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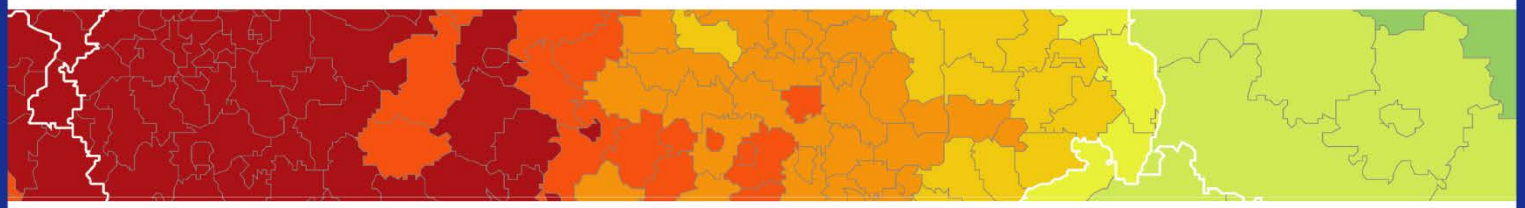

MISTA
Metropolitan Industrial Spatial Strategies & Economic Sprawl

Targeted Analysis

Annex 3.7
Case study report: Warsaw (PL)

Annex 3.7 – Case study report: Warsaw (PL)

This targeted analysis activity is conducted within the framework of the ESPON 2020 Cooperation Programme.

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Abbreviations

AA	Agglomeration Areas
ARDECO	Annual Regional Database of the European Commission
COVID-19	Coronavirus disease 2019
DG REGIO	Directorate General for Regional and Urban Policy
EC	European Commission
ELFS	European Labour Force Survey
ESPON	European Territorial Observatory Network
ESPON EGTC	ESPON European Grouping of Territorial Cooperation
EU	European Union
EU 15	European Union countries that were member states prior to 2004 (incl. UK)
EU 13	European Union countries that joined after 2004
FDI	Foreign Direct Investment
FUA	Functional Urban Area
GDP	Gross Domestic Product
GVA	Gross Value Added
HR	Human Resources
IAB	Institut für Arbeitsmarkt- und Berufsforschung, Die Forschungseinrichtung der Deutschen Bundesagentur für Arbeit (Institute for Employment Research, The Research Institute of the German Federal Employment Agency)
ICT	Information and communication technologies
ISTAT	Istituto Nazionale di Statistica (Italian National Institute of Statistics)
JRC/EC	Joint Research Centre of the European Commission
LAU	Local administrative units
KIBS	Knowledge intensive business services
LQ	Location quotient
MISTA	Metropolitan Industrial Spatial Strategies & Economic Sprawl
MR	Metropolitan Regions
NACE	Nomenclature of Economic Activities for Statistics
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
POLIMI	Politecnico di Milano
R&D	Research and Development
SME	Small and medium-sized enterprises
SBS	Structural Business Statistics
SWOT	Strenghtens, Weaknesses, Opportunities and Threats
US	United States
WIFO	Austrian Institute of Economic Research
WIOD	World Input Output Database

Executive summary

Since Poland entered the European Union, its economy has enjoyed sustained growth with some thanks to a strong manufacturing sector. The City of Warsaw has evolved into a centre for services and finance and exchanged factory workshops for office blocks. This has resulted in moderate population growth reaching 1.78 million people by 2018 and an impressive reduction in unemployment from 13.5% in 2002 to 1.9% in 2018. Prosperity has brought with it increased labour and land costs. In turn traditional large-scale production and manufacturing activities, including vehicle assemblage and food production, have closed down, moved out to surrounding areas of Warsaw or even further away. Former industrial sites have made way for housing and offices. Housing has recently been the main priority for developers which is fuelled by a long housing shortage in the capital and Warsaw's services economy, containing the largest office centre in Central-Eastern Europe. In the meantime, little attention has been given to diversifying the local economy of the city.

Warsaw is now in danger of the economy shifting too far into the services sector, bringing high real estate prices at the city scale. At the metropolitan scale, where the share of industry is still similar to the Polish national average (22% of the GDP), dispersed low density development unsuitable mobility infrastructure is resulting in mobility issues. However, there are two fundamental challenges to the modernisation and competitiveness of its industrial activities. Firstly, land values and labour costs vary notably between the centre and the edges of the metropolitan area. Businesses may have much to gain from acting at a metropolitan scale combining the advantage of the core city as a knowledge hub and the cheaper land and labour force of the environs. Until now there has been little territorial economic cohesion amongst the 70 municipalities that make up the metropolitan area. Secondly, there has been little interaction between researchers (universities), businesses and the public sector which is stalling opportunities for innovation that could support the services sector. Innovation could focus on remaining activities such as pharmaceuticals, aerospace and electronics. These two issues are lying dormant while unemployment levels are low and economic activity is positive. Yet the employment landscape could change quickly due to international economic dynamics or sudden adoption of work saving technology (such as artificial intelligence and automation) also in the service sector. The latter is particularly a relevant threat in the financial service sector, with some projections anticipating a 40% lay-off of the current staff.

The City of Warsaw (and district municipalities of the city) currently has limited access to financial and real estate capital or planning instruments to influence real estate trends. Land ownership is highly fragmented while larger developable land is state owned and inaccessible to the city. The spatial planning system is also not effective. Several legal mechanisms are in place that weakening the municipalities' capacity to enforce zoning plans and thus protect land for industrial activities. This is particularly true for areas of Warsaw where there is a strong competition for developable land. Beyond the city centre, the availability of land and prices are far more accessible. However skilled and especially knowledge workers are still concentrated

in the city. The mismatch of labour demand and supply is also reflected in the problem that while the most prestigious technical universities are located in Warsaw, the work opportunities for technical professionals are scarce within the city. This should provide an incentive metropolitan cooperation.

Planning strategy is not yet formally aligned across the larger urban area. The municipalities of the metropolitan area have not developed a common economic vision yet and until now there is no formal body that operates at the metropolitan scale. This means that any cooperation is voluntary, and municipalities are largely motivated by self-interest, driven particularly by the taxation regime. The net result is incoherent development which does not favour economic development on regional level and risks that Warsaw metropolitan area lags behind other Polish and European city regions. Recently the Integrated Territorial Investments partnership (ITI), has brought together 40 municipalities to collaborate on infrastructure investment which is showing the capacity for informal collaboration and which has been a positive experience for the affected municipalities. Irrespective of the official institutional conditions at a metropolitan scale, the municipalities require a suitable framework for cooperation and to avoid seeing economic development as a zero-sum game.

Through defining a metropolitan scale economic agenda, it will be clearer how to distribute business across a larger area to ensure that activities fit the context. This could allow investment priorities to occur while also strengthening the external investment potential for the larger region. Pooling resources can also result in fusing knowledge and expertise to ensure that the smaller municipalities make well informed decisions. Furthermore, infrastructure development could ensure that large but necessary investments can be made that will benefit the larger metropolitan area.

This research project has revealed several good initiatives in Warsaw and in other metropolitan areas, which can also guide the municipalities of Warsaw and its environs in the process of building stronger cooperation in the field of economic development. The City of Warsaw has introduced a new method of participative planning workshops to develop local spatial development plans including all the affected stakeholders in the planning process, particularly but not limited to landowners and developers. The method aims to establish a consensus between the varying development interests especially concerning the larger available developable lands where industrial activities can be still maintained even in the form of mixed-use developments.

The establishment of a metropolitan scale development agency could provide substantial benefits for the whole region. As the example of several Polish city regions, among them Krakow and Wroclaw, shows such organisations can contribute to the metropolitan scale economic development by attracting foreign investments, supporting local SMEs, through enhancing capacities to attract EU funds and boosting innovation by strengthening the collaboration between public authorities, businesses and research organisations (universities). In order to enhance the competitiveness of the Warsaw metropolitan area, it seems to be

important to support the development of innovation clusters even across the boundaries of the communes (the municipal level) which would require more active public role in land policy. As the research has pointed out one potential area could be the current Chopin Airport, which could be turned to a technology park after the construction of a new airport. This kind of development could efficiently diversify the economy at metropolitan scale and render it more resilient.

This research project has also examined the employment structure of production sectors in the city region. Regarding the structure of the production branches in terms of the share of employment relative to the national average, the most important branches at a metropolitan scale are related to the wholesale and logistics sectors. These sectors also prove to be the most important strongholds in the Warsaw metropolitan region, meaning that they are well-embedded and localised in the regional economy. The fastest growing branches are smaller ones in terms of employment, which may refer to ongoing structural changes in the region. In Warsaw consumer goods production, particularly food production belongs to this category whereas in the environs this applies mainly to medium and high-tech manufacturing. Branches with high potential growth in the future also include smaller ones associated with high and medium tech industries. In this way, the research also suggests that cooperation between Warsaw and its environs could provide substantial returns to the whole region in terms of strengthening existing technological networks and fostering future development.

The results of the interviews and statistical analysis were presented to local stakeholders in a ‘futures workshop’ held in November 2020, in order to gauge their feedback of the portrait that emerged through the MISTA project research and to also contribute feedback on development opportunities. The stakeholders (representing various departments of City of Warsaw, other municipalities, the regional marshal office, and the national development agency) stressed a number of key points. The importance of moving towards stronger collaboration at metropolitan scale and the need for more industrial development has been confirmed by most of the stakeholders. However, concerns have also been raised especially related to obstacles to use land for industrial development, such as crowding out more profitable development, the high cost of decontamination of brownfields and the scarcity of larger developable land in the city. Interest in continuing and broadening the collaboration started in the framework of ITI has been also expressed as tangible results have already become apparent for the stakeholders. Nevertheless, challenges to cooperation have also been listed, amongst other things, that a long-term perspective is necessary to build up cooperation and improve economic development, despite municipalities being driven by shorter-term gains. More knowledge is also needed on how the costs and benefits of metropolitan level cooperation are distributed across municipalities.

The main conclusions of the case study can be summarized in the SWOT table below:

Table 1: Results of the SWOT analysis.

Strengths	**Weaknesses**
▪ A strong economy. ▪ Strong centre for finance. ▪ Significantly cheaper land and labour costs, located on the edges of the metropolitan area (15-30kms away). ▪ The “planning workshop” approach introduced by the chief architect of Warsaw. Participative local spatial planning workshops led by the City of Warsaw. ▪ Warsaw's experience with innovating with the ITI instrument. ▪ Good experience on collaboration between communes.	▪ Many small public authorities, fragmented planning. ▪ Lack of affordable housing. ▪ A development market that favours housing and office space. ▪ Large amounts of low-density housing, making it hard to create clear buffer spaces. ▪ Lack of large, contiguous development sites. ▪ Brownfield sites that are available are likely to be highly contaminated. ▪ A lack of suitable infrastructure (transport & utilities). ▪ Infrastructure costs are shared with public authorities (this could pose a problem for new projects if there is poor infrastructure). ▪ Poor link between (university) research and business.
Opportunities	**Constraints**
▪ A metropolitan scale development agency that can help consolidate interests and create priorities. ▪ The current airport site, planned to be relocated. ▪ Building on positive experiences of the municipalities collaborating in the ITI (Integrated Territorial Investments) which includes only 40 communes. ▪ A high level of manufacturing at a metropolitan level 22% (despite much lower within the city centre). ▪ The existence of some high-value, high skilled manufacturing (pharmaceuticals, aerospace and electronics). ▪ R&D collaboration with the technical university. ▪ Mixed use development for new projects (including industrial uses). ▪ Good working relationships with local government.	▪ Very low unemployment - showing likely staffing challenges. ▪ Lack of economic vision. Unclear what kinds of activities to prioritise. ▪ No formal metropolitan governance structure. ▪ Higher labour costs in Warsaw than other cities. ▪ The focus on logistics (profitable but low-value). ▪ State owned industrial or army land that local actors cannot control. ▪ Limited capacity of public actors to improve competitiveness and modernise older businesses. ▪ Limited opportunities for skilled and knowledge workers in manufacturing. ▪ Lack of priority for manufacturing. ▪ Taxes favour residential activities rather than businesses. ▪ Limited influence of the communes on the taxes, except of land tax.

Source: ESPON MISTA (2020).

1 Introduction

The MISTA project aimed to develop an understanding of the current contrasted and complex relationship between the city and industrial land, manufacturing and productive activities. The project does so through producing an updated and critical understanding of how the sector has evolved over the last decades across Europe and in particular in large urban areas.

The project intends to support (re-)developing a strategic relationship with manufacturing and production systems within the contemporary urban economy and life. In this perspective, the project aims at considering critically the complex debate on the consequences of deindustrialization and changing of the urban economic base. In doing so it heavily builds on the experiences of the seven stakeholder cities/urban areas (Berlin, Oslo, Riga, Stuttgart, Turin, Vienna and Warsaw).

In Warsaw intensive research and consultation activities were conducted between October 2019 and December 2020. Firstly, a questionnaire was prepared by the research team and filled in by the local stakeholders in November 2019. This was followed by an online interview with the main representatives of the city and urban area in December. On the basis of the desk research, data analysis, the results from the questionnaires and interviews, a summary paper has been elaborated. This served as a starting point for the extensive, 3-day long mission in February 2020, where MISTA researchers visited Warsaw and conducted a series of on-site discussions with the local stakeholders. As a result, the first draft of the Warsaw case study report has been prepared by May.

According to the original plans this report should have been validated by an on-site futures workshop in Warsaw in the course of May-June 2020. However, COVID-19 made this impossible, thus the workshop had to be postponed to October and even then, could only be organised online. Despite this difficulty, the half-day long workshop gave a good opportunity to critically revise the statements of the report and also gave the possibility to further develop it in a co-creative way, using inspirational cases as the basis for creative, future-oriented thinking.

The final results of the city case studies are used in the MISTA project in two major ways. Firstly, a comparative analysis has been included in the main text of the final report. Secondly, city case study reports are annexed to the final report as self-standing descriptions and critical discussions of the case of the given city/metropolitan area.

The Warsaw case study report on the following pages summarises all the knowledge gathered in the different activities during the one year of the research. The report does not intend to provide ready-made suggestions for the city, as the local stakeholders are very well aware of the local situation – even if different local actors have different viewpoints in some issues. MISTA rather aims to investigate the transferability of the major statements distilled from the comparative analysis, and the potential validity of inspiring practices of innovative metropolitan areas of the EU, taking into account the particular local conditions of the Warsaw metropolitan area.

As mentioned, the MISTA research has been conducted under very special circumstances, dominated for more than half of the time by the restrictions caused by the pandemic. The spread of COVID-19 has impacted not only the workflow and organisation of the project, but also in a more fundamental and challenging way the relevance of the results when the socio-economic fallout becomes more apparent. The empirical data, the interviews and also the site visits reflect the situation before the pandemic. Moreover, the longer-term effects of the pandemic, the changing context for industrial areas and manufacturing, are not fully known yet, there are only different hypotheses raised which are partly contradicting each other. From all these it follows that the MISTA report cannot address the most recent challenges and opportunities presented to the urban areas and to the local manufacturing and production activities.

The Warsaw case study report begins with the description of the state of manufacturing in the city region. This is followed by the evaluation of the potential of productive sectors, based on sub-sectoral data analysis. The next section summarises the outcomes of the futures workshops. The main body of the report is followed by an annex, including further details of the data driven SWOT analysis.

2 State of manufacturing in the city-region

2.1 Main demographic/social and spatial development trends

Population of Warsaw was 1.78 million in 2018[1], which meant a moderate, 5 % increase since 2001. However, other non-official statistical data shows higher number of inhabitants estimated around 2.1 million people as city users (some 150 thousand people not registered people, and data from service companies such as sewage, etc. show over 2 million people).

The last Master Plan[2] of the city was made in 2006 and it envisioned 3.5 million inhabitants in the future, based on the huge amount of available land and the fact that the share of the capital city to the country is one of the lowest in Europe, both in terms of population and GDP (5% and 10% respectively) despite that the surface area of the city is one of the largest in Europe, 517 sq. km. Thus, there is huge room for more concentration.

Although this forecast was too optimistic, the migration balance is positive for the city as the inflow to the city is higher than the outflow. Thus, migration can be regarded as main source of population growth. As for migration significant number of immigrants have arrived from Ukraine, Belorussia, but also from further away countries. The population of the city is relatively young. The new Master plan being currently under elaboration, counts with 2.5 million city users by 2050.

Regarding employment, the present situation in Warsaw is good, unemployment is only 1.3%, and there is labour shortage in some sectors requiring basic skills, skilled workers (e.g., hotels, services). In 2017 the number of work permits issued for people from outside EU was 35 thousand, while in 2019 over 130 thousand, in a city of 1 million employees. 90% of the 3-year work permits was issued to Ukrainians. Migrants from Pakistan and Bangladesh are also increasing in numbers. The low level of unemployment in Warsaw, which practically means shortage of labour especially low skilled workers, is connected to the lack of (affordable) housing.

In the last decade significant housing construction activities have been going on in the city despite the officially moderate population growth. Since 2011 averagely more than 10 thousand units were built annually. The housing shortage inherited from the socialist past was a main reason in addition to the fact that the number of actual inhabitants might have increased faster than the official data shows. Besides housing, office building construction also heavily formed the city's landscape by creating new monofunctional office districts, which recently is seen as a less positive development.

[1] Source: https://bdl.stat.gov.pl/BDL/dane/teryt/tablica

[2] Master Plan is called „Studium uwarunkowań i kierunków zagospodarowania przestrzennego" in Polish (Study on the conditions and directions of spatial development).

Metropolitan area

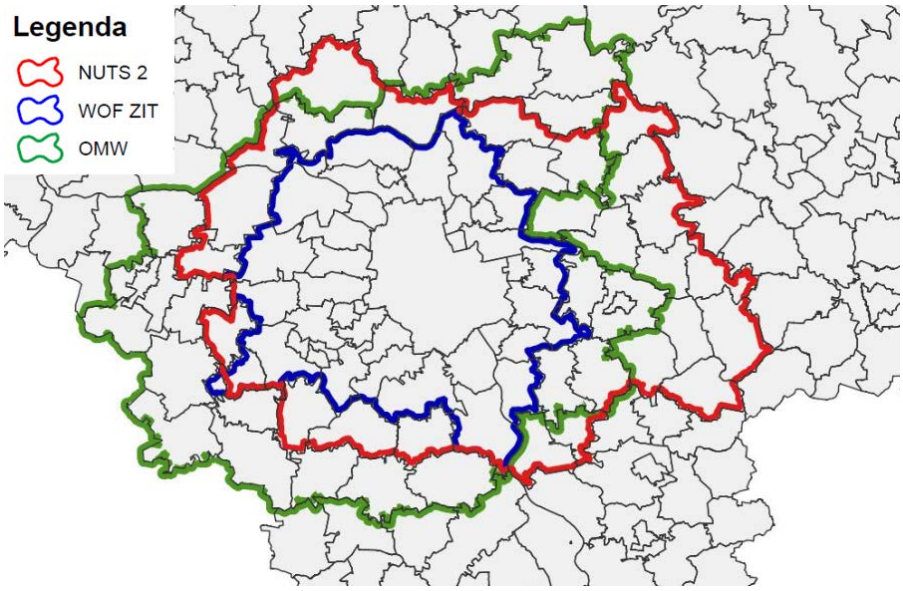
There have been several different delimitations of the metropolitan area of Warsaw. The former metropolitan area was officially determined in 2006 and consisted of Warsaw and 71 communes located in 13 counties. However, from 2018 a new delimitation came into force which divided the Mazovia voivodeship (the former NUTS2) into two NUTS2 regions, one comprising of Warsaw and its surroundings, now named Warsaw Metropolitan Area (WMA) while the other NUTS2 region is the rest of the Mazovia voivodeship (province). The new WMA comprises of 69 communes (in 9 counties) besides Warsaw. As the map below shows several communes on the western part were detached from the previous metro area and others in the East were attached to the present one.

The idea of changing the previous functional delimitation of the WMA was put forward for practical reasons, namely, to enable the rest of Mazovia voivodeship to get access to EU funds on larger scale. Warsaw and its surrounding communes have significantly higher GDP per capita than the rest of the voivodeship but being in the same NUTS2 region the average indicators were higher also for the poorer parts of the region. Splitting the region has made it possible to separate that part of the region that should still receive the EU support.

The present WMA, which is a NUTS2 region at the same time, has around 3 million inhabitants and covers 6104 sq. km. Nevertheless, the WMA is only a statistical category and does not have any governance structure. Furthermore, it does not cover the real functional urban area, which goes more to the West and South from Warsaw (they are also the richer communes). Nevertheless, in the future this WMA will be the subject of metropolitan cooperation. The government has been also considering splitting the current voivodeship into two according to the NUTS2 division. This would have a very negative effect on Warsaw and its metropolitan area as it would mean that they should pay higher financial contribution to the government to finance the poorer voivodeships in the country. Consequently, this plan is highly criticized by Warsaw.

It is also worth mentioning that in the 2014-2020 programming period the EU funded Warsaw ITI (Integrated Territorial Investments) includes only 40 communes (with 2.7 million inhabitants) planning together major EU funded infrastructure developments. ITI does not have any official organisational structure either, it is led by a steering committee consisting of representatives of the affected municipalities. Nevertheless, the cooperation was good between the communes, and ITI is still regarded as a successful collaboration.

Map 1: Different delineations of the metropolitan area.



Borders of the new "capital" NUTS 2 area (red), the ITI area (blue) and the Warsaw Metropolitan Area (green) according to the previous delimitation.

*Table 2***:** *Main characteristics of Warsaw city and Functional Urban Area*

	Warsaw City			**Warsaw FUA***	**Warsaw Metropolitan Area****	
	2001	**2011**	**2018**	**2011**	**2016**	**2018**
Population	1 688 972	1708 491	1 777 972	3 037 856	3008 478	3 057 544
Unemployment rate	13,5 (2002)		1,9	N/A	3,7	2,4
% of mining, energy and manufacturing in employment (NACE 2)	16,6	9,1	N/A	N/A	N/A	N/A

**Source: Urban Audit. The FUA is defined as the commuter zone of the city, its population is close to that of Warsaw Planning Region*
*** Source: Statistics Poland. The Warsaw Metropolitan Area defined as the official delimitation came into force in 2018.*

2.2 Main trends in the development of the economy and manufacturing

Economic and manufacturing profile of Warsaw

In European countries and cities deindustrialization is still going on and manufacturing is around 5% of GDP. Today Warsaw is similar to London and other large cities with 2-5% share of industry. In the Warsaw Metropolitan Area, the share of manufacturing is 22%, similar to the Polish average (in the last years there was a slight increase nationally).

In Warsaw, after 1990, within the first 5 years of transition from socialism to market economy most of the large industries collapsed. Only a few remained especially in the car and machine industry, but lately also the majority of them have closed down, which is showed by that only one of the three formerly biggest factories is still in operation. The big car company FSO (the

successor of Polski Fiat) closed in the end of 2000s, the Ursus tractor factory finished its operation in 2019 and it is only the Steel Work Huta Warszawa that still operates. Other manufacturing in the city is food and electronic industries which also keep shrinking, for example Danone, a main player in food industry, left the city two years ago, and also the famous Wedel chocolate company located in Praga district was considering moving out their production from the city.

From the general trend of losing industry, the pharmaceutical companies might be the exception as these rely on high quality workforce. Also, more innovative industrial branches exist in the city though on smaller scale, such as aerospace and electronics industry.

As a novelty of capitalist development, since the early 2000s many shared services centres came to Poland. After Krakow, Warsaw is the second and Wroclaw is the third city for shared services whereas Warsaw is the largest centre of financial services in the country. On the other hand, not many manufacturing investors were coming to Warsaw (P&G was an exemption, coming to the only special economic zone of the city). The main reason is the cost of labour, which is much higher here than in other parts of Poland.

There are some successful new types of companies in Warsaw in the creative sector - such as CD producing, game industry (e.g. Whitcher), software industry or POLSAT TV studio - applying the most modern techniques, many of them also located in Praga district. These cannot be considered as production in the old meaning, but are important to employ highly educated people, like software experts, actors, graphic designers, etc.

The deindustrialisation also drastically changed the city structure. The way of privatisation effected this process was that the bankrupted socialist firms were bought mainly for the land. This led to quick changes in the former industrial areas, e.g., substantial part of Wola district was industry, now skyscrapers, while in Służewiec the third biggest concentration of offices in Europe (after La Defense and Canary Wharf) has been created as all industry was demolished and new offices were built. All these factors have led in spatial terms to monofunctional developments, such as large office and residential concentrations in previous post-industrial areas within the city (with still many brownfield areas existing).

Regarding the surrounding area of Warsaw several companies moved there from the city, but also new companies, including foreign companies settled there. The majority of new investments are green-field developments. Beside basic industries needed to supply the city and its agglomeration such as food industry also more innovation related industries such as chemical industry, creative industry is growing outside the core city. Logistic is high rocketing recently, the biggest logistic centre in Poland is in Blonie, a smaller town to the West of the city, where the municipality and also private developers facilitates the settlement of new logistic activities. The large logistical and industrial areas in green-field locations are 15-30 km away from the city centre. The agglomeration grows mostly to the western and southern direction of Warsaw, also because to East there is protected forest area. The main development issues between Warsaw and the surrounding communes are transport and road construction.

Main challenges and conflicts of future development in manufacturing

As the economy has recently been going strong, and the employment rate has reached an unprecedented peak with extremely low unemployment rate, a main challenge is to provide sufficient low-skilled workforce for the city economy, particularly in the service sector. The lack of labour force is very much connected to the lack of affordable housing inside the city, another major challenge that the city faces. Many people move out to the agglomeration in order to find more suitable housing. But commuting is problematic from the agglomeration, the transport system is underdeveloped, public transport connections are not sufficient, and roads are congested. That is why some people who can afford it also move back from the agglomeration to the city.

The process that industry, especially more traditional industry has left Warsaw is not conceived as a problem by the city. The city political leadership does not see the outflow of the bulk of foundational industry as a negative development either as even these essential products can be imported from outside, with more and more environmentally friendly ways of transport of goods and services. Although the city tries to support the traditional craft trades in the city and has launched several initiatives to support them and provide them premises on preferential terms, such trades generally struggle to maintain their activities.

Nevertheless, the city wants to preserve some areas for industrial activities, mainly for clean and innovation related industries and it also prioritizes mixed-use development after the past mistakes of creating monofunctional areas. Mixed-use aims at not only office or commercial functions but some industry as well. However, these aims are difficult to achieve because of the fragmented owner structure and dominantly private ownership of lands, and the growing market pressure towards residential developments. As it was mentioned the larger public owned plots, which partly could be used for industrial developments, are in state ownership but no cooperation mechanism in place between the city and state organisations. Basically, the city lacks direct tools to effectively influence the spatial development processes therefore it is forced to shift towards more indirect ways.

Warsaw also faces several obstacles related to the modernisation of industry and increase the competitiveness of the city. There is a low level of internationalisation of enterprises and of cooperation between universities and local businesses despite that several industrial activities grow in the city and its surrounding area and the city is an important scientific and academic hub. The negative factors include low level of innovativeness in the production sector and negative balance of foreign trade, especially in terms of high-technology products (though a positive balance e.g., in the food sector), low activity of municipalities in terms of promoting local entrepreneurs on foreign markets, and lack of unified package for foreign investors, low activity of clusters and associations of entrepreneurs. (Architecture and Spatial Planning Department City of Warsaw, p. 37-39.)

Some experts also see a danger in the recent economic development of the city claiming that its one-sided job structure - namely the very high share of financial and shared services – can

cause unemployment problem even in the mid-term. The automatization of the banking sector in the near future can result in that 40% of its current labour force stock will be redundant. This challenge should also be addressed by the city economic policy by higher diversification of economic activities. The city also risks losing its technical expert capacity as currently there is no good job opportunities for them in the city, after accomplishing the university they leave for other cities or countries.

As for the metropolitan area the lack of governance structure and cooperation mechanism was addressed by experts as a main challenge as without these the metro area cannot grow to a more competitive direction. Beside the above-mentioned transport problems inside the metro area, the underdeveloped infrastructure system (utilities) also poses a challenge to larger scale industry developments.

2.3 Main factors affecting locational choices of manufacturing

The major factors affecting the location choices/outmigration of companies with manufacturing profile are manifold:

- Land prices in Warsaw are much higher than in the surrounding functional area of the city.
- Most of the buildable land in the city is brownfield and often contaminated. The cost of decontamination can be substantial especially if time-saving technologies are applied.
- Big lands suitable for more traditional industries are not available any more in the city whereas there is plenty of possibilities for green-field investment in the agglomeration area.
- Warsaw has significantly higher wage level than its agglomeration and other urban areas in Poland.
- In Warsaw there has been strong competition among development functions for buildable lands, currently it seems that residential developments are the most profitable, but office developments are still going on crowding out other functions such as industrial related developments.
- There are increasing residential objections against industrial and related transport activities in Warsaw.
- The existence of adequate infrastructure is also an important factor. In this regard it is also essential how the cost of infrastructure development is divided between the municipalities and companies.
- Local financial incentives can also affect companies' location choices.
- In Poland, there is a strong competition among major urban areas for new developments especially related to industry 4.0. Companies consider not only the level of land and wages but also the availability of high-skilled labour force, R&D capacities, the existence of business-friendly environment etc.

For most analysts it is clear that within the city boundaries large-scale manufacturing is not feasible anymore, due to the high labour costs and land prices. Many examples exist on the de-location of enterprises from Warsaw, as cheap labour starts some 15 km away from Warsaw. Thus, the metropolitan trend is strong industrial development in lower wage areas, mainly in green-field areas. In these areas, all types of manufacturing can be found, although logistical functions are more rewarding than production functions.

Another location factor is the price difference of land. For example, in Blonie (17 km from Warsaw and being the most important logistical centre in Poland) 1 sqm of industrial land costs €25-50, while in Warsaw it could be as much as €2500-5000. Despite this large difference, the price of land is not the strongest factor for companies to leave the city, labour costs are ongoing and therefore more important.

Blonie is a good example how sites with well-developed infrastructure can attract investments. A developer bought lands in Blonie unified them into one large site and built the necessary infrastructure (roads, utilities) then leased plots to logistic companies who established their own premises there.

In terms of labour factor, not only its price plays a role in companies' decision but also the level of qualification of the labour force. The more innovation related an industry is the more important this factor is in companies' location related decision. A good example is the aviation industry which has already settled in Eastern Poland but now faces with difficulties to find adequately skilled workforce.

Another factor in foreign companies' investment decision is the system of financial incentives which is considered to be more important than land price by some experts. The maximum level of public aid is defined by the EU (regional aid map): in Warsaw 10% is the maximum, area west of Warsaw is 20%, Mazovja 35% (but only for initial investments), while in Eastern Poland it is 50%. Municipalities can apply exemption and reduction on local taxation, such as property taxes and local business taxes. In Warsaw, the city uses maximum level of local taxes while surrounding communes (e.g., Blonie) reduce the level of local taxes for businesses in order to attract new investments. The opinions highly vary among experts how much effect on companies' location choice these kinds of allowances have.

2.4 Tools through which the municipality is able to control the development processes

Financial tools to regulate development

In Poland, the personal income tax (PIT) and corporate income tax (CIT) together with the value added tax (VAT) are defined by the government whereas municipalities impose local taxes which are real estate tax and vehicle tax. Local municipalities get real estate tax, based on the surface of the area used by entrepreneurs. The tax level is decided by the commune, within the limit of an upper level stipulated by the law. For example, Błonie collects €5/sqm, which is below the €6/sqm upper level. Usually communes with worse location charge lower tax level.

The level of Corporate Income Tax (CIT) is 19%, which goes to the central budget but its 7% goes back to municipalities. If the seat of the company and the production place are in different communes, then the corporate tax is divided between the two communes.

The other main form of taxation is the personal income tax (PIT), of which 38% is transferred to the local level from the government, according to the place of residence of the employees.

Within the local budgets usually the real estate tax is less important than the PIT revenue (except for smaller municipalities like Błonie, where the large logistical ventures pay substantial real estate tax). In the case of Warsaw, the share of real estate tax is 9% while the corporate tax and PIT together amount to the 50% of the budget.

In 2019 there were changes in the national regulation, the rate of PIT was reduced by 1% and people below 26 years became exempt of PIT. As a result, municipalities PIT related revenue also decreased and large cities lose a lot of money and have difficulties in financing education and other important local services. (Warsaw will lose €200 mill yearly which is a lot compared to the €4.3 bill total budget). In the upper chamber (Senate of the Republic of Poland) there is a proposal for giving compensation for municipalities which have lost money. However, there is very little probability that the Senate will pass this proposal (partly because all large cities have leadership being in opposition to the national government).

Planning tools

Spatial planning is an important tool of municipalities to influence the level of investments and functions of development in their area, especially in those cases when the municipality does not own larger plots of land in the commune. However, they have to face several limitations regarding the enforcement of spatial plans.

There is a hierarchal system of different spatial plans in Poland. On national level the National Spatial Development Concept 2030 has been elaborated. It presents an assessment and analysis on the state of spatial planning in the country and puts forward a vision for the country's spatial development to the year 2030. On regional level a regional spatial development plan is produced which is much like the National Spatial Development Concept. It is rather a strategic document. The regional plan outlines investments of national and regional importance and general development conditions.

The Warsaw metropolitan area consists of small (up till 50-70 thousand population) municipalities which are all totally independent in deciding about the future development of their territory. The regional government lead by the Marshal's office[3] issues the Spatial Development Plan of the Mazovia Voivodeship which is a rather general guidelines for municipalities who have to check only whether their own master plan is in line with the regional document's guidelines.

Local governments are the main actors in the Polish land-use planning system, which has three level locally.

1. First, the so called "Study of the conditions and directions of spatial development" has to be produced (referred as master plan in English in this case study). It is an obligatory framework study to guide local planning policy in municipalities. It covers the whole area of the municipality. Local spatial development plan should be consistent with this

[3] The voivodship Marshal is the head of the regional government, who is elected by the regional assembly (elected regional self-government).

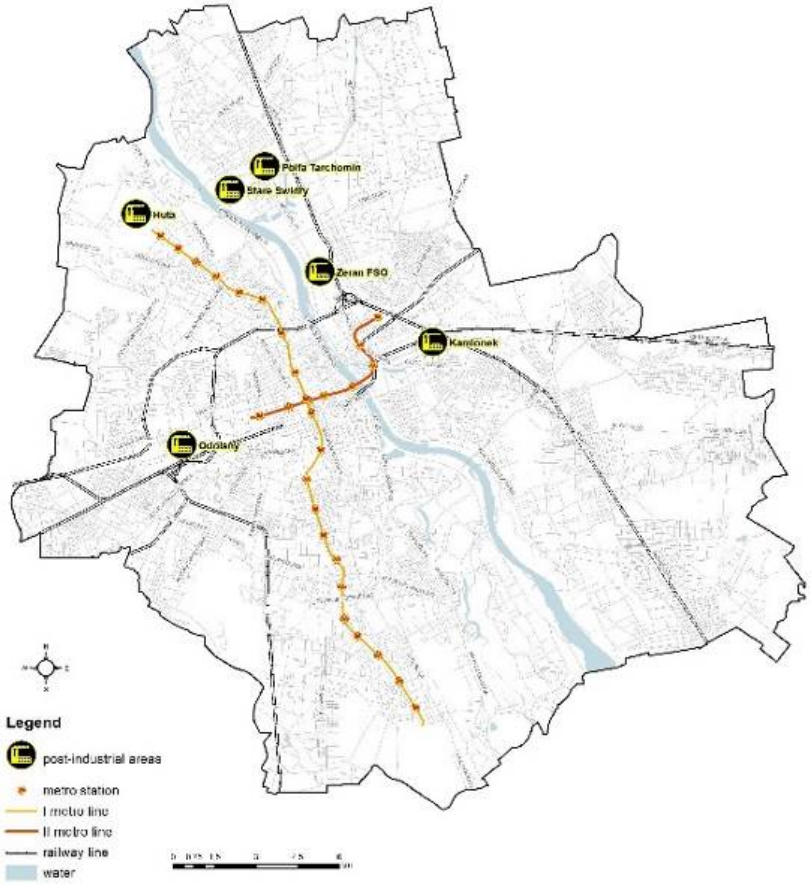
master plan, but the master plan itself is not a legally binding document on local spatial planning. Next to this, the study develops an analysis supported by recommendations on a range of social, economic demographic issues important for local planning.

2. The “local spatial development plans” are produced for smaller areas of municipalities and they are legally binding. It can be regarded as the essential planning document of local governments. It defines particular permissible assignment of land uses and specifies the size and volume of possible developments, rules for property division and protection of cultural heritage. However, not the whole area of municipalities has to be covered by local spatial development plans. Municipalities produce these plans only for those areas where it is important to define more specifically the exact functions and details of future developments.
3. Planning decisions are issued in order to ensure that new development could proceed in the absence of valid local spatial development plan. It is a simplified administrative procedure ensuring that the new development is in line with basic neighbourhood characteristic or at least does not cause any harm in its environment. They are not required to be consistent with the master plan. Planning decisions are made for building approvals, change of land use and for the location of a public investments.

Local spatial development plans covering specific areas of the city regulate that in certain areas what functions are allowed, if mixed functions then it also includes the proportion of the functions. The procedure of elaborating local spatial development plans is based on the German system, with a difficult and lengthy process, where any changes are adopted over a period of 2-3 years. However, if the city wants to change the zoning regulation (meaning the allowed functions) of a certain area then the master plan for the whole city has to be revised which makes the whole spatial planning system very bureaucratic, lengthy and inflexible.

Currently only 40 % of Warsaw is covered by local spatial development plans, which is a big problem. For another 30% the local spatial development plans should be elaborated. There are six areas within Warsaw (mostly privately owned land) which are zoned for industry and where no other uses are allowed at the moment.

Map 2: Post-industrial areas in Warsaw.



Another main problem is that the zoning is not efficiently enforceable mainly because of two legislative measures.

A national law from two years ago, emphasizing the importance for new residential development, decreased the time under which the city council can react on the applications from developers: the city council has to decide within 60 days whether to give permission for the planned development. This “Act of 7 July 2018 on simplifying the preparation and implementation of housing and associated investments” which is often referred to as “Lex Developer”[4] modified the normal planning law of 2003, in order to have faster procedure for new housing construction. This is a serious limitation on the independence of local municipalities – although the Lex Developer makes sense if only small changes needed in the master plan.

Having a local spatial development plan is good as the developer knows exactly what can be done. If there is no local spatial development plan for an area, then the developer has to justify that the function of the planned investment complies with the existing functions of the area. This

[4] The act is called in Polish “ustawa z 7 lipca 2018 r. o ułatwieniach w przygotowaniu i realizacji inwestycji mieszkaniowych oraz inwestycji towarzyszących; (Dz.U. poz. 1496 ze zm.)”. The short, informal term for the act is the “Lex Developer” which is often used but have a negative connotation.

means that if in an industrial area there is only one residential building then the developer can change the whole area into residential use and neglect the stipulation of the existing zoning. A good example is the FSO (former car company) industrial site, which is currently zoned as mixed-use development area, but based on this regulation, it can be turned into monofunctional housing as there is some residential building in the area. If the city does not allow it then the developer can turn to the governor (the representative of the central government). This practically means that developers do not have to follow the zoning plan.

The other problem relates to the state (or state company) owned land which falls out of municipalities' competence in terms of elaborating local spatial development plans. When the municipality prepares the master plan the state entities (for example railway company or army) are obliged by law to provide relevant data / information about their plots with an indication of their development plans. This information is included in the master plan. If it turns out that the area belonging to the state company is used in a different way than previously declared, then the city may apply to the court to transfer the land to city ownership.

Regarding the local development plans, half of them is quite outdated in Warsaw. Now a new planning act is under development, which will require all municipalities to develop zoning plans and their master plan within 3 years, which is seen as a doable requirement.

Warsaw is currently preparing its new master plan also including the zoning plan. Parallel with this the city also prepares the missing local spatial development plans for key areas and revises the old ones where it is necessary. In this process the municipality uses a strong participative approach which includes residents, developers, landowners etc. Main principles of the spatial planning process are

- creating a compact city.
- supporting mixed use of areas instead of monofunctional.
- preserving 25% of the city to green areas.

The planning procedures often are quite over-politicized, with special regard on the actual political situation: the governor of voivodeship (the representative of central government at regional level)[5] has to give opinion on the cities' spatial planning documents which is a significant source of conflict as the governor often turns down the city's plans. The governor has 30 days to give opinion. If this is not accepted by the city, the case goes to the court. There are 230 ongoing cases in court, which is a good indication for the conflicted relation between the city's and regional leaderships.

> The city just won a case in the court against a state-owned company, which had large military areas not in use anymore. The company wanted to use the land for housing development which conflicted with the zoning plan. The city argued that the zoning plan

[5] The regional governor is the representative of the central government at regional level, who on one-hand leads the local state administrative units, while on the other hand supervises the units of the territorial (region, communes) self-governments.

should be binding to the company as the military functions (which meant the base for the exemption from the spatial regulation did not exist anymore).

Taking the relatively weak position of the city in the development process, the chief architect of Warsaw introduced an innovative “planning workshop” approach. This is a workshop for landowners and residents in a given area, which is under redevelopment. In the first three workshops the consultations started with no plan, now in the fourth the city starts with an initial plan. Participation is not compulsory but most of the larger landowners are coming to the workshops. If the city would like to keep the industrial function of an area, the city council can decide for that zoning, but as it was mentioned the regional governor has the right to decline it allowing purely residential zoning. One of the pilot areas for this ‘planning workshop’ was the FSO area, where the city achieved an agreement during the workshop with the landowners on mixed-use also keeping industrial function beside housing and office functions. Later on, some of the owners changed their mind after realising that selling the land for housing developers would bring more profit. This is seen as a negative development by the city main architect. Currently the agreement made with owners and developers are not legally binding.

The last master plan for the city was from 2006 (counting for 3.5 million inhabitants). The industrial areas defined in the old master plan will be changed but the city wants to keep 4-5 larger areas for new types of industry. This is a critical question for Warsaw, where there is still housing shortage. While allowing more space for housing, the city also wants to block urban sprawl and go for a more compact city.
Example of the conflicts around the master plan: the Bialoleka district was connected to the city 20 years ago. It was mainly agricultural and forest area. The new district authorities prepared plans for huge residential areas and the 2006 master plan (with 3,5 million estimated population) approved them. The most important decision of the new master plan will be to decrease the planned density and functions at the edge of the city where there is no sufficient public transportation, infrastructure and public services.

There seems to be a general agreement among planners that the city should prescribe some level of mixity, using the zoning plan, which will have to be obeyed by developers. Not prescribing plot by plot the exact use but the shares of functions for the areas and some basic principles. Such principle could be mixing functions: along big roads only services and other functions but residential can be established while further away from big roads residential function is supported. As planning tool, the local spatial development plan is of key importance for the city even if not having ownership in the area.

Prevailing housing developments

In 2015, Warsaw had the same number of apartments as in Vienna, 907 thousand units. In 2018, 23 thousand units were built, much more than in Vienna and one of the largest in Europe. Since 2011 over 10 thousand units per year were built. Even shopping centres want to be transformed into mixed use with residential as retail developers also recognize the need for housing.

Only one thousand of the 23 thousand new housing units were not privately built, the average price is €2,4 thousand/sqm. This is very high, due to the high price of land and the increasing construction prices. For instance, in Piaseczno - a neighbouring, fast-growing city South to Warsaw, with currently around 90 thousand inhabitants - the price is only €1000 per sqm.

Contamination of post-industrial land is a problem, although only few areas are heavily contaminated. However, in case of housing construction the polluted land has to be totally removed. It is the investor's responsibility to decontaminate the land.

Wola district shows the disastrous consequences of the controversial deficiencies of the spatial planning system: a huge housing development implemented on the state railway company owned sight without basic public infrastructure (roads, sidewalks, schools etc.) near to cement factory more than 10 years ago. Now the inhabitants who bought their housing in their twenties want the services and also want to get the cement factory closed, and now all these became the problem of the municipalities (district, city).

Another conflicted area is the already mentioned Steel work Huta Warszawa, a large industrial area (200 ha) owned by the AcelorMittal. After decontamination of the land (and even planting forest) the company sold one part of the plot (further away from the public transport and services) to Coimpex and the new owner decided to go for housing, which was not allowed next to the industrial activity. After a huge debate with city hall the land now is sold to an American company which understood the situation and does not want housing anymore but light industry and logistics.

Ursus district is another neuralgic point, which is a former industrial district still having substantial development potential. The Technical University also has campus there and wants to expand activities in cooperation with companies in order to establish more R+D activities (labs and industries). To a larger development area, which is in private ownership, the city in cooperation of technical university has planned a project of mixed functions with new industry also including workers' housing related investments. However, now the private developer's investment plan is only for housing and commercial use.

According to the city's chief architect people have to be educated that workplaces are needed in the city while still housing can be built. There are already a few developers who are smarter and think not only in short-time money earning way but are going for quality and mixed functions – but this is not the general case. The situation in Warsaw today is like in SIMCITY: developers are crazy about housing. The city has weak tools to convince them about mixed developments.

Opportunities for industrial development in Warsaw

During the course of interviews many possible initiatives came up regarding the future development of industry in Warsaw.

Interesting opportunity for Warsaw could be the Aerospace industry (GE R&D centre is already substantial employing 2000 people). Warsaw has no problem to find employees for that while Rzeszow (city in South-East Poland) has such problems with its aviation valley. Also,

electronics industry could be a target for Warsaw, especially maintenance centres. Electronics is not polluting; small components do not need much transport.

Significant future opportunities relate to the current Chopin Airport area. According to some experts Warsaw should participate in the preparation of the new airport (between Łodz and Warsaw) and should also think ahead what to use for the area of the current Chopin airport. This is a huge land within the city boundaries, well connected to the city centre and could be developed to a new technology park with light manufacturing. The city could take the lead to define the future use and could heavily negotiate with the state which owns the territory. The city could also cooperate with neighbouring communes in the development of the area, for example with Pomiechówek commune where there is a 100-ha big land, which would be especially suitable for the aerospace industry because of the vicinity of the Modlin airport. After the joint preparation of the area also including the establishment of train access, municipalities could make advertisements for investors.

The city could use more incentives to direct the desired development investments to areas designated for industrial activities.

One of such incentives is linked to public infrastructure development. If the new infrastructure is used by more than one entity, it is not counted as direct state support. Warsaw could create industrial park, especially in combination with special economic zone, which is also important because then the tender is not necessarily an open but limited tender, thus the city can influence more what kind of companies/functions come to the area. Logistic centres are most profitable but not necessarily the most desirable for the city. (e.g., city Zabrze had open tender for a 20-ha industrial land, finally a manufacturing company won the tender over a logistic centre but it was a luck).

Another incentive can be the local property tax exemption as it is flexible tool and companies can immediately enjoy its effect. The city should define that what kind of industry, with how many employees can apply the exemption. However, in case of Warsaw the effect of such incentive can be limited (as the degree of the exemption is moderate).

Warsaw should definitively designate a place for manufacturing activities, if possible, linked to the special economic zone. To do so it should take into account state owned lands as well and look at some good examples how other cities could successfully cooperate with the state or state-owned companies (e.g., Lódź successfully managed to work together with the railway company (PKP).

2.5 Potentials for metropolitan area cooperation

In the metropolitan area only, soft methods can be applied in the field of spatial planning but also in economic development, based on common sense and common interests e.g. for public transport.

The mayor of Blonie is one of the 40 members of the Warsaw ITI steering committee, which is led by the mayor of Warsaw. According to the mayor during the ITI planning there were no big

conflicts among the communes, decisions were taken unanimously, each commune having one vote.

The ITI, in the magnitude of €167 million, mainly included transport projects. In the case of Blonie 12 km bike routes were built (between the localities inside the commune), and P+R near the railway station. The next plans are for further developing public transport to Warsaw, to have more trains and more buses, as the demand for this is big. Many municipalities in Warsaw surroundings face similar development needs.

ITI only gives a framework for communication but there is no legal background for a metropolitan law. The regional level spatial plans practically have no effect on strengthening the cooperation on metropolitan level in the most important issues such as suburbanisation and transportation. The ITI created some momentum towards coordinating development, mainly in transport. Also, sport, leisure functions should be coordinated according to some of the communes. Even closer coordination of spatial planning processes between neighbouring municipalities would be needed.

On the basis of the positive ITI experiences the general opinion among the interviewees was that stronger leadership in metropolitan area would be needed, especially in transport.

The core of the problem is that there is no cooperation among the municipalities in the metropolitan area. This is not sustainable and leads to uncontrolled suburbanization activities in different sectors, such as concentration of office spaces and that of advanced businesses in certain areas.

To tackle the different problems in manufacturing in and around Warsaw, a publicly owned business agency would be needed, in the best case on metropolitan level according to several experts.

Currently there is a business unit established in the municipal economic development department, but they are just starting to reach out to economic stakeholders, and investors. Krakow, Lodz, Gdansk, Wroclaw, Poznan are the best cases in Poland for more coordinated economic development, some of them do it even on metropolitan area level. Lodz has a department while the others have agencies outside the city administration to negotiate and attract investors. Gdansk has this on the city level, Krakow and Wrocław established a metropolitan level agency, in the form of joint stock companies. Later on, the Krakow one was turned to a regional development agency and the main owner is the regional government. In case of Wrocław development agency the owners are the Wrocław and the other 29 municipalities.

Future directions to govern industrial development in the metropolitan area

The economic development challenge in the Warsaw area can only be tackled in metropolitan area context: Warsaw alone has no tools and has no land, while wise metropolitan policies could create good solutions. Also, more resilient solutions can better be achieved on metropolitan level.

Based on a shared vision across the whole metropolitan area, new planning tools are needed to protect those manufacturing and logistical functions which are needed for the whole area but would otherwise disappear due to market processes if such areas are not protected by zoning.

The creation of a strong governance system on metropolitan level is not in the short-term agenda in Poland. Although in 2015 a general rule was adopted to create metropolitan areas, the government never prepared the executive law. After one year the general law was cancelled and the new governance model was assured by law only for Silesia, as a pilot.

As several experts share the opinion that under such circumstances, the coordinated development of manufacturing can only be initiated from below, in a bottom-up way, by the establishment of a metropolitan wide business agency.

However, for larger industrial area Warsaw has to cooperate together with the surrounding municipalities. They could establish and operate a Development Agency on metropolitan level. The small municipalities do not have financial resources to do major infrastructure and transport developments (and no EU money is available for that any more in the Warsaw region). The small municipalities are not able to do the marketing and organize the labour force either. Warsaw should cooperate with such metropolitan municipalities where still land is available and it is not polluted. This would be indirectly an advantage for Warsaw as much of the PIT (Personal Income Tax) would go to Warsaw as many Warsaw residents would go there to work. The investments would be of mutual interests but would bring different gains to the municipalities: local tax is paid to the municipality in the agglomeration which provides the land, but the increased PIT is the interest of Warsaw.

2.6 Potential inspirational cases from the stakeholder city-region

The initiative of the City of Warsaw to elaborate local spatial development plans in participative workshops (‘planning workshops’) can be seen as a positive new initiative despite that its longer-term actual effects on the realisation of more diversified developments including manufacturing is not known yet. The inclusion of the different stakeholders in the process can reveal the varying interests related to the development of a given area. It is also good opportunity for the municipality to negotiate its interest with the other stakeholders, developers, residents, property owners.

Błonie is a good example how to attract investors: a private person had a good vision about creating an industrial park, made brave investments (bought the lands, developed all the infrastructures) and then real customers came. The municipality itself is also very active to attract new developments through it spatial planning system and applying preferential local taxes.

Although the Warsaw Metropolitan Area does not have a regional development agency, several good examples can be found in Poland for such regional organisations successfully attracting investments from outside of the area including many foreign investors and developing the regional business sector.

- ARAW Wrocław Agglomeration Development Agency has been created in Wroclaw. Since its creation 15 years ago Wroclaw became a booming city from a very bad starting position. Even too many investments went to Wroclaw, no more labour is available now (labour availability in Warsaw is higher than in Wroclaw).
- Another good example is Krakow, where land is also expensive and unavailable within the city. Krakow cooperated with the surrounding municipalities regarding the use of the industrial land around the city, and the city led the process.[6]

[6] The Krakow example is included in the MISTA Atlas of Inspirational Cases as Małopoplska Regional Development Agency.

3 A data-driven SWOT analysis for Warsaw Metropolitan Area

3.1 Introduction and methodology

The following chapters provide an analysis of the employment structure of Warsaw metropolitan area. They are based on the analysis of shares and number of employees being employed in different sectors of productive economy (measured at NACE 3-digit level).

The detailed analysis has three main parts: 1) displaying and analysing the productive sectors that provide the biggest employment in the region compared to the national average, 2) displaying and analysing the sectors that resulted in the fastest growth – compared to the national average - between 2012-2017 and 3) highlighting the sectors that represent the biggest potentials and the highest threats for the local economy.

There is a well-established methodological background behind Part 3 that follows the approach to the analysis of the regional network of branches pioneered by Otto et al. (2014) and Neffke et al (2017A, 2017B). The basis for this approach is the common recognition that innovation (and thus growth) is driven by the exchange of knowledge between firms, having a complementary knowledge base, in the form of labour flow between branches (labelled as “embeddedness”). In addition, the development potential of a production branch is also based on the existence of a “critical mass” of employees in the metropolitan area being metered by the share of employees exceeding the national average (labelled as “specialisation”).

Table 3: Categories of the empirical SWOT analysis.
Development potentials according to degree of specialisation and embeddedness

	Regional embeddedness of a branch	
Regional degree of specialisation	High localisation and well embedded (Strength S)	High localisation but weakly embedded (Threat T)
	Low localisation but well embedded (Opportunity O)	Not localized and weakly embedded (Weakness W)

Source: Otto et al. (2014), ESPON MISTA (2020).

Overall, both the degree of specialisation and the embeddedness in the regional sectoral structure are decisive for an assessment of the development potential of a branch. According to Otto et al. (2014) economic branches in a region can be classified into four different categories, by differentiating, according to the values of their localisation quotient and their embeddedness indicator (Table 3):

1. If the branch under consideration is heavily localized in the region and if this branch is also well embedded in "related" branches, the branch is large relative to the regional economy and it is likely that it will also strongly profit from localised knowledge transfers across industries in the region. As a consequence, its future development prospects

should be favourable, and the branch can be considered to be a "strength" of the regional economy.

2. By contrast, a branch with a low degree of specialisation and embeddedness is unlikely to profit substantially from localized knowledge transfers but is also small in terms of the regional economy. Despite the fact that such branches may be of importance for the other reasons (e.g., the presence of natural resources or the satisfaction of local demand) such branches have therefore been regarded as a regional "weakness" in previous analysis from a technological development perspective.
3. Branches that are lowly localised but well embedded are faced by a favourable regional environment of technologically or cognitively "close" branches (and thus diverse opportunities to use a common knowledge base) but are still relatively small. Such branches could thus offer special "opportunities" to develop new strengths through structural policy initiatives in the future.
4. Finally, branches which are highly localized, but only weakly embedded in complementary in the region, tend to be seen at risk which could be reduced by strengthening complementary branches through structural policy initiatives. This is because they are relatively large but are unlikely to profit substantially from their regional knowledge base.

(A more detailed explanation on this methodology can be found in the Annex.)

Two types of analysis are presented in this chapter. The first represents the sectoral employment shares and growth rates of productive activities at the level of NACE 3-digit branch groups. The second type of analysis presents the SWOT profiles for productive activities (Chapter 3.4). It allows to identify viable sector specialisations and areas of opportunity for innovation-driven economic growth in the region. These results thus provide essential direct inputs for structural and cluster policy.[7]

3.2 Spatial scope of data analysis

Since, as already highlighted in the background report to task 1 of the MISTA project, urban regions are open systems and may thus also profit from knowledge spillovers from nearby regions, we present results for three different regions: the city of Warsaw, the environs of the city of Warsaw and the Warsaw metropolitan region, which is the sum of the city of Warsaw and its environs. While the city of Warsaw is defined from a purely administrative perspective, as the territory covered by the Warsaw city administration, the Warsaw environs were defined in the course of the project in co-operation with the respective city administration. In defining this region three criteria were applied:

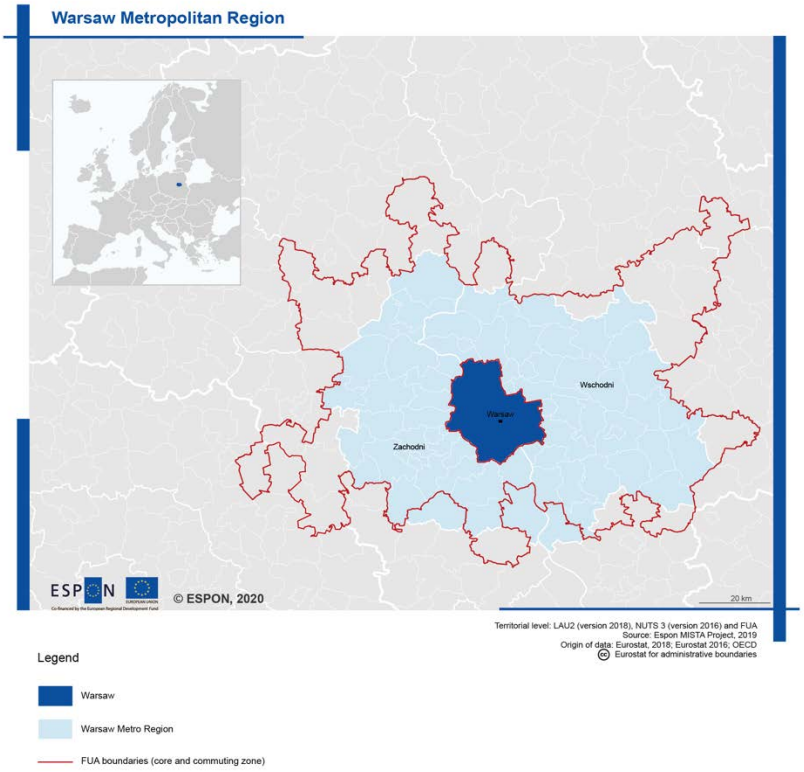
1. The most important of these was an administrative criterium according to which the chosen definition should to some degree reflect the administrative boundaries of existing institutions (or mechanisms) for inter – regional co-operation in the city. This

[7] Note that strengths, weaknesses, etc. are identified according to their degree of specialisation and embeddedness in the regional economy and not based on their degree of technology, R&D intensity and other factors evaluating the complexity and sophistication of a branch. Rather, being labelled as a “strength” can be regarded as a measure of revealed competitiveness of a branch in a specific region. Employment is reported at plant level and not at company level. This means that their assignment is to branch and region of the plant and not to that of the company headquarters.

criterium was chosen to ensure to the best possible degree that the analytic results are useful for existing urban planning processes.

2. The second criterium was based on data availability. Since the analysis conducted below requires detailed information on the development of employment at a NACE 3-digit level at a highly granular regional disaggregation level, this criterium prove to be the most constraining in the analysis.
3. Finally, the third criterium was based on analytical consideration and was derived from the fact that knowledge spillovers as the central analytical concept guiding the current analysis in all likelihood exceed the regional scope of travel to work areas, which speaks in favour of using larger regions rather than smaller ones for the current analysis.

Map 3: Definition of the metropolitan region of Warsaw.



Source: ESPON MISTA (2020).

In the case of Warsaw, it was decided to use the two neighbouring NUTS 3 regions of Warsaw city (Warszawski wschodni and Warszawski zachodni) as an approximation of the Warsaw environs and to merge two data sources to provide information on the employment structure of the metropolitan region of Warsaw and its subregions. The first is a special elaboration of employment data from national tax data, that reports the employment levels for firms in excess of 20 employees at the NACE 3-digit industry level, for the city of Warsaw and the environs. This data was kindly provided to us by the city of Warsaw and the Polish Statistical Office[8] but is unfortunately only available at a NACE 1-digit level in the national statistics.

[8] We would like to express our gratitude to Andrzej Czajkowski for making this data available to us.

Consequently, in cases where we compare this data to national data (i.e., for the analysis of location quotients and comparisons to national growth rates), we augmented this information with data from the Polish Structural Business Statistics. Since the data differ in definition of the minimum enterprise size, with the structural business statistics focusing on all enterprises and the national data only including enterprises with more than 20 employees, we used structural business statistics data to interpolate the missing NACE 3 digit data at the national level.[9] Despite substantial efforts in providing reliable data for the analysis we, therefore, cannot preclude a slight bias in results, in those cases where reginal data is compared to national data. In the text below we, however, highlight those cases where we consider the results to be questionable on account of this interpolation.

3.3 Size and growth of individual productive activities

3.3.1 Sector shares

Considering first the absolute size of NACE 3-digit branches, the 10 largest branches in the production sectors in the city of Warsaw in terms of employment are related either to transport and logistics ("support activities for transportation", "other passenger land transport", "freight transport by road and removal services") or wholesale trade ("wholesale of household goods", "other specialised wholesale, wholesale of food, beverages and tobacco", "sale of motor vehicles", wholesale on a fee or contract basis", "wholesale of other machinery, equipment and supplies"), throughout. Together the wholesale trade branches account for 11.1% of the total employment in the city, and the transport and logistics sector for another 5.7%. None of the 10 largest NACE 3-branches in the city is affiliated with manufacturing.

Table 4: Top 10 branches in terms of size (2018).

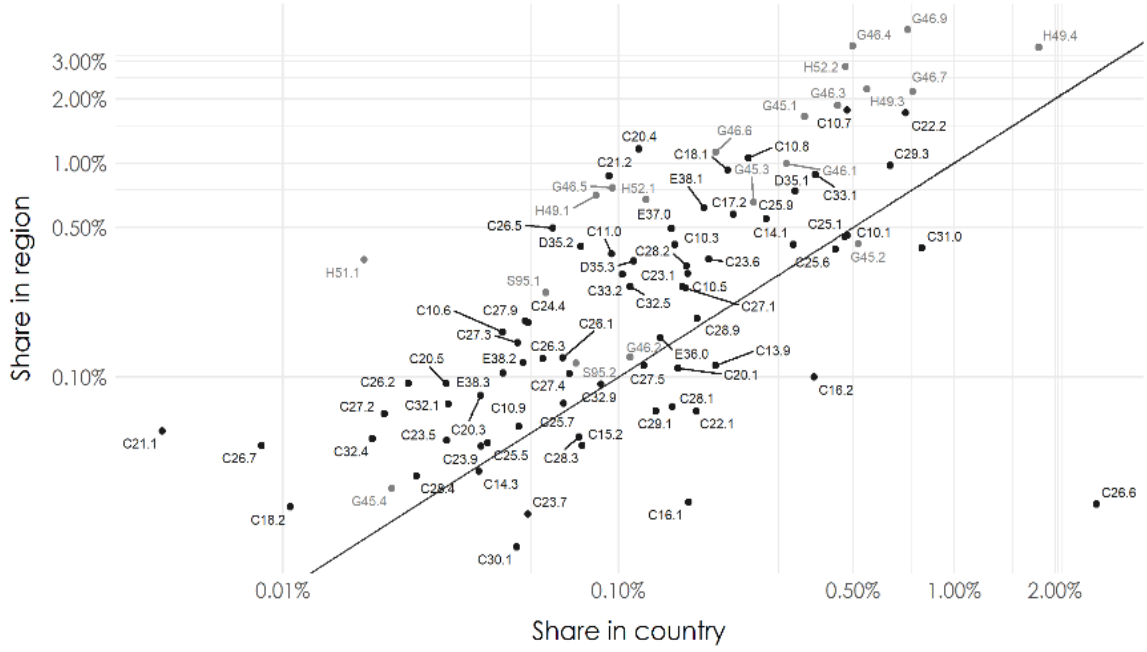
NACE	Name	Empl.	Share in %
Total metropolitan region			
G46.9	Non-specialised wholesale trade	29716	4,21
G46.4	Wholesale of household goods	25059	3,55
H49.4	Freight transport by road and removal services	24679	3,49
H52.2	Support activities for transportation	20063	2,84
H49.3	Other passenger land transport	15665	2,22
G46.7	Other specialised wholesale	15308	2,17
G46.3	Wholesale of food, beverages and tobacco	13220	1,87
C10.7	Manufacture of bakery and farinaceous products	12496	1,77
C22.2	Manufacture of plastics products	12174	1,72
G45.1	Sale of motor vehicles	11680	1,65

Source: Statistics Poland, ESPON MISTA (2020) team calculations. Separate illustrations for the city and its environs are provided in Table A1 in the annex.

[9] This interpolation assumed that the (percentage point) bias resulting from the different definitions is equal for all NACE three-digit branches within one NACE 2-digit group (or equivalently that the average).

The economic structure of the regions surrounding Warsaw (the Warsaw environs) is more balanced. Here too the majority of the 10 largest 3-digit branches are logistics and transport related ("freight transport by road and removal services", "support activities for transportation", "warehousing and storage") or belong to the wholesale trade sector ("non-specialised wholesale trade", "wholesale of household goods", "other specialised wholesale", "wholesale of food, beverages and tobacco"). In contrast to the city, however, the combined employment share of logistics and transport (with 3.4%) and wholesale trade (with 3.3%) were about equal. Similarly, in the environs, also three manufacturing branches ("manufacture of plastics products", "manufacture of bakery and farinaceous products", "manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations") belong to the 10 largest NACE 3-digit groups in terms of employment. These jointly are about as large as the logistics and wholesale trade branches and account for 3,4% of employment.

Figure 1: Sector shares of productive activities (total Warsaw metropolitan area).

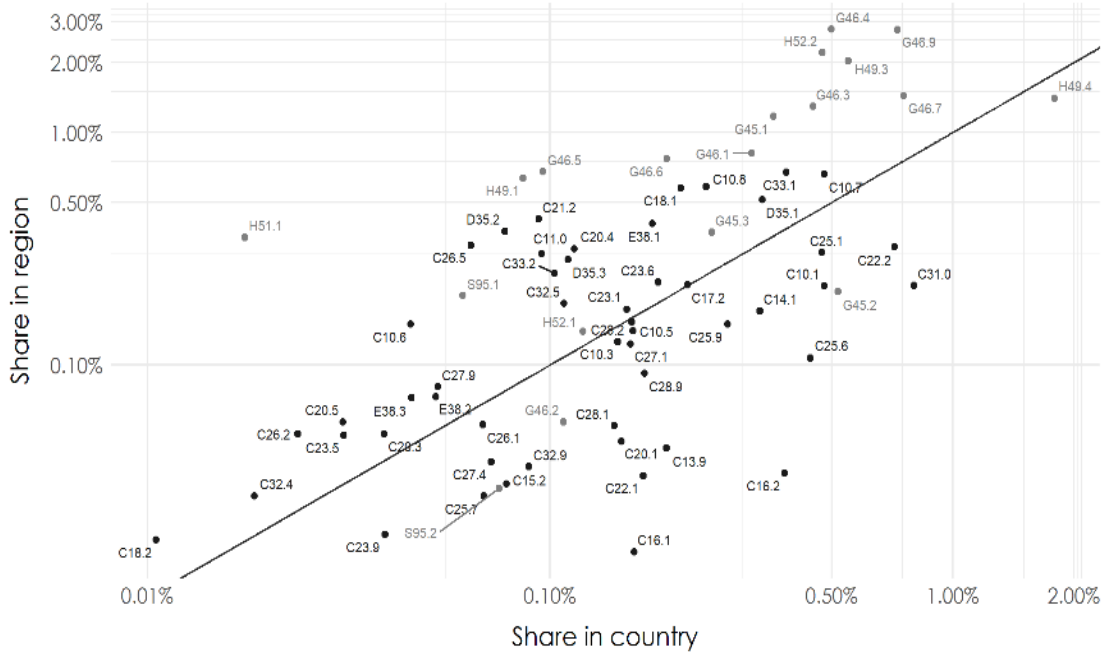


Source: Statistics Poland, ESPON MISTA (2020) calculations; Industry (service) activities in black (grey); For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

As a consequence of this specialization of the two sub-regions the most important NACE-3-digit branches in terms of employment in the total Warsaw region are also mostly affiliated with wholesale trade and transport and logistics. Thus, the largest two branches are "non-specialized wholesale trade" (with an employment share of 4.2%) and "wholesale trade of household goods" (3.6%)., while the third largest is "freight transport by road and removal services" (3.5%). Among the manufacturing branches that are mainly located in the environs only the "manufacture of bakery and farinaceous products" and the "manufacture of plastics products" belong to the group of the largest 10 branches in the overall metropolitan region. Together these account for 3.5% of total employment.

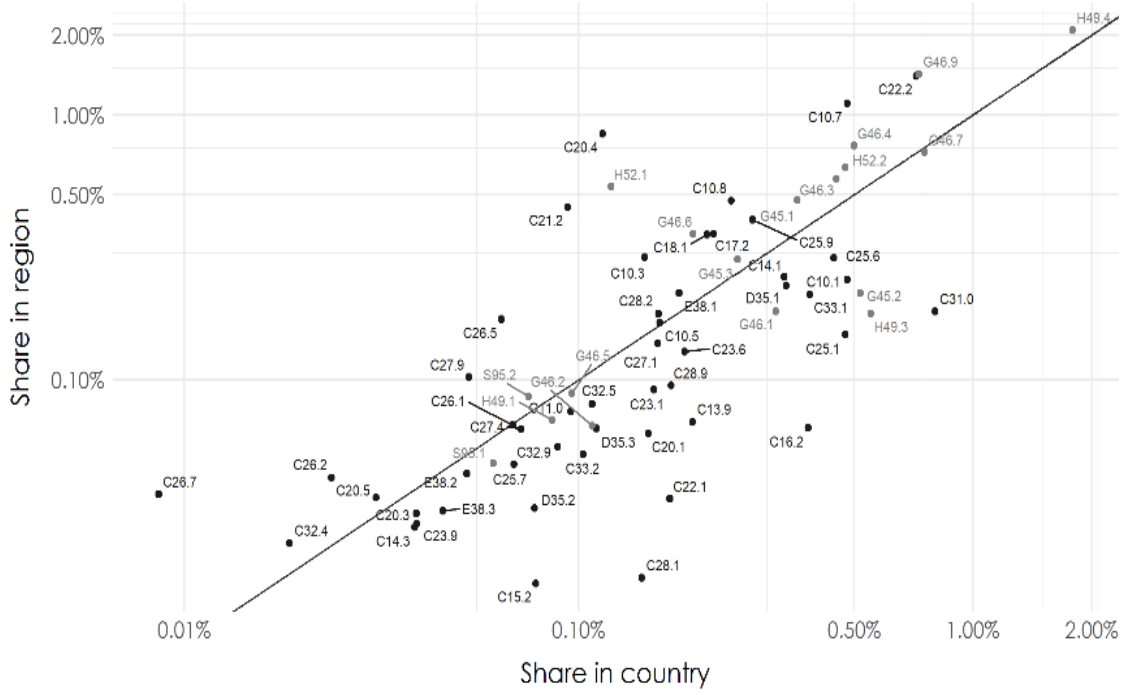
These figures, however, relate to the absolute employment size of the sectors and are therefore also influenced by the size of sectors in the national economy. From a regional perspective therefore measures of the size of sectors relative to the national average (such as the localization coefficient shown in table 3) may be a preferable measure of the importance of a branch in a region even if – given the nature of our data – tis indicator may be slightly biased by differences in the branch specific size distribution of firms in Warsaw and the rest of the Polish economy.

Figure 2: Sector shares of productive activities (city of Warsaw).



Source: Statistics Poland, ESPON MISTA (2020) calculations. Industry (service) activities in black (grey). For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

Figure 3: Sector shares of productive activities (environs).



Source: Statistics Poland, ESPON MISTA (2020) calculations. Industry (service) activities in black (grey). For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

Indeed, shifting the analysis to this indicator provides a more favourable picture of the manufacturing sector in both the city of Warsaw and the Warsaw metropolitan region (see Table 3), while also reconfirming the importance of the logistics and transport as well as the wholesale trade sector. Of the 10 most heavily localised branches in the city of Warsaw three ("manufacture of basic pharmaceutical products", "manufacture of instruments and appliances for measuring, testing and navigation, watches and clocks" and "manufacture of pharmaceutical preparations"). Among these the "manufacture of basic pharmaceutical products" is the second most heavily localized branch, despite being rather small in absolute terms (with less than 300 employed). The "manufacture of instruments and appliances for measuring, testing and navigation, watches and clocks" and the "manufacture of basic pharmaceutical preparations", by contrast" are also of relevance in absolute terms, as they both employed more than 2000 employees each.

Table 5: Top 10 branches in terms of specialisation (location quotient, 2018).

NACE	Name	Empl.	LQ
Total metropolitan region			
H51.1	Passenger air transport	2493	20,21
C21.1	Manufacture of basic pharmaceutical products	395	12,82
C20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	8230	10,14
C21.2	Manufacture of pharmaceutical preparations	6169	9,32
H49.5	Transport via pipeline	1212	9,10
H49.1	Passenger rail transport, interurban	5006	8,27

G46.5	Wholesale of information and communication equipment	5425	8,00
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	3508	7,81
G46.4	Wholesale of household goods	25059	7,11
H52.2	Support activities for transportation	20063	5,99

Source: Statistics Poland, ESPON MISTA (2020) calculations. Only industries with at least 100 employees are considered; Separate illustrations for the city and its environs are provided in Table A3 in the annex.

Other than that, also in this perspective transport and logistics branches (such as “passenger air transport”, “passenger rail transport, interurban”, “transport via pipeline”, “support activities for transportation”) as well as wholesale trade branches (“wholesale of information and communication equipment”, “wholesale of household goods”) belong the list of the heavily localized branches. This reflects the function of Warsaw as a capital city and also applies to many other of the case study cities analysed in the MISTA project.

In the environs a focus on relative rather than absolute employment shares, shifts the results in the direction of smaller manufacturing branches as important sectors: Of the 10 most localized branches in that region 8 are in manufacturing. Among these, three branches (“manufacture of optical instruments and photographic equipment”, “manufacture of pharmaceutical products”, “manufacture of batteries”) are small in absolute terms, with less than 300 employees, while the “manufacture of soap and detergents” and “the manufacture of pharmaceutical preparations” as the two most heavily localized branches are also large in absolute terms and the other three (“manufacture of batteries and accumulators”, “manufacture of instruments and appliances for measuring, testing and navigation, watches and clocks” and the “manufacture of bakery and farinaceous products”) with an employment of around 1000 persons each are medium sized. All in all, these data thus characterize the Warsaw environs as a centre of the chemical and pharmaceutical industry in Poland.

This also applies to the overall Warsaw metropolitan region. In this region to 4 of the 10 most strongly localised branches (“manufacture of basic pharmaceutical products“, “manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations”, “manufacture of pharmaceutical preparations”, “manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks“) belong to the manufacturing sector. The remainder is associated with logistics (“passenger air transport”, “transport via pipeline”, “passenger rail transport, interurban”, “support activities for transportation”) and wholesale trade (“wholesale of information and communication equipment”, “wholesale of information and communication equipment”, “wholesale of household goods”). Interestingly both when considering employment shares as well as when focusing of localisation quotients none of the top branches belong to the construction sector, despite this sector accounting for a substantial share of employment in other case study cities considered in the MISTA project.

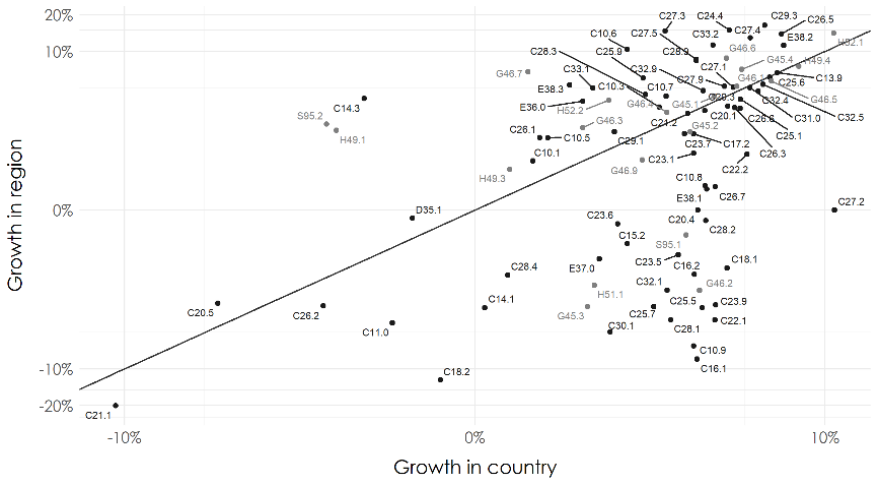
When considering the economic structure of the Warsaw metropolitan region therefore, the region can best be characterized as a location for logistics and trade that also has a substantial

specialisation on (mainly high or medium high technology) manufacturing industries in the Polish economy. Importantly, in contrast to a number of other cities covered in the MISTA project in Warsaw an analysis of absolute employment shares leads to a rather different picture with respect to the most important branches in both the city and the environs than an analysis of employment shares relative to the national shares. This suggests that next to the "top dog" branches with high employment, the region is also specialised in a number of less visible "niche branches" that altogether do not have high employment in Poland but are strongly localised in the Warsaw metropolitan region. In addition, in the city of Warsaw there is a noticeable clustering of such branches in the consumer goods industries and in the environs in high to medium tech manufacturing.

3.3.2 Growth

When however, considering the growth performance of individual branches, this picture changes quite substantially, as a number of rather small manufacturing branches have recently outperformed these "top dog" branches both in the city and the environs. Thus, in the city of Warsaw the fastest growing branch in the years between 2012 and to 2018 was "waste treatment and disposal", which expanded its employment by 28.2% in the time period. After these eight manufacturing branches[10] follow. Of these only one ("manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks") belongs to the top 10 in terms of localisation. In addition, only one of the top 10 branches in the wholesale trade belongs to the fastest growing branches according to the fastest growing branches.

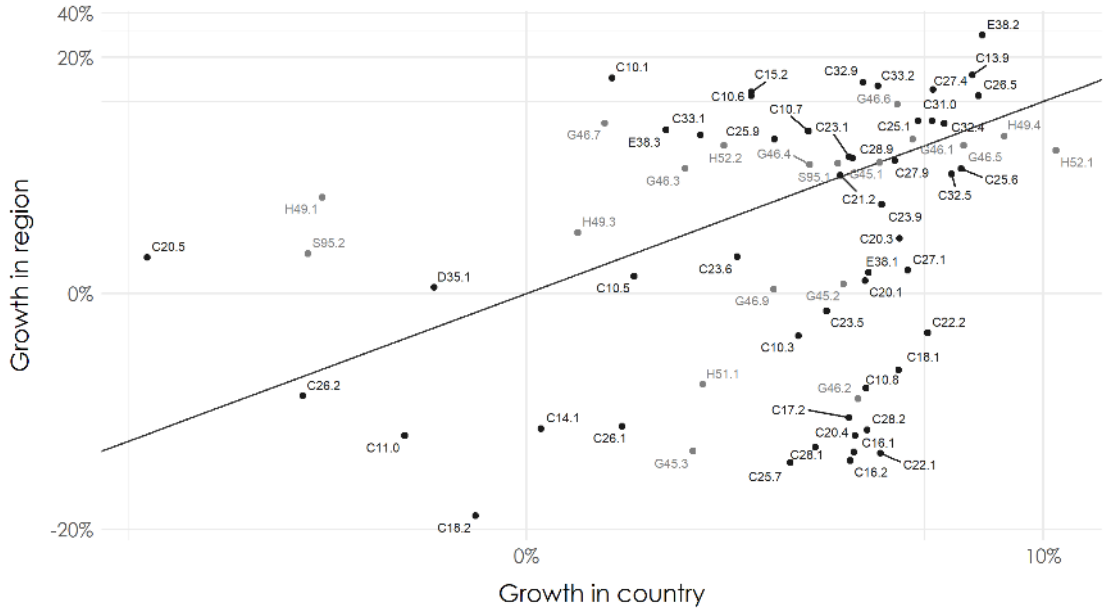
Figure 4: Growth of productive activities (total Warsaw metropolitan area).



Source: Statistics Poland, ESPON MISTA (2020) calculations. Industry (service) activities in black (grey). For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

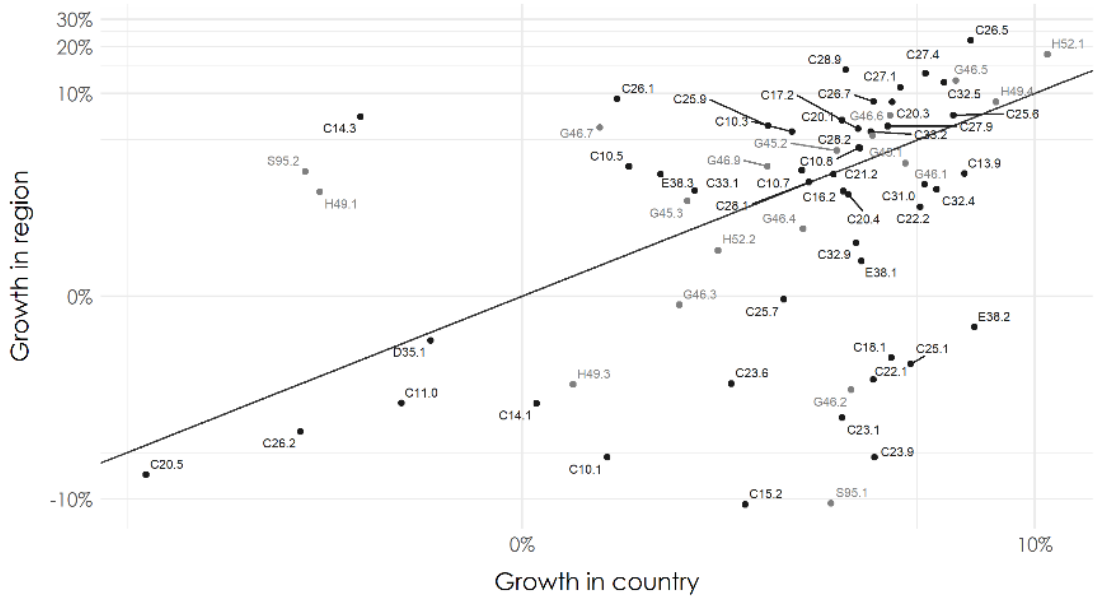
[10] These are "manufacture of other textiles", "processing and preserving of meat and production of meat products", "manufacturing n.e.c.", "installation of industrial machinery and equipment", "manufacture of electric lighting equipment", "manufacture of footwear", "manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks", "manufacture of grain mill products, starches and starch products")

Figure 5: Growth of productive activities (city of Warsaw).



Source: Statistics Poland, ESPON MISTA (2020) calculations. Industry (service) activities in black (grey). For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

Figure 6: Growth of productive activities (environs).



Source: Statistics Poland, ESPON MISTA (2020) calculations. Industry (service) activities in black (grey). For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

Table 6: Top 10 branches in terms of growth (2012-2018)

NACE	Name	Empl.	Growth p.a. in %
Total metropolitan region			
C29.3	Manufacture of parts and accessories for motor vehicles	6901	16,36
C24.4	Manufacture of basic precious and other non-ferrous metals	1267	15,06
C27.3	Manufacture of wiring and wiring devices	1023	14,71
H52.1	Warehousing and storage	4783	14,11
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	3508	13,94
C27.4	Manufacture of electric lighting equipment	732	12,92
C33.2	Installation of industrial machinery and equipment	2127	11,30
E38.2	Waste treatment and disposal	827	11,22
C10.6	Manufacture of grain mill products, starches and starch products	1147	10,41
C19.2	Manufacture of refined petroleum products	726	9,55

Source: Statistics Poland, ESPON MISTA (2020) calculations. Only industries with at least 100 employees in 2017 are considered; Separate illustrations for the city and its environs are provided in Table A2 in the annex.

These fast-growing manufacturing branches often belong to the consumer goods and in particular the food industry. Thus, among the case study cities covered in the MISTA project Warsaw is a primary example of the cities, where manufacturing is returning to the core city. This said it should, however, also be noted that these branches are mostly small in term of absolute employment as only two ("manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks", "wholesale of other machinery, equipment and supplies") have more than 2000 employees and five have around 500 or less.

Similar observations apply to the Warsaw environs as well as to the entire metropolitan region. In the Warsaw environs 8 of the 10 fastest growing branches[11] belong to the manufacturing sector. These branches too are mostly small in terms of employment, but in contrast to the city, here the focus is more on technology intensive machine building and high or medium-tech branches than on consumer goods industries. As a consequence, manufacturing branches also dominate the list of the 10 fastest growing NACE 3-digit branches in the entire metropolitan region (see Table 4). Here only three of the 10 fastest growing branches ("warehousing and storage", "waste treatment and disposal", "wholesale of other machinery, equipment and supplies) do not belong to the manufacturing sector.

These findings may in part be influenced by the nature of our data, as the focus on enterprises with more than 20 employees also implies that smaller newly founded enterprises (that are often affiliated with the service sector) may be missing in this analysis. Nonetheless they also

[11] These are „manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks", "manufacture of other special-purpose machinery", "manufacture of electric lighting equipment", "manufacture of medical and dental instruments and supplies", "manufacture of electric motors, generators, transformers and electricity distribution and control apparatus", "manufacture of electronic components and boards", "manufacture of optical instruments and photographic equipment", "manufacture of paints, varnishes and similar coatings, printing ink and mastics"

suggest a strong structural change in the years 2012 to 2018 as even within the manufacturing sector mainly smaller branches have shown the highest growth.

In addition, within the manufacture there is also a differentiation between Warsaw city and the environs. In the city of Warsaw mainly smaller (in terms of employment) consumer goods industries show a high growth performance. In the environs this often applies to smaller high or medium high technology production branches.

3.4 SWOT profiles of productive activities

This finding of a strong structural change towards smaller manufacturing branches in Warsaw is also corroborated by the empirical SWOT analysis. In particular when considering the entire network of branches (see Figures A.1 to A.3 in the appendix) it turns out that industries in the centre of the networks (which are the most strongly embedded branches in the regional economies) are usually also rather small in terms of employment.

As a consequence, the 10 most strongly embedded branches in particular in the city of Warsaw are mostly small in terms of the number of employed (see table 4.4 in the appendix). For example, the most strongly embedded branch in the city of Warsaw is the “reproduction of recorded media”, in which according to our data only 125 five people were employed in the year 2018. Similarly, the “manufacture of basic pharmaceutical products”, “wholesale of agricultural raw materials and live animals”, “warehousing and storage” and the “manufacture of cement, lime and plaster”, all belong to the top 10 embedded branches in the city of Warsaw and all also employed less than 1000 people in the year. The only branches with more than 2000 employed in the top 10 in terms of embeddedness in the city of Warsaw are “manufacture of other food products”, “wholesale of information and communication equipment”, “steam and air conditioning supply” and “manufacture of gas; distribution of gaseous fuels through mains”. Among these – as discussed above, however, only two (“manufacture of basic pharmaceutical products” and “manufacture of gas; distribution of gaseous fuels through mains”) also belong to the ten most strongly localised in Warsaw.

Table 7: Top 10 branches in terms of embeddedness (2018)

NACE	Name	Empl.	Embed.
Total metropolitan region			
C18.2	Reproduction of recorded media	174	4,91
C26.6	Manufacture of irradiation, electromedical and electrotherapeutic equipment	179	4,02
C21.1	Manufacture of basic pharmaceutical products	395	3,84
G46.2	Wholesale of agricultural raw materials and live animals	875	3,38
C10.8	Manufacture of other food products	7492	3,17
C30.2	Manufacture of railway locomotives and rolling stock	263	3,12
H52.1	Warehousing and storage	4783	3,04
H51.2	Freight air transport and space transport	363	3,03
C10.3	Processing and preserving of fruit and vegetables	2946	3,02
C23.5	Manufacture of cement, lime and plaster	356	2,92

Source: Statistics Poland, ESPON MISTA (2020) team calculations. Only industries with at least 100 employees are considered; Separate illustrations for the city and its environs are provided in Table A4 in the annex.

While similar observations also to the Warsaw environs, relative to the city there are still a few larger highly embedded manufacturing branches in this region. These include the "manufacture of other food products", "processing and preserving of fruit and vegetables", "manufacture of bakery and farinaceous products" and "printing and service activities related to printing", which all employ more than 2000 workers in 2018. In sum therefore the Warsaw environs have a larger number of well-embedded production branches that are also large in terms of employment than the city of Warsaw.

When considering the whole Warsaw metropolitan region again small branches dominate the list of the 10 best embedded branches, with many of these branches (such as "manufacture of irradiation, electromedical and electrotherapeutic equipment" and "manufacture of basic pharmaceutical products") again being affiliated with high and medium – tech industries or with consumer goods production ("manufacture of other food products" and "processing and preserving of fruit and vegetables"). By contrast, among the wholesale trade and logistics branches, that are of central importance in terms of employment shares only three ("wholesale of agricultural raw materials and live animals", "warehousing and storage and freight air transport and space transport") belong to the most strongly embedded branches.

Following this general characteristic of the embedded and localised branches therefore there is a strong differentiation with respect to those branches that are localised and strongly embedded and may thus be considered as strengths of Warsaw and the branches that are embedded but not localised.

Table 8: SWOT Profiles for the total metropolitan region (2018).

NACE	Name	Employment
Embedded and localized		
C21.1	Manufacture of basic pharmaceutical products	395
H51.1	Passenger air transport	2493
H49.5	Transport via pipeline	1212
C21.2	Manufacture of pharmaceutical preparations	6169
G46.5	Wholesale of information and communication equipment	5425
H52.1	Warehousing and storage	4783
C20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	8230
D35.2	Manufacture of gas; distribution of gaseous fuels through mains	2893
G46.9	Non-specialised wholesale trade	29716
H49.1	Passenger rail transport, interurban	5006
Embedded but not localized		
C30.2	Manufacture of railway locomotives and rolling stock	263
C20.1	Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms	775

C28.3	Manufacture of agricultural and forestry machinery	371
C15.2	Manufacture of footwear	338
C23.7	Cutting, shaping and finishing of stone	161
C30.1	Building of ships and boats	113
C13.9	Manufacture of other textiles	798
C22.1	Manufacture of rubber products	487
C16.1	Sawmilling and planing of wood	183
H51.2	Freight air transport and space transport	363
Localized but not embedded		
G45.1	Sale of motor vehicles	11680
C26.1	Manufacture of electronic components and boards	867

Source: Statistics Poland, ESPON MISTA (2020) team calculations. Only industries with at least 100 employees are considered; Separate illustrations for the city and its environs are provided in Tables A5 to A7 in the annex.

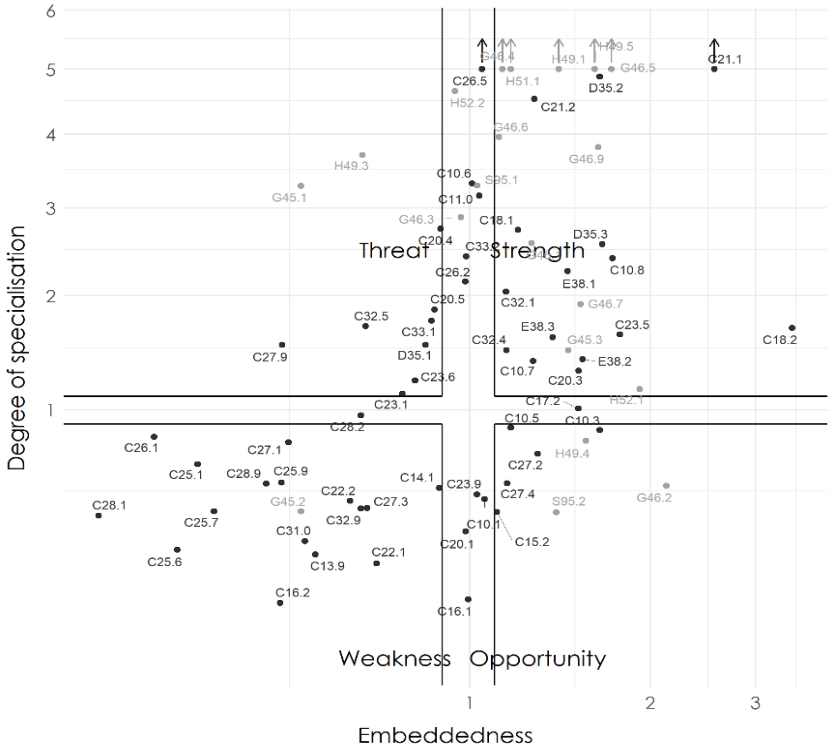
In the city of Warsaw the list of localised and well embedded branches includes a number of branches in the logistics sector ("passenger air transport, "transport via pipeline", "passenger rail transport, interurban", "warehousing and storage"), the wholesale trade sector ("wholesale of information and communication equipment", "non-specialised wholesale trade") and mainly high and medium tech manufacturing (e.g. "manufacture of basic pharmaceutical products" and "manufacture of pharmaceutical preparations").

The embedded but not localised branches, by contrast, are mainly operating in the consumer goods manufacturing sector (e.g., "processing and preserving of fruit and vegetables", "wholesale of agricultural raw materials and live animals", "manufacture of dairy products", "repair of personal and household goods" and "manufacture of footwear").

Figure 7: SWOT Profile (total Warsaw metropolitan area).

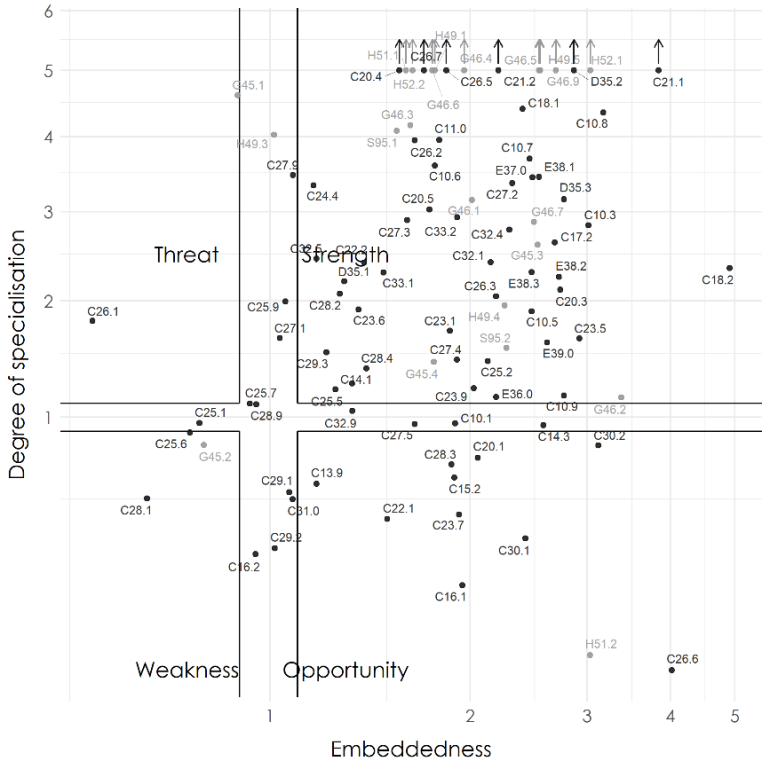
Source: Statistics Poland, ESPON MISTA (2020) team calculations; Industry (service) activities in black (grey); For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

Figure 8. SWOT Profile (city of Warsaw)



Source: Statistics Poland, ESPON MISTA (2020) team calculations; Industry (service) activities in black (grey); For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

Figure 9: SWOT Profile (environs).



Source: Statistics Poland, ESPON MISTA (2020) team calculations; Industry (service) activities in black (grey); For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

In the Warsaw environs by contrast the list of well embedded and localized branches (i.e. strengths) as well as the embedded but not localized branches (i.e. opportunities) is somewhat shorter and more strongly focused on the manufacturing sector. The list of embedded and localised branches includes five manufacturing branches ("manufacture of basic pharmaceutical products", "manufacture of bakery and farinaceous products", "manufacture of other food products", "processing and preserving of fruit and vegetables") of which four are associated with the production of food stuffs. The later includes a list of three rather disparate branches ("manufacture of paints, varnishes and similar coatings, printing ink and mastics", "manufacture of knitted and crocheted apparel" and "wholesale of agricultural raw materials and live animals") for which it is difficult to find a clear common denominator.

When considering the entire Warsaw metropolitan area (see table 6), however, the strengths of the region are mainly located in logistics and while branches in wholesale trade and manufacturing branches are less numerous. Thus "passenger air transport" and "transport via pipeline" as well as "freight rail transport" are all localized and embedded branches as are "wholesale of information and communication equipment" and "repair of computers and communication equipment" and "manufacture of communication equipment".

By contrast, the embedded but not localized branches, that may be considered opportunities for future development, are in manufacturing throughout. They include in particular high and medium -high tech branches industries (i.e. "manufacture of wearing apparel, except fur

apparel", "manufacture of irradiation, electromedical and electrotherapeutic equipment", "manufacture of motor vehicles and manufacture of basic pharmaceutical products")

Finally considering the list of localized but not embedded industries that may be considered a risk for the future development of the region suggests that co-operation between the city of Warsaw and the environs in terms of industrial policy may provide substantial returns to both regions. When considering the city of Warsaw and the Warsaw environs separately, the list of endangered or risky branches list is rather long for both regions. In particular for both regions it includes a number of branches in the wholesale trade and logistics sectors as well as in manufacturing that have been shown to have rather high employment shares.[12]

When, however, considering the region as a whole this list diminishes substantially and includes only the following branches: "manufacture of games and toys", "construction of other civil engineering projects", "wholesale of other machinery, equipment and supplies, manufacture of grain mill products, starches and starch products", "repair of fabricated metal products, machinery and equipment", "manufacture of weapons and ammunition".

3.5 Main take-aways

- In the Warsaw metropolitan region in particular the wholesale trade and the logistics sector are the most important employers in the region. Relative to the national average, however, a number of smaller branches emerge as highly localized in the city region. This suggests that next to the "top dog" branches also a number of "niche producers", that are members of smaller branches in the Polish economy are located in the capital city region. In the city of Warsaw this applies in particular to producers in consumer goods industries, in the environs this often applies to producers in medium-high and high-tech manufacturing branches.
- According to an analysis of employment growth rates in the years 2012 to 2018 many of the fastest growing branches in the Warsaw metropolitan region were small in terms of employment. This suggests that substantial structural change occurred in this region. Furthermore, from a sector perspective in the city of Warsaw there is a noticeable concentration of small but fast-growing branches in consumer goods production, and in the environs, this applies mainly to medium and high-tech manufacturing.
- Consequently, the empirical SWOT analysis conducted in this chapter identifies mainly wholesale trade and logistics branches as important strongholds (i.e. embedded and localized branches) in the Warsaw metropolitan region, with the former mainly located in the city of Warsaw and the later in the environs. By contrast the embedded but not localised

[12] Examples of this include "other passenger land transport", "sale of motor vehicles", "manufacture of soap and detergents" and "cleaning and polishing preparations, perfumes and toilet preparations" in the city of Warsaw and "manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations", "manufacture of pharmaceutical preparations", "manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks" in the environs.

production branches (that may be considered to have a high future growth potential) include a list of smaller branches that inter alia include high and medium -high tech industries (such as “manufacture of irradiation, electromedical and electrotherapeutic equipment”, “manufacture of motor vehicles and manufacture of basic pharmaceutical products”).

- In addition, the list of localized but not embedded industries that may be considered a risk for the future development of the region is much shorter, when considering the total Warsaw metropolitan region than when considering the city of Warsaw and the Warsaw environs separately. This may suggest that co-operation between cities and their environs in terms of industrial policy may provide substantial returns to both the city of Warsaw and the Warsaw environs in terms of strengthening existing technological bonds and also fostering future development.

4 Outcomes of the future workshop

4.1 Workshop structure

Motivation

The workshops were intended as an exploratory and self-reflective process for MISTA's seven stakeholder cities to review how their planning policy, plans, regulation and technical capacity reflect their ambitions in terms of research from the MISTA project. Each workshop followed a similar structure and contained similar ambitions, including:

- Helping to expose motivations and priorities for each of the cities.
- Seeking feedback on how research could be applied to decision making processes.
- Exploring the relevance of the Inspirational Cases, based on a shortlist of 27 cases.
- Showcasing how to facilitate stakeholder co-creation based on the outcomes of the MISTA project and to create 'Metropolitan Industrial Spatial Strategies' related to 'Economic Sprawl'.

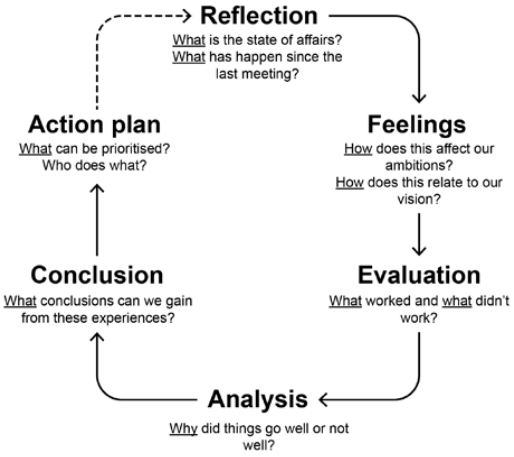
The workshops were not expected to generate exhaustive results but were designed to help create conditions for collaboration, exchange and expose what issues were most relevant to each city. The workshops also provided participants with a range of tools that could help to facilitate the use of the MISTA research for discussion and collaboration in the longer term.

Workshop program

Knowledge transfer can depend on a number of factors. This could include the technical skills of those involved, the institutional capacity to interpret and apply the knowledge to the local cultural context, the planning environment, the economic conditions and the political landscape. As noted in the main MISTA report, the public sector at city and metropolitan level across Europe has rarely been involved in shaping urban production networks. To be more actively involved in shaping the local (production) economy would require public authorities adopting new knowledge, developing new forms of collaboration (both inter-institutional but also outside the public sector) and in some cases new skills. Organisational change management offers a useful pathway. A development process where challenges are unclear, where shared meaning is required and where the end is poorly defined, can benefit from a reflexive approach based on co-creation and learning, what has been referred to as a 'community of practice'.

The MISTA futures workshop was based on 'experiential learning' methodology developed by Graham Gibbs 1988. The program was built around a six-step process, illustrated in the diagram below. The ambition of using this methodology was to bring together local actors within a community of practice and based on experiential learning, while showcasing a methodology that could be applied after the MISTA project was completed.

Figure 10*: Steps of the experiential learning methodology.*



Source: MISTA adaptation, based on Graham Gibbs 1988

4.2 Workshop structure for Warsaw

Due to the limitations imposed by COVID-19, the event was conducted online. This presented certain disadvantages but allowed the local stakeholders to embrace online collaboration platforms.

The Warsaw workshop was hosted on the 20th of November with local actors for four hours. The event was hosted by Andrzej Czajkowski, Małgorzata Kucińska and Andrzej Gawron from the City of Warsaw. The event included attendees from: the City of Warsaw, Municipalities of Warsaw Metropolitan Area, the Institute of Urban Economics, the Polish Development Fund Group, the Polish Investment and Trade Agency, the Marshal Office of Mazovia Region and Bluehill.

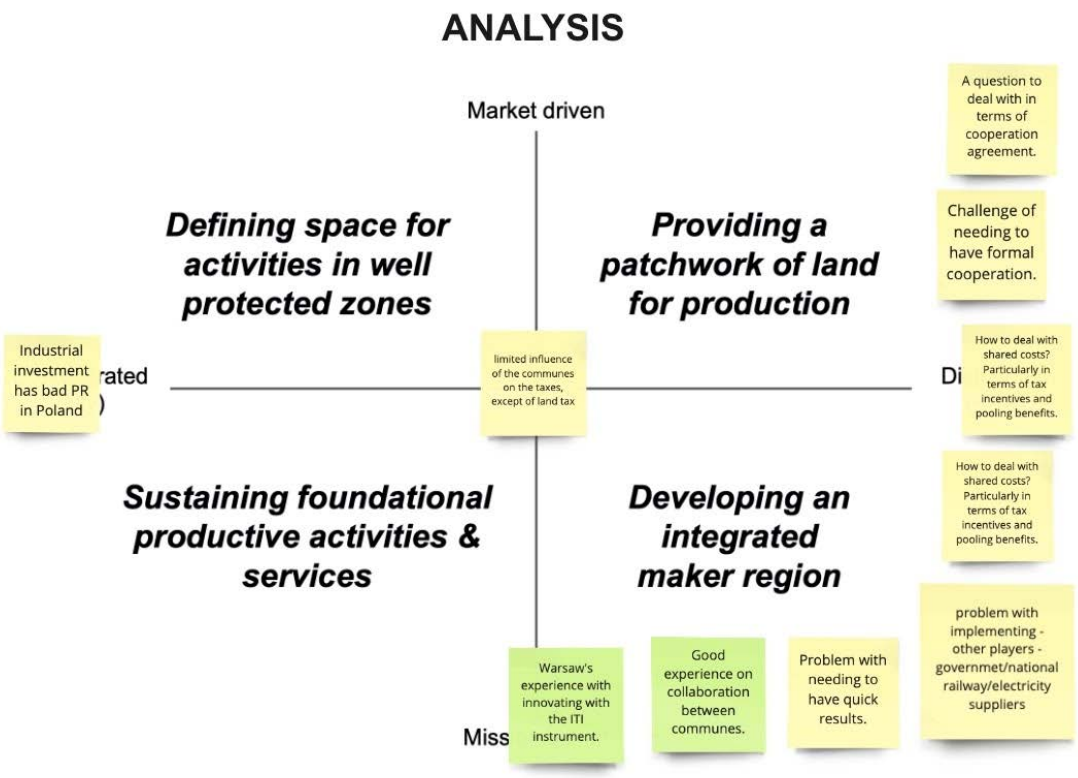
The workshop methodology followed the six steps noted above. The first step (reflection) began with a presentation of the MISTA's analysis of the city (see the report, above). The second and third step were combined and explored a generic SWOT analysis regarding the role of production and industrial land. The fourth step (Analysis) aimed to narrow the focus towards action and involved presenting four scenarios for the future of Warsaw. The following step (Conclusion) connected the result of discussion with the presentation of 8 inspirational cases relevant to Warsaw. The final step (Action plan) was left for general discussion.

4.2.1 Scenarios

In step fourth of the workshop (Analysis), four scenarios were presented. The scenarios are aimed to develop debate and are particularly useful to gauge how different actors view current and future ambitions. The scenarios are essentially structured around two questions:

- What is the scale of action?
- What is the role of the public sector in stimulating the local economy?

Figure 11*: The two axes that define the policy scenarios.*



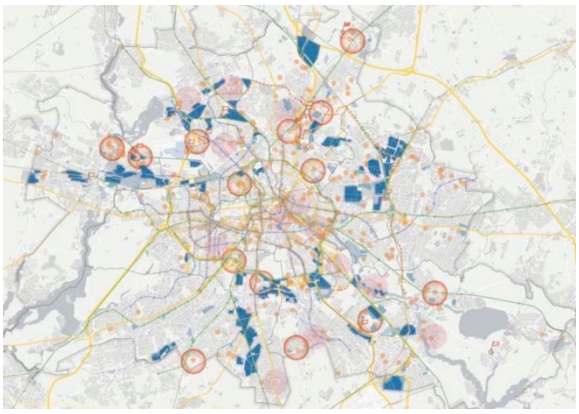
Source: ESPON MISTA (2020).

Until recently, there has been a strong difference between the City of Warsaw and the surrounding municipalities in terms of land value and demand for space. Before discussing the scenarios, the participants were asked to vote on which scenario they felt was most relevant to the future of Warsaw. Most of the participants responded with the most complex scenario: mission driven metropolitan scale action, called ‘developing an integrated maker region’. Considering Warsaw’s strategy to encourage the services sector and the poor integration of research in the economy, this provides an ambitious choice.

4.2.2 Inspirational cases selected

Eight inspirational cases were selected for the workshop which provide an indication of the kind of interventions that were considered a priority.

Figure 12: The inspirational cases presented and discussed within the workshop.



Greater Manchester Combined Authority

Warsaw's metropolitan planning competencies have been evolving, particularly through recent project partnerships. National legislation is providing some limitations, but the example of how Greater Manchester developed its Combined Authority offers a positive precedent in terms of what to expect and how to grow metropolitan cooperation.

Berlin Regional Development Plan 2030

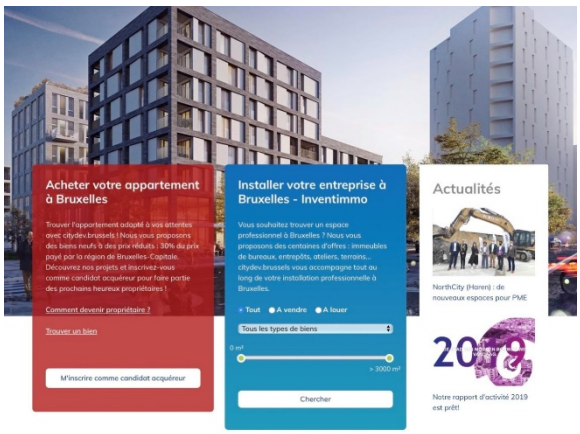
The City of Warsaw which can be problematic in terms of focusing investment in infrastructure and diversifying its local economy. Berlin's Economic Urban Development Plan helps to flesh out how certain activities can be best distributed across the city to take advantage of logistics and links to research.

Malopolska Regional Development Agency

Warsaw could explore regional development based on local business development. Malopolska offers a wide range of services and support for businesses within the region.

Vienna Business Districts

Business networking and support can help with creating partnerships and coalitions. Vienna's Business Districts are inspirational in terms of creating strong personal contacts.



Citydev.brussels

Metropolitan development can be showcased by a public developer that can create space that the market may not be prioritising. Citydev provides a useful model of a publicly owned private developer.

RDM Campus

The RDM site links education and entrepreneurship under the same roof and encourages collaboration between people with technical and theoretical expertise. This kind of space could be an appealing investment opportunity for Warsaw in developing a more diversified local economy.

Sheffield Advanced Manufacturing Innovation District

Clusters can be important for focusing on specific skills and knowledge. Sheffield's manufacturing cluster focuses on machinery and metals, which is supported by training and incubator spaces. This example can help Warsaw link local research and production.

Strijp-S

Inner-city brownfield sites can be developed in a profitable way that results in an evolution of the industrial heritage and benefits the local economy. Through public partnership in the development process, community space can be integrated into the heart of the project.

Source: ESPON MISTA (2020).

4.2.3 Outcomes and discussion

The results of the workshop showed the interest from participants to more formally integrate industrial land uses and the production sector into economic planning. Concerns were raised regarding obstacles to use land for industrial development such as the crowding out effect of more profitable development (such as housing or office space), the high cost of decontamination of brownfield sites and the scarcity of larger developable land in the city. This largely showed the limitation of focusing on the City of Warsaw.

The scenario selected showed a strong will of the participants to explore metropolitan scale planning. Interest in continuing and broadening the collaboration started in the framework of Integrated Territorial Investments (ITI) area, including some 40 local government areas, which has been considered as a positive experience. A development framework would be necessary to be able to collaborate. There was a lack of clarity regarding what this kind of organisation would look like and if there was a way to adapt an existing organisation to broaden its responsibility. The inspirational cases presented three different formats of a development agency.

Nevertheless, challenges to cooperation were raised in the time taken for economic development, while municipalities are driven by shorter-term gains. More knowledge would be needed on how the costs and benefits of metropolitan level cooperation are distributed across municipalities. Likewise, current taxation regulation does not provide attractive conditions for municipalities to stimulate industrial land uses so some kind of metropolitan scale financial instrument would be needed to enable municipalities to build trust and share the benefits of cohesive economic development.

5 Annex: Further details on the methodology of the SWOT analysis used

5.1 Detailed description of the methodology

The methodology follows the approach to the analysis of the regional network of branches pioneered by Otto et al. (2014) and Neffke et al (2017A, 2017B). The basis for this approach is the common recognition that innovation (and thus growth) is driven by the exchange of knowledge between firms. According to increasing empirical evidence[13], knowledge exchange (and thus innovation) does not occur primarily within branches along narrow technological paths, as assumed by traditional approaches to agglomeration theory (beginning with Marshall, 1890) – and as referred to by a long tradition of "picking-the-winner" approaches to identifying sectoral strengths or "lead branches", which shaped regional economic policy until the 1980s. More recent results rather show that sectoral diversity is more likely to be positive for knowledge spillovers because a broad spectrum of branches offers access to different knowledge bases. Consequently, innovations are often generated by applying existing technological solutions (from one branch) to new problem areas (in another branch) by recombining knowledge from different areas (initially Jacobs, 1969).

Companies can, however, only absorb and process new knowledge if this knowledge is not too far away from their own knowledge base. Consequently, a central issue in the related varieties analysis conducted below is the measurement of the “embeddedness” of a branch. In this respect several approaches have been proposed in literature.[14] Most of them, however, are only able to identify proximity and define relatedness within the manufacturing sector or within the service sector. This makes them unsuitable for the present project as they are unable to measure the increasing linkages between services and production that characterize the economic “ecosystems” of urban agglomerations. For this reason, the current analysis relies on an approach by Neffke and Henning (2013). This approach argues that the exchange of personnel between branches (i.e. the direct movement of employees from one branch to another) is a good measure of the proximity of their knowledge base as such flows show that workers from one branch can meaningfully apply their knowledge base (gained in the source branch) in the destination branch. The approach therefore derives the measure of the proximity of the knowledge flow from flow data of employees between branches across all economic sectors.[15] This is because human capital of the workforce is highly job-specific, so that individuals (necessarily) lose part of their human capital when they move to a branch in which

[13] For an overview of the results of the meanwhile numerous relevant studies see, for example, Baudry and Schiffauerova (2009) and Boschma (2017).

[14] For a more detailed description of these approaches and their methodological advantages and disadvantages see Firgo and Mayerhofer (2018).

[15] This is the only approach that allows to consider the integration of and interdependencies between industry and services in the definition of proximity and relatedness, which is one of the central topics of the present project.

they cannot or can hardly make use of their previously accumulated (job- or branch-specific) knowledge (Neal, 1995; Parent, 2000). Such job changes between cognitively distant branches are rather unlikely. Rather, employees prefer to switch between branches that share a common knowledge base (i.e. are technologically or cognitively related to each other) and therefore need workers with similar skills, so that the employees can transfer a large part of their human capital when changing jobs between branches (and thus avoid losses of human capital and therefore income).[16]

Thus, the degree of cognitive or technological relatedness between two branches can be deduced from the probability of labour flows between these branches. Of course, this requires complete information on all job changes between branches at a very disaggregated sectoral level. Such data is provided by the results of a major research project conducted by the Institute for Employment Research (IAB) in Germany (Neffke et al., 2017A, 2017B), which examined labour flows between branches at a highly disaggregated level on the basis of the IAB dataset on employment history (BeH)[17] in order to define technologically or cognitively "close" branches for Germany (referred to here as "skill-relatedness"). The application of the labour-flows between branches obtained for Germany to regions of other countries seems justified. It can be feasibly assumed that branches (groups) that prove to be technologically or cognitively "close" or "skill-related" in Germany on the basis of inter-sectoral labour market flows at the level of NACE 3-digit branches, will be so in other highly developed parts of Europe as well: In fact, it can be rather ruled out that the same NACE 3-digit branches in Germany and regions in Austria, Norway or (Northern) Italy - that are subject to the present analysis - as regions with very similar levels of economic and technological development, differ substantially from each other in terms of production technology, qualification structure, input-output interdependencies etc., such that they would require systematically different knowledge bases.

We therefore use the matrix of branch-relatedness obtained from intersectoral job changes, the resulting sectoral connections for the analysis of the stakeholder city regions of the project. IAB distinguishes a total of 265 branch groups at the NACE 3-digit level in Germany. This means that a symmetrical matrix can be used to map a total of more than 70,000 target-source relationships between branches. For each of these bilateral relations a "Skill-Relatedness" index (*SRij*) is formed, which depicts the relative magnitude of the respective flow of labour between two branches i and j as a measure of their "skill-relatedness". The basic idea here is

16 An empirical confirmation of this hypothesis is provided by Neffke et al. (2017A) for Germany. They show that job changes between branches are restricted to a limited spectrum of target branches that are cognitively "related" to the respective branch of origin.

17 In principle, the results were calculated at the 4-digit level of economic activities, but for our purposes they were aggregated to the level 3 branches. We are very grateful to Anne Otto of IAB Nuremberg for providing the data and additional processing for the purposes of our analysis. The BeH data set (for a more detailed description see Bender et al., 2000) represents a complete survey. The employee history contains comprehensive personal information on all employees and companies in Germany subject to social insurance contributions as of 30 June each year. Information on employees and companies can be linked by means of anonymous personal and company numbers, so that on this basis (also) changes of job of employees can be identified.

that comparatively "large" labour flows between two branches are an indication that workers from branch i tend to move to branch j without any problems and can reuse their knowledge or skills from the old branch i quite easily. In this case the pair of branches under consideration can be qualified as cognitively/technologically "close" (or "skill-related").

What is meant by "comparatively large": In addition to their cognitive proximity, other factors are responsible for the extent of job changes between two branches, especially their size, but also their dynamics, wage levels or similar. An observable bilateral labour flow can thus be considered "relatively large" (and only then) if the number of job changes between the two branches is greater than would have been expected taking all the factors mentioned into account. Consequently, the "Skill-Relatedness" index compares the actual number of job changes measured with those that would have occurred if job changes between the two branches (given the characteristics of the branch) had been purely random. This (in the case of random changes) "expected" labour flows thus represents the benchmark for the classification of the observed labour flows. It can be easily calculated based on probability theory (cf. Otto et al., 2014).

Specifically, the "skill-relatedness" indicator as a measure of the cognitive "proximity" between two branches i and j is thus denoted as

Equation *(3)* $$SR_{ij} = \frac{F_{ij}}{\hat{F}_{ij}},$$

where F_{ij} denotes the observed job changes between branches i and j, and $\hat{F}_{ij}$ denotes the expected job changes between i and j. If this "skill-relatedness" index is > 1, the actual flows between the two branches are greater than would be expected in the case of purely random job entries and exits, which means that the pair of branches can be regarded as technologically or cognitively "related" or "skill-related". With index values < 1, on the other hand, job changes between the two branches are less frequent than would be expected, and a technological or cognitive relatedness obviously is not high in this case.[18] On the basis of the matrix of these 70,225 indicator values for the 265 branch groups of the NACE classification (level 3) it is now possible to represent the entire network of cognitively or technologically "related" branches and to use it subsequently for the calculation of the embeddedness (see above) as part of the empirical SWOT analysis for the individual branches in each stakeholder region.

Against this background, the starting point of the analysis is that the development potential of a productive branch in a region is determined not only by its own "critical mass" (i.e. its degree of specialisation), but also by the extent to which it can rely on a fertilising environment of complementary, (technologically or cognitively) "related" branches. Thus, following Otto et al. (2014), a branches potential in a region can be empirically assessed along two dimensions.

[18] In the further analysis, a normalized "skill-relatedness" index is used, which assumes values between -1 and +1. Positive values thus indicate cognitive proximity, whereas negative values do not indicate such proximity.

The first is the size of the branch in the regional economy, which is measured by the location quotient (LQ_{ir}) as a measure of the relative regional of branch *i* in region *r.* If this indicator is larger than one the branch is localized in the region, otherwise it is not.

The second is the embeddedness of a specific branch *i* in the "knowledge environment" of the region. This, similarly, to its own size, can be measured by the (weighted) regional specialisation of related branches (LQ_{ir}^{rel}) in the region. If its value of is larger than 1, then branch i is well embedded in the economy of region r, as it can draw on a large pool of "related" branches with a similar knowledge base. Values smaller than 1, on the other hand, denote branches that do not have such a regional "ecosystem" of related activities, which can affect their stability and resilience.

Table 1: Categories of the empirical SWOT analysis
Development potentials according to degree of specialisation and embeddedness

		Regional embeddedness of branch *i*	
		high $LQ_{ir}^{rel} > 1{,}1$	low $LQ_{ir}^{rel} < 0{,}9$
Regional degree of specialisation in branch *i*	High $LQ_{ir} > 1{,}1$	High specialisation and well embedded (Strength S)	High specialisation but weakly embedded (Threat T)
	low $LQ_{ir} < 0{,}9$	Low specialisation but well embedded (Opportunity O)	Not specialised and weakly embedded (Weakness W)

Source: Otto et al. (2014), ESPON MISTA (2020).

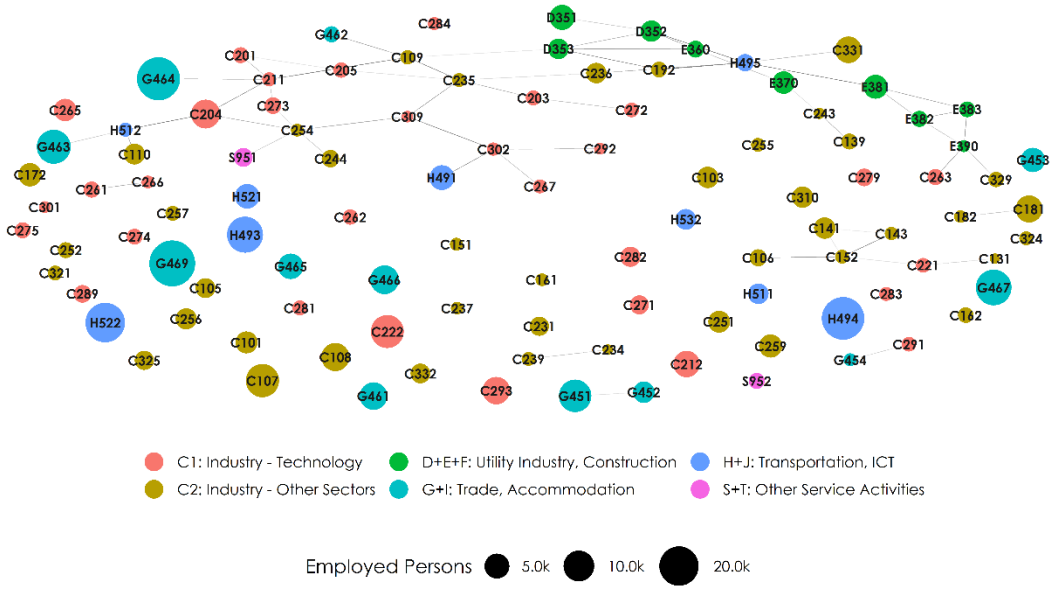
Overall, both the degree of specialisation and the embeddedness in the regional sectoral structure are decisive for an assessment of the development potential of a branch., According to Otto et al. (2014) economic branches in a region can be classified into four different categories, by differentiating, according to the values of their localisation quotient and their embeddedness indicator (Table A1):

1. If the branch under consideration is heavily localized in the region (LQ_{ir} > 1.1) and if this branch is also well embedded in "related" branches (LQ_{ir}^{rel} > 1.1), the branch is large relative to the regional economy and it is likely that it will also strongly profit from localised knowledge transfers across industries in the region. As a consequence its future development prospects should be favourable, and the branch can be considered to be a "strength" of the regional economy.
2. By contrast, a branch with a low degree of specialisation and embeddedness (LQ_{ir} as well as LQ_{ir}^{rel} < 0.9) is unlikely to profit substantially from localized knowledge transfers but is also small in terms of the regional economy. Despite the fact that such branches may be of importance for the other reasons (e.g. the presence of natural resources or the satisfaction of local demand) such branches have therefore been regarded as a regional "weakness" in previous analysis from a technological development perspective.

3. Branches that are lowly localised (LQ_{ir} < 0.9) but well embedded (LQ_{ir}^{rel} > 1.1) are faced by a favourable regional environment of technologically or cognitively "close" branches (and thus diverse opportunities to use a common knowledge base) but are still relatively small. Such branches could thus offer special "opportunities" to develop new strengths through structural policy initiatives in the future.
4. Finally, branches which are highly localized (LQ_{ir} > 1.1), but only weakly embedded in complementary in the region (LQ_{ir}^{rel}< 0.9), tend to be seen at risk which could be reduced by strengthening complementary branches through structural policy initiatives. This is because they are relatively large but are unlikely to profit substantially from their regional knowledge base.

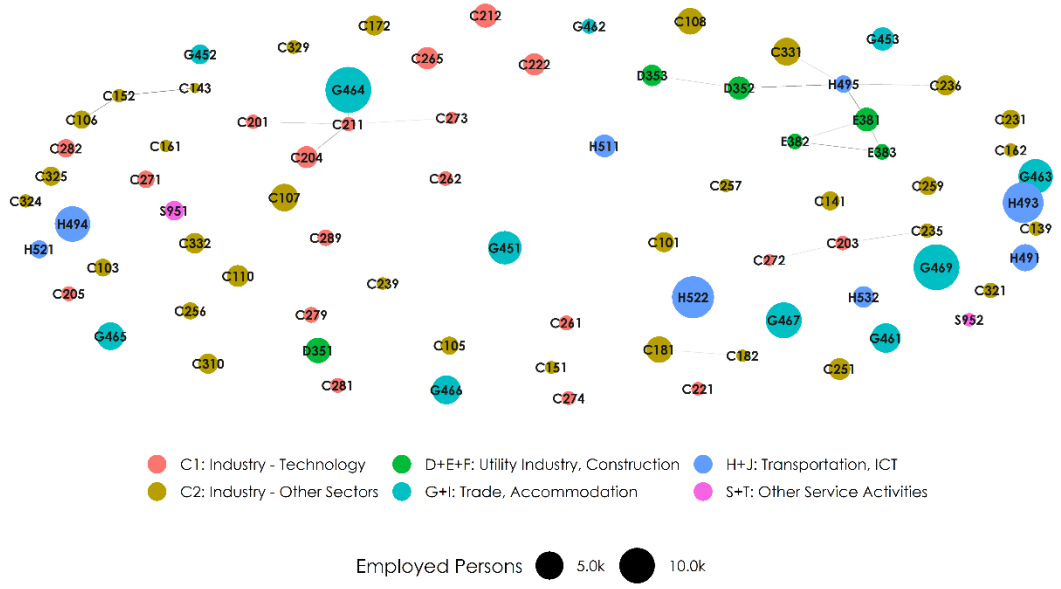
5.2 Network of branches

Figure A1: Network of branches (total Warsaw metropolitan area).



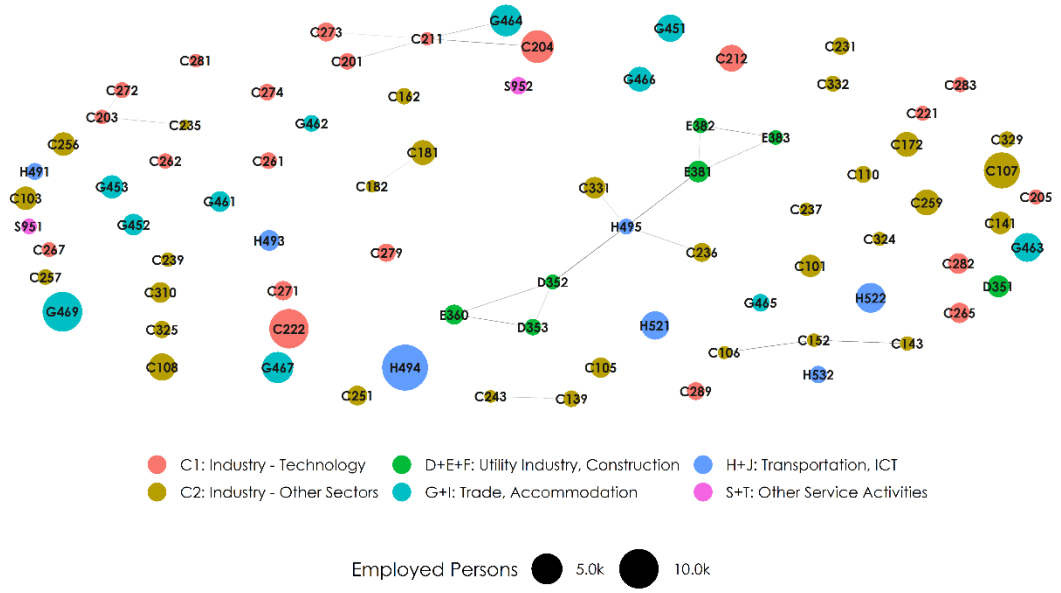
Source: Statistics Poland, network structure based on Neffke et al. (2017B), ESPON MISTA (2020) team calculations. For illustrative purposes, only NACE 3-digit branch groups marking productive activities (in bold) and non-productive activities with strong links to productive activities with at least 100 employees are displayed.

Figure A2: Network of branches (city of Warsaw).



Source: Statistics Poland, network structure based on Neffke et al. (2017B), ESPON MISTA (2020) team calculations. For illustrative purposes, only NACE 3-digit branch groups marking productive activities (in bold) and non-productive activities with strong links to productive activities with at least 100 employees are displayed.

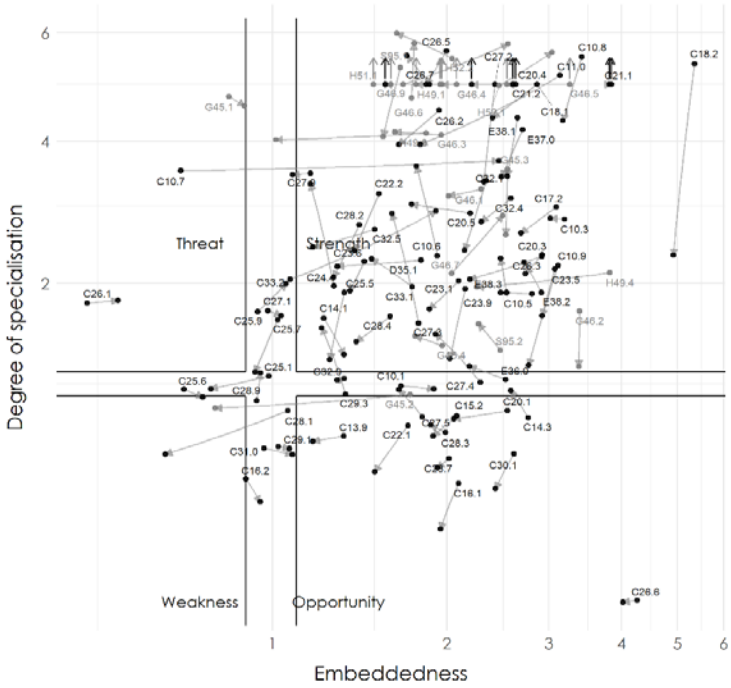
Figure A3: Network of branches (environs)



Source: Statistics Poland, network structure based on Neffke et al. (2017B), ESPON MISTA (2020) team calculations. For illustrative purposes, only NACE 3-digit branch groups marking productive activities (in bold) and non-productive activities with strong links to productive activities with at least 100 employees are displayed.

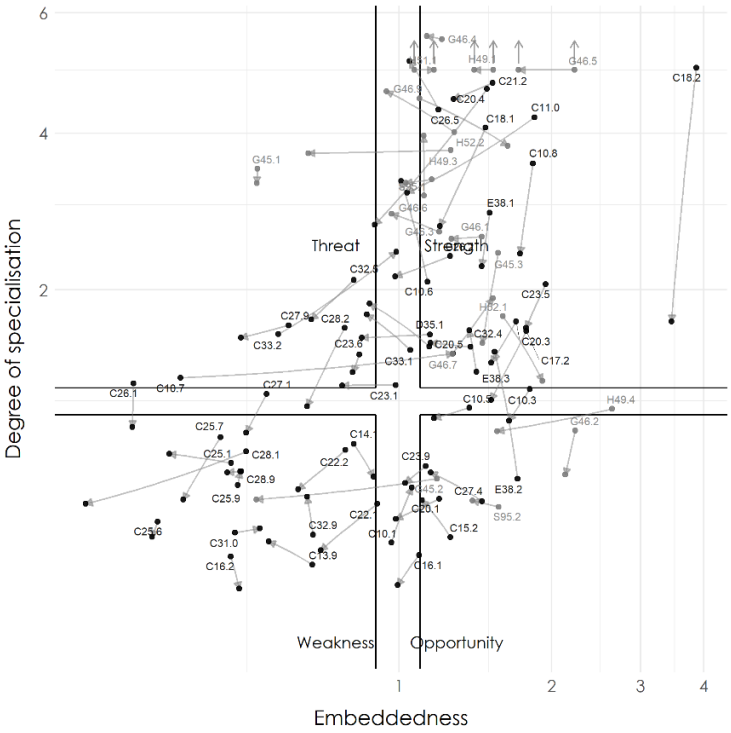
5.3 A dynamic perspective on the SWOT profiles

Figure A4: Dynamic of the SWOT Profile (total Warsaw metropolitan area).



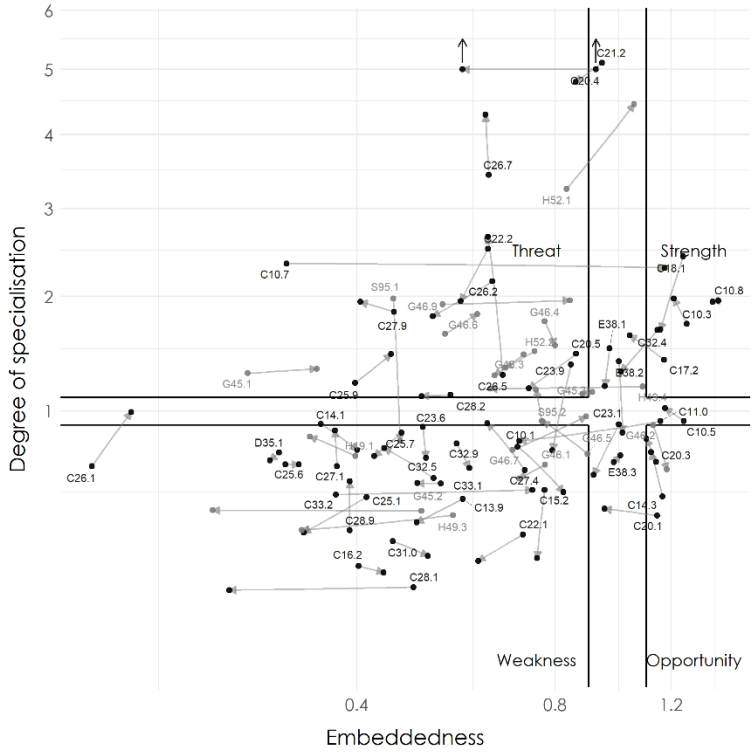
Source: Statistics Poland, ESPON MISTA (2020) team calculations. Industry (service) activities in black (grey). For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

Figure A5: Dynamic of the SWOT Profile (city of Warsaw).



Source: Statistics Poland, ESPON MISTA (2020) team calculations. Industry (service) activities in black (grey). For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

Figure A6: Dynamic of the SWOT Profile (environs).



Source: Statistics Poland, ESPON MISTA (2020) team calculations. Industry (service) activities in black (grey). For illustrative purposes only branches with at least 100 employees are displayed. For NACE codes and branches see Table A8 in the annex.

5.4 Top 10 Tables for Subregions

Table A2: Top 10 branches in terms of size (2018).

NACE	Name	Empl.	Share in %
Total metropolitan region			
G46.9	Non-specialised wholesale trade	29716	4,21
G46.4	Wholesale of household goods	25059	3,55
H49.4	Freight transport by road and removal services	24679	3,49
H52.2	Support activities for transportation	20063	2,84
H49.3	Other passenger land transport	15665	2,22
G46.7	Other specialised wholesale	15308	2,17
G46.3	Wholesale of food, beverages and tobacco	13220	1,87
C10.7	Manufacture of bakery and farinaceous products	12496	1,77
C22.2	Manufacture of plastics products	12174	1,72
G45.1	Sale of motor vehicles	11680	1,65
City of Warsaw			
G46.4	Wholesale of household goods	19664	2,78
G46.9	Non-specialised wholesale trade	19628	2,78
H52.2	Support activities for transportation	15581	2,20
H49.3	Other passenger land transport	14406	2,04
G46.7	Other specialised wholesale	10195	1,44
H49.4	Freight transport by road and removal services	9938	1,41
G46.3	Wholesale of food, beverages and tobacco	9171	1,30
G45.1	Sale of motor vehicles	8317	1,18
G46.1	Wholesale on a fee or contract basis	5759	0,81
G46.6	Wholesale of other machinery, equipment and supplies	5449	0,77
Environs			
H49.4	Freight transport by road and removal services	14741	2,09
G46.9	Non-specialised wholesale trade	10088	1,43
C22.2	Manufacture of plastics products	9903	1,40
C10.7	Manufacture of bakery and farinaceous products	7802	1,10
C20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	6001	0,85
G46.4	Wholesale of household goods	5395	0,76
G46.7	Other specialised wholesale	5113	0,72
H52.2	Support activities for transportation	4482	0,63
G46.3	Wholesale of food, beverages and tobacco	4049	0,57
H52.1	Warehousing and storage	3797	0,54

Source: Statistics Poland, ESPON MISTA (2020) team calculations.

Table A2: Top 10 branches in terms of growth (2012-2018).

NACE	Name	Empl.	Growth p.a. in %
Total metropolitan region			
C29.3	Manufacture of parts and accessories for motor vehicles	6901	16,36
C24.4	Manufacture of basic precious and other non-ferrous metals	1267	15,06
C27.3	Manufacture of wiring and wiring devices	1023	14,71
H52.1	Warehousing and storage	4783	14,11
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	3508	13,94
C27.4	Manufacture of electric lighting equipment	732	12,92
C33.2	Installation of industrial machinery and equipment	2127	11,30
E38.2	Waste treatment and disposal	827	11,22
C10.6	Manufacture of grain mill products, starches and starch products	1147	10,41
C19.2	Manufacture of refined petroleum products	726	9,55
City of Warsaw			
E38.2	Waste treatment and disposal	515	28,20
C13.9	Manufacture of other textiles	310	15,15
C10.1	Processing and preserving of meat and production of meat products	1551	14,48
C32.9	Manufacturing n.e.c.	258	13,61
C33.2	Installation of industrial machinery and equipment	1757	12,80
C27.4	Manufacture of electric lighting equipment	271	12,04
C15.2	Manufacture of footwear	218	11,57
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	2314	10,96
C10.6	Manufacture of grain mill products, starches and starch products	1057	10,94
G46.6	Wholesale of other machinery, equipment and supplies	5449	9,54
Environs			
H53.2	Other postal and courier activities	594	26,35
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	1194	21,95
H52.1	Warehousing and storage	3797	17,90
C28.9	Manufacture of other special-purpose machinery	672	14,20
C27.4	Manufacture of electric lighting equipment	461	13,47
G46.5	Wholesale of information and communication equipment	628	12,13
C32.5	Manufacture of medical and dental instruments and supplies	572	11,79
C27.1	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	967	10,96
C26.1	Manufacture of electronic components and boards	476	9,25
C26.7	Manufacture of optical instruments and photographic equipment	261	8,84

Source: Statistics Poland, ESPON MISTA (2020) team calculations. For illustrative purposes only branches with at least 100 employees in 2018 are displayed.

Table A3: Top 10 branches in terms of specialisation (location quotient, 2018).

NACE	Name	Empl.	LQ
Total metropolitan region			
H51.1	Passenger air transport	2493	20,21
C21.1	Manufacture of basic pharmaceutical products	395	12,82
C20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	8230	10,14
C21.2	Manufacture of pharmaceutical preparations	6169	9,32
H49.5	Transport via pipeline	1212	9,10
H49.1	Passenger rail transport, interurban	5006	8,27
G46.5	Wholesale of information and communication equipment	5425	8,00
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	3508	7,81
G46.4	Wholesale of household goods	25059	7,11
H52.2	Support activities for transportation	20063	5,99
City of Warsaw			
H51.1	Passenger air transport	2493	20,21
C21.1	Manufacture of basic pharmaceutical products	291	9,44
H49.1	Passenger rail transport, interurban	4508	7,45
G46.5	Wholesale of information and communication equipment	4797	7,07
H49.5	Transport via pipeline	856	6,43
G46.4	Wholesale of household goods	19664	5,58
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	2314	5,15
D35.2	Manufacture of gas; distribution of gaseous fuels through mains	2662	4,88
H52.2	Support activities for transportation	15581	4,65
C21.2	Manufacture of pharmaceutical preparations	2995	4,53
Environs			
C20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	6001	7,40
C21.2	Manufacture of pharmaceutical preparations	3174	4,80
H52.1	Warehousing and storage	3797	4,45
C26.7	Manufacture of optical instruments and photographic equipment	261	4,29
C21.1	Manufacture of basic pharmaceutical products	104	3,37
H49.5	Transport via pipeline	356	2,67
C27.2	Manufacture of batteries and accumulators	376	2,66
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	1194	2,66
C27.3	Manufacture of wiring and wiring devices	877	2,48
C10.7	Manufacture of bakery and farinaceous products	7802	2,30

Source: Statistics Poland, ESPON MISTA (2020) team calculations. For illustrative purposes only branches with at least 100 employees are displayed.

Table A4: Top 10 branches in terms of embeddedness (2018).

NACE	Name	Empl.	Embed.
Total metropolitan region			
C18.2	Reproduction of recorded media	174	4,91
C26.6	Manufacture of irradiation, electromedical and electrotherapeutic equipment	179	4,02
C21.1	Manufacture of basic pharmaceutical products	395	3,84
G46.2	Wholesale of agricultural raw materials and live animals	875	3,38
C10.8	Manufacture of other food products	7492	3,17
C30.2	Manufacture of railway locomotives and rolling stock	263	3,12
H52.1	Warehousing and storage	4783	3,04
H51.2	Freight air transport and space transport	363	3,03
C10.3	Processing and preserving of fruit and vegetables	2946	3,02
C23.5	Manufacture of cement, lime and plaster	356	2,92
City of Warsaw			
C18.2	Reproduction of recorded media	125	3,45
C21.1	Manufacture of basic pharmaceutical products	291	2,56
G46.2	Wholesale of agricultural raw materials and live animals	401	2,13
H52.1	Warehousing and storage	986	1,92
C23.5	Manufacture of cement, lime and plaster	352	1,78
C10.8	Manufacture of other food products	4141	1,73
G46.5	Wholesale of information and communication equipment	4797	1,72
D35.3	Steam and air conditioning supply	2005	1,66
C10.3	Processing and preserving of fruit and vegetables	891	1,65
D35.2	Manufacture of gas; distribution of gaseous fuels through mains	2662	1,65
Environs			
C10.8	Manufacture of other food products	3351	1,39
C21.1	Manufacture of basic pharmaceutical products	104	1,26
C10.3	Processing and preserving of fruit and vegetables	2055	1,21
G46.2	Wholesale of agricultural raw materials and live animals	474	1,18
C10.5	Manufacture of dairy products	1158	1,18
C10.7	Manufacture of bakery and farinaceous products	7802	1,17
C18.1	Printing and service activities related to printing	2499	1,16
C14.3	Manufacture of knitted and crocheted apparel	196	1,12
C20.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	221	1,10
D35.3	Steam and air conditioning supply	463	1,07

Source: Statistics Poland, ESPON MISTA (2020) team calculations. For illustrative purposes only branches with at least 100 employees are displayed.

Table A5: Top Strengths (2018).

NACE	Name	Employment
Total metropolitan region		
C21.1	Manufacture of basic pharmaceutical products	395
H51.1	Passenger air transport	2493
H49.5	Transport via pipeline	1212
C21.2	Manufacture of pharmaceutical preparations	6169
G46.5	Wholesale of information and communication equipment	5425
H52.1	Warehousing and storage	4783
C20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	8230
D35.2	Manufacture of gas; distribution of gaseous fuels through mains	2893
G46.9	Non-specialised wholesale trade	29716
H49.1	Passenger rail transport, interurban	5006
City of Warsaw		
C21.1	Manufacture of basic pharmaceutical products	291
H51.1	Passenger air transport	2493
G46.5	Wholesale of information and communication equipment	4797
H49.1	Passenger rail transport, interurban	4508
H49.5	Transport via pipeline	856
D35.2	Manufacture of gas; distribution of gaseous fuels through mains	2662
G46.4	Wholesale of household goods	19664
G46.9	Non-specialised wholesale trade	19628
C18.2	Reproduction of recorded media	125
C21.2	Manufacture of pharmaceutical preparations	2995
Environs		
C21.1	Manufacture of basic pharmaceutical products	104
C10.7	Manufacture of bakery and farinaceous products	7802
C10.8	Manufacture of other food products	3351
C10.3	Processing and preserving of fruit and vegetables	2055
C18.1	Printing and service activities related to printing	2499

Source: Statistics Poland, ESPON MISTA (2020) team calculations. For illustrative purposes only branches with at least 100 employees are displayed.

Table A6: Top Opportunities (2018).

NACE	Name	Empl.
Total metropolitan region		
C30.2	Manufacture of railway locomotives and rolling stock	263
C20.1	Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms	775
C28.3	Manufacture of agricultural and forestry machinery	371
C15.2	Manufacture of footwear	338
C23.7	Cutting, shaping and finishing of stone	161
C30.1	Building of ships and boats	113
C13.9	Manufacture of other textiles	798
C22.1	Manufacture of rubber products	487
C16.1	Sawmilling and planing of wood	183
H51.2	Freight air transport and space transport	363
City of Warsaw		
C10.3	Processing and preserving of fruit and vegetables	891
H49.4	Freight transport by road and removal services	9938
G46.2	Wholesale of agricultural raw materials and live animals	401
C10.5	Manufacture of dairy products	992
C27.2	Manufacture of batteries and accumulators	100
C27.4	Manufacture of electric lighting equipment	271
S95.2	Repair of personal and household goods	208
C15.2	Manufacture of footwear	218
Environs		
C20.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	221
C14.3	Manufacture of knitted and crocheted apparel	196
G46.2	Wholesale of agricultural raw materials and live animals	474

Source: Statistics Poland, ESPON MISTA (2020) team calculations. For illustrative purposes only branches with at least 100 employees are displayed.

Table A7: Top Threats (2018).

NACE	Name	Empl.
Total metropolitan region		
G45.1	Sale of motor vehicles	11680
C26.1	Manufacture of electronic components and boards	867
City of Warsaw		
C20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	2229
H49.3	Other passenger land transport	14406
G45.1	Sale of motor vehicles	8317
C20.5	Manufacture of other chemical products	402
C33.1	Repair of fabricated metal products, machinery and equipment	4777
D35.1	Electric power generation, transmission and distribution	3631
C32.5	Manufacture of medical and dental instruments and supplies	1300
C23.6	Manufacture of articles of concrete, cement and plaster	1606
C23.1	Manufacture of glass and glass products	1225
C27.9	Manufacture of other electrical equipment	568
Environs		
C20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	6001
C21.2	Manufacture of pharmaceutical preparations	3174
C26.7	Manufacture of optical instruments and photographic equipment	261
C27.2	Manufacture of batteries and accumulators	376
C27.3	Manufacture of wiring and wiring devices	877
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	1194
G46.9	Non-specialised wholesale trade	10088
G46.4	Wholesale of household goods	5395
C22.2	Manufacture of plastics products	9903
G46.6	Wholesale of other machinery, equipment and supplies	2511

Source: Statistics Poland, ESPON MISTA (2020) team calculations. For illustrative purposes only branches with at least 100 employees are displayed.

5.5 Summary table on size and SWOT-profiles of all productive activities

Table A.8: NACE 3-dgit branch groups and SWOT profiles.

NACE	Name	Total Empl.	City	Envi-rons	Total Reg.
C10.1	Processing and preserving of meat and production of meat products	3240		W	
C10.3	Processing and preserving of fruit and vegetables	2946	O	S	S
C10.5	Manufacture of dairy products	2150	O		S
C10.6	Manufacture of grain mill products, starches and starch products	1147			S
C10.7	Manufacture of bakery and farinaceous products	12496	S	S	S
C10.8	Manufacture of other food products	7492	S	S	S
C10.9	Manufacture of prepared animal feeds	413			S
C11.0	Manufacture of beverages	2663		W	S
C13.9	Manufacture of other textiles	798	W	W	O
C14.1	Manufacture of wearing apparel, except fur apparel	2938	W	W	S
C14.3	Manufacture of knitted and crocheted apparel	255		O	
C15.2	Manufacture of footwear	338	O	W	O
C16.1	Sawmilling and planing of wood	183			O
C16.2	Manufacture of products of wood, cork, straw and plaiting materials	706	W	W	
C17.2	Manufacture of articles of paper and paperboard	4082			S
C18.1	Printing and service activities related to printing	6575	S	S	S
C18.2	Reproduction of recorded media	174	S		S
C20.1	Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms	775			O
C20.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	578	S	O	S
C20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	8230	T	T	S
C20.5	Manufacture of other chemical products	655	T	T	S
C21.1	Manufacture of basic pharmaceutical products	395	S	S	S
C21.2	Manufacture of pharmaceutical preparations	6169	S	T	S
C22.1	Manufacture of rubber products	487	W	W	O
C22.2	Manufacture of plastics products	12174	W	T	S
C23.1	Manufacture of glass and glass products	1872	T		S
C23.5	Manufacture of cement, lime and plaster	356	S		S
C23.6	Manufacture of articles of concrete, cement and plaster	2508	T	W	S
C23.7	Cutting, shaping and finishing of stone	161		W	O
C23.9	Manufacture of abrasive products and non-metallic mineral products n.e.c.	334		W	S
C24.4	Manufacture of basic precious and other non-ferrous metals	1267			S
C25.1	Manufacture of structural metal products	3200	W	W	
C25.2	Manufacture of tanks, reservoirs and containers of metal	782			S
C25.5	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	347			S
C25.6	Treatment and coating of metals; machining	2792	W	W	W
C25.7	Manufacture of cutlery, tools and general hardware	531	W	W	

C25.9	Manufacture of other fabricated metal products	3891	W	T	
C26.1	Manufacture of electronic components and boards	867	W		T
C26.2	Manufacture of computers and peripheral equipment	659		T	S
C26.3	Manufacture of communication equipment	861			S
C26.5	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	3508		T	S
C26.6	Manufacture of irradiation, electromedical and electrotherapeutic equipment	179			O
C26.7	Manufacture of optical instruments and photographic equipment	337		T	S
C27.1	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	1837	W	W	
C27.2	Manufacture of batteries and accumulators	476	O	T	S
C27.3	Manufacture of wiring and wiring devices	1023	W	T	S
C27.4	Manufacture of electric lighting equipment	732	O		S
C27.5	Manufacture of domestic appliances	798			
C27.9	Manufacture of other electrical equipment	1291	T	T	
C28.1	Manufacture of general-purpose machinery	513	W	W	W
C28.2	Manufacture of other general-purpose machinery	2332		T	S
C28.3	Manufacture of agricultural and forestry machinery	371		W	O
C28.4	Manufacture of metal forming machinery and machine tools	243			S
C28.9	Manufacture of other special-purpose machinery	1322	W	W	
C29.1	Manufacture of motor vehicles	489			
C29.2	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	114			
C29.3	Manufacture of parts and accessories for motor vehicles	6901			S
C30.1	Building of ships and boats	113			O
C30.2	Manufacture of railway locomotives and rolling stock	263			O
C31.0	Manufacture of furniture	2829	W	W	
C32.1	Manufacture of jewellery, bijouterie and related articles	529	S		S
C32.4	Manufacture of games and toys	363	S		S
C32.5	Manufacture of medical and dental instruments and supplies	1872	T	W	S
C32.9	Manufacturing n.e.c.	652	W	W	
C33.1	Repair of fabricated metal products, machinery and equipment	6264	T	W	S
C33.2	Installation of industrial machinery and equipment	2127		W	S
D35.1	Electric power generation, transmission and distribution	5232	T	W	S
D35.2	Manufacture of gas; distribution of gaseous fuels through mains	2893	S		S
D35.3	Steam and air conditioning supply	2468	S		S
E36.0	Water collection, treatment and supply	1078		T	S
E37.0	Sewerage	3491			S
E38.1	Waste collection	4371	S		S
E38.2	Waste treatment and disposal	827	S		S
E38.3	Materials recovery	735	S		S
E39.0	Remediation activities and other waste management services	113			S
G45.1	Sale of motor vehicles	11680	T	T	T
G45.2	Maintenance and repair of motor vehicles	2962	W	W	W
G45.3	Sale of motor vehicle parts and accessories	4650	S	T	S

G45.4	Sale, maintenance and repair of motorcycles and related parts and accessories	213			S
G46.1	Wholesale on a fee or contract basis	7037	S	W	S
G46.2	Wholesale of agricultural raw materials and live animals	875	O	O	S
G46.3	Wholesale of food, beverages and tobacco	13220		T	S
G46.4	Wholesale of household goods	25059	S	T	S
G46.5	Wholesale of information and communication equipment	5425	S		S
G46.6	Wholesale of other machinery, equipment and supplies	7960	S	T	S
G46.7	Other specialised wholesale	15308	S		S
G46.9	Non-specialised wholesale trade	29716	S	T	S
H49.1	Passenger rail transport, interurban	5006	S	W	S
H49.3	Other passenger land transport	15665	T	W	
H49.4	Freight transport by road and removal services	24679	O	T	S
H49.5	Transport via pipeline	1212	S		S
H51.1	Passenger air transport	2493	S		S
H51.2	Freight air transport and space transport	363			O
H52.1	Warehousing and storage	4783	S		S
H52.2	Support activities for transportation	20063		T	S
S95.1	Repair of computers and communication equipment	1753		W	S
S95.2	Repair of personal and household goods	819	O	T	S

Source: ESPON MISTA (2020) team calculations; S… Strength, W… Weakness, O… Opportunity, T… Threat; Empty cell indicates no specific SWOT profile in the region.

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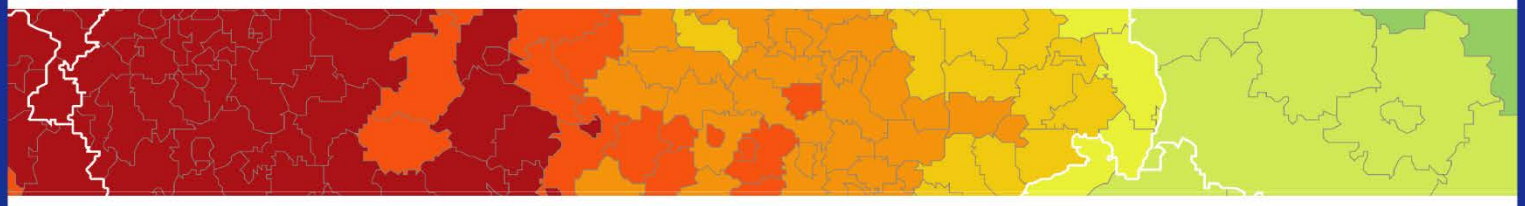

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