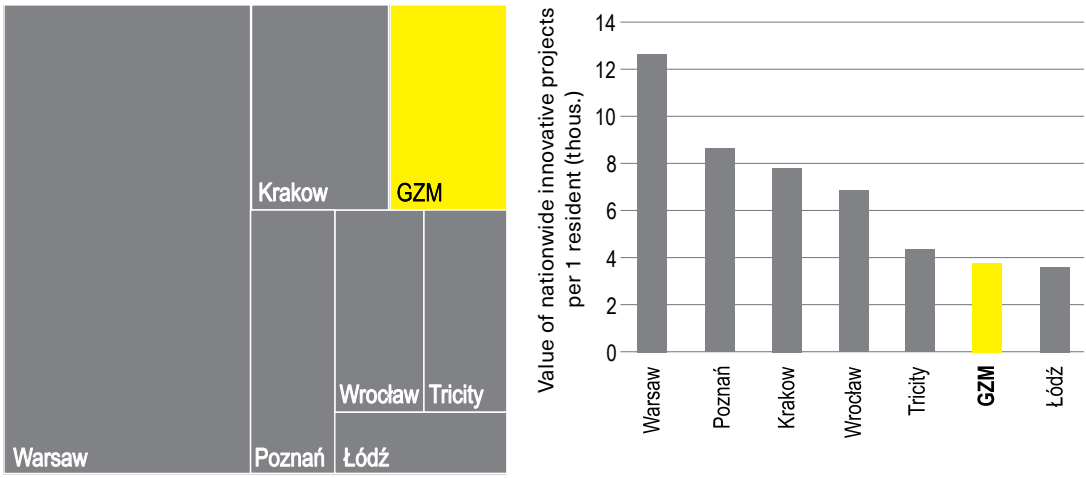


Fig. 13. employees in knowledge-intensive industries in the GZM in 2019
Source: author's own elaboration based on BDL GUS unpublished data.



Value of nationwide innovative projects in the years 2007–2020

Metropolitan Area

Fig. 14. Nationwide innovative projects in the research, development and innovation category of the last two EU financial perspectives 2007–2013 and 2014–2020
Source: author's own elaboration based on data from mapadotacji.gov.pl portal [as of 1.01.2021].

characterised by indicators comparable to other leading central cities of national metropolitan areas, while other GZM centres are ranked lower in this respect. That is why it is worth taking a closer look at internal diversity within GZM.

The absolute number of employees in the knowledge-intensive sectors and this number in relation to the number of inhabitants shows a clear hierarchy of metropolitan centres: Katowice with the highest number of knowledge-intensive entities (31.5% of the entire GZM), Gliwice as the second order centre and Tychy, Sosnowiec, Zabrze as the third order centres (fig. 13). The first three cities are also characterised by the highest 'density' of jobs in knowledge-intensive sectors. Three other cities in the metropolitan core also stand out (absolutely): Chorzów, Dąbrowa Górnicza and Bytom, followed by Ruda Śląska and Tarnowskie Góry. The cities mentioned above employ as many as 84% of all people working in knowledge-intensive activities in the GZM (their share in the population is 70%).

The expenditures of the national operational programmes on pro-innovation projects from European funds under the last two EU financial perspectives 2007–2013 and 2014–2020 within the category of "research, development and innovation" place the GZM on the third spot in Poland – after the Warsaw and Kraków metropolitan areas. However, the same issue measured per capita places GZM among

the three metropolitan areas with the lowest index (fig. 14). All in all, when ranking the Polish metropolitan areas in terms of the analysed innovation indicators (in relation to population), three groups clearly emerge – the dominant Warsaw metropolitan area, the strong Wrocław, Kraków and Poznań areas, and the weaker GZM, Tricity and Łódź. However, it is worth bearing in mind the clear internal differentiation of GZM, which – with its highly polycentric spatial structure – averages out the picture for the entire metropolitan area, while on the one hand there are strongly innovative poles within it (especially Katowice and Gliwice), yet on the other hand large cities feature little innovation in their economy (see also M. Suchacka 2014). This can be perfectly seen, for example, in the scope of pro-innovation projects under national operational programmes implemented with the support of European funds.

In terms of the number of innovative projects completed, Katowice and Gliwice play a leading role – together these two centres concentrate as much as 48% of all projects. In terms of the total value, Dąbrowa Górnicza also stands out (fig. 15), whose position in terms of the number of projects is also strong (6th position). It is worth noting that in no other indicator analysed in this study is the position of Gliwice and Dąbrowa Górnicza so high. In terms of the number of projects, five large core cities are clearly visible: Tychy and Zabrze, Chorzów, Bytom and Sosnowiec (fig. 16). The hierarchy is slightly different when it comes to the value of the projects – in this respect Sosnowiec stands out and (giving way to Dąbrowa Górnicza, Gliwice and Katowice) towers over both Tychy and the remaining large cities. Mikołów, in terms of the number of innovative projects, exceeding as many as five of the core cities – Ruda Śląska, Mysłowice, Świętochłowice, Piekary Śląskie and Siemianowice Śląskie.

The cartographic picture of variations in the activity of businesses in obtaining funds for innovation throws light on at least two regularities. The north-eastern fringes of low activity, which include a compact area of municipalities in this part, are clearly outlined in the metropolitan area. It also highlights some kind of 'innovation banana' stretching from Dąbrowa Górnicza in the east, through Sosnowiec, Katowice, and Tychy, Bieruń, and Mikołów, neighbouring in the south, and then spreading in the direction of Gliwice and further on to Rudziniec, located at its western end.

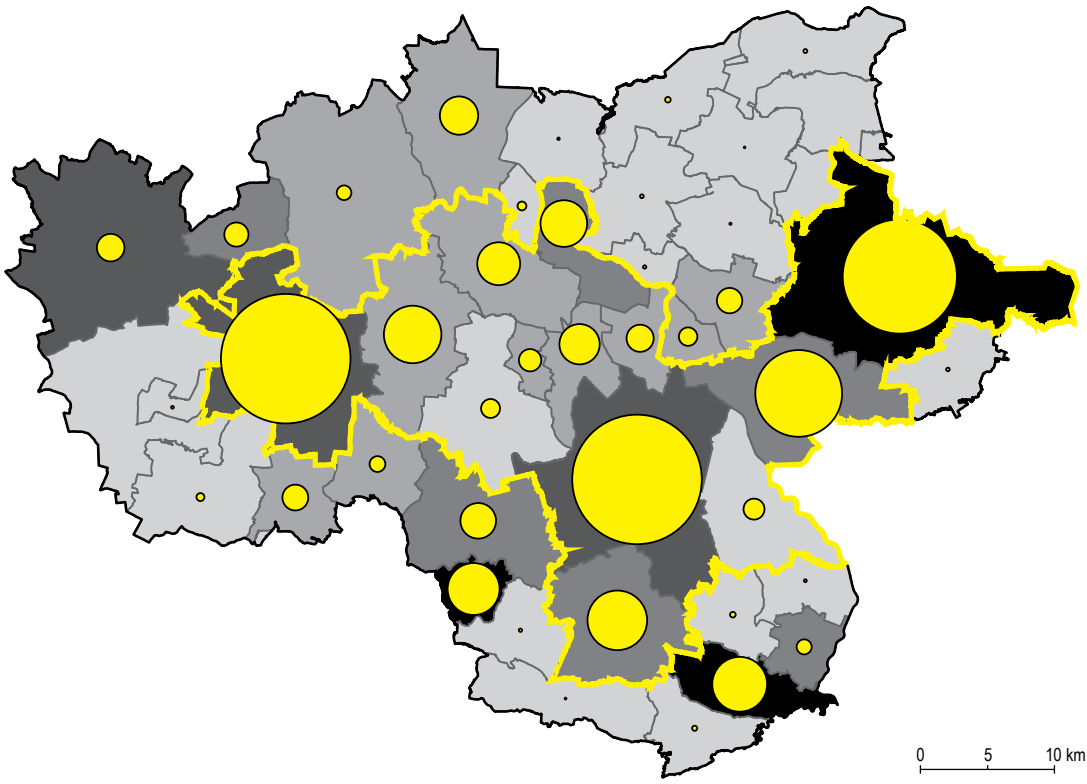


Fig. 15. The value of EU projects in national operational programmes within the research, development, and innovation category of the last two EU financial perspectives 2007–2013 and 2014–2020
Source: author's own elaboration based on data from mapadotacji.gov.pl portal [as of 1.01.2021].

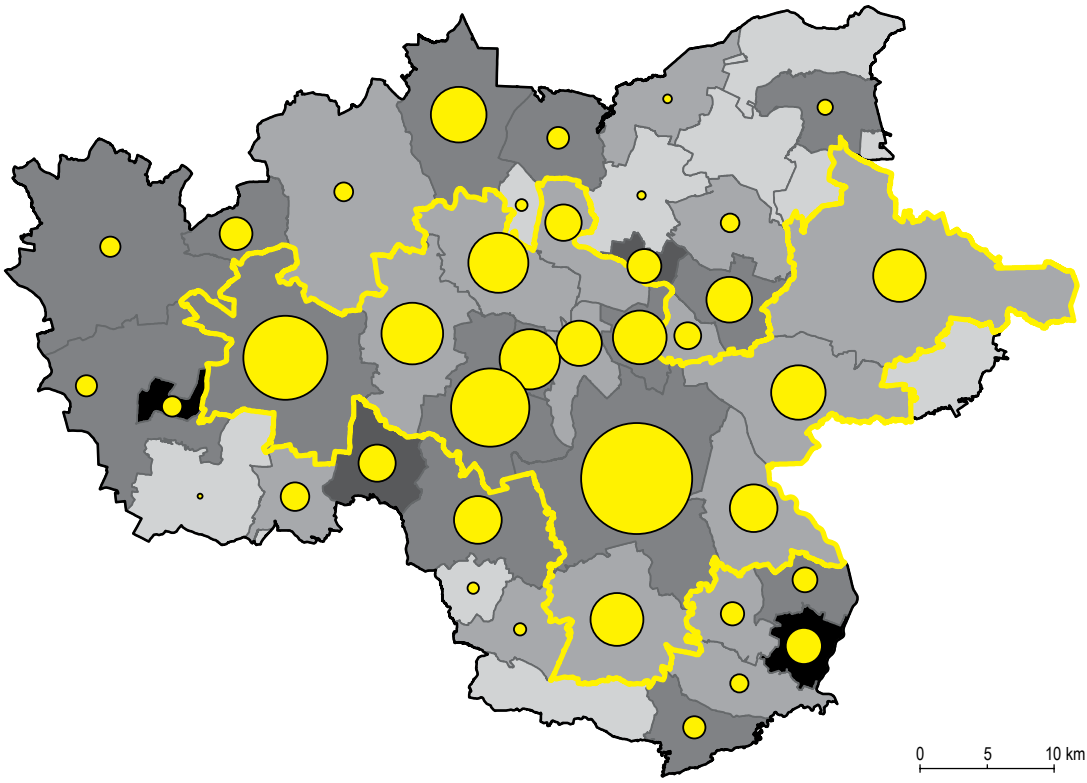


Fig. 16. Innovation projects for small and medium-sized enterprises within the Silesian voivodeship operational programme 2014–2020, 3.2 innovations in SME
Source: author's own elaboration based on data from mapadotacji.gov.pl portal [as of 1.06.2021].

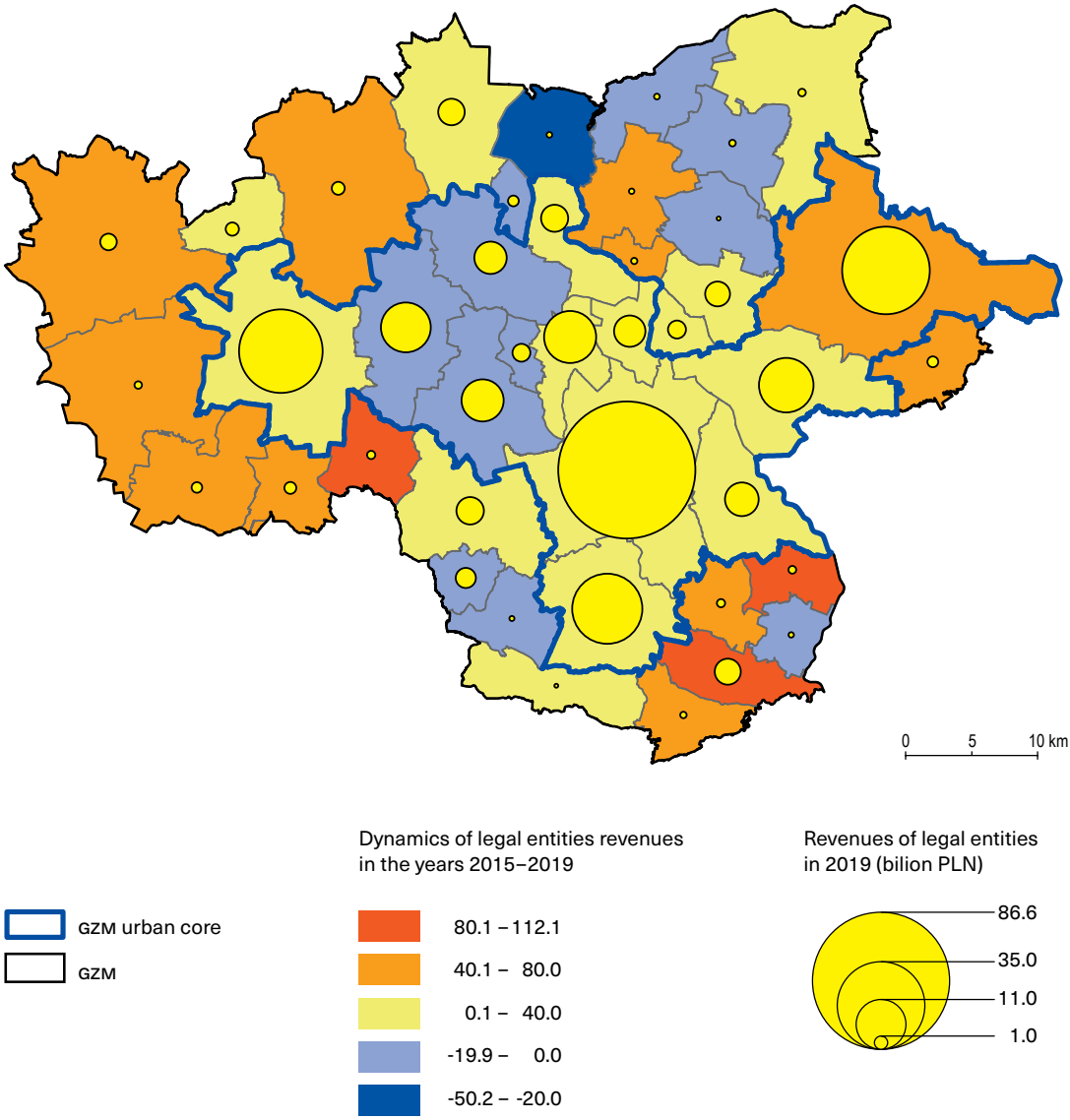


Fig. 17. Dynamics of legal entity revenues in the GZM from 2015 to 2019
Source: author's own elaboration based on POLTAX data (https://przedsiebiorczosc.monitorrozwoju.pl/).

3.5. Company revenue

In 2019, companies with a legal personality based in the metropolitan area generated at least PLN 263 billion net revenue. This was 17% more in real terms (at constant prices) than in 2015. The 2015–2019 period of prosperity resulted both in a real, **absolute increase in revenues for companies** in the metropolitan area and also in a noticeable 9% or more **increase in the number of companies** with a legal personality in the GZM. The growth in the number of businesses occurred to a greater or lesser extent in almost all municipalities in the GZM. The strongest growth dynamics in terms of number of companies and revenue took place in municipalities located outside the metropolitan core (fig. 17), which indicates the processes of economic overspill reflected not only in the case of companies owned by natural persons, which are closely related to the residential suburbanisation, but also – although on a much smaller scale – economically stronger entities that have a legal personality.

The size and dynamics of company revenues are a good indicator of the rank (and its changes) of individual cities of the metropolitan area. The advantage of Katowice over the other centres in this respect is significant and growing – in 2019 with a 32.6% share of company revenues, which was more than two and a half times higher than in Dąbrowa Górnicza and Gliwice, next on the list of highest revenues generated by companies located there. About 8.5% of the total revenue was produced by companies in Tychy, noticeably more than in Sosnowiec, Chorzów, Zabrze and Ruda Śląska. Companies located in those eight cities generated over 83% of the total revenue of companies based in the metropolitan area. However, the growth dynamics were extremely different in each of them – the highest in Chorzów, Katowice and Tychy, which clearly strengthened their role in the metropolitan area, relatively high in Sosnowiec, with the lowest – and negative, taking inflation into account – in Zabrze and Ruda Śląska. The dynamics were slightly different in the number of businesses, which grew in all the major cities of the metropolitan area. The largest number (relative to 2015) of company-taxpayers increased in Ruda Śląska and Sosnowiec, while the smallest number increased in Zabrze and Gliwice.

The analysed period fell within a time of economic prosperity; the data for 2020–2021 will reveal the resilience of companies in the metropolitan area in the face of the COVID-19 pandemic.

3.6. Residents' income

The variation in the average income of residents in the metropolitan municipalities ranged between 43,000 and 62,100 PLN per person in 2019, with a median of 51,100 PLN per person. On average, the wealthiest taxpayers reside in rural or rural-urban municipalities of the outer zone of the metropolitan area (Wyry, Imielin, Świerklaniec, Bojszowy, Pilchowice, Gierałtowice, Chełm Śląski, Psary, Sośnicowice, Kobiór) (fig. 18). These municipalities are the main beneficiaries of suburbanisation processes, attracting wealthy taxpayers who tend to move there from larger cities of the metropolitan core (see Sykała et al. 2021). On average, they drew almost 7% more taxpayers between 2015 and 2019. The relatively wealthiest population among the metropolitan cities resides in Mikołów and Katowice, followed by Gliwice and Tychy. On average, the least affluent residents live in Świętochłowice, Bytom, followed by Piekary, Wojkowice and Mierzęcice. The ten cities with the lowest per capita average income in the metropolitan area also include the large cities within its core: Ruda Śląska, Zabrze, Sosnowiec, Siemianowice Śląskie and Chorzów. Depopulation processes in these cities lead to stagnation or less taxpayers (especially in Świętochłowice and Sosnowiec), which – along with the relatively less affluent population – translates into reduced revenue potential for local governments (fig. 19).

3.7. Revenues of local governments

Assessing the financial health of local governments is a complex matter, as there is no single satisfactory way to measure it. B. Filipiak (2018), based on an extensive literature review, indicates that two analytical strategies dominate: measurement based on multiple empirical parameters and synthetic indicators. Looking for a compromise between the multiplicity of indicators and a synthetic approach, in recent years many authors in Poland – especially Paweł Swianiewicz – have advocated operating surplus,[20] which faithfully (or at least the best of all available) reflects changes in the financial condition of local governments (Swianiewicz 2007, Swianiewicz and Łukomska 2010). Apart from analysing the evolution of operating surplus, it is definitely

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Operating surplus is the difference between current revenue and current expenditure. It indicates how much money remains at the disposal of the local government after financing its current operations.

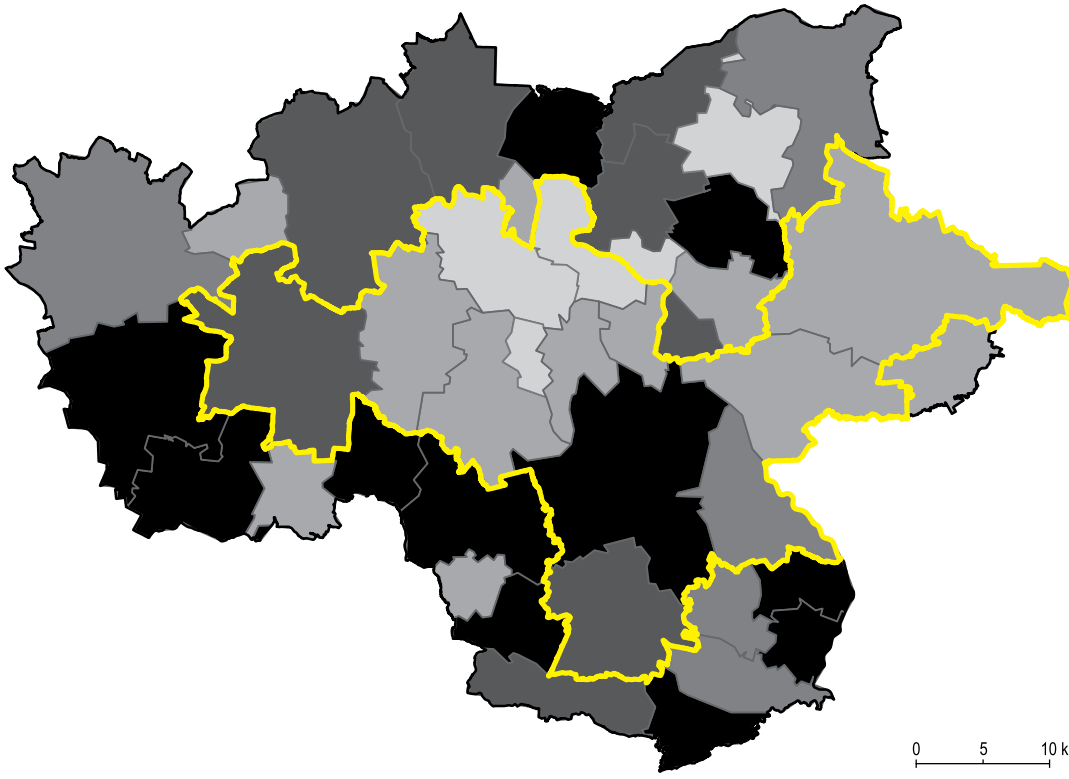


Fig. 18. The average income of taxpayers who were NATURAL PERSONS in the GZM in 2019
Source: author's own elaboration based on POLTAX data (https://przedsiebiorczosc.monitorrozwoju.pl/).

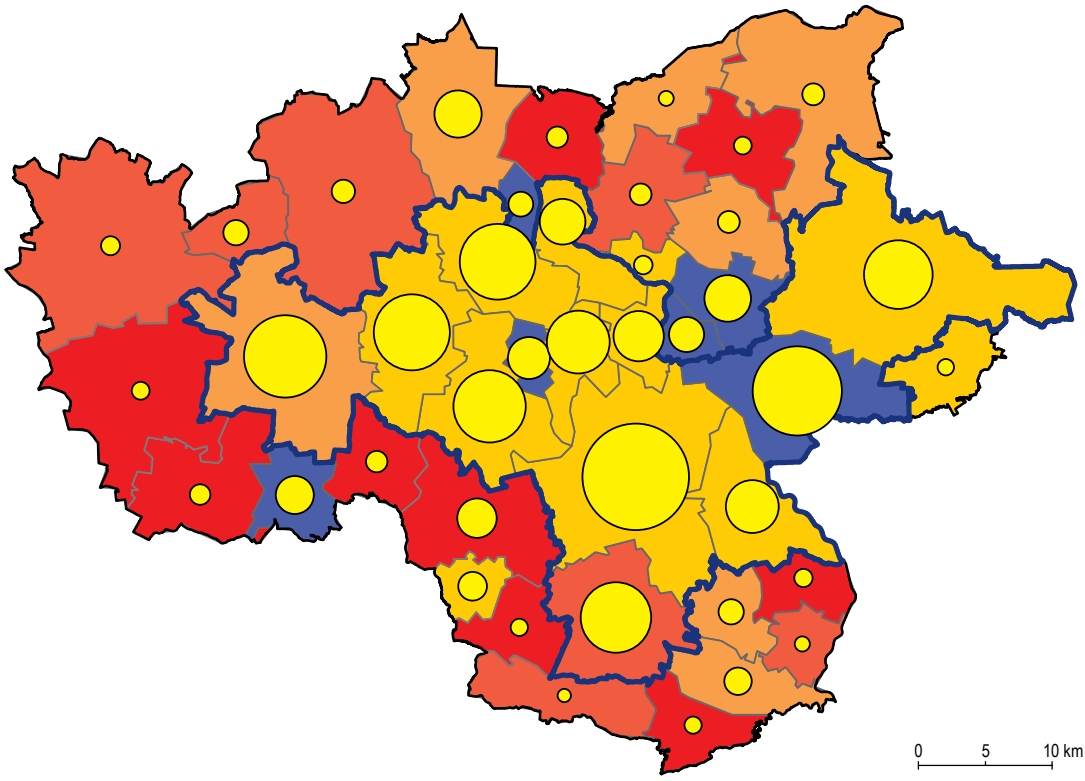


Fig. 19. Dynamics of the number of taxpayers subject to personal income tax in the GZM from 2015 to 2019
Source: author's own elaboration based on POLTAX data (https://przedsiebiorczosc.monitorrozwoju.pl/).

worth following the dynamics of indicators illustrating general revenue potential, as well as level of debt. An in-depth analysis of the economic condition of local governments goes beyond the objectives of this study.[21] However, it is undoubtedly worthwhile to take a glance at indicators related to the revenue area of local government finance and, in particular, the income generated by local governments themselves. This follows from the fact that the dynamics and diversity of self-generated income are usually linked to the size and development trends of the local economic base (Swianiewicz 2004). Therefore, the development of income structure may also be a measure describing the quantitative dimension of economic development.

Self-generated income of local governments in the GZM – calculated in absolute values, taking inflation into account – in the period 2010–2020 increased by 36% in cities with powiat rights and 50% in other municipalities. Starting from 2013, two different trajectories of dynamics are visible for those two categories of metropolitan local government units: more pronounced growth of self-generated income for urban, urban-rural and rural municipalities, and slower growth among cities with powiat rights. Those differences should be associated first and foremost with the processes of depopulation in the core cities and suburbanisation (also economic). It is worth noting that during the period of very good prosperity in 2015–2019, during which the sum of residents' income and corporate income in the metropolitan area increased: by 20.2% and 16.4% (in cities with powiat rights) and 26.3% and 20.8% (in other territorial self-government units), respectively, the dynamics of local government self-generated income was lower – 12.5% in mnpp and 20.5% in other territorial self-government units. Apart from the lower growth rate of local government revenue than that of the other two segments of the local economy, a noticeable trend is the declining share of self-generated revenue in total revenue. P. Swianiewicz (2004: 33) lists arguments, both political and economic, in favour of the fact that as much local

21
A comprehensive index assessment of the condition of local governments is possible thanks to databases (including cartographic and tabular visualisation) maintained by the GZM (infogzm.metropoliagzm.pl), the Association of Polish Cities (SAS, Development Monitor) and the Ministry of Finance. A detailed diagnosis of revenues of the GZM local governments was prepared in August 2020. GZM Department of Strategy and Spatial Policy.

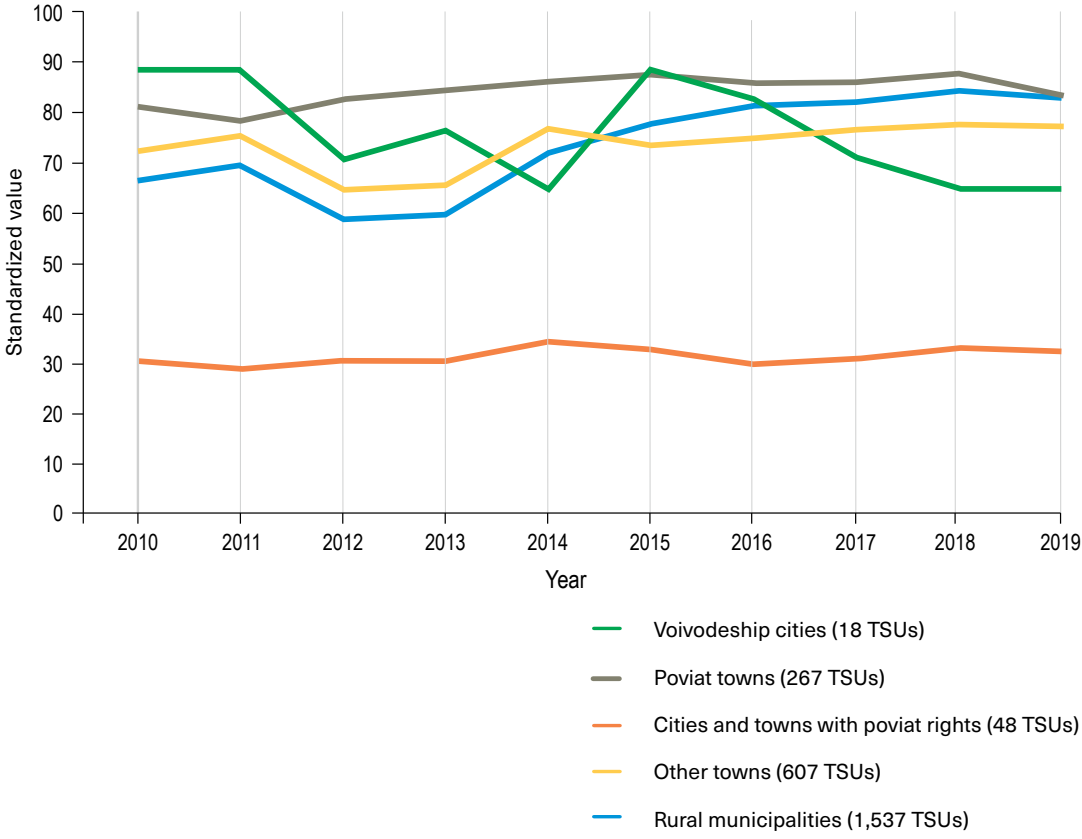


Fig. 20. The position of GZM cities and municipalities in the Local Government Wealth Ranking in 2010–2019

Source: author's own elaboration based on the Community Wealth of Local Governments (Wspólnota Bogactwo Samorządów) ranking.

Note: The Wealth of Local Governments ranking presents individual territorial self-government units (TSUs) according to 5 categories: voivodeship cities (18 TSUs in 2019), cities with powiat rights (48 TSUs), powiat cities (267 TSUs), other cities (607 TSUs) and rural municipalities (1537 TSUs). Since there are different numbers of territorial local government units in each category, in order to illustrate them in one chart, the authors made a standardisation so that regardless of the number of territorial local government units in a given category, 100 denotes the unit with the highest position in a given category in a given year (the richest), and the value 1 denotes the lowest (the poorest). The average of the standardised values (1–100) was calculated to aggregate territorial local government units in each category.

government revenue as possible should come from self-generated income, so its declining share should be considered a negative process.[22]

A synthetic presentation of the income position of particular types of local government units in the GZM and its dynamics, against the background of all the local governments in Poland, is well reflected in a summary drawn up by the authors on the basis of the Community Wealth of Local Governments ranking (Swianiewicz and Łukomska 2020). It reveals several interesting regularities. The position of Katowice, above average in the set of 16 voivodship cities, fluctuates quite strongly but with a general downward trend which can be seen especially in the period of prosperity in Poland (2015–2019) (fig. 20). Undoubtedly, this is related to the lower dynamics of the number of taxpayers who are natural persons (to a lesser extent legal entities) in comparison with other voivodeship cities. The position of the GZM urban powiats remains stable but low. This group of units, however, is strongly diversified internally. The revenues of Gliwice and Dąbrowa Górnicza place them among the richest local governments. The position of Tychy is strong. The wealth of Chorzów's local government is growing systematically – against the background of the comparative group. On the other hand, the remaining cities within the GZM are among the poorest municipalities in Poland and have been stuck in that low position for the last decade (in individual years – almost all or all of the 10% poorest municipalities in the country were municipalities from the GZM area!)

On the other hand, the remaining three types of local governments in the metropolitan area are ranked high among similar territorial local government units in Poland, and their position is improving more or less systematically. Five out of thirteen rural municipalities in the metropolitan area belong to the group of 10% wealthiest municipalities and municipalities in Poland (Ożarowice, Gierałtowice, Chełm Śląski, Wyry and Zbrosławice). The significant increase in the position of rural municipalities of the metropolitan area is further evidence of the role of suburbanisation, which has been much less intense compared to other leading metropolitan areas in Poland (see in-depth analysis in Ł. Sykała et al. (2021)).

22
These include the argument of the authorities' responsibility towards their inhabitants, rationalisation of expenditure, active economic and pro-investment policy, adjustment of fiscal policy to local preferences, reducing the pressure on the size of total state expenditure and, last but not least, strengthening the position of local government in the state (see Swianiewicz 2004: 33–34).

chapter 4

Economic base of The GZ Metropolitan Area

4.1. The theory of economic base – introduction

The functional diversity of the territory and the direction of its development is well illustrated by the so-called surplus of employees, which is identified with the city-forming sector, also interchangeably referred to as the base, exogenic or export sector. This classical approach in urban economics clearly distinguishes the 'basic' occupational structure of the population (the number of people working in particular sectors of the economy) from the functional structure, calculated by comparing the economic profile of a city with a broader reference system, e.g. a country (see Sokołowski 2008).

The theory of the economic (export) base emphasises the leading role played in the city's economy by activities aimed at supra-local markets. The linkage of export industries with the local economy – e.g. through the supply of raw materials, semi-finished products and services, as well as employees' wages – creates a multiplier effect that helps the endogenic sector to develop, satisfying the needs of companies and the city's inhabitants. Economic success according to the economic base theory is achieved primarily by cities that are able to create a strong export base with high local multiplier effects. The extent of a city's economic development is reflected primarily in indicators like its economic base as its total size (measured most often by the number of 'surplus' employees), industry structure (the type of industries dominating the base, developing and declining) and indicators of the diversification of the economic base (see Sokołowski 2008, Gwosdz and Sobala-Gwosdz 2012).

Due to limitations in access to disaggregated data on the employed, the analysis of the economic base was possible for the 16 largest municipalities of the metropolitan area only – magistrate districts and municipalities with a seat of rural powiat (tab. 2). These centres comprise 85% of the metropolitan area's population and 89% of those employed, and the general regularities observed on their basis may be applied to the metropolitan area as a whole.

City with powiat rights	Size of the base sector (number of surplus employees)	Development of the economic base (share of the base sector in the number of employees)	Industry share (sections B-E of NACE Rev.2)	Economic base diversification indicators (Amemiya indicator)*
Katowice	167.9	57.2	8.6	4
Gliwice	57.6	45.8	38.6	12
Tychy	27.9	37.0	76.9	55
Dąbrowa Górnicza	22.5	35.4	64.4	73
Chorzów	18.3	29.3	5.9	25
Zabrze	11.4	16.2	8.7	40
Sosnowiec	10.9	13.7	0.0	45
Ruda Śląska	8.2	16.5	74.5	51
Bytom	7.7	15.7	56.2	34
Tarnowskie Góry	6.7	24.4	5.8	11
Mikołów	6.5	32.5	39.8	13
Mysłowice	4.8	17.6	79.7	61
Będzin	4.7	22.8	38.1	16
Piekary Śląskie	3.5	16.3	36.1	15
Siemianowice Śląskie	3.0	13.7	58.9	36
Świętochłowice	0.9	6.7	9.6	71

Tab. 2. Characteristics of the economic base of the largest cities in the GZM in 2019
Note: * the smaller the value of the indicator, the greater the diversification of the economic base (1 – all sectors of the economy have the same share; 100 – all the economic base is concentrated in 1 sector of the economy).
Source: own elaboration for the 16 largest cities of the GZM in terms of population based on Poltax data (https://przedsiebiorczosc.monitorrozwoju.pl/) and data purchased from Central Statistics Office (GUS).

4.2. The size, dynamics and structure of the base (exogenic) sector in the cities of the GZ Metropolitan Area

In the GZ Metropolitan Area, three main directional changes in the economic base took place in the second decade of the 21st century: first, **its absolute size increased**. Secondly, **its level of development grew**[23] (by several percentage points) and thirdly, **the role of the knowledge-intensive services sector expanded** significantly. All these three trends are positive markers of the directions of development for the economy of the entire metropolitan area. Taken together, the metropolitan area today is service-industrial in character. Of the four main export sectors of the metropolitan economy, the market services sector is the most important (44%), followed by the industrial sector at 32% (together with construction), with the rest falling on public services. The role of services classified as knowledge-intensive (sections J, K, M, O, P, Q, R) exceeded in 2019 ⅓ of the economic base of GZM, while the share of mining in the economic base is less than 8%.

In 2010–2019, the growth sectors were almost all economic sectors except for mining and three service industries: trade (section G according to NACE Rev.2), transport and storage (section H) and finance and insurance (section K).[24] The sector with the largest increase in surplus workers was administration and support services, followed by manufacturing (fig. 21). Since employee outsourcing companies are classified in the former industry, in fact industries responsible for

23
Development of the economic base means the share of the base sector in the number of employees.

24
The decrease in the size of surplus employment in those three service industries may be partly illusory and may result from the method used by enterprises to collect data (if there was a concentration of ownership of entities and the acquiring entity is based outside the metropolitan area, the number of persons insured by employers of a given activity in the GZM will be fewer in the data set; similarly, new jobs are not visible in this method if they are created by enterprises based in Poland outside the GZM). In section H a significant percentage of workers are also employees of temporary agencies, so the apparent loss of employment may also be associated with a change in the employment model.

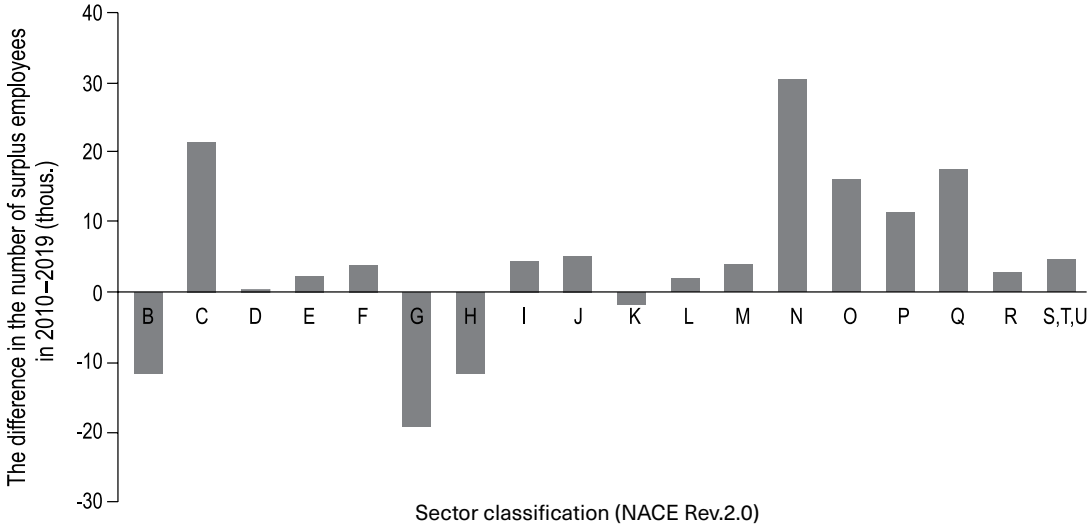


Fig. 21. Changes in the base sector in the City with powiat rights of the GZM in 2010–2019

Note: Section:
B – Mining and quarrying,
C – Manufacturing,
D – Electricity, gas, steam and air conditioning supply,
E – Water supply; sewerage, waste management and remediation,
F – Construction,
G – Wholesale and retail trade; repair services of motor vehicles and motorcycles,
H – Transportation and storage,
I – Accommodation and food services,
J – Information and communication,
K – Financial and insurance,
L – Real estate,
M – Professional, scientific and technical work,
N – Administrative and support services,
O – Public administration and defence; compulsory social security,
P – Education,
Q – Health care and social work,
R – Arts, entertainment and recreation,
S – Other services,
T – Activities of households employing personnel; households producing goods and services for own use,
U – Activities of extraterritorial organisations and bodies.

Source: own elaboration based on unpublished data of the Central Statistics Office and data of the Association of Polish Cities (przedsiebiorczosc.monitorrozwoju.pl).

this increase were manufacturing and logistics, which are the main clients of temping agencies.[25]

The public services sector also grew fast. An extremely positive phenomenon is the doubling of the technologically advanced ICT services industry, whose 4.4% share in the GZM economic base is already significant (for comparison, it is 6.4% in the Tricity, and 7.3% in Wrocław, which is another ICT industry leader in Poland).[26]

Local dissection of the metropolitan economic base and, in particular, analysis of the dynamics of economic base indicators in the last decade in individual municipalities (tab. 3) present a number of analytical conclusions.

The process of concentration and strengthening of the base sector is progressing in the metropolitan area's leading economic centres – Katowice and Gliwice. They are characterised not only by the largest, strongly diversified and growing exogenic sector, but also the major share of knowledge-intensive activities, including knowledge-based market services. Both cities concentrate the overwhelming majority of the exogenous sector in high technology knowledge-intensive services, primarily in ICT and research and development (Tychy and Dąbrowa Górnicza are also of minor importance in these areas).

Two cities neighbouring with Katowice – Chorzów and Siemianowice Śląskie – strengthened their economic base. Within the metropolitan area, Chorzów presented the largest relative increase in the exogenic sector in the second decade of the 21st century. However, the base of Siemianowice Slaskie, despite a favourable trend, remains shallow and poorly diversified.

25
According to the authors of the report ManPower Group Logistics in Poland (2020) temporary work usually accounts for up to 30% of total employment in the logistics sector. Data of the Polish HR Forum Report 2020 Employment Agency Market reveals that the main client of outsourcing companies is manufacturing companies, and their market share of temporary workers is as high as 69%.

26
Data only for the core cities of those metropolitan areas, in the entire Tricity and Poznań metropolitan areas the share is lower – by comparison, in the leading cities of the GZM, the ICT share in Katowice amounted to 5.2, and in Gliwice as much as 9.7%.

City with powiat rights	Size of the base sector (number of surplus employees)	Development of the economic base (share of the base sector in the number of employees)	Share of knowledge-intensive services	Economic base diversification indicators (Amemiya indicator)
Będzin	↓	↓	↓	↓
Bytom	↑	↑	↑	↓
Chorzów	↑	↑	↑	↓
Dąbrowa Górnicza	↑	↑	↑	↓
Gliwice	↑	↑	↑	←
Katowice	↑	↑	↑	←
Mikołów	↑	←	↑	↑
Mysłowice	↓	↓	↑	↓
Piekary Śląskie	↓	↓	↑	↑
Ruda Śląska	↓	↓	↑	↑
Siemianowice Śląskie	↑	↑	↑	↑
Sosnowiec	↓	↓	↑	↓
Świętochłowice	←	↓	↑	←
Tarnowskie Góry	↑	←	↑	←
Tychy	←	↓	↑	←
Zabrze	↑	↑	↑	↓

Tab. 3. Trends in economic base development of cities with powiat rights in the GZM in 2010–2019
Note: ↑ – increase compared to the base year (2010), ↓ – decrease compared to the base year, ← – with little change compared to the base year.
Source: own elaboration based on data from Central Statistics Office and the Association of Polish Cities (przedsiebiorczosc.monitorrozwoju.pl).

The situation in Zabrze changed for the better, although its economy grew less diverse; nevertheless, this was a result of a significant increase in surplus employment in manufacturing there. Also the multifunctional centres located in the zone surrounding the core cities of Mikołów and Tarnowskie Góry strengthened their base moderately. In comparison with the end of the first decade of the 21st century, the economic base indicators for Bytom improved. However, the city's economic base only grew in the mining sector and public services, with a deficit of competitive manufacturing and market services in the structure of the city's economic base.

The absolute size of the economic base took a strong downturn in cities where mining activities were reduced or ceased (Ruda Śląska, Mysłowice, Piekary Śląskie). The increase in the share of the knowledge-intensive sector and diversification in those cities resulted not so much from growing economic dynamics as from the regression of current specialised activities. The regression of the economic base occurred in two cities in the Zagłębie conurbation – Sosnowiec and Będzin – while a slight increase in the base in Dąbrowa Górnicza took place in the leading manufacturing sector, which reduced the diversification indicators (tab. 3).

The size of the economic base of Tychy, which is strong in manufacturing, did not change significantly. This fact, together with the decrease in the depth of the economic base, demonstrates the difficulties in creating local dynamic activities in market services. Nevertheless, Tychy, after Gliwice and before Dąbrowa Górnicza, remains the city in the GZM metropolitan area with the most developed economic base in manufacturing (together the three cities concentrate as much as 94% of the exogenic sector in this industry). The base sector stagnates at a very low level in Świętochłowice, whose economic base – after profound deindustrialisation in the transformation period – practically does not exist and so far shows no signs of restoration.

Based on the observed detailed empirical data, as well as drawing on the results of older analyses concerning the economic base and functional specialisation of the cities in the GZM after 2000 (Sokołowski 2008, Gwosdz 2012, Gwosdz and Sobala-Gwosdz 2012, Gwosdz 2016), three general conclusions may be formulated, related to the direction of economic transformations and the

mechanisms of creating the foundations for new dynamic activities in the Silesian GZM.

The selectivity of the growth of the economic base, especially the competitive manufacturing industry and market services, is strong. In connection with the varied dynamics of the exogenic sector's development, the new spatial and functional organisation of the metropolitan area is becoming increasingly consolidated. The role of undisputed main service centre for metropolitan area and region is played by Katowice, whose service centre already extends beyond the city borders and incorporates Chorzów. In the south and east of the metropolitan area three distinct cities of competitive manufacturing industries have formed: Gliwice, Tychy and Dąbrowa Górnicza. The multifunctional powiat centres outside the core of the conurbation – Tarnowskie Góry and Mikołów – also have a strong economic base. The technopolis of the GZM consists of two centres only: Katowice and Gliwice, the development of technologically advanced sectors in the other cities remaining weak.

The economic base of many GZM centres is still poorly diversified. As many as half of the 16 diagnosed metropolitan centres are characterised by low or very low diversification of economic base. Moreover, in the cities that used to be poorly diversified centres of traditional industry in the early 1990s, there has been no significant increase in the degree of diversification of the economic base over the last three decades, while maintaining or increasing its depth.[27] This means that the metropolitan area largely remains sensitive to short-term economic turmoil and is thus characterised by relatively low resilience. None of the cities (except Chorzów) that lost their traditional economic base after 1990 (mainly mining

27
According to the study by D. Sokołowski (2008), which covered all cities in Poland with a population of 100,000 or more, in 1993 six large metropolitan cities (Ruda Śląska, Bytom, Dąbrowa Górnicza, Tychy, Sosnowiec, Zabrze) had a low or very low degree of diversification of economic base, two medium (Chorzów and Gliwice) and only one – Katowice – high. In 2019, from the first group of cities, only Bytom was included in the cities with a medium degree of diversification, but this was due not to the development of the base of that city, but to the regression of the then dominant mining and steel industry activities. A significant positive change was the promotion of Gliwice from a medium degree of diversification to a high one, with simultaneous quantitative development.

		Development of the exogenic sector (surplus employment/number of employees working in the city)		
		Low (15% >)	**Medium (15–30%)**	**High (< 30%)**
Diversification of the economic base	**High (n < 15)**	—	Tarnowskie Góry	Katowice, Gliwice, Mikołów
	Medium (35 > n >= 15)	—	Chorzów, Bytom, Będzin, Piekary Śląskie	—
	Low (60 > n >= 35)	Sosnowiec	Zabrze, Ruda Śląska	Tychy
	Very low (n >= 60)	Siemianowice Śląskie, Świętochłowice	Mysłowice	Dąbrowa Górnicza

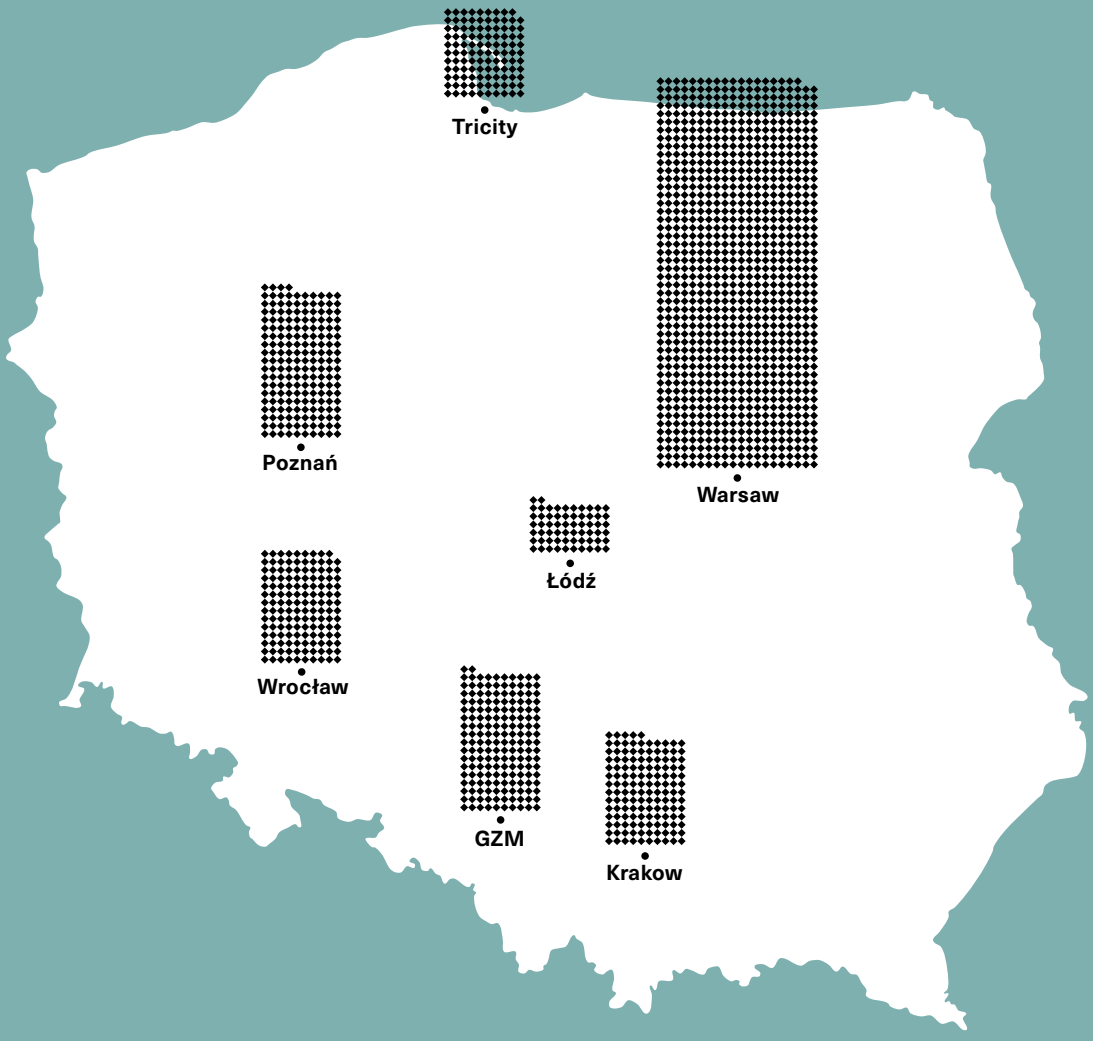
Tab. 4. Typology of the largest cities in the GZM regarding development and diversification of the economic base in 2019
Source: own elaboration based on Central Statistics Office and Association of Polish Cities data (przedsiebiorczosc.monitorrozwoju.pl).

and steel industry) have managed to create a strong exogenic sector so far. Some individual centres did show fairly positive dynamics in the first decade of the 21st century (e.g. Sosnowiec), a few in the second (Zabrze, Siemianowice Śląskie), nevertheless, the base of most of those cities is shallow or very shallow (tab. 4) and its diversification level is medium or low.

Photo 7. New residential estates nearby the Culture Zone in Katowice.
Author: Krzysztof Malinowski

chapter 5

Decision-making and Control Functions



A particular expression of the economic power of a metropolitan area, in terms of control and decision-making, are the headquarters of supra-regional public institutions and the management boards of large companies. Headquarters offer well-paid and highly qualified positions. This is where management, control, support, purchasing, as well as research and development are concentrated. They strongly influence the economic development of the cities as they generate high local multiplier effects, especially in the service sector.

So far, no institution of international calibre has been located in the GZM, and among the central offices only the State Mining Authority in Katowice is based there. Poland is characterised by a disproportionately high concentration of central institutions in Warsaw (see Sokołowski 2011).[28] According to Wałachowski et al. 2019, as many as 92 of the 107 institutions they studied are located in the capital city. Similarly to the GZM, other supra-regional metropolitan areas, such as Wrocław, Poznań do not have central offices at all, or – as in the GZM – they are single institutions (Krakow – 2, Gdańsk – 1). The only exception is Łódź, which has 'as many as' four head offices, which may partly be related to its proximity and very good accessibility to Warsaw (see also Heffner 2015).

The headquarters of companies are somewhat more spatially deconcentrated in Poland than central government offices, but the position of the Warsaw metropolitan area in comparison with other metropolitan areas is unquestionable and it groups more than 31% of the 2,802 largest companies.[29] The GZM ranks second among Polish metropolitan areas in terms of the number of seats, and third in terms of revenue generated – significantly more than the other four supra-regional metropolitan areas – Tricity, Krakow, Wrocław and Łódź (tab. 5).

The strong position of the GZM is due to the location of the headquarters of industrial companies in the metropolitan area, above all.

28

A characteristic feature of the service system in Poland is the multiple predominance of Warsaw over the remaining regional centers, which is much greater than would be expected based on the relevant population relationship – functional macrocephaly (Sokołowski 2011: 14).

29

Over the 1995–2014 period, the capital city's share in the concentration of large companies has been increasing. In 1995, Warsaw was home to 10.8% of companies employing at least 250 people. In 2014, this share increased to 17.3% (Szymaniak 2021).

Metropolitan Area*	Number of headquarters	Income (in PLN billion)**	Percentage	
			Number of headquarters	Income
Warsaw	958	772.1	34.2	31.1
Poznań	164	243.5	5.9	9.8
GZM	178	154.2	6.4	6.2
Tricity	109	120.8	3.9	4.9
Krakow	135	118.4	4.8	4.8
Wrocław	139	98.3	5.0	4.0
Łódź	68	54.3	2.4	2.2
Areas outside the 7 major metropolitan areas	1,051	921.3	37.5	37.1
POLAND	2,802	2,482.9	100.0	100.0

Tab. 5. Position of the GZM compared to other largest polish metropolitan area in the field of the headquarters of the 2,802 largest companies in Poland by revenue
Note: *Range of metropolitan areas (outside the GZM) based on the delimitation of P. Sleszynski (2013). **Revenues excluding companies in the financial intermediation and insurance sector (section K of NACE Rev.2). Source: own elaboration based on Ministry of Finance data https://www.gov.pl/web/finanse/2019-indywidualne-dane-podatnikow-CIT [version of the list as of 1/08/2020].

In no other Polish metropolitan area do the headquarters of companies from the second sector of the economy (mining, manufacturing, energy industry and construction) play such a significant role (fig. 22, tab. 6). Among them, the industries traditional for the region – coal mining, steel and energy production – still hold a strong position. These three industries (including companies trading and distributing their products) account for 40% of revenues generated by the largest companies located in the metropolitan area. The national headquarters of companies from the manufacturing industry, especially automotive, have a strong presence – nearly 20% of revenues of the largest companies in the GZM. In total, companies from the industrial sector (together with construction) which are based in the GZM generated 60% of revenues in 2019; trade companies (mainly wholesale trade) accounted for ⅕ of revenues and ⅛ for other services, like in the Poznań and Tricity metropolitan areas. An issue that would require separate analyses is the breadth of decision-making powers exercised by the management boards of companies located in the GZM, and in particular their position in international and national capital groups and the size of controlled assets outside the metropolitan area and the Silesian voivodeship. In terms of the latter, it is worth noting that the GZM is home to one of the largest banks in Poland (ING Silesian Bank), one medium-sized retail chain operating nationwide (Aldi), and a leader in Polish bookmaking services STS – Star-Typ Sport.

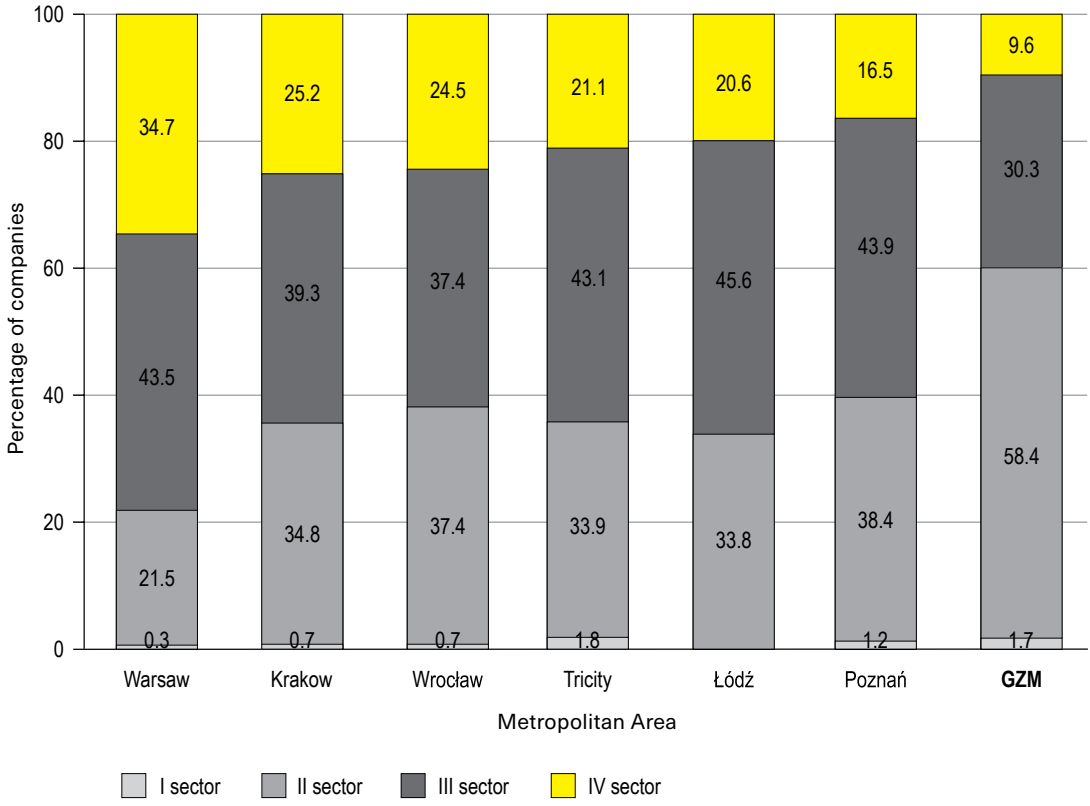


Fig. 22. Share of particular economy sectors in the number of headquarters of the 2,800 largest companies in Poland in 2019
Note: sector I – agriculture, forestry and fishing, mining, sector II – industry, energy, provision of media, construction, sector III – less knowledge-intensive services, sector IV – knowledge-intensive services.
Source: comparison base on Ministry of Finance data https://www.gov.pl/web/finanse/2019-indywidualne-dane-podatnikow-CIT [version of the list as of 1/08/2020].

Sector	Section of NACE Rev.2 Classification	Number of companies	Share (GZM=100)	Income in PLN billion	Share (GZM =100)	Poland =100
Agriculture	A	0	0.0	0.0	0.0	0.0
Mining	B	3	1.7	10.9	7.0	37.9
Manufacturing	C	86	48.3	83.5	54.2	8.3
Energy	D	4	2.2	3.9	2.5	4.0
Provision of media	E	5	2.8	1.8	1.1	19.0
Construction	F	9	5.1	3.0	1.9	2.1
Trade	G	44	24.7	32.2	20.9	4.2
Transportation & logistics	H	8	4.5	9.3	6.0	8.8
Hotels & restaurants	I	0	0.0	0.0	0.0	0.0
ICT	J	4	2.2	1.2	0.8	1.3
Finance and insurance*	K	3	1.7	–	–	–
Real estate service	L	1	0.6	0.4	0.2	2.4
Professional, scientific and technical activities	M	0	0.0	0.0	0.0	0.0
Administrative services	N	1	0.6	2.0	1.3	4.3
Public administration	O	0	0.0	0.0	0.0	0.0
Education	P	3	1.7	1.4	0.9	7.5
Health care	Q	5	2.8	1.4	0.9	5.0
Culture & entertainment	R	2	1.1	3.3	2.2	13.4
Other services	S,T,U	0	0.0	0.0	0.0	0.0
TOTAL*	–	178	100.0	154.2	100.0	3.7
Finance and insurance**	K	–	–	7.7	–	0.4

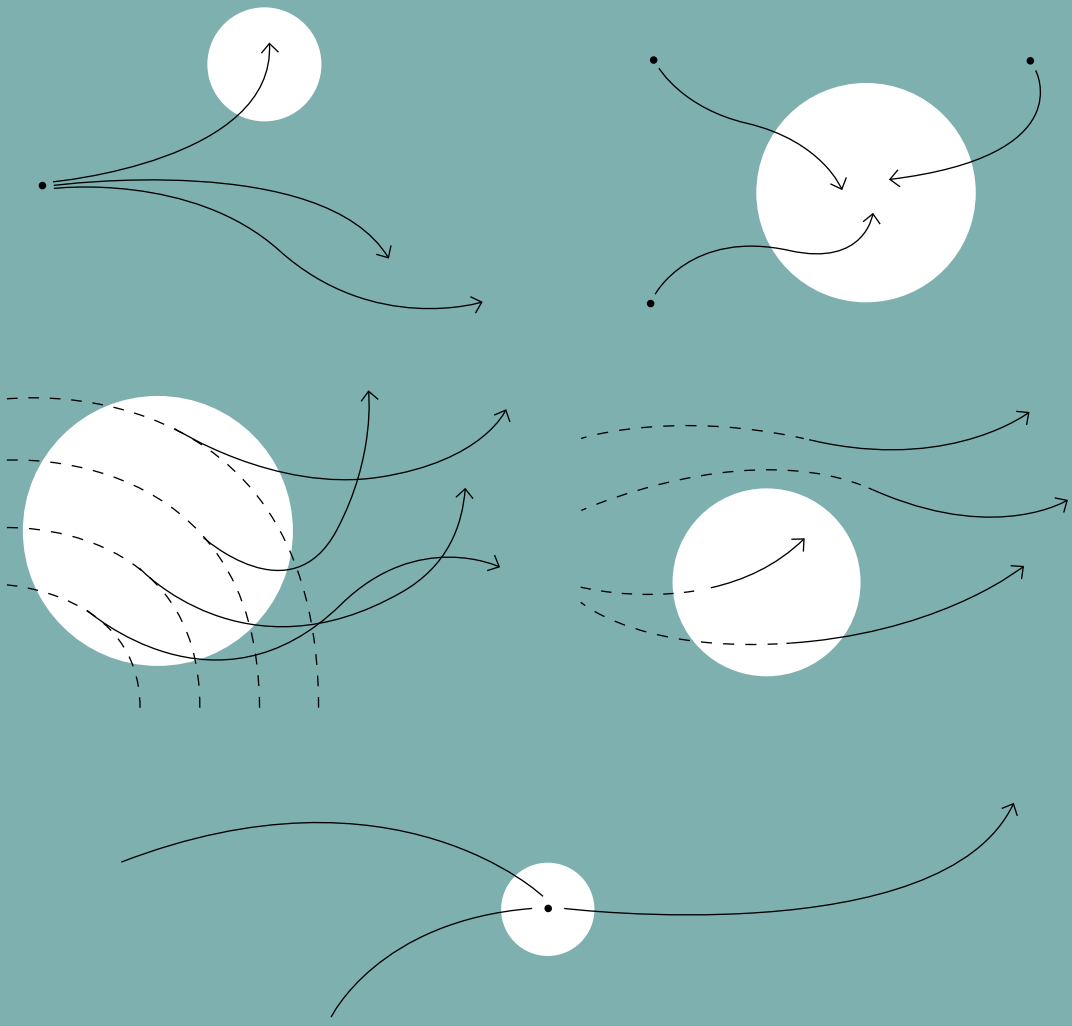
Tab. 6. Industry structure of the largest companies headquartered in the GZM in 2019
Note: *income excluding financial sector, **income from the financial sector only.
Source: own elaboration based on Ministry of Finance data https://www.gov.pl/web/finanse/2019-indywidualne-dane-podatnikow-CIT [version of the list as of 1/08/2020].

The location of the largest companies within the GZM reflects its polycentric character, with the leading role played by Katowice (29% of headquarters of the largest companies), and the very strong position of three cities that concentrate competitive companies in manufacturing – i.e. Gliwice, Tychy and Dąbrowa Górnicza. The latter, due to the headquarters of the largest steel company in the country – ArcelorMittal – is the second centre after Katowice revenue-wise. Ruda Śląska's position remains relatively strong in the context of other economic indicators. In total, at least one large company is based in each of the 19 cities of the metropolitan area and two rural communities (Rudziniec and Zbrosławice).

Photo 8. There are 25.8 square meters of green areas per inhabitant of the GZM.
Author: Krzysztof Malinowski

chapter 6

Structural Changes. New Industry Development Paths



The economic evolution of the area where the GZM operates in the last three decades represents a history of deep structural change arising from the need for a twofold adaptation of a region of a traditional, declining industry, which in 1989 was the central part of what was then the Katowice Voivodeship: the transformation from a centrally controlled to a market economy and adaptation to the changing paradigms of a late capitalist market economy. At the most general level, the traditional trend in development economics narrated this change through the concepts of sectoral transition and the increasing tertiarisation of the economy – i.e. the growing importance of the service sector and the decline of other two sectors: agricultural and industrial. In the light of traditional classifications, today GZM is a service economy (over 70% of those employed are in the tertiary sector). However, equating advanced structural changes with a large tertiary sector share may be misleading. The growing importance of the service sector may have occurred either as a result of rapid development, while maintaining competitive industry, or as a result of deindustrialisation. The history of local economy transformation of certain cities in the GZM followed those two scenarios, with very different consequences. Despite empirical confirmation, the sectoral transition theory is not particularly helpful in the interpretation of contemporary processes. Fundamental transformations in particular sectors of the economy, the crossing of economic activities, the outsourcing of production activities to services, and the parallel industrialization of services (it is characteristic that most authors refer to tourism or creative services, for example, as 'industries', etc.). (see Gupta 2012) forces the need for a completely different perspective on the restructuring of the region.

We suggest looking at the structural transformations of the GZM through the prism of evolutionary economic geography and the theory of the creation of new industry development paths – *path creation* – in particular. In a broad sense, the creation of new industry paths is understood as 'the emergence and development of new sectors of the economy'. (MacKinnon et al. 2018: 3). The economic structure of a region is interpreted in this light as the result of the overlapping of individual 'layers' or 'investment cycles', as once put by D. Massey (1984). In effect, the characteristics of an economy are formed by the interplay between the historically shaped characteristics of a place and new developmental impulses.

Historically shaped pathways may limit opportunities for new pathways to emerge (e.g. by capturing or blocking development resources), or they may create an environment conducive to new pathways through existing diversity benefits, for example. In her classic work *The economy of cities*, J. Jacobs (1969) argued that the more diversified the local economy is in the course of its development, the higher its potential for creating new products and services. In turn, developing paths may be interdependent – for example, depending on whether they use the same or different local resources (e.g. skilled workers) and whether they have common or different markets (see Frangenheim et al. 2020). It may also be the case that two or more industry pathways can give rise to an entirely new course through a merger (which is often difficult to predict and anticipate) (see Micek, Gwosdz et al. 2021).

Evolutionary economic geographers (Lester 2003, Martin and Sunley 2006) distinguish four main sources of a new growth path: 1) the sculpting of new industries from within, as a result of local and regional entrepreneurial and leadership creativity; 2) the transplantation of activities and technologies from elsewhere, primarily through foreign direct investment; 3) the diversification of the economy into technologically related industries; and 4) the upgrading of existing industries. In this chapter we discuss these mechanisms using examples of aggregate data for many activities and case studies of individual industries that have developed in the GZM after 1989. We attempt to identify not only what factors and mechanisms caused the development of a particular pathway, but also the 'geography' of new activities in the metropolitan area.

At the same time, the evolution of the GZM industry portfolio must be examined from the point of view of the technological sophistication of individual pathways. A fairly accurate measure (albeit not without its drawbacks) in this respect is the classification of economic activity proposed by the European Statistical Office that divides industries into high technology, medium-high technology, medium-low technology and low technology. It classifies two areas of services in general terms as 'knowledge-intensive' and 'less knowledge-intensive', while on a more detailed level it distinguishes, among others, high-tech knowledge-intensive services.

Because a complete picture of the current technological portfolio is lacking (ideally, we would have a database containing

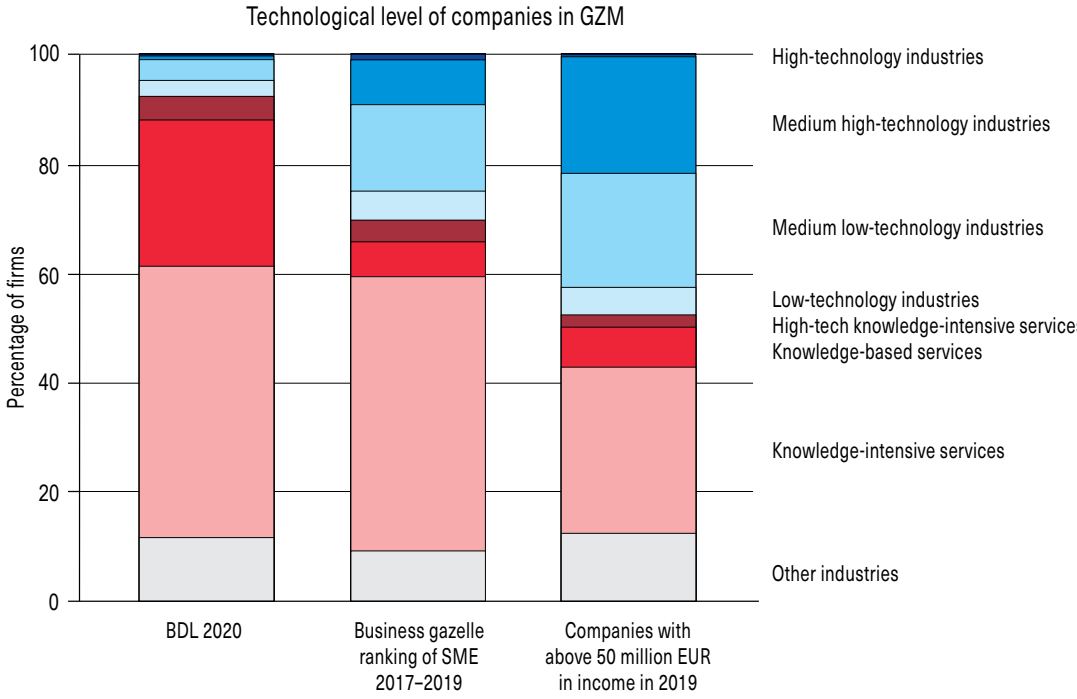


Fig. 23. The technological level of companies
Source: own elaboration based on the Local Bank Data (Central Statistics Office), 'Business Gazelle' ranking, Ministry of Finance data https://www.gov.pl/web/finanse/2019-indywidualne-dane-podatnikow-CIT [version of the list as of 1/08/2020].

information on all entities in the metropolitan area, including at least employment and generated revenue, or at least disaggregation to three-digit codes from the NACE Rev.2 Classification), we will base our conclusions on the number of companies, and for some groups we can additionally use financial and employment data (for large companies and investors operating in the Katowice Special Economic Zone).

If we look at the structure of all economic entities registered in the GZM (it should be remembered that about 95% are micro businesses), the contemporary economy of the metropolitan area appears to be predominantly service-based and, to a lesser extent, knowledge-based businesses. A look at the most thriving small and medium-sized firms shows a somewhat different picture. Admittedly, the role of less knowledge-based services does not change significantly (46% in the 'Business Gazelle' ranking), but the industrial sector plays a more significant role, predominant involving medium-low-tech industry (15%). In comparison with the industry structure of all registered entities in the Silesian Voivodeship, one should note that in the 'Business Gazelle' ranking for the GZM a greater share is held by the knowledge-intensive service sector (knowledge-based services,

knowledge-intensive high technology services) and a much smaller share by industrial low technology companies, with a significantly higher percentage of medium technology industries. This phenomenon is even more strongly demonstrated by the breakdown for the largest entities in the GZM in terms of generated revenue (admittedly, there are only 181 of them – i.e. less than 0.7 per mile of all registered companies in the metropolitan area, but they accounted for as much as 62% of total company revenue in 2019). Half of them are industrial, with an almost equal share of medium-high and medium-low technology businesses. Remarkably, regardless of the group of entities involved, high tech and high tech services industries play a minor role numerically. However, the technological level of companies ranked by 'Business Gazelle' generally corresponds to the position of the Silesian Voivodeship, which in the latest Regional Innovation Scoreboard (2021) is ranked as an emerging innovator, the penultimate class of European regions[30] in terms of innovation indicators, with a relatively low – compared to other Polish regions – growth in innovation over the period 2012–2020. This raises the question about the direction and pace of change that has led to the contemporary structure of the economy and about the sources of growth of innovation in the region and new industries in the metropolitan area.

The direction of transformations is illustrated by changes in the number of registered businesses in the metropolitan area in the period 2010–2020 in comparison with Poland as a whole (fig. 24). The dynamics of emergence for new businesses in the GZM was significantly lower than the national average, which is associated primarily with the declining population potential of the metropolitan area and the rapid ageing of its population. The start-up rate of small businesses, which constitute 95% of all entities, is strongly connected with demographic processes (fig. 25).

An indicator of the increase in technological advancement of the Polish and metropolitan economies is the highest growth rate

30
Other Polish regions (voivodeships, with Warsaw as a separate metropolitan area) with supra-regional metropolitan areas were classified in this ranking as emerging innovator+ (Lower Silesian Voivodeship, Pomeranian Voivodeship, Greater Poland Voivodeship) or even, as Lesser Poland Voivodeship and Warsaw, two levels higher (moderate innovator) See Regional innovation scoreboard, https://ec.europa.eu/growth/industry/policy/innovation/regional_en.

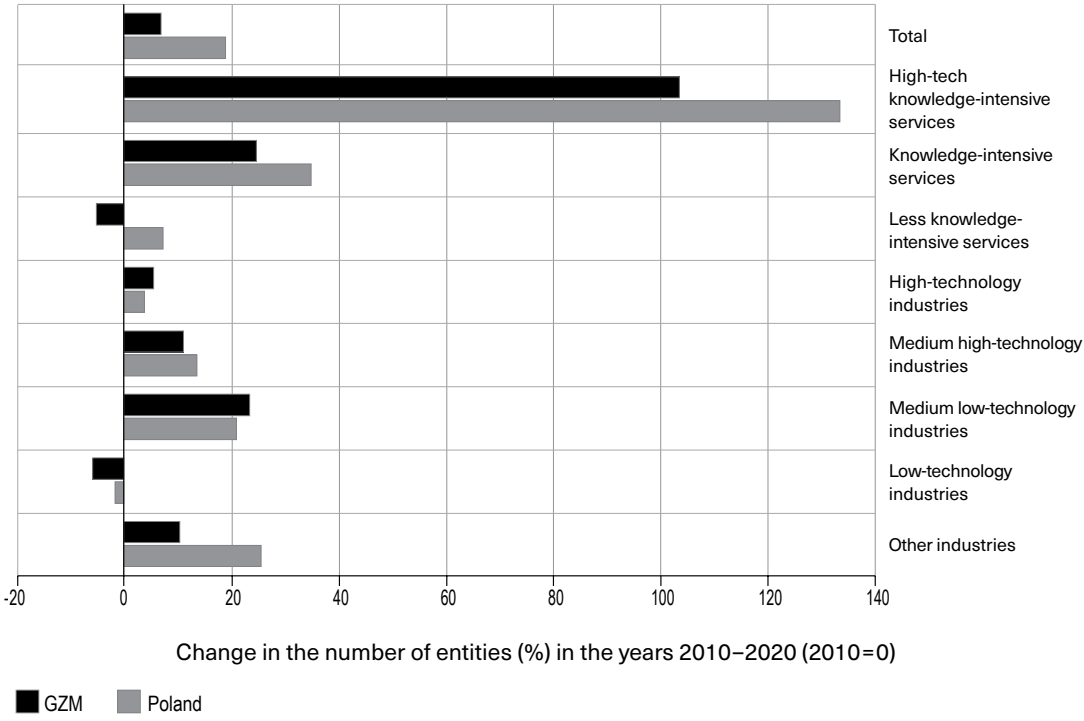
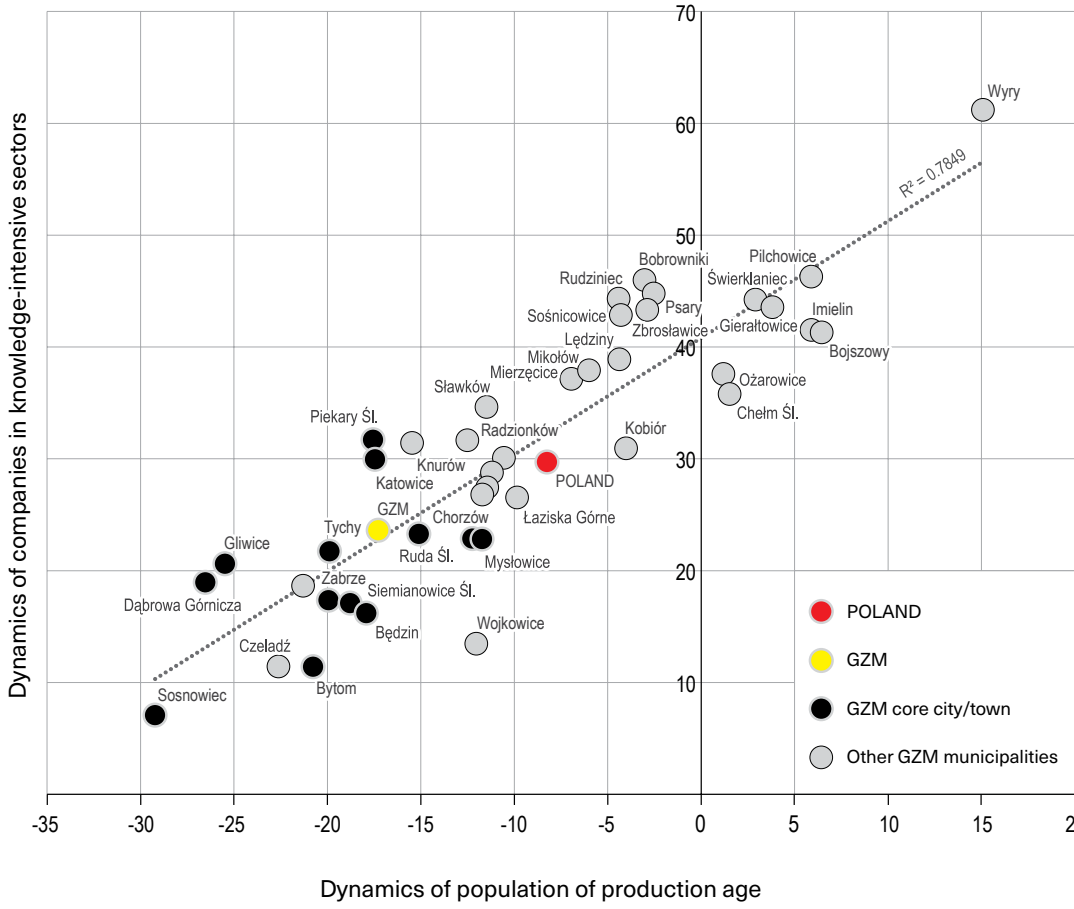


Fig. 24. Changes in the number of entities by level of technological advancement in 2010–2020
Source: own elaboration based on Local Bank Data (Central Statistics Office).

in high technology services, which in Poland and the metropolitan area was by far the highest among all other selected types of activity. However, the average level of growth in the GZM was lower than in Poland. The situation was different in high technology industries, where the GZM was characterised by a higher relative growth than the national average. At the same time – contrary to the national trend – the GZM was characterised by a decrease in the number of entities in services that were less knowledge-based. This may be the result of three interdependent processes – a declining number of consumers, a GZM economy more vulnerable to the aftermath of the COVID-19 pandemic (► Chapter 1), and further concentration processes in industries that generated the greatest number of new companies. It is difficult to assess these processes clearly without detailed studies of individual industries.

The relatively faster rate of decline in low tech businesses than in the country as a whole, with an above-average growth in the number of medium-low technology businesses and slightly weaker growth in the number of medium-high technology businesses than in Poland



in general, quite clearly shows where the evolution of industry is heading in this conurbation. This trend is even more pronounced if we look at the data on the number and technological sophistication of a large sample of enterprises represented by investors located in the Katowice Special Economic Zone. For these firms we also have a much longer time series (and measures of activity other than just the number), which facilitates our further analysis of the technological level of the GZM economy.

Between 2004 and 2020, both the number of companies operating in the Katowice Special Economic Zone and the number of jobs created by them increased very strongly (in 2004: 13,444, and in 2020: 67,333 employed). At the same time, there has been a characteristic improvement in the sectoral sophistication (fig. 26). The share of

Fig. 25. Relation between dynamics of companies in knowledge-intensive sectors and population trends in Poland, GZM, GZM core city/town, other GZM urban and rural municipalities in 2009–2020
Source: own elaboration based on data purchased from Central Statistics Office and Local Bank Data (Central Statistics Office).

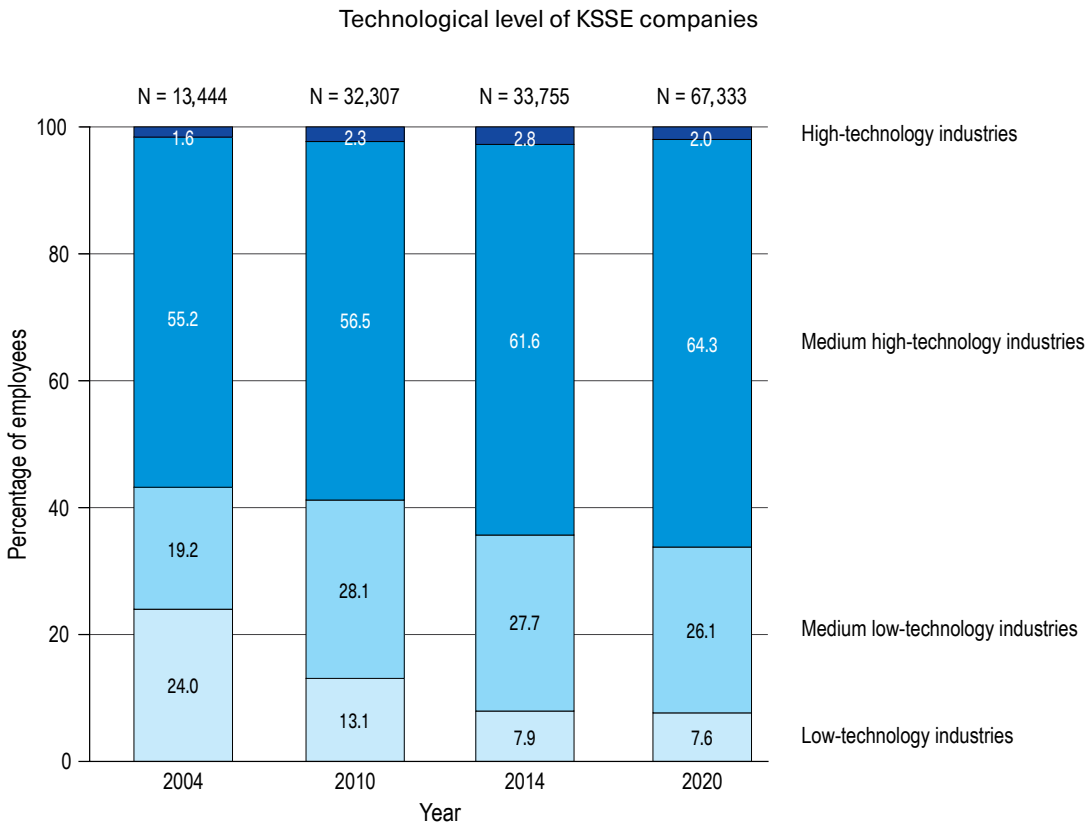


Fig. 26. Level of technological advancement of manufacturing companies in the Katowice Special Economic Zone in the GZM between 2004–2020
Note: N – number of employees.
Source: own elaboration based on Katowice Special Economic Zone data.

industrial investors from the low technology sector (measured by the number of people employed – from 24.0% to 7.6%) decreased the most, while the share of employment in industrial companies of medium-high technology (from 55.2% to 64.3%) and medium-low technology (from 19.2% to 26.1%) increased. Despite the increase in the share of high technology industry, it still plays a marginal role in employment (growing from 1.6% to 2.0%).

A comprehensive analysis of the specialisation of particular cities and communities within the metropolitan area in activities with different degrees of innovation is only possible – due to the availability of data – in terms of the number of business entities. The classic indicator which allows local specialisation and concentration to be determined is LQ (Lorenz location quotient). This indicator should be interpreted in such a way that the value of 1.00 means the average concentration of a given activity in relation to the reference area (Poland), and the higher the LQ value, the higher the specialisation

in a given activity. In the literature, LQ=1.30 is taken as the limit of strong specialisation.

Most of the towns and municipalities in the GZM specialise in manufacturing – most often in high technology, then in medium and medium-high technology. However, characteristically, only two cities of the metropolitan area present a strong specialisation in services: Katowice and Gliwice, as well as one rural municipality (Ożarowice). A dozen or so other cities show an above-average concentration in service activities that are less knowledge-based. Moreover, while knowledge-intensive industries have increased in concentration in many cities and municipalities of the GZM, this process has not been observed for services and is limited to individual centres.

The observed data confirm – diagnosed by the authors of this analysis (Gwosdz 2014, Sobala-Gwosdz and Gwosdz 2012), as well as by other authors (Baron 2016a, 2016b) – the characteristic direction of the evolution of economic development of the GZM. It is expressed primarily in the process of incremental improvement of the technological structure of the sectors of the regional economy, especially in the manufacturing industry. This evolution takes place both in the sector of small and medium enterprises with domestic capital and among large companies established in the metropolitan area by external investors, mainly foreign ones. The most important industries in the structure of the economy are still medium-advanced and services classified as 'less knowledge-based'. The role of high technology industry remains small. The share of the (so far modest) most advanced service activities is growing rapidly (but slower than in the country), but it is very selective in the metropolitan area. All in all, the example of the GZM shows that the creation of new foundations for the economic development of a region – once dominated by traditional industry – can be based on sectors of the economy with different levels of technological advancement. In this respect, we completely agree with M. Baron (2016: 86), who accurately noted that 'the industrial region of Katowice is not condemned to one or more modern and desirable paths of further change.'

6.1. Mechanisms for developing new industry pathways in the metropolitan area

After 1989, in the area that the GZM encompasses, new industry paths developed or were created almost from scratch which significantly increased the complexity of the economy, often building the foundations of its metropolitan character. With reference to the typology of M. Baron (2016), it can be said that while in the first half of the 1990s the closed profile of traditional industries definitely dominated, supplemented by the few modern industries and services with strong R&D linkages (medicine, industrial automation), nowadays the leading role is played by the profile associated with corporate models of competitive medium-high technology manufacturing industries, and the profile of open innovation is gaining momentum. At the same time, the emergence of new profiles would not be possible without radical changes in the regional innovation system, which has systematically evolved from supporting simple pro-investment activities to a whole range of activities. A good example in this regard is the evolution of the activities of the Katowice Special Economic Zone, which – in a nutshell – has changed from a developer of physical infrastructure to a broker of knowledge and animator of advanced cluster initiatives (led by *Silesia Automotive and Advanced Manufacturing*). Metropolitan Universities also play an increasingly important role as knowledge brokers (e.g. Silesian Competence Centre of Industry 4.0 at the Silesian University of Technology).

Five major mechanisms, described in the theory of economic evolutionary geography, were identified as stimulating the development of new industry pathways in the metropolitan area (tab. 7). Flagship examples of industries whose growth was primarily driven by outside investors include automobiles and parts manufacturing, logistics distribution centres, and modern business services. The development of a strong IT sector was primarily the result of internal resources and competencies, as well as creative activities and the rapidly growing pre-pandemic leisure sector – including the meetings industry and industrial tourism. The emergence of the latter would not have been possible without the prior involvement of the public sector in infrastructure, which in turn would not have been created without extensive support from EU funds. Behind the development of many branches of medium-low and medium-high technology industries lies the mechanism of 'industry affinity'. This is particularly

Pathway	Mechanism of the new industry pathway	Description	Examples of industries in GZM
1.	Creating new economic activity 'from within'	The emergence of new economic activities and technologies in a region through endogenous development, especially through local innovation and spin-offs	• information technology (IT) • creative activities (especially in the field of design and architectural design) • leisure services (meetings and events sector, industrial tourism)
2.	Transferring activities and technologies from other locations	Import of new activities and technologies through investments by external entities or migration of people	• manufacture of automobiles and their parts • logistic distribution centres • modern business services (BPO/SSC, R&D, ITO)
3.	Diversification of the economy towards technology-related industries	Previously dominant industries are disappearing, but key abilities are being utilised by emerging, similar in technology, but usually more advanced industries	• manufacture of metal products • manufacture of machinery and equipment for the industry • manufacture of chemical products • medical engineering
4.	Modernisation (upgrading) of existing industries	Rebuilding economic potential based on the region's traditional industries that strengthen competitiveness by using new technologies or introducing new products and services	• medicine • manufacture of steel • reclamation and remediation technologies • clean coal technologies (potentially)
5.	Conjuncture (critical conjuncture)	Emergence of new business as a result of combining separate industry pathways, e.g. through market relations	• providers of services and products for industry 4.0

Tab 7. Mechanisms for the emergence of new industry pathways in the GZM
Source: own study. Typology of new industry pathway sources 1–4 after Lester (2003; 2006); 5 – after G. Micek et al. (2021).

important for small and medium-sized companies and is expressed in the high percentage of dynamic industrial enterprises operating in industries such as manufacturing metal products or machinery and equipment – that is, branches referring technologically to the leading metallurgical industry complex in the conurbation in the past. The main mechanism for the increase in sophistication of existing industries in the region, such as medicine and steel production, was the use of new technologies or the introduction of new products and services. The dynamically developing for several years high-technology sector of providers of services and products in the area of the so-called

industry 4.0 is in turn the result of the conjunction of two other industry pathways – information technology and advanced manufacturing, mainly the automotive industry.

6.2 New industry pathways in the metropolitan area

The scale and pace of differentiation of the economic structure due to the development of new industries in the GZM should be seen in the specific configuration of internal and external factors, and in particular in the different endowment of particular metropolitan centres with internal resources (as a legacy of the existing path of development), in their different positions in the network of connections and in different competencies to formulate and implement development policies. The emergence of new competencies in the metropolitan area was, in effect, quite spontaneous, or at least not coordinated at the supra-local level. As a result, the development of new competencies reflected the market competitiveness of individual locations for particular branches of activity. A spectacular manifestation of this is the growing concentration of economic activity, especially of knowledge-intensive services in Katowice (fig. 27). Obviously, knowledge-intensive services have a natural tendency to be clustered in one place. However, there is some scope for public intervention by strengthening seed locations in industries that offer the hope of self-sustainable growth and thus create concentration benefits. This has been exemplified by policies in the Ruhr metropolitan area (notably Project Ruhr GmbH) to identify and strengthen 'territorial fields of competence' across the metropolitan area, where between 3 and 6 such clusters have been identified in each powiat for acceleration and support (Keil and Wetterau 2012).

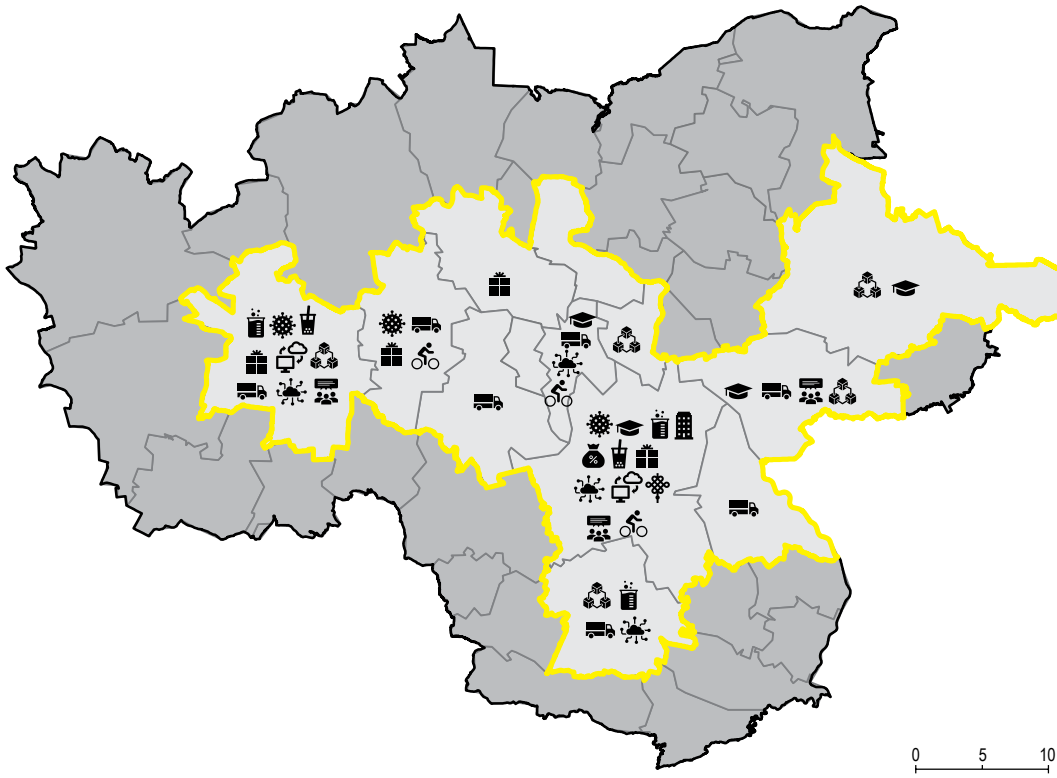
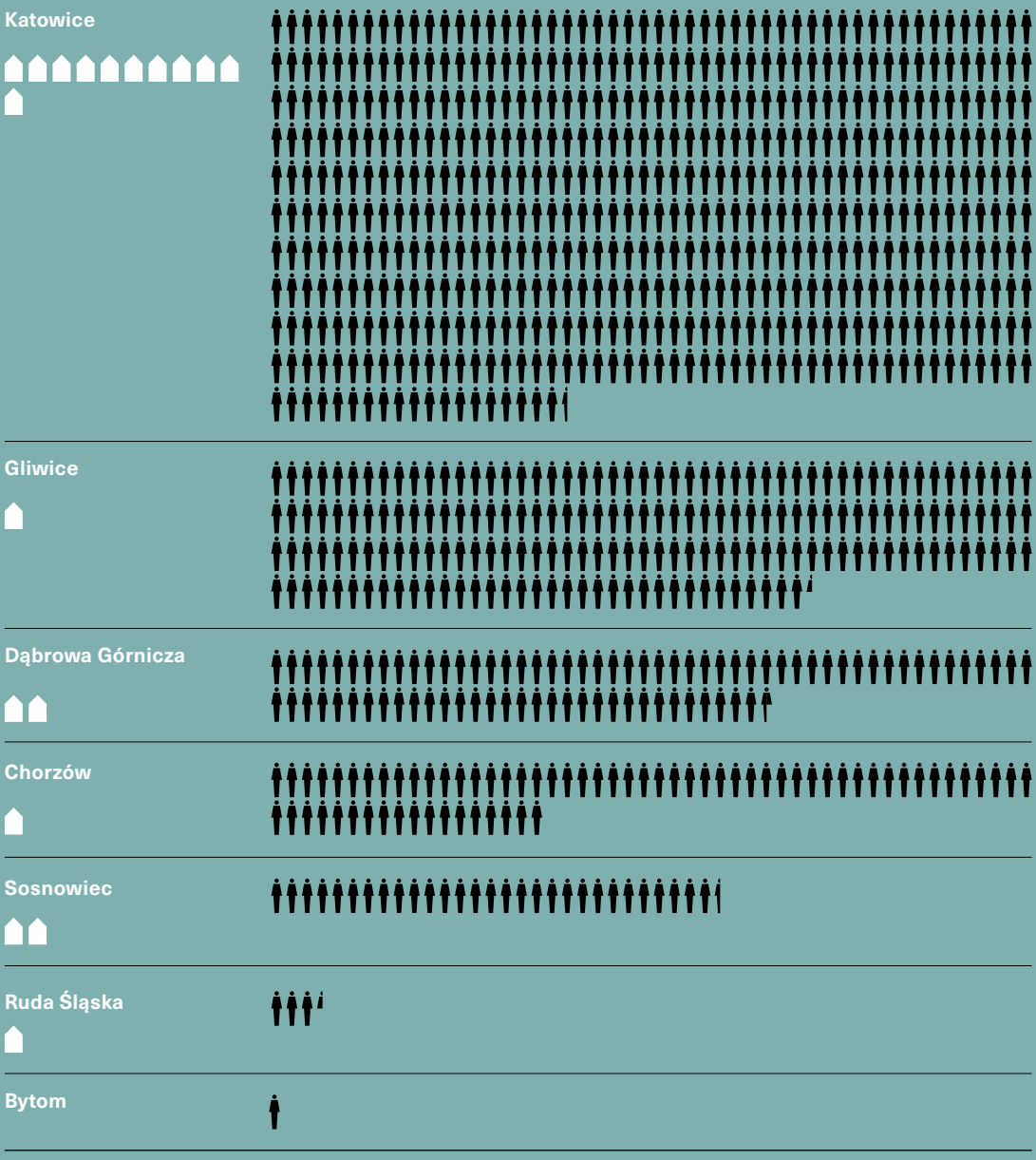


Fig. 27 New industry specialisations of metropolitan core cities
Note: HORECA (Eng. Hotel, Restaurant, Catering/Café) – a combined term for the hotel and catering sector.
Source: own study.

chapter 7 **Human Capital**



7.1. The characteristics of post-industrial areas in the context of human capital

Since the mid-20th century, development researchers have increasingly shared the opinion that the exploratory value of natural and physical capital endowment in explaining the spatial differentiation of welfare is limited, and the list of factors should be extended to include non-economic and qualitative dimensions (Pogonowska 2004, Sachs 2003). Therefore, recent decades have brought the development of outlooks that value the importance of knowledge and cultural content in determining the level of economic development (Sachs 2003). Human capital, defined as the knowledge and skills of individuals that enable them to create economic value, is recognised as the basis for sustainable economic growth and social development (incl. Hansen and Winther 2014, Schwab and Xavier Sala-i-Martín 2016, among others).

Talent availability is a key factor for the location of modern service sector companies (Micek 2017, Micek et al. 2017, Skowronski 2017). Moreover, areas with high human capital gain advantages over other areas in productivity, wage growth, and employment (Gwosdz et al. 2019). The clustering of talent allows for the accumulation of knowledge and creativity, which accelerates the growth of existing companies and attracts new investors. Individuals with higher levels of knowledge capital are also more entrepreneurial, which encourages them to start new businesses. It is also noted that a high stock of human capital is reflected in higher incomes, greater willingness to use services, as well as greater public engagement. Ultimately, this results in strengthening the economy, urban diversity, relationship networks and civil society structures.

For the last thirty years, the area of the contemporary GZM, especially the cities at its core, has not only undergone intensive economic transformation (a decline in importance of mining and heavy industry) but also of consistent efforts to change the negative image of the region. Breaking the image of the Katowice conurbation as an industrial and environmentally degraded area and going beyond the archetypal cliché of describing its inhabitants as miners and workers that live in so-called familoks (Oslislo 2014) is no easy task. Such an image, although highly mythologised (Oslislo 2014, Smolorz 2012), nevertheless has its sources in available stories relating the side effects of industry (Jędryka 2020) or the durability of

the traditional Silesian family model and vision of work (Swadźba 2012). Additionally, due to its setting in long-duration processes, social transformation in terms of human capital has been delayed. This means that its tangible, intensified and coherent effects began to be observed only from the second decade of the 21st century. It was then that within the conurbation we witnessed a synergy of increased infrastructural investments, cultural events and social activity among young and educated people. For Katowice, the main centre of the present metropolitan area, these were mainly: the construction of the Culture Zone, efforts to obtain the title of the European Capital of Culture 2016, and social involvement in the defence of the brutalist railway station. Importantly, manifestations of synergy of the above-mentioned processes – although on a smaller scale – can be found not only within Katowice, but also in other cities of the present metropolitan area: Chorzów, Będzin, Zabrze, Siemianowice Śląskie (Szymczyk 2016, Urbaniak, Kowalska 2013).

The resultant of the synergy mentioned above was an impulse towards creating a new narrative of the region and its new visual identity (Oslislo 2015). It is possible to point out repeatedly cited, and thus well-known to local experts, projects bordering popularisation, design and urban activism: the Gryfnie and Geszeft stores, the illustrations of Ewa Kucharska (e.g. the collection *Silesian Myths*), the goods of the bro. Kat studio (e.g. the jewellery series), the activities of the Cukerman's Gate Foundation (e.g. *Opowieści Nieobecnych* [the Absentee Stories] project), Marta Frank's *Sadza Soap*, My City Association and KATO bar, the revitalisation of the space of former Defum factory in Dąbrowa Górnicza, Sosnowiec cultural initiatives support program – to name just a few. The assumptions of most of these initiatives fit into the trend that art historian Irma Kozina describes as sentimental design, that is, 'using symbolic and verbal associations, inscribing the product in the process of building a Silesian identity using a cultural code' (Kozina 2012).

In order to encapsulate all the observed changes in one term, Zofia Oslislo (2015) coined the phrase 'New Silesians' to collectively define *people who consciously decided to live and work in the region, regardless of where they were born (...). They dedicate their talents and commitment to this place and try to make life in Silesia better.* As the cited author argues, *some of them maintain the memory, research history, revive multiculturalism, while others care about the tradition and the*

dialect, or just take care of public space and simply contribute to cultural life. According to the proposed definition, the 'New Silesians' are mainly people aged 20–30, who are mostly activists, artists, architects, ethnographers, art historians, musicians and designers. This conceptual bracket, while representing a new descriptive quality, remains vague in its definitional layer. This also means that the generational dimensions of the new Silesianness proposed by the author are difficult to defend (see Wyka 1977). Therefore, in order to use a more neutral term, while preserving respect for the idea discussed earlier, we suggest using the term 'New Silesian and Zagłębie Creative Wave'. In operationalising the above terminological framework, the conceptual components of Richard Florida will be followed. Searching for the determinants of urban prosperity, the researcher proposed the concept of 'creative capital' (Florida 2010). This resource is a combination of determinants of regional technological advancement, human capital, and cultural capital. In contemporary concepts of economic geography, creative capital is among the key factors in building post-industrial agglomeration structures (Klasik 2018). Therefore, in the following pages we will refer to the data available for us that fall under the issues of human and cultural potential. They will be additionally supplemented with information on the situation of the region in terms of innovation and population potential. It is already known that the analysis of qualitative sources allows for the identification of symptoms of a revival in terms of design, identity reconfiguration, and social activism within the GZM. However, it remains to be seen to what extent these observations can be complemented by quantitative insights.

7.2. Educational potential

One of the basic measures of regional educational potential is examination results. On the one hand, they provide standardised information about the quality of teaching in a given area. On the other hand, by indicating the discrepancy of the averaged results, they are also a possible predictor of future local workforce skills. The analysis took into account information on two subjects: English – which determines the ability to function in an international environment, and mathematics – which represents the potential for further education in science. The data obtained suggest two regularities. On the one hand, within the metropolitan core there is a cluster of centres

educating the majority of students. On the other hand, this cluster within the metropolitan core is not accompanied by polarisation in terms of results (fig. 28). With the exception of Katowice (50.5%) and Gliwice (49.5%), the indicated largest school education centres do not obtain particularly high results in the eighth grade exam in mathematics. Similarly, the results for Zabrze (42.6%), Sosnowiec (44.7%), and Ruda Śląska (40.3%) are lower than average for the metropolitan area (45.4%). Bytom (37.9%), which together with Świętochłowice (37.1%) are at the bottom of the ranking, stands out even more clearly from that reading. On the other hand, very good results were recorded by students from municipalities located outside the core of the city: Tarnowskie Góry (50.5%) and Mikołów (50.1%), as well as former voivodeship centres located outside the GZM – Częstochowa (50.3%) and Bielsko-Biała (53.2%).

A similar pattern of diversification can be observed in the case of English exams (fig. 28) with the only difference that the average results in the GZM were much higher (55.4%) than for mathematics. Again, in the cities with powiat rights – Zabrze (51.9%), Ruda Śląska (50.2%), Bytom (49.9%) – the results were below average. At the opposite end of the scale one may find: a) the core cities – Katowice (61%), Gliwice (61.4%) and Tychy (60%); b) the non-core municipalities of the GZM – Ożarowice (59%), Tarnowskie Góry (62.4%), Gierałtowice (60.6%) and c) the former voivodship towns located outside the metropolitan area: Częstochowa (60.4%) and Bielsko-Biała (62.9%).

A greater spatial polarisation appears when information concerning the measurement of the effects of secondary school education is taken into account. The mapping reveals that in terms of the average results obtained by students, there is a clearer division between the GZM core and the surrounding areas. The above observation is confirmed by the increasing value of the measure of the data set dispersion (standard deviation), which for the eighth grade exam was 4 (mathematics) and 4.8 (English) within the GZM, while for the basic level high school exam it amounted to 8.8 (mathematics) and 7.4 (English). Cities with powiat rights in the metropolitan area have the largest number of secondary school graduates, but they also outdistance most of the non-powiat units in terms of average examination scores. The final results of Katowice and Gliwice secondary school graduates at the basic level are clearly above average. For mathematics this was 55.8% (Katowice) and

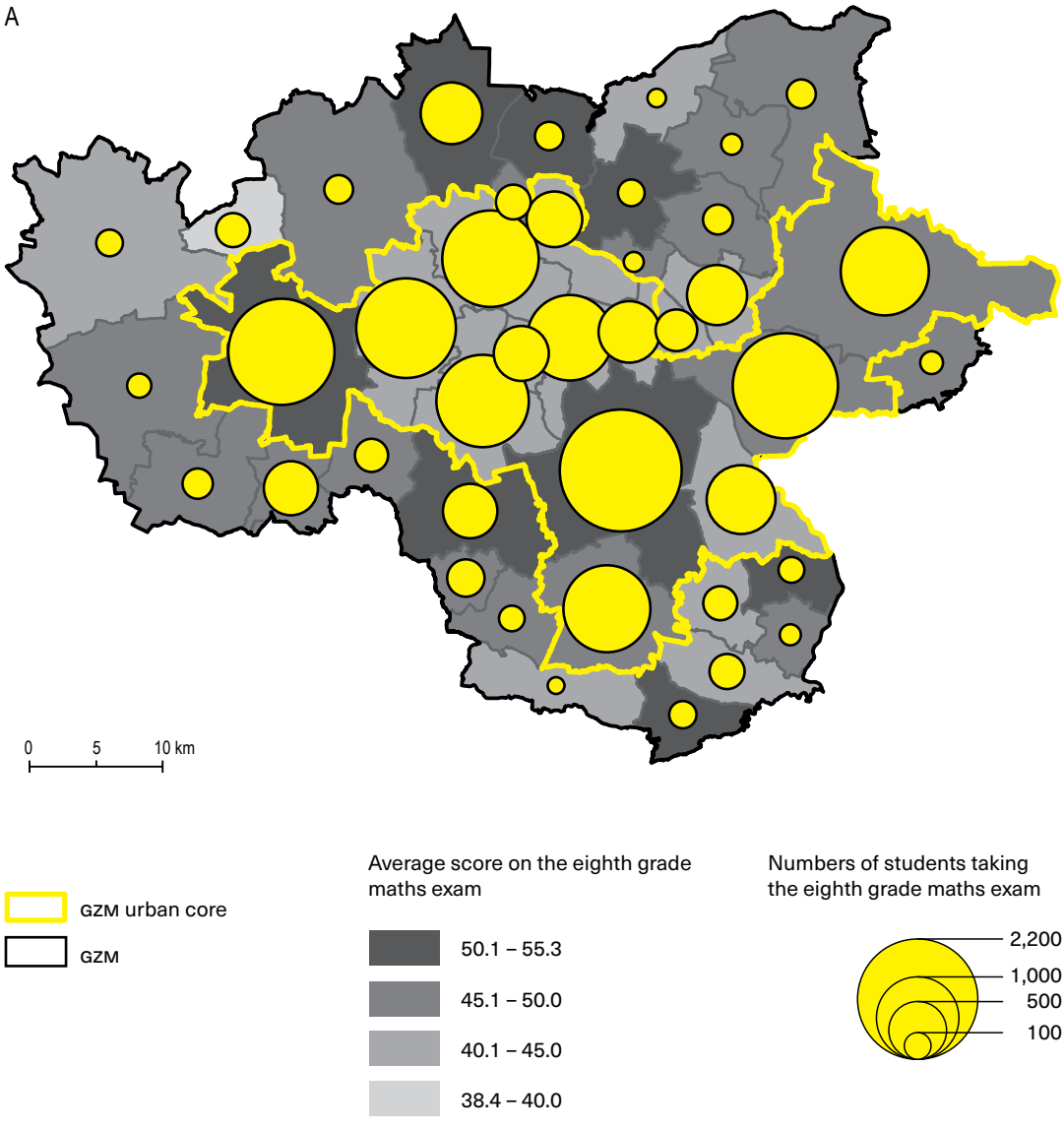


Fig. 28. Examination results of elementary school students in the GZM in 2020 – mathematics (a) and English (b)
Source: own study based on data from the District Examination Board in Jaworzno.

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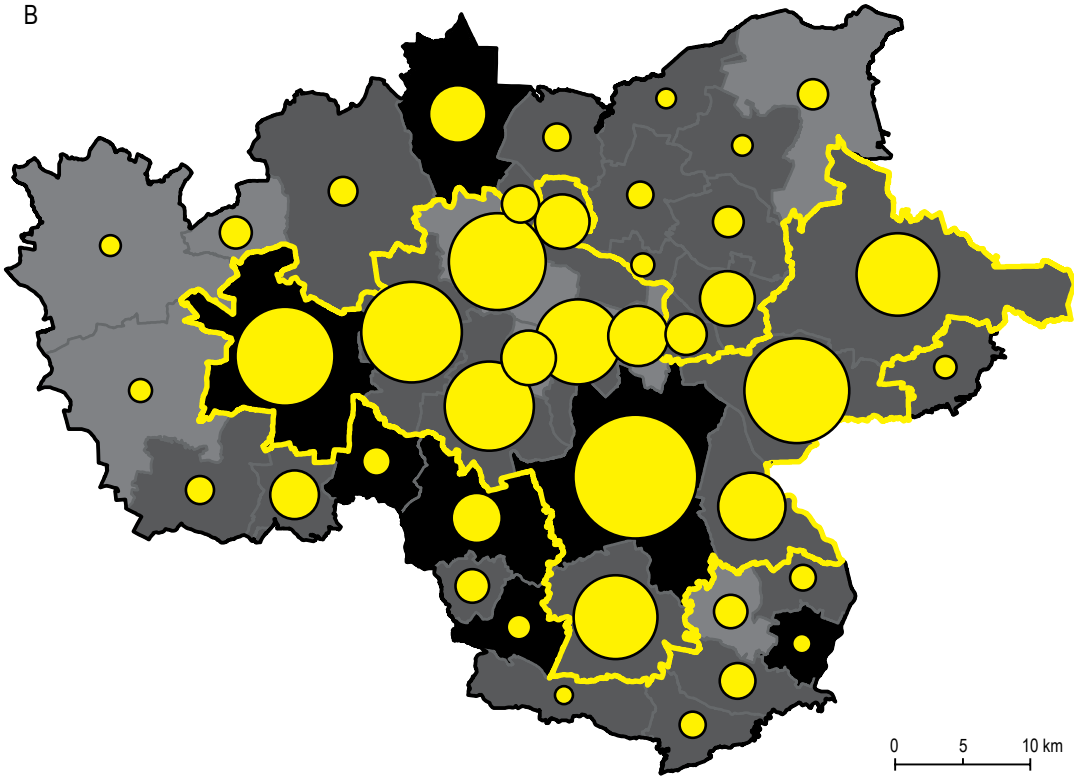

GZM urban core

GZM

Average score on the eight grade English exam

60.1 – 62.4

50.1 – 60.0

45.1 – 50.0

Numbers of students taking the eighth grade English exam

2,000

1,000

500

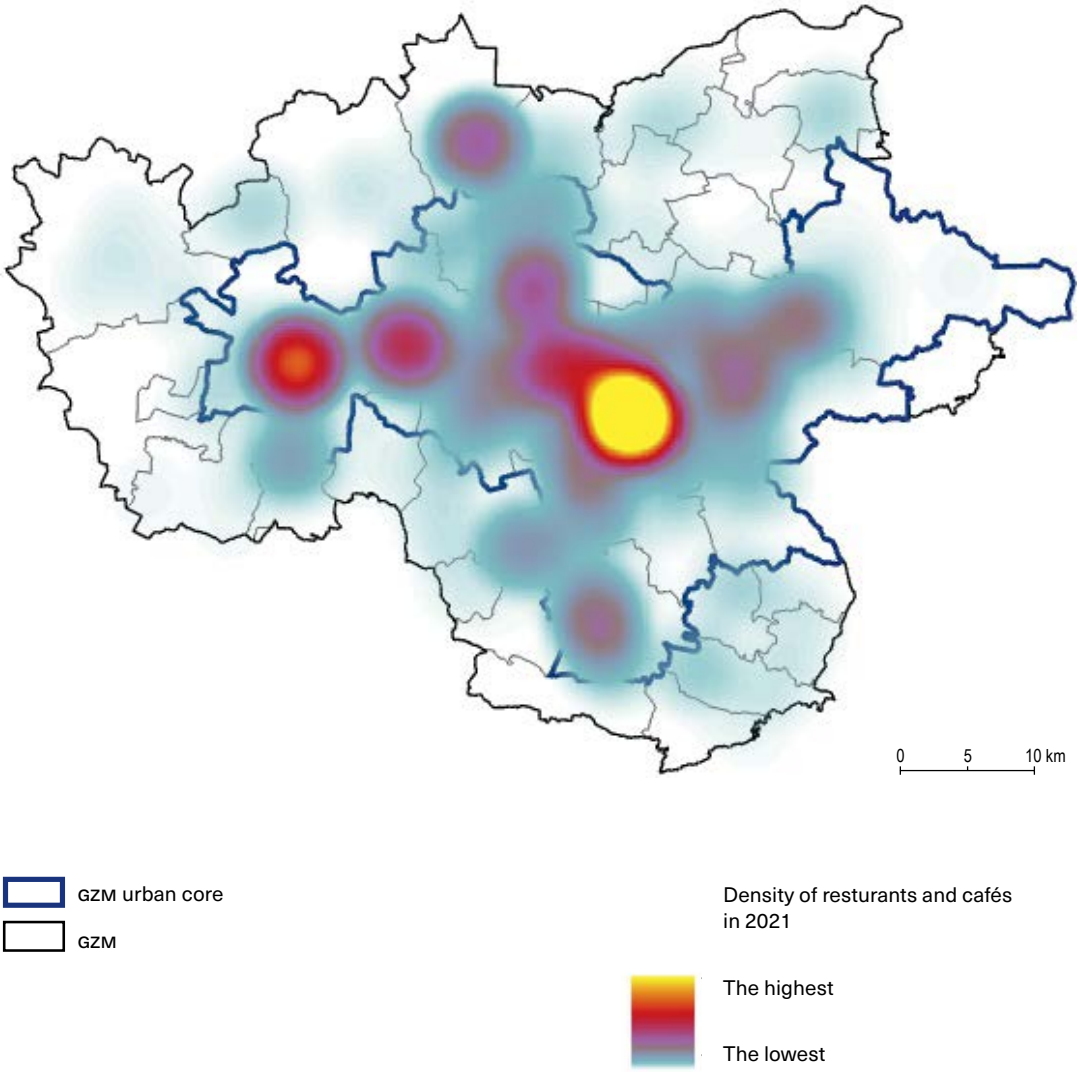

Fig. 29. Density of restaurants and cafés in GZM municipalities in 2021
Source: own study based on OpenStreetMap data [data as of 1.06.2021].

55.2% (Gliwice) against an average of 45.6%. For English it was 78.6% (Katowice) and 75.6% (Gliwice) against an average of 68.7%. Areas that tend to obtain poor high school exam results are the municipalities located outside the metropolitan area core: Pyskowice (30.2% mathematics; 48.4% English), Łaziska Górne (25.9% mathematics; 55.3% English) and Lędziny (37.3% mathematics; 63.3% English). A more detailed analysis of the disproportions between the core and the rest of the GZM is, however, difficult due to the lack of data for the municipalities without (or at least not in the analysed period) secondary schools where the high school exam was held.

7.3. Cultural potential

According to the adopted model, the specificity of human capital in the metropolitan area should not be considered without examining its cultural potential. This is a broad issue, which due to the synthetic nature of this study will be shortened to a few key dimensions. Since human cultural activity – although it escapes unambiguous definitions – is relatively often reduced to the dimensions of institutionalised and non-institutionalised proliferation of knowledge, meanings and values (Kłoskowska 1981), the following analysis will focus on several issues. These include, respectively, the number of cultural institutions (high culture), the number of art schools (proliferation of high culture), the number of cinemas (mass culture), the number of training events and courses (embodied cultural practices), the number of nongovernmental organisations (institutionalised cooperation), the number of restaurants (non-institutionalised relations) (fig. 29).

The series of indicators constituting the cultural potential of the GZM indicates not only the dominance of the core of the administrative structure but also the polarisation of functions within the cities with powiat rights. On the one hand, cultural institutions (art galleries, museums, theatres and philharmonics) are incomparably more numerous in the largest municipalities. This is not surprising, if one takes into account the size and population potential of those centres. On the other hand, it is interesting to note the extent to which Katowice functions as a metropolitan centre of cultural activity. The number and share of art galleries, museums, theatres and philharmonics in total is not the only manifestation of this

trend. The capital of the voivodeship towers over the other surrounding cities also in terms of cinema, training events and courses, the number of non-governmental organisations and the density of restaurants. As previously underlined in other parts of the study, the second and slightly weaker area of the metropolitan area is Gliwice. The situation is no different in this case. In most of the areas under discussion, this city located on the Kłodnica river is inferior only to the capital of the voivodship. The only exceptions to this rule are cinema (Zabrze has a larger number of seats) and the number of art schools (all cities in the Upper Silesian core have a similar number). Another regularity worth noting is the relatively low cultural potential of the cities with powiat rights in the Zagłębie metropolitan area. In other words, another axis of polarisation can be identified within the metropolitan core, which shows that Sosnowiec and Dąbrowa Górnicza, in relation to their population potential, are relatively weak in terms of the number of cultural institutions, cinema facilities, art schools, nongovernmental organisations and the number of restaurants.

7.4. Entrepreneurial and creative potential

The literature outlines the far-reaching relations between economic activity, its form and human capital (Budd 2011). The performance of work affects individual life trajectories, determines relationship circles, the possibility of broadening knowledge, and the prospects for consuming goods and services (Budd 2011). Significantly for this analysis, data on ways of making money can also be examined from a macrostructural perspective. They can then provide information on the entrepreneurial and creative potential of the population inhabiting a given area. These areas will be presented with reference to two sets of data: firstly, information on the proportions of different categories of taxpayers (own business, employment contract, contract of mandate and contract for specific work, copyrights, pensions) for every hundred adults in the constituent units of the GZM. Secondly, data on the number of employees classified in sections J, M and R of the NACE will also be referred to. They correspond to the information and communication (J), professional, scientific and technical activities (M) and activities related to culture, entertainment and recreation (R), respectively.

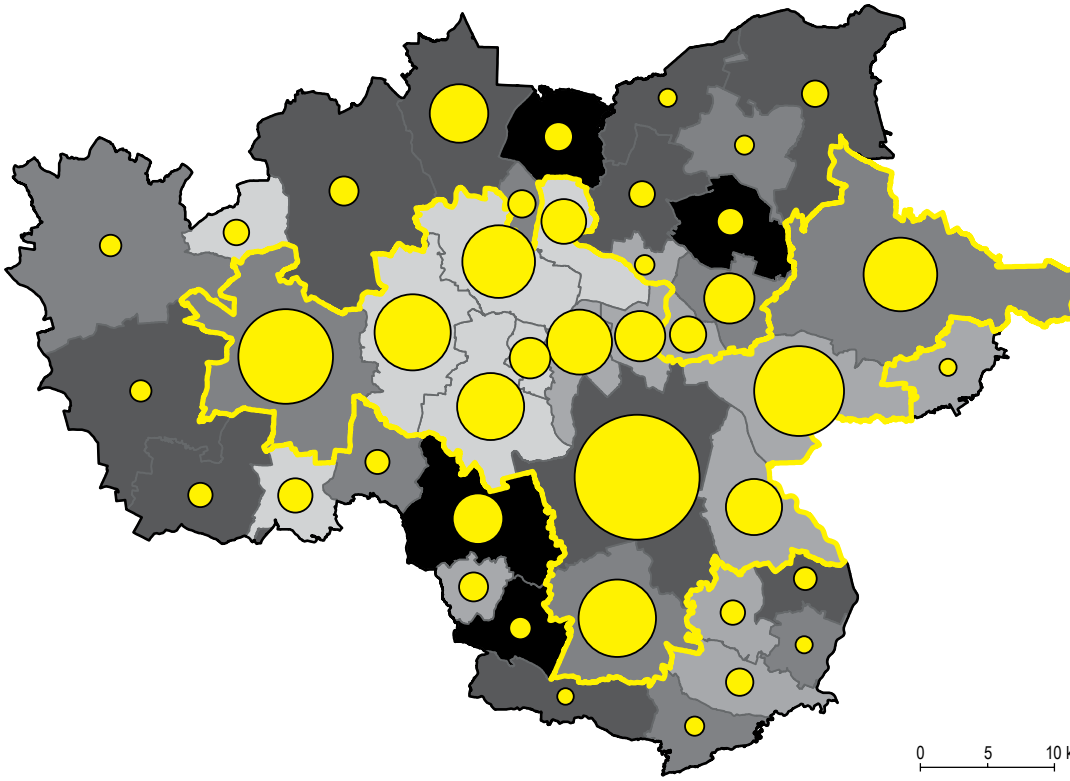

Fig. 30. Taxpayers in the GZM by source of income in 2019 – business activity
Source: own study based on data from the Association of Polish Cities (database przedsiebiorczosc.monitorrozwoju.pl).

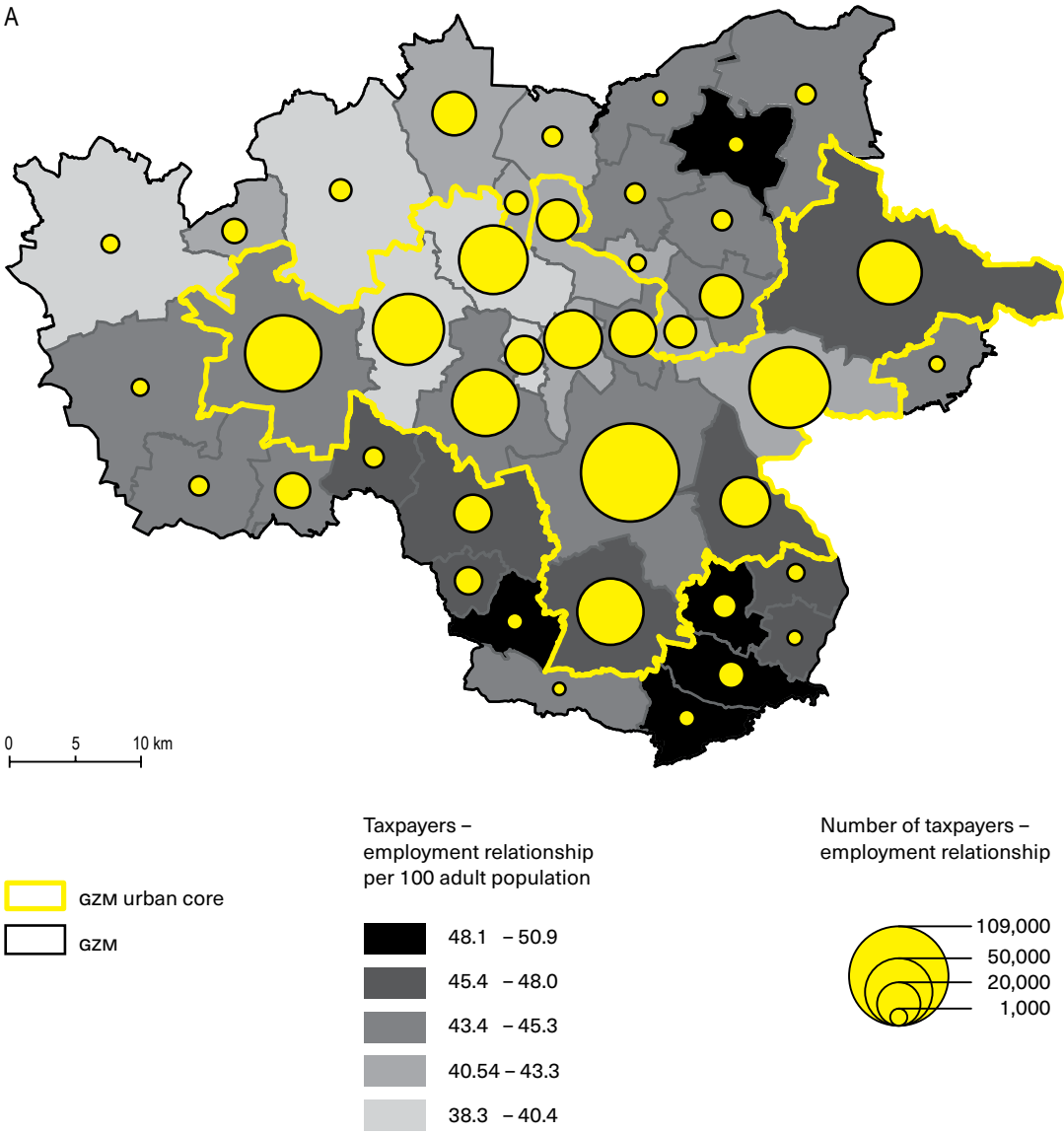

Fig. 31. Taxpayers in the GZM by source of income in 2019 – employment relationship (a), pensions (b)
Source: own study based on data from the Association of Polish Cities (database przedsiebiorczosc.monitorrozwoju.pl).

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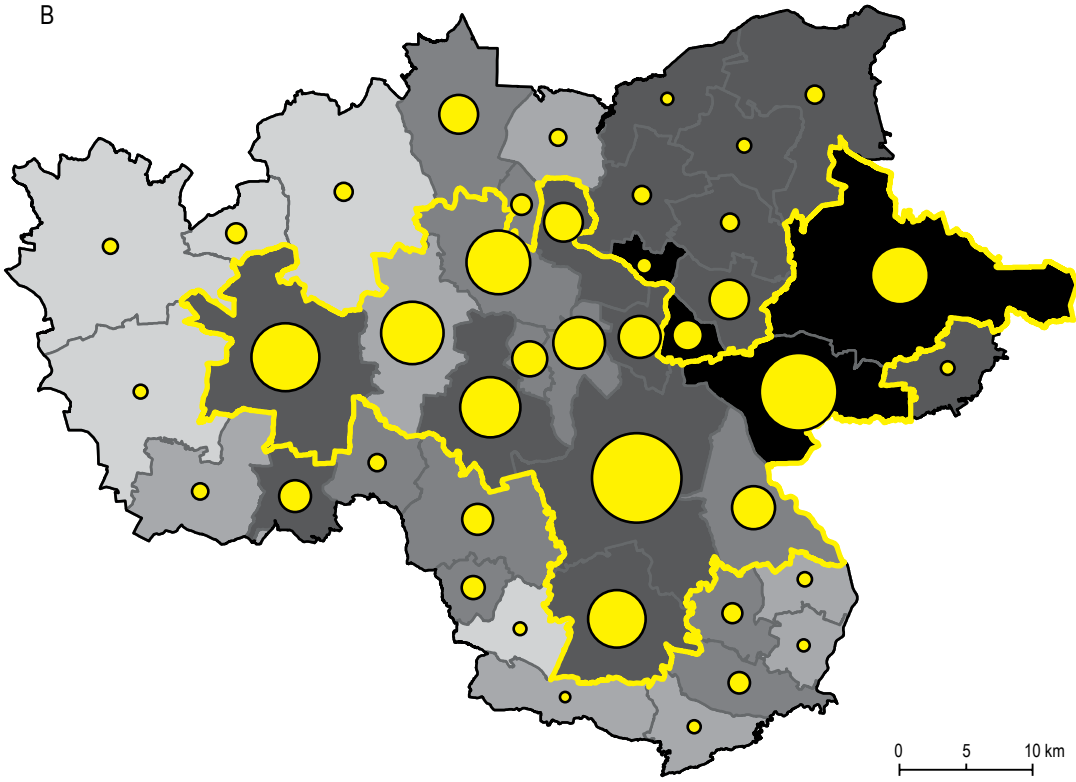

GZM urban core

GZM

Taxpayers – pension
per 100 adult population

36.3 – 38.9

33.6 – 36.2

31.5 – 33.5

28.9 – 31.4

26.6 – 28.8

Number of taxpayers –
pension

88,500

40,000

10,000

1,000

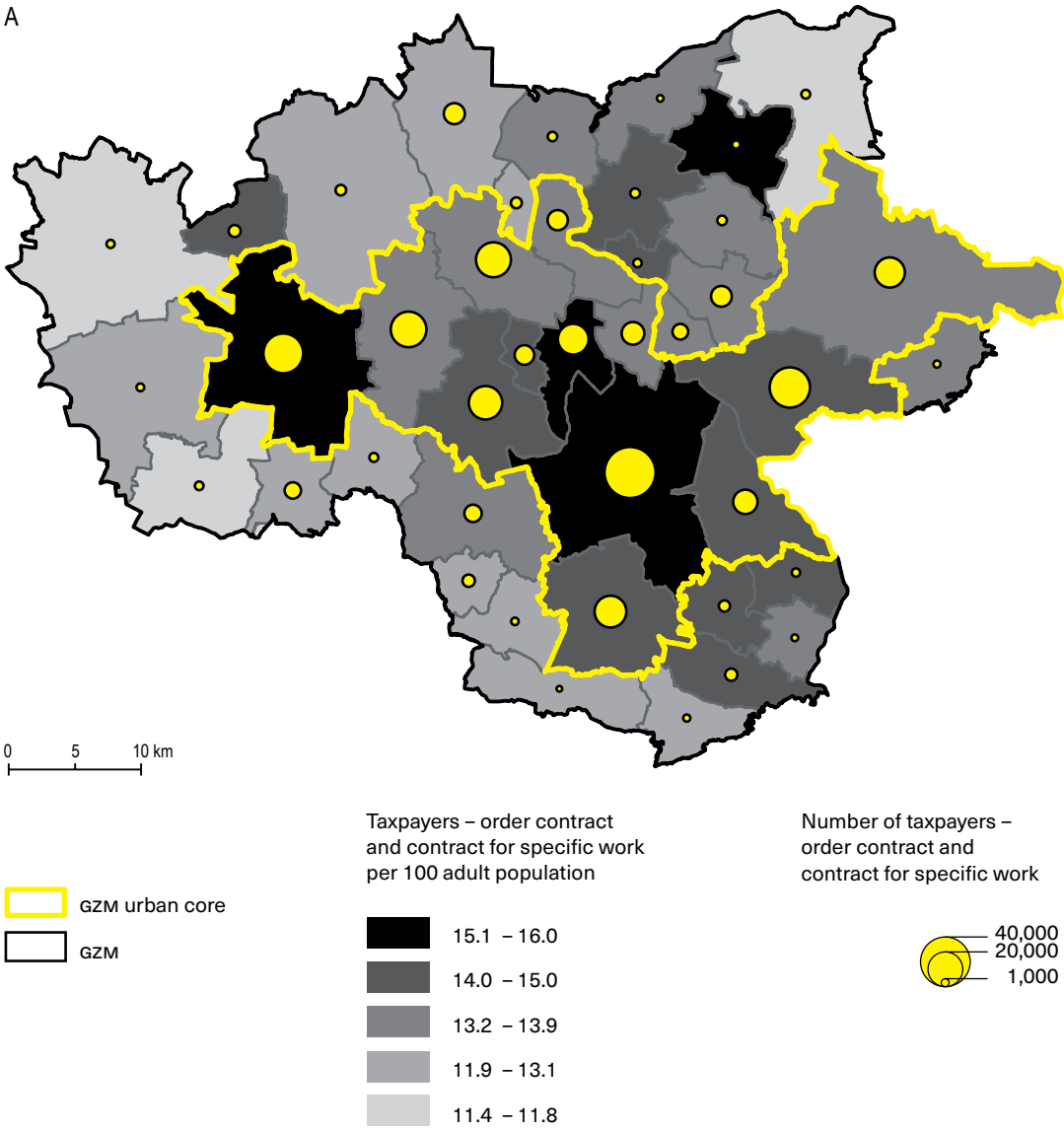

Fig. 32. Taxpayers in GZM by source of income in 2019 – order contract and contract for specific work (a), copyrights (b)
Source: own study based on data from the Association of Polish Cities (ZMP) – database przedsiebiorczosc.monitorrozwoju.pl

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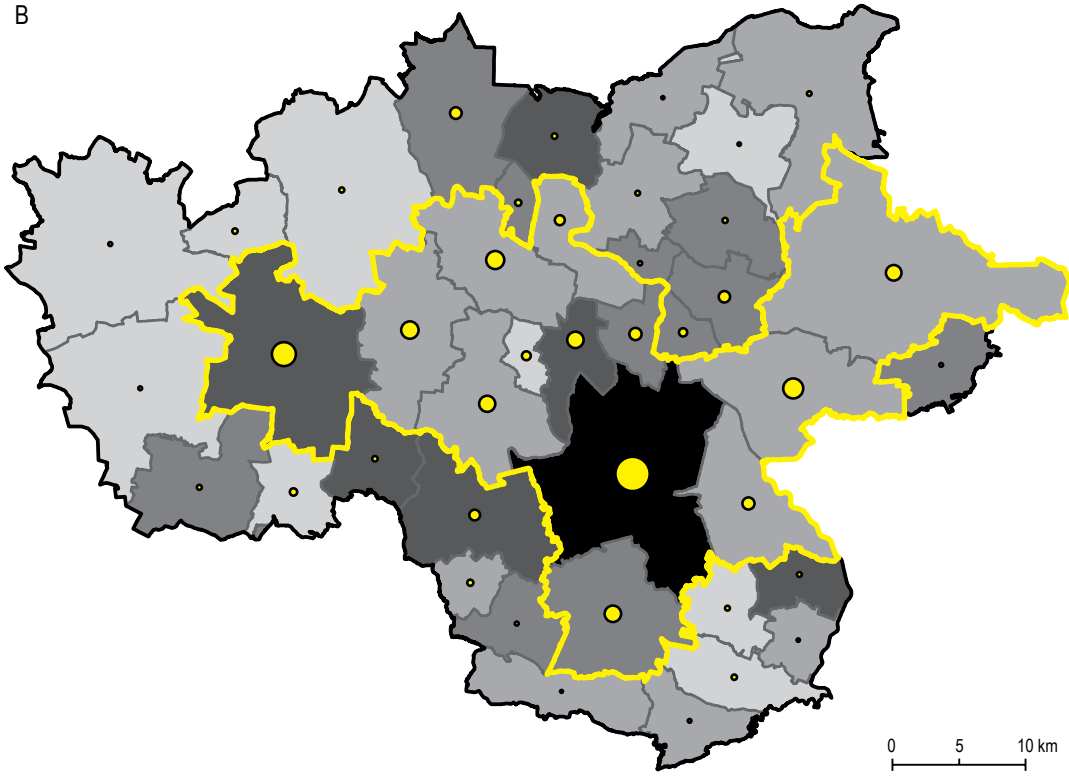


GZM urban core

GZM

Taxpayers – copyright
per 100 adult population

1.8 – 2.1

1.4 – 1.7

1.2 – 1.3

1.0 – 1.1

0.8 – 0.9

Number of taxpayers – copyright

5,300

1,000

When characterising the tax base of GZM attention should be paid to several regularities that distinguish the cities of its core from the units located outside it (fig. 30–32). Firstly, the cities with powiat rights located in the metropolitan area are characterised by a relatively higher share of pensioners and annuitants in the taxpayer structure (core average 34.4%; surroundings average 32.4%), a relatively lower proportion of people with their own business (core average 6.3%; surroundings average 7.5%) and a relatively lower share of people in an employment relationship (core average 43.4%;surroundings average 45.1%). The lowered proportion of the core in the entrepreneurial base is due to their relatively low percentage in the population structure of neighbouring Zabrze (5%), Bytom (4.8%), Świętochłowice (5%) and Piekary Śląskie (5.5%). If, on the other hand, the information on pensioners and annuitants is considered, then, although all cities with powiat rights in the GZM are characterised by their high representation in absolute and average values, in the cities of the Zagłębie region the exclusion rate from the labour force is the highest (Sosnowiec 38.9%, Dąbrowa Górnicza 36.8%). This information could indicate a lower entrepreneurial and creative potential for the largest urban centres of the metropolitan area. However, the obtained data are more complex and a second, complementary examination of the description cannot ignore the relatively high percentages of entities receiving income from intellectual property recorded in Katowice (2.1%) and Gliwice (1.7%) (core average: 1.2%, surroundings average: 1.1%), as well as the high percentage of freelance contracts of mandate and contracts for specific work in the structure of taxpayers (core average: 14.3%, surroundings average: 13.3%). The two sides of the above description would thus constitute an ambiguous view of the metropolitan entrepreneurial and creative resources. Urban and urban-rural municipalities on its periphery, whose absolute number of taxpayers is low, are characterised by both a higher share of self-employed and those in an employment relationship. The cities of the core, on the other hand, reveal signs of more flexible forms of work performance and a greater concentration of proprietary activity. It is worth remembering, however, that non-standard work contracts – while associated with greater potential for creativity – are also subject to greater risk of precariousness for those performing them (Czakon 2020; Mrozowicki, Czarzasty 2020).

Photo 9. Urban fabric of the central part of GZM.
Author: Krzysztof Malinowski

7.5. Population potential

As mentioned in the introduction to this part of the study devoted to human capital, the presence of young people aged 20–30 is of great importance for the analysis of the perspectives of the new wave of creativity in Upper Silesia and Zagłębie. Recent data from 2020 indicate that in the central part of the voivodeship, the percentage of people in the 20–29 category is relatively the lowest. Although, in absolute terms, people between 20 and 30 years of age are mostly concentrated within the GZM (over 40% of people aged 20–29 from the Silesian voivodeship live in the metropolitan area), they constitute a relatively low proportion of the population there due to the aging processes of the urban population. Moreover, over 70% of the metropolitan area's twentysomethings reside in its core area, where they form an even smaller proportion (the share of 20–29-year-olds in the Silesian Voivodeship is 11.5%; in the GZM, 10.4%; in the GZM core area, 10.1%).

The above data, if additionally combined with the previously presented information on the presence of pensioners and annuitants, indicate the weakening population potential of the metropolitan core. Even this time the conclusions cannot be unequivocal. It is worth mentioning that large cities with powiat rights are the part of the metropolitan structure – despite the progressing demographic ageing processes – function as important centres of higher education bringing together thousands of young adults (tab. 8).

In 2019, thirty higher education institutions were located in the area of the Silesian Voivodeship. Nearly one third of them (14, including 3 branches) operated in Katowice alone (and 24 in the area of GZM). The centres of academic education in the voivodship had over 112,000 students, of whom 78.9% (over 88,000) were students of universities located in the cities with powiat rights in the metropolitan core (tab. 8). The above information points to the high attractiveness of the central areas of the voivodship for young people, connected with the function of academic education – with a special role of Katowice as the most developed hub of the local university network. At the same time, it is worth noting that in terms of the number of students in 2019, the GZM was ranked fifth in the country. More university students were attracted by the following cities: Warsaw, Kraków, Wrocław and Poznań. Taking into account the spatial and population scale of the metropolitan area's structures, its place in the

Cities with powiat rights	Number of universities	Number of students
Katowice	11	51,958
Gliwice	1	18,518
Częstochowa	5	12,415
Dąbrowa Górnicza	2	8,281
Chorzów	1	6,808
Bielsko-Biała	6	6,425
Sosnowiec	2	2,956
cieszyński	0	2,233
raciborski	1	1,306
Żory	0	407
żywiecki	0	390
Rybnik	0	360
Ruda Śląska	1	327
wodzisławski	0	120
Bytom	0	93
Jastrzębie-Zdrój	0	56
Jaworzno	0	43
Silesian voivodship	30	112,696

Tab. 8. higher education institutions and students in the counties of Silesian voivodship in 2019
Note: excluding students of branches and subbranches located outside a given powiat.
Source: own study on the basis of the data from the BDL GUS (Local Data Bank; Central Statistical Office).

above-mentioned ranking can be considered disappointing. Thus, the metropolitan area is primarily a local higher education centre, which is further confirmed by the dominance of people from the Silesian voivodeship in the structure of students (more than 80% of the composition in 2019) (*Students and universities...* 2021). Unfortunately, the Silesian and Zagłębie university base is not highly ranked in Poland. None of the public academic institutions was classified in the top ten of the latest ranking by the Educational Foundation 'Perspektywy' (the highest position was held by the University of Silesia – 13th place). Among non-public universities only one institution was distinguished (*Perspektywy Ranking* 2021). However, it is worth mentioning that the Silesian University of Technology was in the prestigious group of ten research universities selected in the competition of the Ministry of Science and Higher Education 'Initiative of Excellence – Research University' in 2019.

7.6 The development of GZM and the role of human capital

At the beginning of this part of the paper, the issue of the state of human capital in the GZM, as an example of post-industrial space, was raised. The premise for formulation the problem in this way was the existence of a large corpus of written accounts, constituting a narrative indicator of the direction in which the identity and social transformation of the region was heading. On the basis of journalistic statements, it is possible to reconstruct the Upper Silesian and Zagłębie vision of transformation as consisting in the synergy of new industrial design, traditional craftsmanship, artistic and social activity. Although this vision seems coherent enough to be given a name ('New Silesian-Zagłębie Creative Wave'), the final verification of the working hypothesis coined in this way required reference to parameters of a quantitative nature. This way, the qualitative analysis was complemented with specific measurements.

The results of the undertaken analysis are not unequivocal. Although the GZM area concentrates numerous institutions of culture, education, cultural activity and social activity, they are not evenly distributed. At this point one can repeat the conclusion about Katowice and Gliwice as the most important regional centres. They concentrate a large part of the metropolitan cultural and educational potential. To a large extent, this also explains why narratives about the transformations in the region are often constructed from the perspective of the regional capital. Additionally, it should be mentioned that the polarisation patterns also follow the division between the metropolitan core and the rest of the metropolitan area. The former part, that is cities with powiat rights located in the centre of the GZM, is characterised by a higher share of pensioners and annuitants among taxpayers, a lower share of entrepreneurs and a lower share of full-time employees. A certain developmental impulse in the outer circle of the metropolitan area can also be indicated by the strong growth dynamics of businesses in the fields of IT, professional activity, culture and recreation.

In other words, the core of the GZM is still characterised by tremendous potential measured in absolute numbers. However, the dynamics of changes would indicate the occurrence of 'overspill' of the potential of creativity to the suburbs of that administrative structure, which may also be interpreted as one of the consequences of

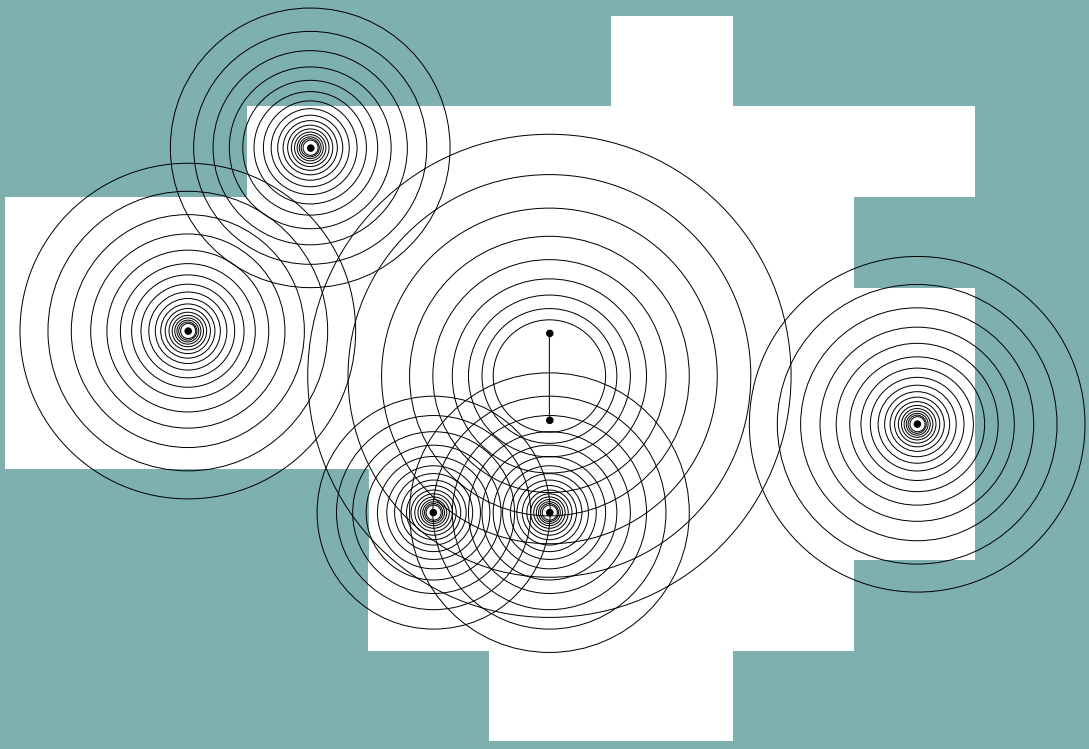
the progressing depopulation of the core cities. This process should not necessarily be considered negatively. On the one hand, it means that the narrative of Silesian transformation created in the core is to a large extent endogenous and based on considerable, but stagnating resources. These conclusions are partly the same as Irma Kozina's observations made several years ago. The researcher argued that the modest financial scale of many Silesian cultural projects is not an obstacle to their implementation. More important is their internal initiation, which results in inclusion in the reconfigured identity and better social perception (Oslislo 2015).

On the other hand, the strong dynamics of creative industries outside the core may herald the initiation of identity-narrative processes within the outer circle of the metropolitan area – leading to greater pluralism in this regard.

Regardless, there are some more critical points to be raised at the end. Certain points in the analysis can be perceived as serious question marks over the possibility of sustaining the creative wave in the long term. The most serious of these relate to the relatively poor test scores of eighth graders and negative demographic trends within the metropolitan area as a whole. However, making more precise predictions about the prospects for the development of GZM's human capital requires further in-depth research.

chapter 8

Growth Poles in the GZ Metropolitan Area



The theory of growth poles remains an attractive and useful concept in regional studies and the pragmatic of regional planning. In the first decade of the 21st century one can even talk about a lively interest in this canonical theory; hence the contemporary economic development processes promote polarisation and increase of the spatial concentration of the economic operators (see Grzeszczak 1999, Christofakis and Papadaskalopoulos 2011, Dziemianowicz et al. 2011, Churski 2014, Sobala-Gwosdz 2016a, 2016b). Its fundamental assumption is the claim of F. Perroux (1955) that development does not appear everywhere at the same time; it is visible with different intensity in the form of points or poles of development, it spreads through different channels with different results for the economy as a whole (as cited in R. Capello 2007: 161). The theory of growth poles makes an attempt to answer both the question of how economic development proceeds, as well as where (in which places) it is held and by means of which mechanisms it spreads. The growth pole according to J.R. Boudeville (1966: 11) is understood as *a collection of growth economic activities, located in the urban centre and stimulating further economic development in the area of its impact*.

An area is to be recognised as a pole (centre) only after meeting three criteria (see Sobala-Gwosdz 2005, 2010, Grzeszczak 2007, Domański and Noworól 2010):

1. It must show a sufficient internal economic potential.
2. When compared to other centres, this area is characterised by above-average economic growth dynamics, the source of which are the so-called motor activities located there – i.e. with rapid growth, with extensive markets and advanced in the product and process dimensions (Meardon 2001). These may be various activities, both industrial and service.
3. It exhibits a positive impact on the development of the surrounding areas through multiplier effects, capital flow and innovation.
4. It contains all innovative activities.

A correct definition of **where growth poles are concentrated in space, what their dynamics are, and the extent of their impact** is of great importance for accurate public intervention. It is imperative to notice that another thing is the growth pole as a set

of dynamic activities located in space, **and another thing is the settlement unit characterised by an above-average level of development and the dynamics of economic development!** A frequent mistake is to consider the growth of each medium or large city as a pole, to identify the rank of growth poles with the levels of administrative division, as well as to overestimate the impact of a given pole (e.g. treating each voivodeship city as a supra-regional pole).

An accurate determination of where the centre of growth spreads in space and where the zone of its impact reaches is a great challenge, especially in polycentric settlement systems, and in addition, where there are large differences in the level and dynamics of development of individual centres constituting them. A clinical example of such a complex structure is the GZM. This is intensified by another challenge today – namely, the fact that **the spatial organisation of the economy is increasingly networked**, and mapping network ties is much more difficult than traditional hierarchical ties. Meanwhile, as E. Soja (1993) remarked, *the new metropolitan area is rather decentrally organised and, more and more, it consists of a mosaic unevenly developed settlement areas that creates a new geography.*

The strategies used to delimit the growth poles that have been applied so far are not particularly helpful regarding the challenges outlined above. Instead, we propose a new approach, based primarily on two tools: the concept of methodological geographical scales and spatial autocorrelation (Sobala-Gwosdz and Gajda 2021).[31] As a diagnosis of the internal economic potential, in place of the previously used multi-indicator methods or synthetic indicator, we adopted one specific measure – the number of active businesses entered in the National Court Register (KRS). They were assigned an exact location according to the address of the head office. The measure expresses both density and diversity, which is the basic condition for economic development according to J. Jacobs. It allows to show the diversity of dynamic economic activities and, in particular, to capture the endogenous potential of identified potential growth poles, which is of fundamental importance both from the cognitive and application perspective.

31
Spatial autocorrelation, as indicated by A. Kołodziejczak and T. Kossowski (2016: 24), is defined as *the influence of a process or phenomenon at a point/points in space on the course of that process or phenomenon at another point/points in space.*

The concept of methodological geographical scale (see Domański 2005) implies that the 'resolution' that is sufficient for us in the accurate delimitation of growth poles may vary depending on the level of territorial analysis and design of intervention policies. A glance at the concentration of economic activity in the entire Silesian Voivodeship indicates that the entrepreneurial potential of GZM is cantered in a compact polygon that extends from Gliwice (peripheral powiats not included) to the western part of Dąbrowa Górnicza, and from the southern powiats of Katowice to the downtown area of Bytom and Piekary Śląskie (fig. 33). In the south, it almost merges with the area of Mikołowski and Tyski Powiats. Meanwhile, in the north, there is a visible though without spatial continuity with the main core presence covering a significant part of Tarnowskie Góry. **The result of the analysis on this scale shows that in regional or national delimitations, the (potential) growth pole of GZM should be treated collectively as a supra-regional growth pole.** In order to facilitate comparisons with other growth poles on a national scale, it is necessary to adopt the boundaries of the units constituting it based on five vertices: Gliwice, Katowice, Tychy, Dąbrowa Górnicza and Tarnowskie Góry.

Increasing the resolution to the scale of the metropolitan area of GZM allows for much more accurate diagnosis of areas of 'hot spots' of the GZM economy using geostatistics methods. A compact territory containing the vast majority of the urbanised areas of Katowice and Chorzów and also covering the southern part of Siemianowice Śląskie is revealed as the main intra-metropolitan growth pole. It correlates perfectly with the various indicator analyses contained in the previous chapters. Regardless of the adopted measure of economic development, Katowice almost always dominated (in some dimensions being an absolute hegemon – e.g. in modern business services), and Chorzów was usually characterised by stronger dynamics than average among the group of core cities in the metropolitan area. It is not surprising that the second area of the strongest concentration of the economy in the light of the geostatistical tool used includes Gliwice. However, the concentration in Gliwice is generally lower than in the metropolitan pole of Katowice-Chorzów and, at the same time, noticeably higher than the next four areas of increased concentration of economic activity. These are Sosnowiec, Bytom, Zabrze, and Tychy. The next line is formed by Dąbrowa Górnicza and Tarnowskie Góry. A small 'hot spot', much smaller than all the above, is noticeable in the area of Mikołów and Mysłowice.

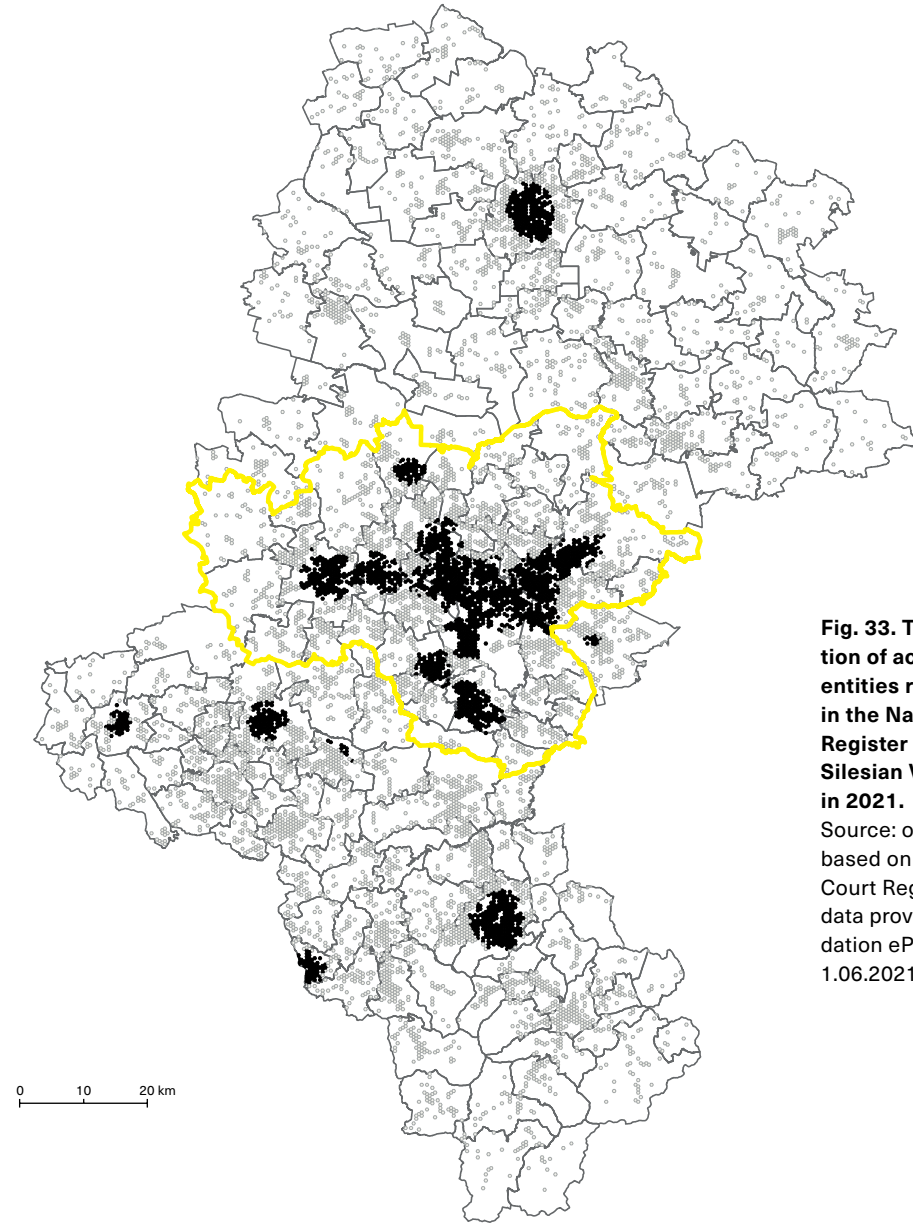


Fig. 33. The concentration of active business entities registered in the National Court Register based in the Silesian Voivodeship in 2021.
Source: own study based on the National Court Register (KRS) data provided by Foundation ePaństwo [as of 1.06.2021].

The ten identified areas of concentration require in-depth analysis, including in particular their interrelationship, the dynamics of economic growth processes and the assessment of surplus economic potential. These features will allow to conclude on their actual strength, they are also necessary for the design of potential public intervention.

The strength and nature of interconnections between cities is of paramount importance. The right approach to this topic is to analyse the size and directions of tangible and intangible flows. Predominantly, the analyses use migration flows, commuting, less often social networks or knowledge (see Micek 2017). The main criterion for assessing the importance of a city is its position in the network, which can be determined by the centrality index. In this analysis, it will be assessed using the indicator of the centrality of market services and the strength and directions of connections in the field of commuting (fig. 34).

The connections between cities in polycentric systems are characterised by high complexity resulting from their scale, dispersion of directions, mutual overlap of connections (coincidences) and the impact of indirect possibilities (Runge 1991). All the areas of economic 'hot spots' in the GZM distinguished above, with the exception of Bytom, Sosnowiec, Mysłowice and Siemianowice Śląskie, are immigration labour markets – i.e. more people commute to work there. This surplus is the most visible in Katowice and Gliwice. It is also high in Tychy, Mikołów and Tarnowskie Góry. In the spatial structure of the connections, the role of Katowice as an 'axis' (keystone) from which individual 'spokes' connecting them with other cities of the metropolitan area and other locations emerge is most strongly visible. The connections between Katowice and other cities in terms of commuting to work are highly asymmetrical (commuting to Katowice is predominant). In addition to Katowice, the position of Gliwice, which produces its own strong 'hub and spoke' system in the west of the metropolitan area, is clearly visible. The city of Gliwice (on the GZM scale) has a negative balance of commuting to work only with Katowice and given the fact that the position of this city *vis-à-vis* the neighbouring units is clearly superior, we can consider it the second post-Katowice GZM parent centre. The nodality of other cities is weaker, with five of them – i.e. Tychy, Sosnowiec, Chorzów, Dąbrowa Górnicza and Zabrze – having a very similar power of attraction (between 15.4 and 13.8 thousands workers), while the others are clearly lower (Mysłowice and Mikołów 8.0–8.2 thousands, Tarnowskie Góry and Bytom 9.0–9.2 thousands).

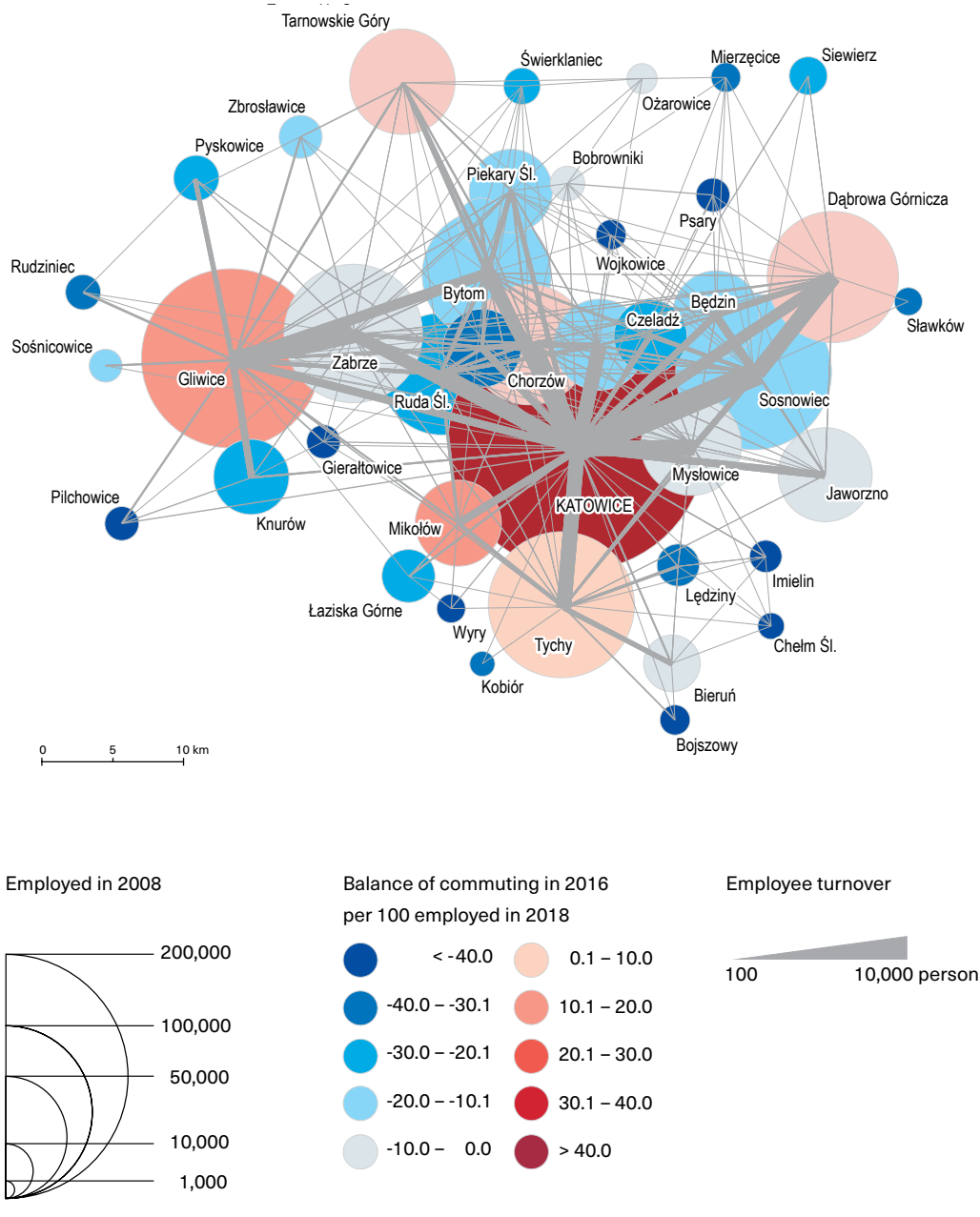


Fig. 34. Commuting to work in the GZM in 2016.
Note: *Data on the number of employees in 2018 as in P. Śleszyński and K. Wiedermann (2020).
** Jaworzno was also considered in commuting

Four of the larger cities of the metropolitan area are characterised by a surplus of arrivals over departures to work, both in joint relationships (with all places outside them) and those that include other municipalities of the GZM. However, the strength of this relationship is different – very clear in the case of Katowice and Gliwice, and much smaller in the Tarnowskie Góry and Mikołów. Two cities – Tychy and Tarnowskie Góry are generally of an immigration nature (arrivals > departures), but when it comes to relations with other metropolitan units, the balance of arrivals and departures is close to 0 or slightly negative. On the other hand, all other large cities of the GZM present a double emigration characteristic (trips > arrivals) – both the balance of transport from all directions and from other municipalities of the GZM was negative.

Further diagnostic indicators are the excess of economic potential in relation to the population potential of a given city, which is well reflected by the size of the economic base (► Chapter 4) and the indicator of centrality in the field of market services. These indicators complement each other, as the economic base factors show the role of specialised industrial activities in the economic structure particularly well. The empirical values of both measures indicate quite clearly the excess potential of individual territories in the metropolitan area.

What strongly differentiates the analysed GZM centres is the surplus or shortage of market services in relation to the number of inhabitants. Katowice, Tarnowskie Góry and Mikołów are characterised by their largest surplus, which shows their nodal role in the network of connections (although Katowice and the other two cities, of course, differ in the scope and strength of these relations), it is also relatively high for Gliwice, and positive for Tychy, Chorzów and Siemianowice Śląskie. However, four large cities of the GZM – Zabrze, Sosnowiec, Ruda Śląska and Bytom – have a clear deficit in this respect; this indicator is also negative for Dąbrowa Górnicza and Mysłowice (fig. 35).

The resulting analysis of indicators of economic growth dynamics for GZM centres in the second decade of the 21st century reveals a large diversity of local trajectories.[32] The three strongest economies in the metropolitan area – Katowice, Gliwice, and Tychy – strengthene

32
Estimated using a synthetic index of shift-share on the basis of three compounds: the number of people working in knowledge-intensive services (2009 and 2019); the number of registered business entities (2010 and 2020) and the number of people working according to actual jobs in companies >9 people (2011 and 2019).

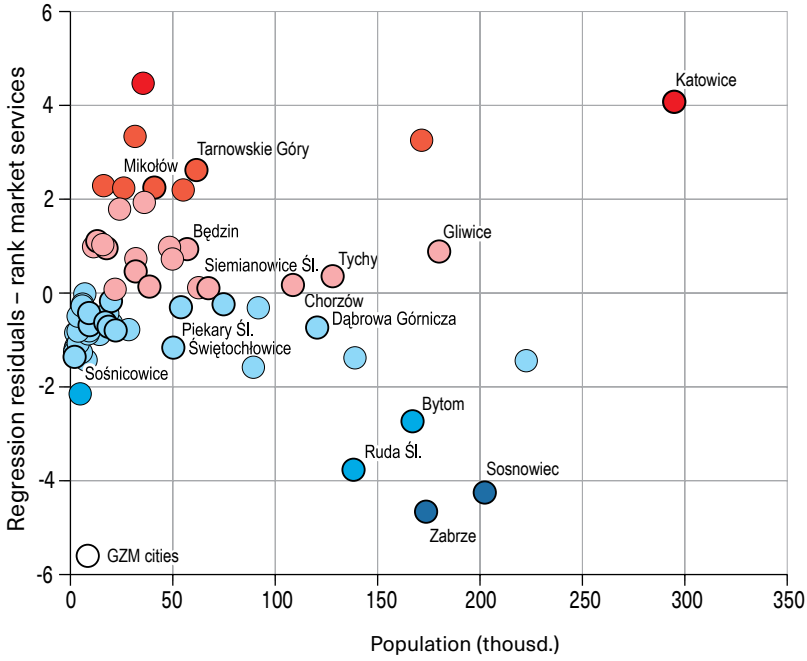
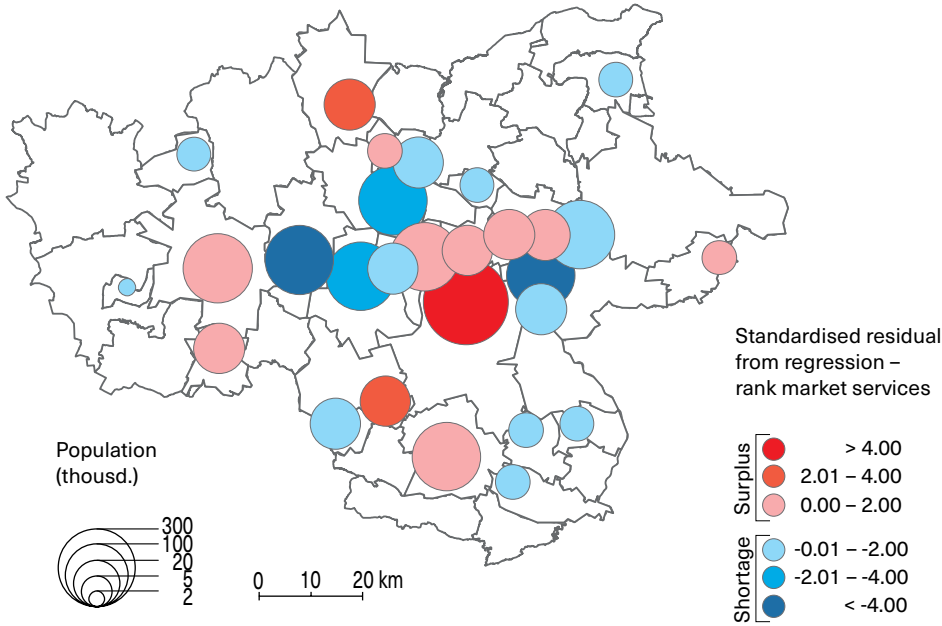


Fig. 35. Surplus and shortage of market services in GZM in 2020
Source: own research A. Sobala-Gwosdz as part of the OPM IRMIR team (▶ Report on the Position of Cities as Central Centres (Sobala-Gwosdz 2021)).



their economic position the most. In addition, almost all municipalities on the outskirts of the metropolitan area have increased their share in the metropolitan economy, being the beneficiary of suburbanisation processes and the effects of the growth poles spreading through infectious diffusion. Characteristically, the position of medium-sized, strongly monofunctional cities (Knurów, Łaziska Górne, Lędziny, Bieruń) has weakened. The dynamics of growth in the eastern part of the metropolitan area was generally weaker. However, the role of four large cities of the metropolitan area decreased the most – in the light of the share transfer rate: Zabrze and Ruda Śląska did so moderately, while Bytom and Sosnowiec were the strongest (fig. 36).

The picture that emerges from the analysis and triangulation of various indicators and methods is quite clear. The main centre of growth, the most powerful 'engine' driving the economic development of the metropolitan area, is the main pole of growth that was created in the central part of the metropolitan area, including Katowice and Chorzów. In the west of the metropolitan area, the economy is driven by the Gliwice pole, which is particularly important due to its high level of innovation. Importantly, these two drivers of the metropolitan economy are complementary. In the south and east of the metropolitan area, the centres of growth are highly specialised in the manufacturing industries of Tychy and Dąbrowa Górnicza. In the external zone of the GZM, two multifunctional powiat cities – Tarnowskie Góry and Mikołów – are important centres of concentration and dynamism. The role of other large and medium-sized core cities can be described as 'supporting'. The majority of them have experienced a phase of deep deindustrialisation of traditional industries over the last 30 years (or remain strongly specialised in them, such as Ruda Śląska). It is possible that some of them will always be cities with a predominant housing function in the medium and long term. However, the need to strengthen some of their economies (especially Bytom) is one of the basic conditions for spatially sustainable development of the metropolitan area. It is impossible to activate the northern part of the GZM without creating (or rebuilding) a strong growth pole in this region. We are fully aware that this is a major challenge, but one that must be faced.

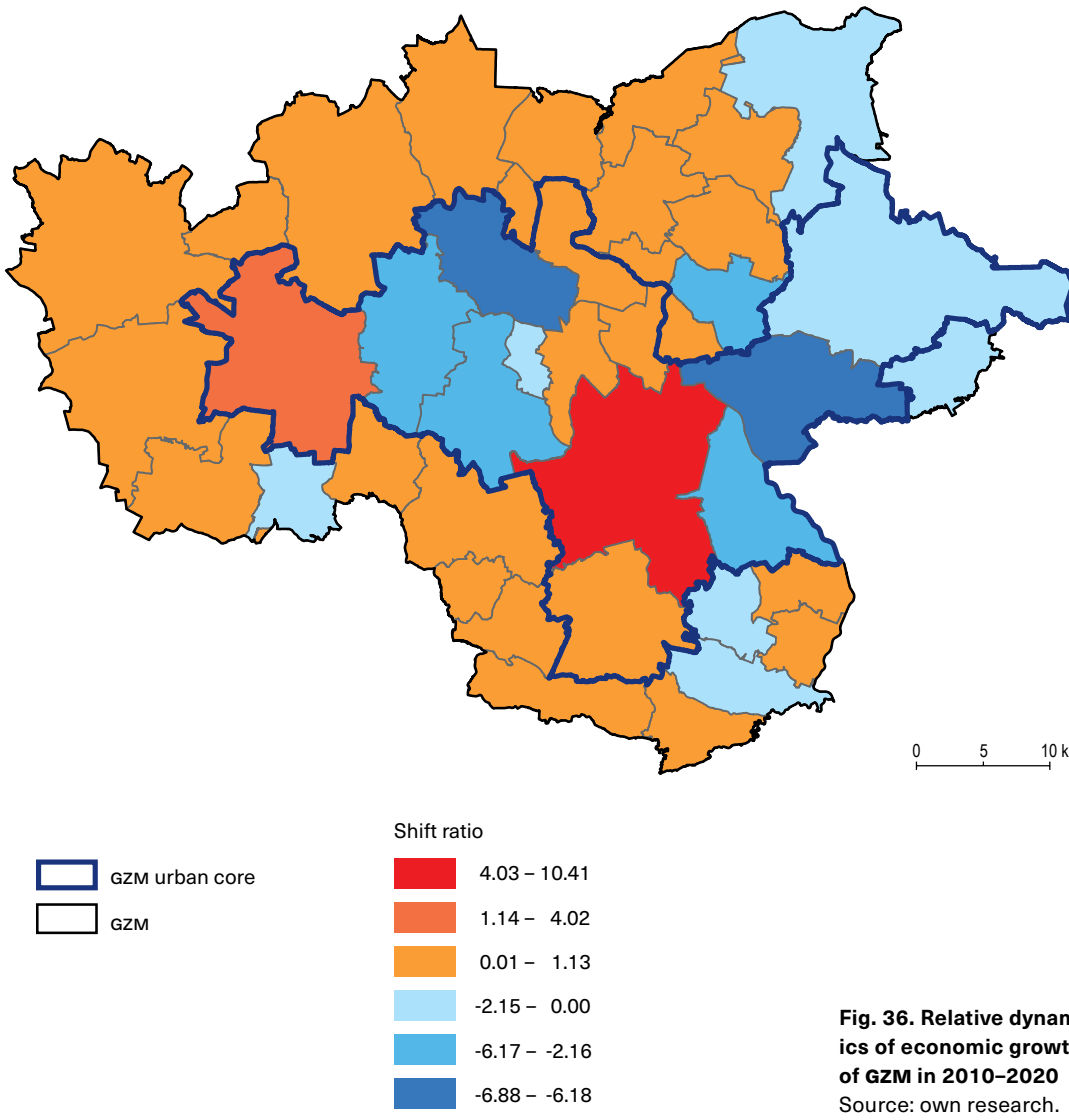
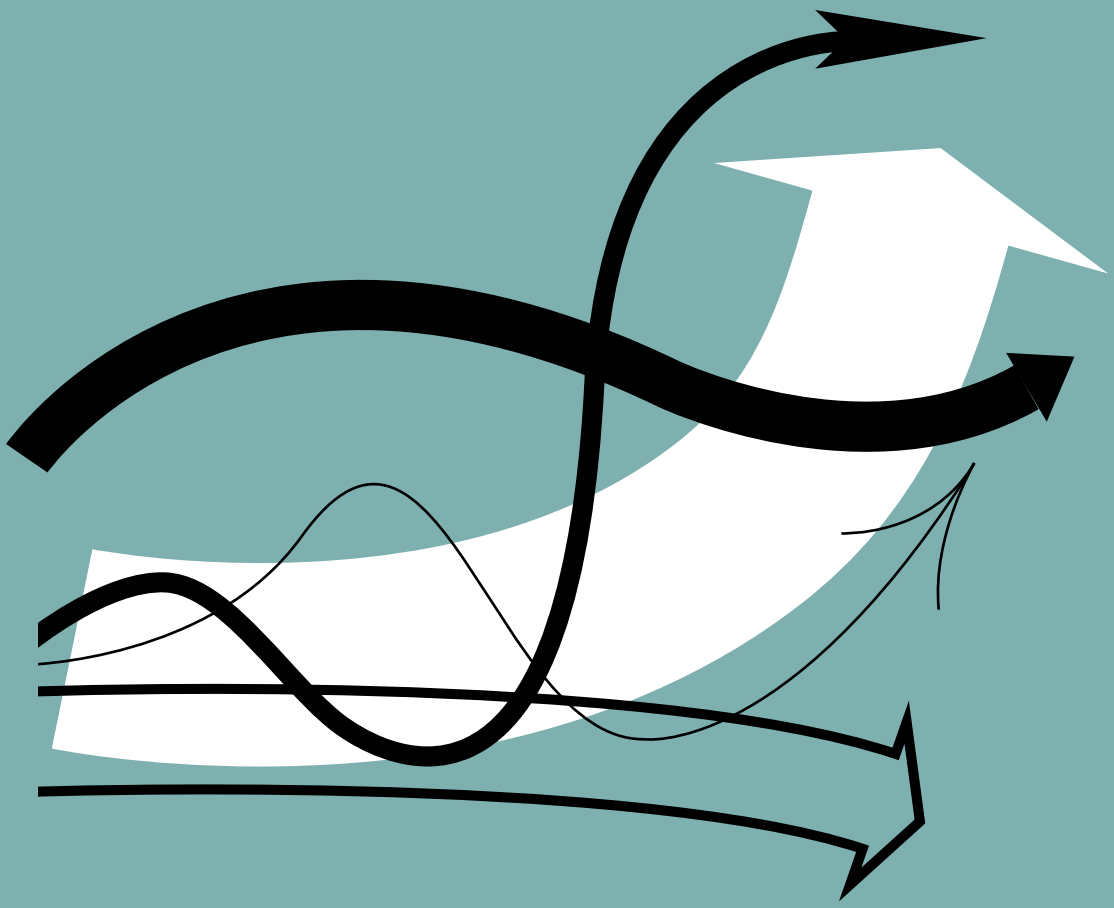


Fig. 36. Relative dynamics of economic growth of GZM in 2010–2020
Source: own research.

chapter 9 **Conclusions**



The GZ Metropolitan Area in terms of the absolute size of its economic potential, regardless of the metric, be it the number of employees, number of companies, fast growing small enterprises, or headquarters of companies, is the Polish metropolitan area with the greatest economic potential after that of Warsaw. On the other hand, the 'density' of this potential, related to the number of inhabitants, still ranks it decidedly lower than the monocentric Polish metropolitan areas with older traditions of urbanity (Poznań, Kraków, Wrocław and Gdańsk).

Compared to other supra-regional metropolitan centres, the GZM is distinguished by a high share of competitive manufacturing industries. Most are new industries in which the region did not have a great tradition before 1989 and partially modernised branches of traditional industry for the region. Many cities of the metropolitan area (measured by the number of business entities) specialise in medium and high technology industry, while a couple (Gliwice and Katowice) specialise in knowledge-intensive services. As a result of sectoral changes, services already cover 70% of GZM employees, although the role of industry, measured by added value, the share in the economic base and metropolitan functions of innovation, is still significant. A competitive manufacturing industries, along with related business services and the IT sectors, form the basis for the economic competitiveness of the metropolitan area.

The number of inhabitants in the modern GZM has been decreasing for nearly thirty years. So far, however, depopulation has not been accompanied by a loss of economic potential and creative drive, so in no case can the GZM be considered a shrinking region in the classic sense of the term. During the decade 2010–2020, which has been analysed in detail in this study, the metropolitan area as a whole was an area of absolute economic growth regardless of the measure adopted. However, these dynamics show very strong spatial variation inside the GZM, and the areas of growth are accompanied by areas of stagnation. A rarely emphasised and important process on the way of transformation from an industrial agglomeration to a (post-)industrial metropolitan area is the increase in the professional activity of its inhabitants, especially women. Nevertheless, the labour force participation rate is still lower than in other leading metropolitan areas.

New economic functions are continuously embedded in the metropolitan area, which increase its diversity and complexity. In addition to the GZM's distinctive ability to achieve reindustrialisation

and advanced production, the region has become a significant Polish centre for the IT industry. The integration of industry, hitherto resource and market-independent advanced industry (and logistics) in the IT sector, which has been progressing for several years, creates a great opportunity for the rapid development of a new, technologically advanced industry of service and product providers, known as Industry 4.0. The metropolitan area, thanks to the concentration of competitive economic entities and the activities of public institutions, has created an ecosystem supporting the development of Industry 4.0 (SAAM cluster, SINOTAIC cluster, Industry 4.0 Center at the Silesian University of Technology) quite early compared to other regions, thanks to which it is becoming the leading region in Poland in this promising direction of development. In the metropolitan area, other dynamic economic activities have developed in the last two decades, in particular logistics services, creative sectors (distinguished award-winning architectural offices and design studios) and the meetings and events industry – unfortunately slowed down by the COVID-19 pandemic.

Economic development, on the one hand, and deindustrialisation, on the other, have contributed to a significant change in the spatial organisation of economic activities in the metropolitan area and thus to a change in the functional relations between cities. Of course, the GZM remains the most polycentric metropolitan area in Poland, but a strong central business district (CBD) has developed within it, including Katowice, spilling over into neighbouring Chorzów.[33] The metropolitan CBD (Katowice–Chorzów) includes more than 90% of the modern office space in the metropolitan area, more than 86% of persons working in modern business services, 34% of the headquarters of the largest companies, which is many times more than the shrinking population potential of this area. In total, the ongoing process of metropolitan development of the CBD resembles the emergence of a central business district previously described for large American metropolitan areas, and the metaphor of 'the GZM city with

33
CBD (*Central Business District*) is a central business district, a central part of the city, which is mainly home to institutions related to trade, services, and the headquarters of large companies.

its CBD in Katowice' is close to the actual situation.[34] This is also confirmed by the service preferences of the inhabitants of the metropolitan area (see Kłosowski 2019).

On the outskirts of the core of the metropolitan area, strong, specialised fields of industrial activity have developed and are growing, where competitive branches of the manufacturing industries are located. These are sometimes connected with logistics centres, which prefer, above all, the proximity of major road nodes. The largest zones of this type include Gliwice and Tychy, as well as Dąbrowa Górnicza and Sosnowiec – the latter largely in post-industrial areas. New clusters of industry and logistics in post-industrial areas are also noticeable, where, in addition to the cities of Zagłębie, they are also found in Chorzów and Zabrze (near expressway DTŚ) and Siemianowice Śląskie. The core cities of the metropolitan area have also become attractive locations for numerous shopping centres, about half of which were built in post-industrial or degraded areas.

Two strong technological poles have developed in the metropolitan area. The first includes Gliwice, and the second Katowice and its neighbours (which have less potential) Mikołów and Tychy. The development of new economic competences and metropolitan specialisations has so far been quite spontaneous. It is most important to note its strong dependence on the internal potential of individual centres and their market-competitive position. In total, this process led to an increasing concentration of new competences in Katowice, with partial leaching from other centres. On the one hand, these processes have led to the self-propelled development of some industries due to the benefits of concentration; however, across the whole metropolitan area, the lack or low dynamics of new competences causes a strong polarisation of its development. As an example of the activities undertaken in the Rhine-Ruhr Metropolitan area, it is necessary to consider the conscious shaping (embedding) of competences in the metropolitan

34
Let us note that the tradition of referring to processes and ideas drawn from the United States is strongly embedded in the tradition of Katowice. One only has to refer to, for example, narratives related to the modernist architecture of the 1930s ('Silesia as the most American district of Poland'), and even – paradoxically – socialist modernism. The famous skyscrapers, whose shape resembles corn cobs, in the Osiedle Tysiąclecia (estate area in Katowice), designed by Henryk Buszta and Aleksander Franta, were clearly inspired by the Marina City in Chicago (see Kozina 2009, 2019).

Photo 10. Katowice – spring in the Culture Zone.
Author: Krzysztof Malinowski

area which will act as local growth centres. Multifunctional centres located in post-industrial facilities, for which China Park in Katowice, Nowe Gliwice or Fabryka Pełna Życia in Dąbrowa Górnicza can be a model, have the greatest potential in this respect. These activities should mainly be carried out in a public-private partnership.[35]

9.1. Areas requiring support

The central and northern Upper Silesian part of the GZM core. Historically, this includes the earliest and most industrialised areas of the metropolitan area (Bytom, Zabrze, Świętochłowice, Ruda Śląska, Piekary Śląskie, Siemianowice Śląskie, the northern part of Chorzów), where economic and population development peaked in the 1970s. After 1989, this area, previously strongly monofunctional, with a heavily decapitalised infrastructure and degraded environment, experienced profound deindustrialisation (with the exception of Ruda Śląska, which remains the last major GZM area heavily dependent on mining). This was not accompanied by sufficiently strong reindustrialisation incentives, and the tertiarisation of the economy was not a sufficient stimulus to break the negative development trends. The main problem in this area is the persistence of a trend negatively impacting development, driven by the outflow of demographic potential and generally the weakest quality of human capital in the entire metropolitan area (comparing the results of students' levels of achievement), low-income generating potential of local governments, low endogenous potential, and low external interest in capital investment (with the exception of Zabrze, which has been consistently rebuilding its economic base). The pressures spreading from the main growth centres contribute to some extent to economic regeneration (Chorzów, Siemianowice Śląskie, Zabrze), and the dynamic effects of good transport accessibility after the construction of the road infrastructure (re-urbanisation along the DTŚ and new logistics centres in the A1 highway neighbourhood) are slowly emerging. However, without the entire metropolitan area being coordinated on a large scale (including the stagnant municipalities of Zagłębie) in a comprehensive regeneration and renewal action, this area of the metropolitan

35
Potential locations for such multifunctional centres could be EC Szombierki in Bytom, Stara Ręźnia in Chorzów or Stara Fabryka Mararyny and the Franciszek shaft in Ruda Śląska.

area, which requires the greatest support, is unable to break out of the loop in the negative development spiral using its own internal resources. Funds related to the Fair Transformation of Coal Regions create a great opportunity for such regeneration.

The Zagłębie part of the core of the conurbation. After 1989, this part of the metropolitan area underwent profound deindustrialisation. Apart for Dąbrowa Górnicza, this resulted in an almost complete disappearance of the traditional sectors – mining and metallurgy. Reindustrialisation (mainly Dąbrowa Górnicza and Sosnowiec) and servitisation of the economy only partially compensated for the lost jobs. Apart from Dąbrowa Górnicza, whose economic basis is strongly shaped by competitive traditional and new industries, this subregion of the conurbation has generally weak growth dynamics, stagnation in many areas, and even absolute regression in some metrics. Nowadays, the key determinant affecting this state of affairs is the demographic situation, above all depopulation and population ageing. The majority of taxpayers in this part of the metropolitan area are pensioners. Compared to the Upper Silesian area, the region is characterised by more entrepreneurship, but this does not significantly translate into dynamic growth of new advanced activities. The restructuring of the economy of this part of the metropolitan area is mainly based on less knowledge-based sectors (trade, logistics centres) or labour-intensive segments of more advanced activities (production of parts and motor vehicles).

Northeastern periphery of the metropolitan area. The common feature of this rural area is the strong entrepreneurship of the inhabitants. However, the economic entities operating there are almost exclusively micro-enterprises in traditional sectors with low potential for growth and innovation. It also has the lowest absorption of resources for innovation and a negligible number of economic strengths. Its problems, given its small share in the population and economic potential of the metropolitan areas, can be marginalised. The growth potential of this area continues to weaken the neighbourhood with the economically stagnant urban complex of Zawiercie.

Locally, the areas requiring support (measures to diversify the economy and improve the quality of the housing environment) remain strongly monofunctional medium-sized cities in the conurbation, especially from the perspective of the closure of coal mines in the GZM area. An important direction of intervention, combining

spatial and economic objectives, should be the development of an optimal model of sustainable suburbanisation in rural municipalities and re-urbanisation in the cities, taking into account the economic, social and landscape values of land and the degree of territorial fragmentation.

9.2. Challenges for the further economic development of the metropolitan area

Over three decades of deep transformation the territory of the contemporary GZM turned out to be a region much more capable of competing in the market and the international economy than the analyses in 1990 predicted. New paths of industrial development have been created in the region. The years 2015–2019 were a period of rapid development of the metropolitan economy, during which the real revenue earned by companies, residents and local governments increased by ⅕.

The multiple challenges that have arisen both in relation to general megatrends (climate change, accelerating technological progress), unforeseen events (COVID-19 pandemic), as well as resulting from the internal processes of GZM (depopulation and ageing of the population and old and new areas of multiple deprivation), necessitate the initiation of a new wave of regional transformation. Economically, this will involve energy transformation (more RES in the energy mix, the first national nuclear power plant) and the phasing out of the mining industry by 2050 (see e.g. M. Bukowski 2018), far-reaching transformations of energy-intensive industries and the automotive industry (electric and hydrogen drive, new materials and mobility strategies), new work models (possible radical dissemination of remote work) that will affect the development of the modern business services and the ICT sector. The acquisition of human capital, including creative capital, in the face of unfavourable demographic trends and the relatively low appeal of metropolitan universities, both nationally and internationally, will represent an increasing challenge.

Despite the great challenges, however, the GZM is not doomed to failure or stagnation. Economically, the metropolitan area has the potential to initiate new industrial paths, thanks to a very varied technological and industrial portfolio. New value chains can be initiated both through the continuous modernisation of traditional industries, further products, processes, and competence advancements of companies operating in European production networks or open innovation,

as well as the emergence of completely new business models as a result of the digitisation of the economy and the development of leisure services. The metropolitan area has the appropriate creative, entrepreneurial, and expert potential to explore these paths, supported by the wise assistance of higher-level authorities.

Above all the challenge is – in the face of the current environmental, technological, and demographic megatrends – to change the thinking about the economy of cities and regions. According to H. Stegeman (2021), if we want to transform our economy into a sustainable, regenerative, more resilient, and inclusive economy, we need to rethink the concept of growth. *Growth should mean much more than just economic growth.* Researchers involved with the think tanks of leading international organisations (including the UN, OECD, and EU) are undertaking the first attempts to construct new measures that adequately describe the position of individual territories in the post-growth era. For example, the EU is developing the 'Beyond GDP' initiative, which aims to develop indicators that are as clear in design, synthetic and as attractive as the GDP measure that is currently used (and increasingly criticised) but take greater account of the environmental and social aspects of progress. According to T. Jackson (2019), the key is the reflection on what we want the new economy to look like in an era of economic contraction or broader growth, and what activities may be the basis of its productivity. The GZM, due to its difficult experience of deindustrialisation and, at the same time, large internal expert and reflective potential, is created to generate ideas and solutions to these issues as they are crucial for the reconstruction, maintenance, or growth of the well-being of its inhabitants.

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