Urban resilience: the case of cities from Upper Silesian Agglomeration, Poland

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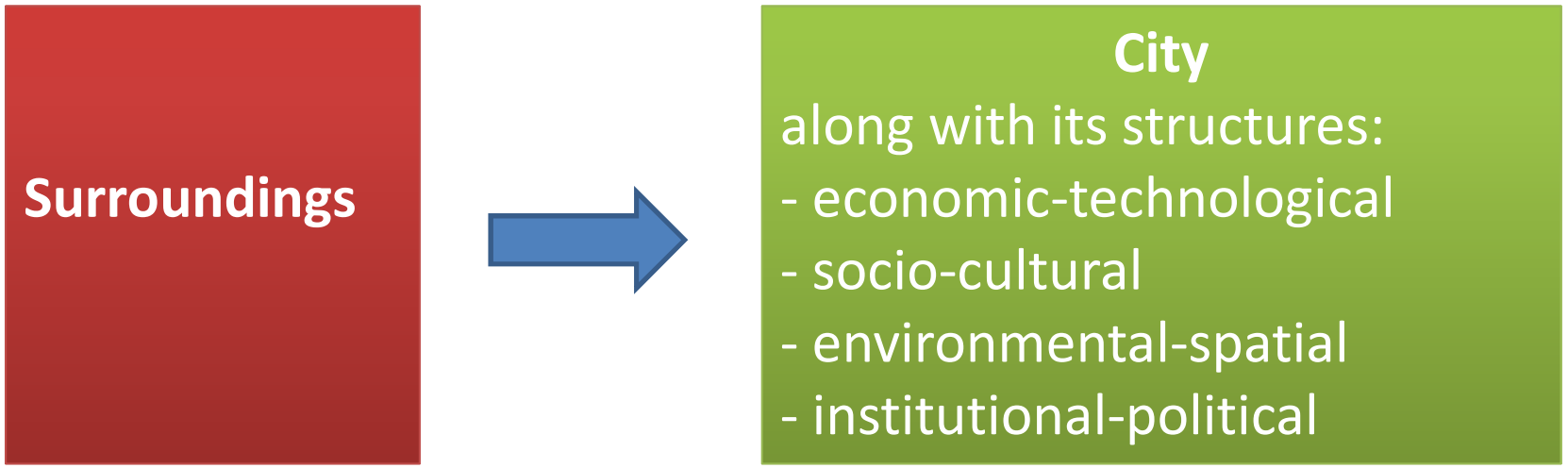
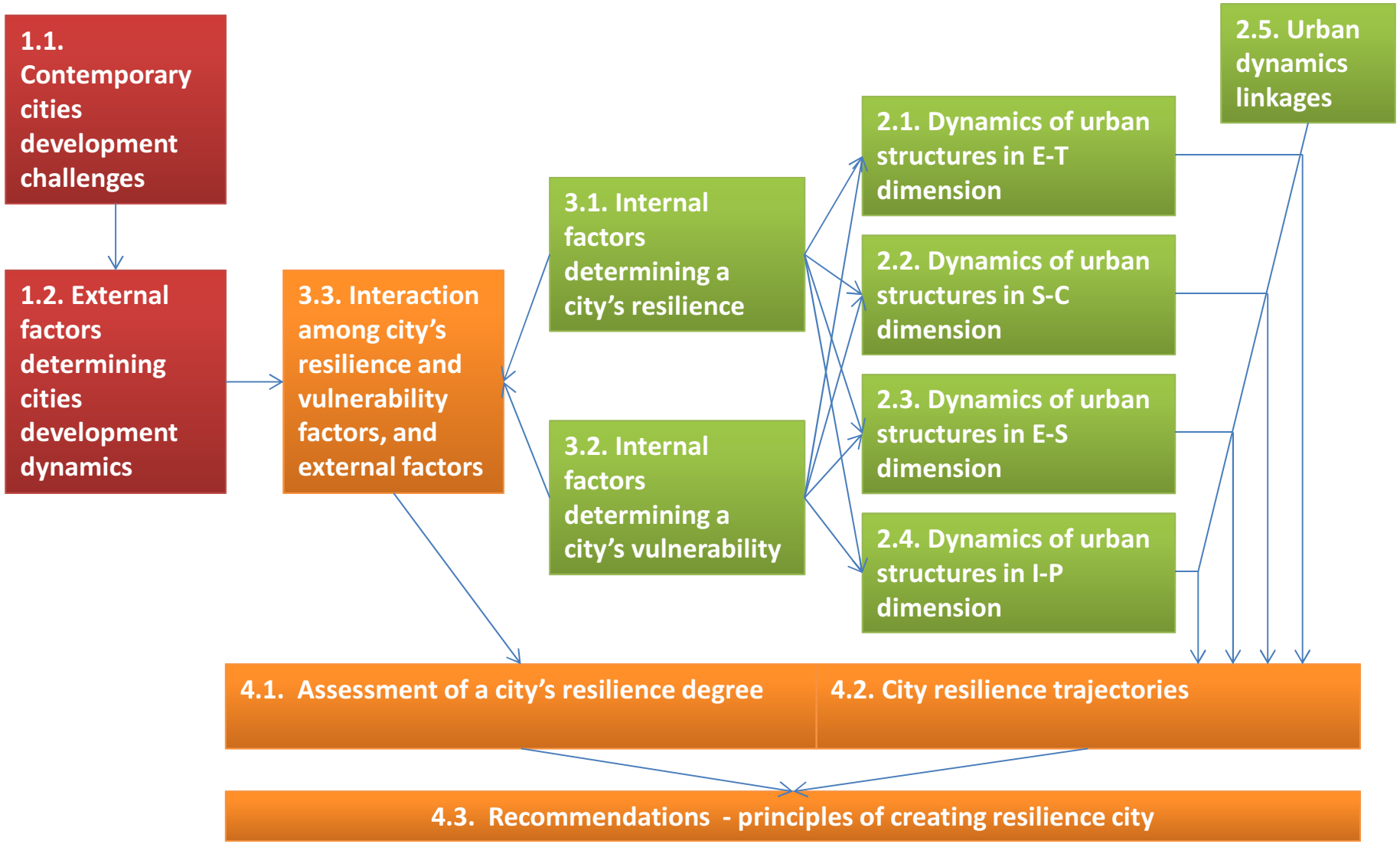
G yőr, 21st of May 2014

National Science Centre,
Urban resilience concept and post-industrial cities in Europe
(2012-2014)

Regional Studies Association Research Network,
Transition and Resilience for Post-industrial Agglomerations in Central Europe: Diagnosis and evaluation
(2012-2013)

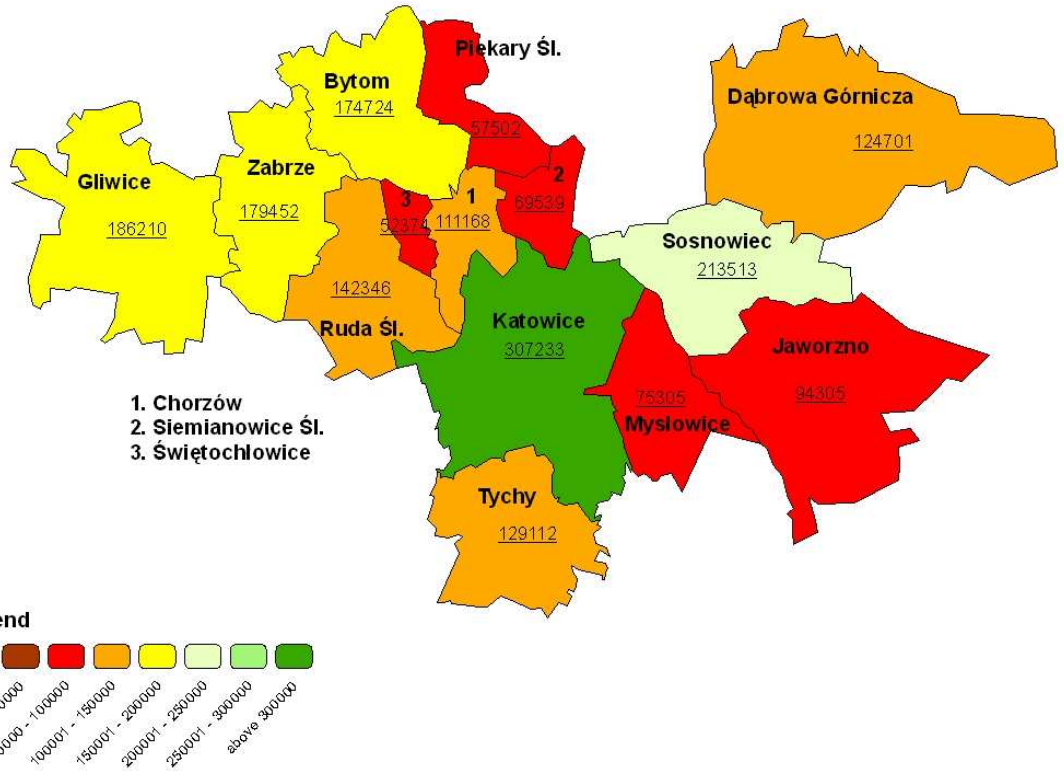


The research project idea



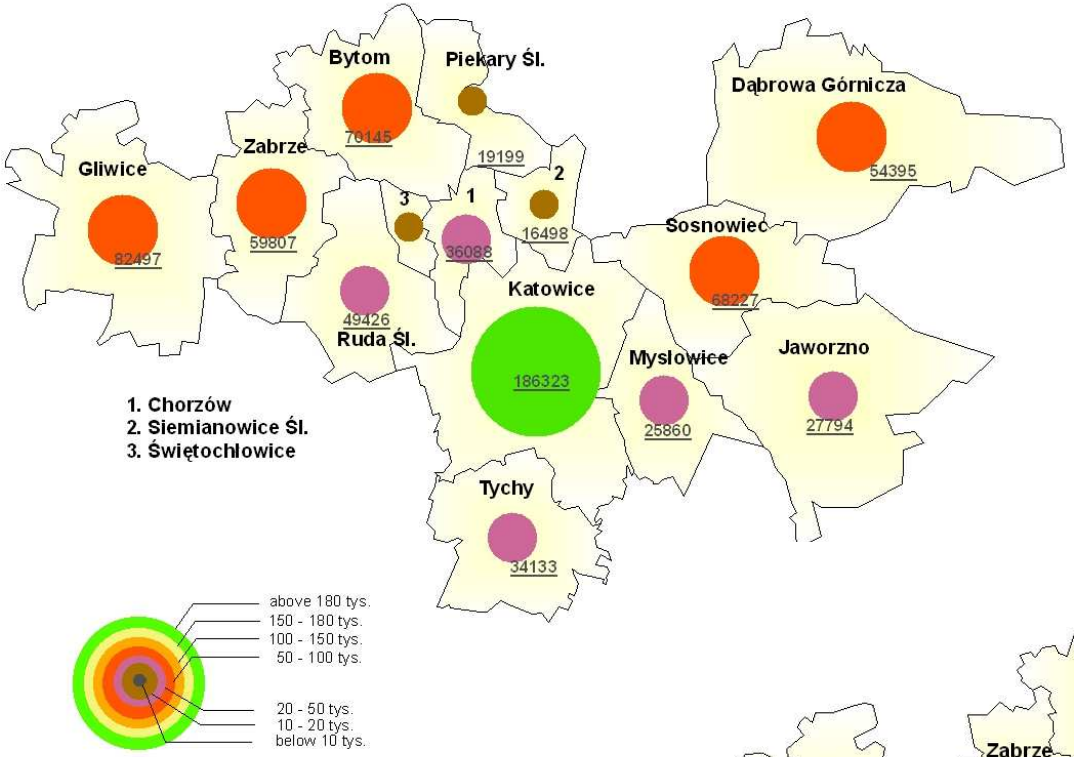
Population, Upper Silesian Agglomeration

2012,
Population = 1,917,482



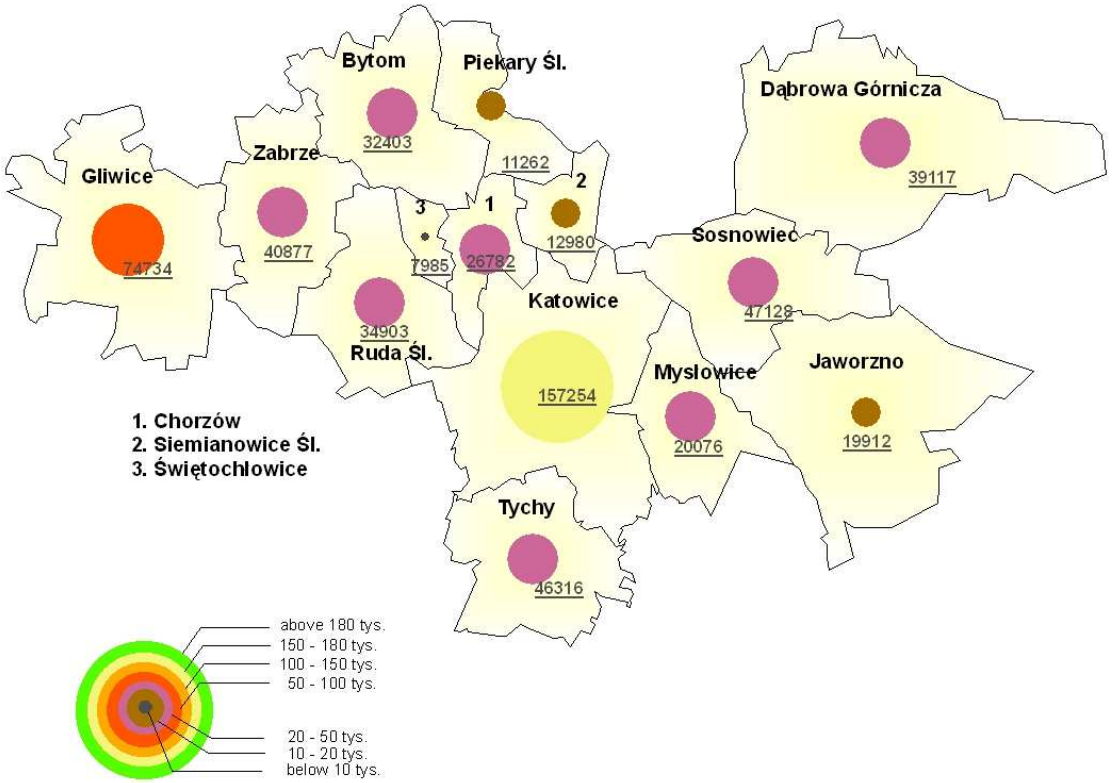
1995,
Population = 2,178,492

Total employment, Upper Silesian Agglomeration

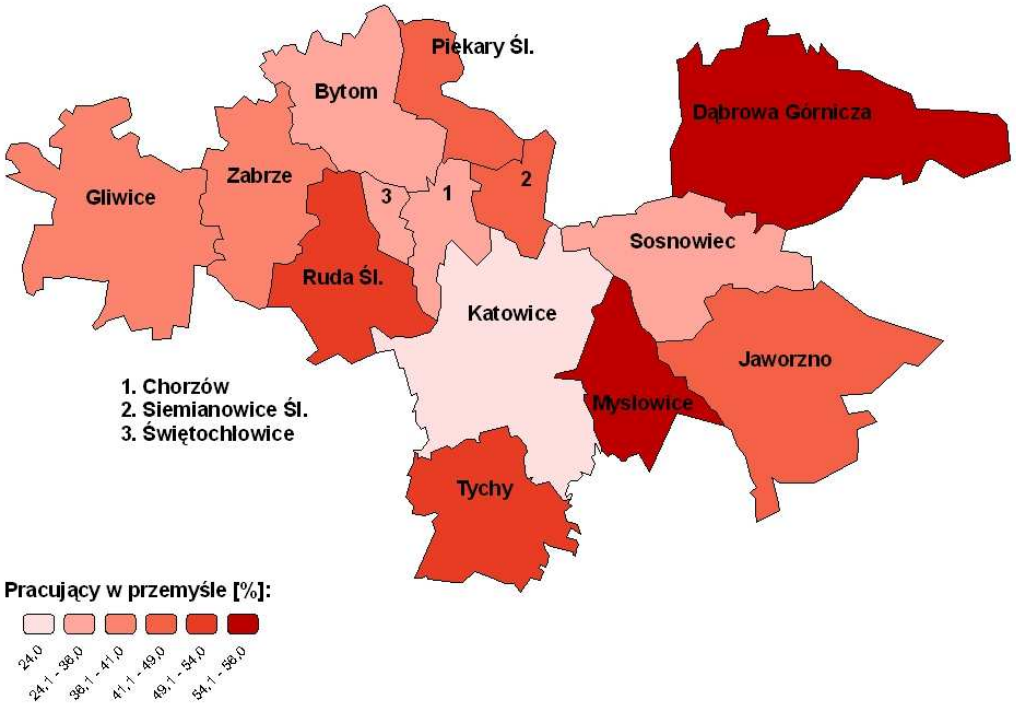


1995,
Employment = 744,980

2012,
Employment = 571,729

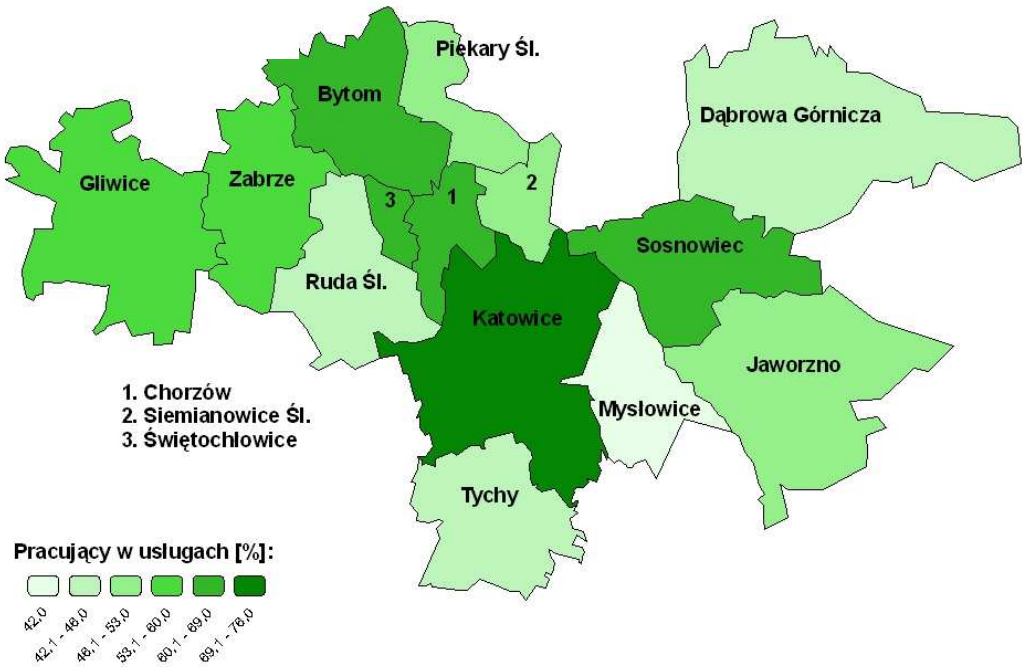


Employment structure – services and industry
Upper Silesian Agglomeration

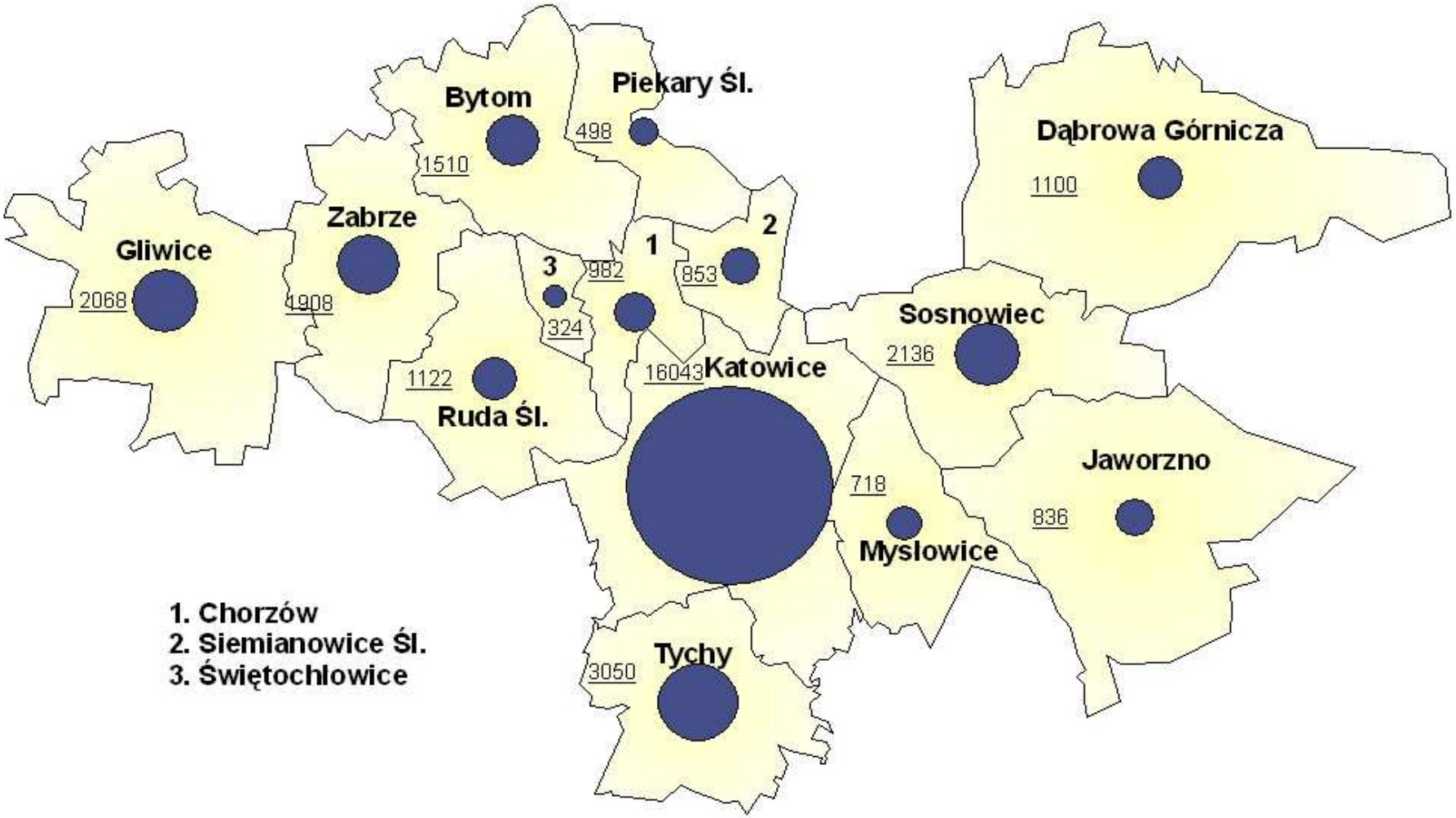


2011,
Employment in services:
= 353,477
= 61,3%

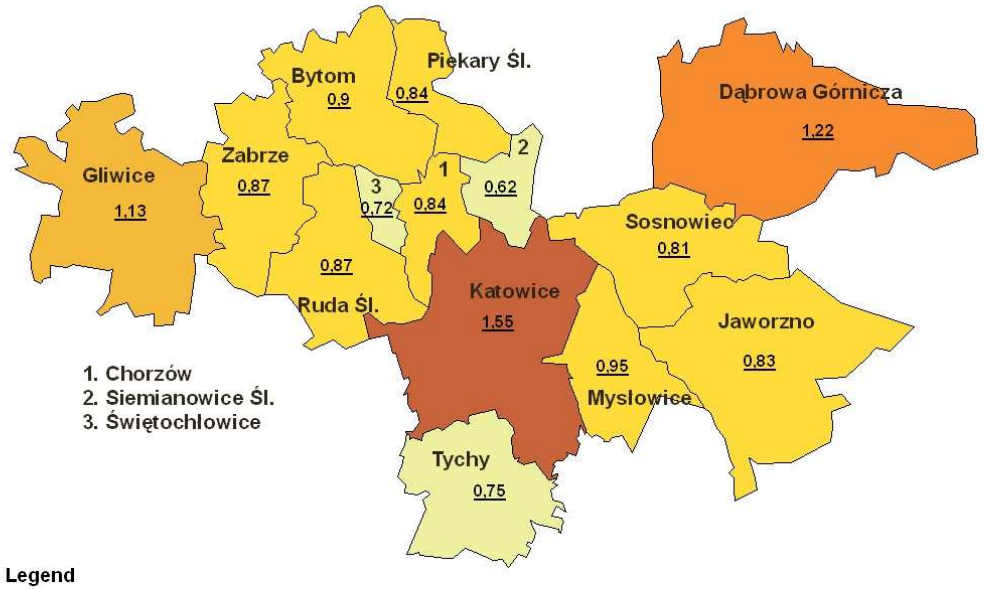
2011,
Employment in industry:
= 222,764,
= 38,7%



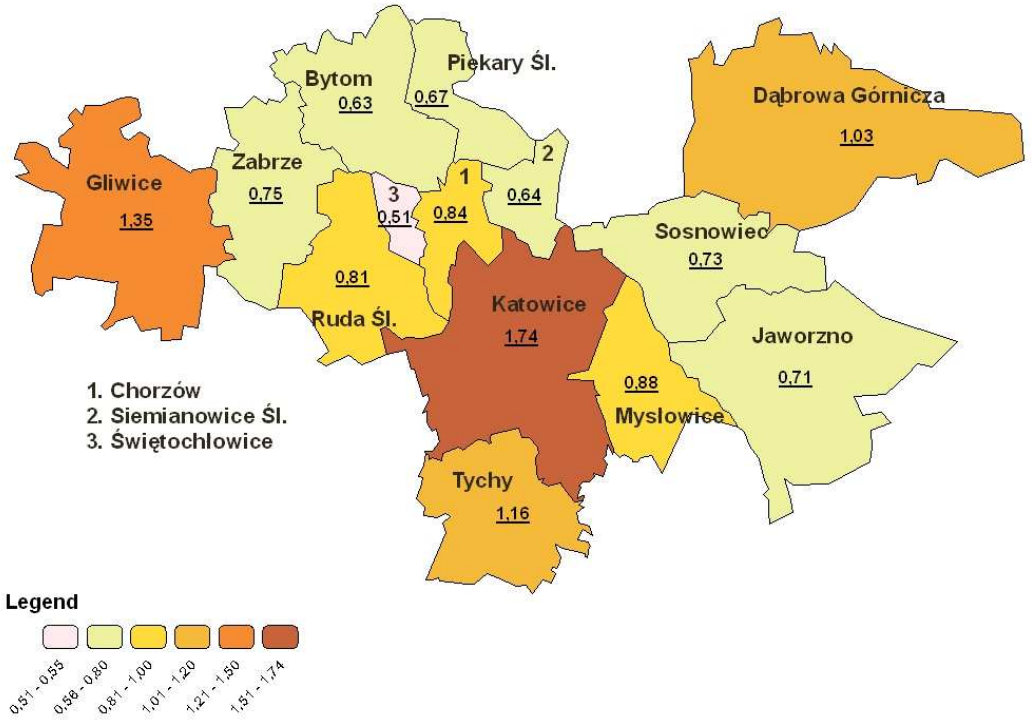
Employment in financial and insurance sector: Upper Silesian Agglomeration



Employment concentration, Upper Silesian Agglomeration



1995

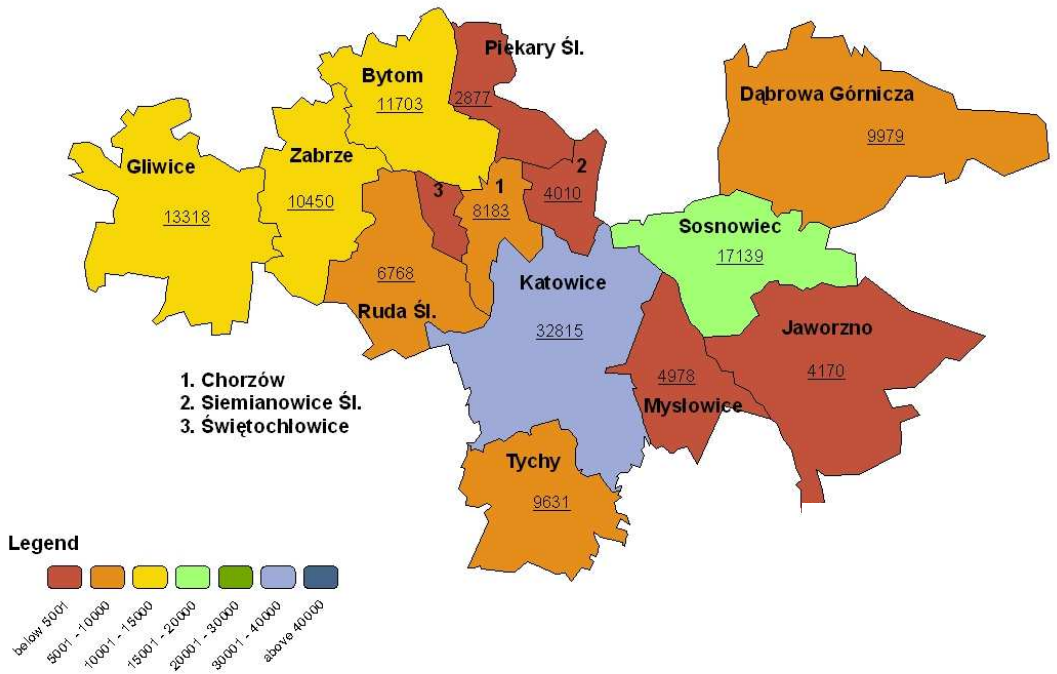


2012

Employment sectoral concentration, Upper Silesian Agglomeration

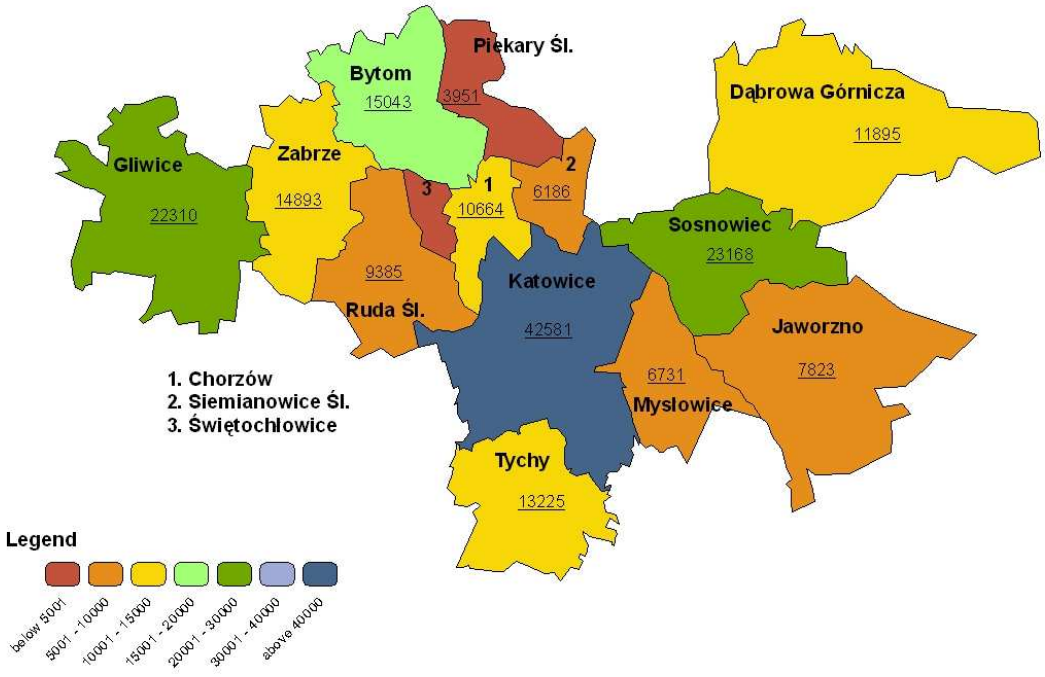
Sectors	Bytom	Chorzów	Dąbrowa Górnicza	Gliwice	Jaworzno	Katowice	Mysłowice	Piekary Śl.	Ruda Śl.	Siemianowice	Sosnowiec	Świętochłowice	Tychy	Zabrze
A. Agriculture	0,74	0,99	0,88	1,26	0,90	1,00	1,11	1,08	1,11	0,53	1,34	0,63	1,28	0,63
B. Mining	0,82	0,95	0,87	1,04	1,06	1,82	1,84	0,88	0,99	0,29	0,33	0,97	0,61	0,89
C. Manufacturing	0,87	0,94	1,04	1,31	0,89	1,26	0,90	0,84	0,75	1,04	1,00	0,72	1,08	0,74
D. Energy production and supply	0,50	0,63	0,83	2,66	0,81	2,09	0,25	0,50	0,34	0,70	0,49	0,19	0,36	0,80
E. Water supply, wastet management	0,66	1,02	1,80	1,15	0,97	1,57	1,16	0,44	0,67	0,77	0,84	0,54	0,71	0,65
F. Construction	0,96	1,08	1,13	1,20	0,85	1,17	1,01	0,64	0,69	1,09	1,08	0,86	0,99	0,78
G. Wholesale and retail trade	0,86	1,03	1,02	1,04	0,87	1,28	0,87	0,75	0,72	0,93	1,25	0,73	0,97	0,83
H. Transport and storage	0,81	1,15	0,99	0,99	0,88	1,13	1,03	0,74	0,78	0,96	1,26	0,84	1,05	0,92
I. Hotels and restaurants	0,98	1,24	0,99	1,05	0,73	1,33	1,04	0,74	0,65	1,05	1,11	0,86	1,01	0,63
J. Information and communication	0,67	0,92	0,68	1,59	0,57	1,88	0,82	0,55	0,57	0,80	0,88	0,62	0,92	0,68
K. Finance and insurance	0,95	1,07	0,85	1,17	0,75	1,38	0,74	0,67	0,67	0,92	1,15	0,70	1,19	0,70
L. Real estate services	1,39	0,64	0,69	1,83	1,02	1,31	0,62	0,44	0,38	0,48	0,62	0,61	0,64	1,52
M. Professional, scientific and technical activities	0,76	0,86	0,76	1,48	0,62	1,79	0,79	0,50	0,50	0,80	0,99	0,51	1,16	0,62
N. Administration and support services	0,75	1,25	0,83	1,13	0,86	1,78	0,84	0,57	0,54	0,96	0,97	0,70	0,95	0,59
O. Public administration	0,69	0,00	3,06	0,81	2,20	0,98	1,95	1,04	0,63	0,44	0,42	1,73	0,23	1,16
P. Education	0,70	0,85	0,85	1,51	0,90	1,51	0,79	0,61	0,52	0,62	1,03	0,46	1,27	0,81
Q Health services and social assistance	0,73	0,89	0,74	1,17	0,71	1,76	0,81	0,71	0,53	0,72	0,92	0,69	1,00	1,05
R. Culture, entertainment, recreation	0,96	1,22	0,74	1,25	0,78	1,46	1,01	0,62	0,76	0,97	0,85	0,71	0,97	0,79
S+T. Other services	0,88	1,03	0,87	1,13	0,85	1,56	0,93	0,85	0,75	0,94	0,89	0,73	0,81	0,86

Private sector economic entities, Upper Silesian Agglomeration

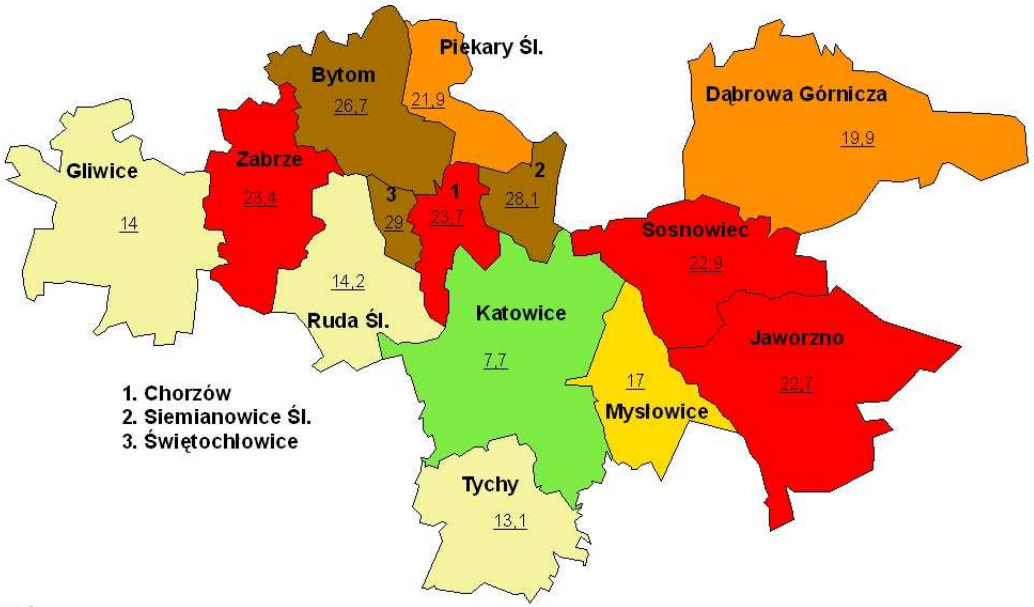


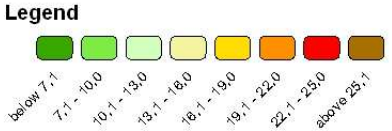
1995: 139,004 entities

2012: 191,557 entities



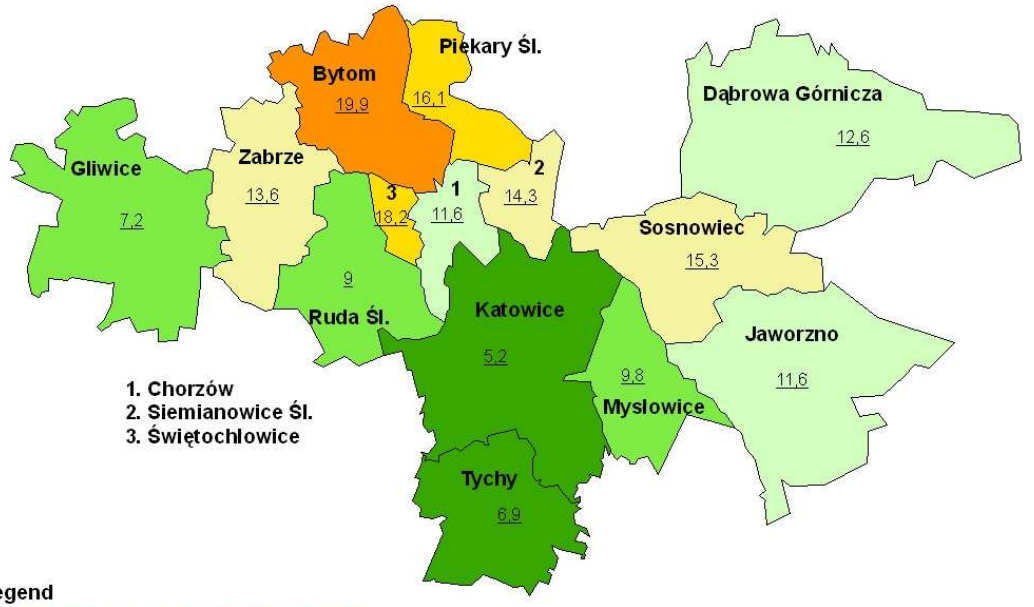
Unemployment, Upper Silesian Agglomeration

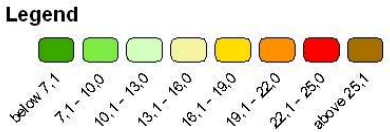




2004

2012





External factors determining development dynamics

Year	Changes in the Agglomeration's surroundings	
1995	- Regional Contrast for Silesia Voivodeship - first attempt in the country of programming a regional development	- crisis in mining and steel works sectors, reduction in employment from 400 to about 100 thousand. jobs, - closedown of many mines in the region - numerous government reform of mining sectors
1996	- General Motors location of the Opel plant in Gliwice - Foundation of sub-zones of the Katowice Special Economic Zone	
1997	- The beginning of the process of Poland's integration with the EU	
1998	- Reform of Poland's territorial division - creation of 16 NUTS2 regions	
1999	- Location of ISUZU plant within the Katowice Special Economic Zone	
2000	- Creation of South Energy Consortium	
2001	- Creation of Polish Entrepreneurship Development Agency	
2002	- Act on financial support for investment (assistance from government budget for modernisation investment of up to 500 thousand. euro)	
2003	- Sale of the state shares in the Polish Steel Mills SA company to ArcelorMittal - Restructuring and concentration of the mining sector - creation of the Coal Company	
2004	- Integration of Poland to the EU	
2005	- Handover of the A4 motorway segment passing through the Upper Silesian Agglomeration and linking it with Kraków and Wrocław	
2006	- Postponing adaptation of the euro by Poland	- gradual improvement in the mining sector - intensification of out-migration to the EU countries
2007	- Foundation of Upper Silesian Metropolitan Association, which gather 14 cities of SA	
2008	- Start of worldwide financial crisis - Opening the B terminal at the Pyrzowice (the regional airport) allowing for service for 3.6m of passengers per year	
2009	- Rejection of the Chorzów application as a host town for the European Football Championship EURO 2012	
2010	- Stock market debut of the TAURON-Poland Energy (company rooted in the region)	
2011	- Rejection of Katowice application to the European Capital of Culture - Handover of the A1 motorway segment passing through the Upper Silesian Agglomeration and linking it with Ostrava	

Internal factors determining resilience and vulnerability

General resilience and vulnerability attributes of a city

←VULNERABILITY	RESILIENCE →
Inadaptability – city's structures are unable to change or to fit into changed circumstances	**Adaptability** – a city's structures have ability to change or to fit into changed circumstances; they are flexible (adaptable or variable)
Fragmentation – city's structures are separating into fine particles	**Connectivity** – a city's structures have a property of being connected
(over) Specialisation – city's structures have excessive adaptation capacity but only for one special purpose	**Diversity** – a city's structures are mixed, have noticeable heterogeneity and are varied
Inefficiency – city's structures are not producing desired results (lack of the ability to perform effectively)	**Efficiency** – a city's structures provide positive ratio between an output to an input for whole system, and/or they have the ability to avoid waste of time and efforts
Insufficiency – city's structures (or their parts) have inability to function normally	**Redundancy** – a city's structures have the ability to provide additional/duplicate/ elements of a system (or its parts) in case it fails.
Discordance – a city's structures along with their elements resulting from a lack of agreement, discord	**Interdependency** – a city's structures create the relations between different elements of a system that are interdependent but each gains benefits from the other

Internal factors determining resilience and vulnerability

Factors enhancing a city's resilience in the economic-technological dimension

RESILIENCE attributes→	Factors of resilience for economic-technological area (proposals)
Adaptability	– **high entrepreneurship spirit** – **high capacity to innovate** – **significant local knowledge assets** (knowledge base and research infrastructure, transmission of knowledge) – **significant economic assets (number of companies)**
Connectivity	– **networks of economic actors** (clustering in production and distribution chains) – **cross-sectoral knowledge linkages** (platforms in innovation and commercialisation chain, spill-overs effects)
Diversity	– **diverse specialisation of industries** (industrial mix)
Efficiency	– **over-local competitiveness** – **high value added in production chains** (profitable value chains e.g. knowledge intense industries) – **recovery quickness**
Redundancy	– **effective and durable energy sources** – **redundant ICT application**
Interdependency	– **economic cooperation patterns** – **complementarities of local industries** (external, and internal including agglomeration effects)

Internal factors determining resilience and vulnerability

Factors deepening a city's vulnerability in the economic-technological dimension

←VULNERABILITY attributes	Factors of vulnerability for economic-technological area (proposals)
Inadaptability	– **economic inactivity** (absence of entrepreneurship activity) – **restructuring failure** – **passive attitudes** (vacuum of innovation) – **scarcity of local knowledge assets** (weak knowledge base and lack (poor) of research infrastructure)
Fragmentation	– **separation of economic actors** (atomized production and distribution) – **disconnection of knowledge linkages** (knowledge excessive protection and separation)
Over-specialisation	– **single specialisation of industry** (industrial single)
Inefficiency	– **non-competitive economic base** (outmoded economic structures) – **low value added in production chains** (costly/expensive, low-margin products) – **recovery slowness**
Insufficiency –	– **traditional energy sources** (single not-environmentally friendly source of energy) – **fragile ICT application** (lack or single sensitive ICT application)
Discordance	– **destructive competition patterns** (excessive competition) – **accidental local industries** (unrelated businesses unable to gain effects of complementarities)

Dynamics of a city's structures in E-T / S-C / E-S dimensions

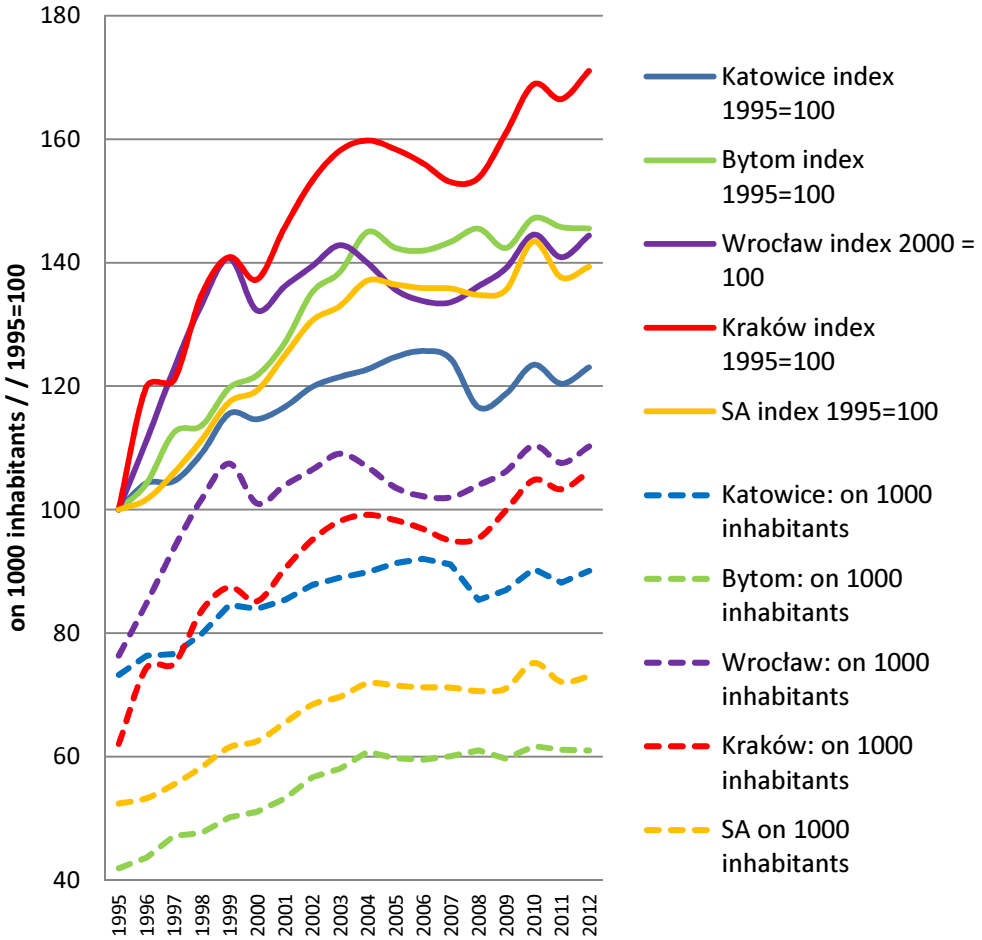
Selected factors of resilience for the economic-technological area	Exemplary indexes
– high entrepreneurship spirit – high capacity to innovate – significant local knowledge assets	– **number of companies run by individuals on 1000 inhabitants** – **number of economic entities on 1000 inhabitants** – number of patents on 1000 economic entities in private sector – number of R&D units – employment in R&D units
– networks of economic actors – cross-sectoral knowledge linkages	– number of economic entities participating in clusters' projects – number of sill-overs operating in technological parks
– diverse specialisation of industries	– number and scale of industries
– over-local competitiveness – high value added in production chains – recovery quickness	– **number of employees on 1000 inhabitants** – value of export in overall value of manufacturing and service – **discounted inflow of taxes from limited liability companies and stock exchange companies into a city's budget**
– effective and durable energy sources – redundant ICT application	– percent of energy supply by renewable sources of energy
– economic cooperation patterns – complementarities of local industries	– number of business association – number of business international events (fairs and exhibitions)

Dynamics of a city's structures in E-T / S-C / E-S dimensions

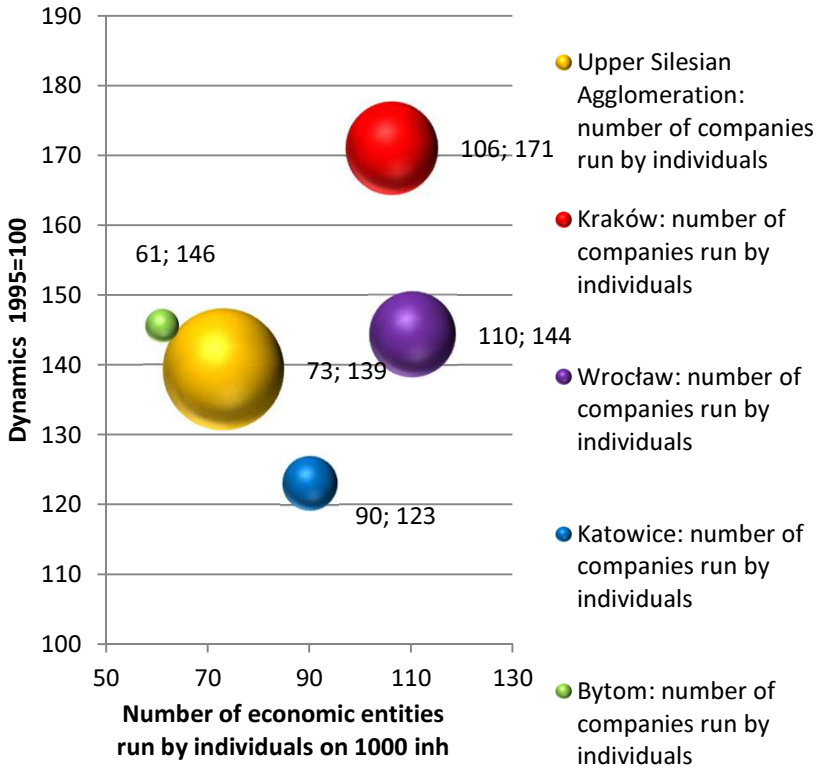
Factors of vulnerability for economic-technological area (examples)	Exemplary indexes
– economic inactivity – failure and closedown attitudes – scarcity of local knowledge assets	– **number of unemployed on 1000 inhabitants** – **persons without work experience registered as unemployed as a proportion of a total employment**
– separation of economic actors (atomised production and distribution) – disconnection of knowledge linkages (knowledge excessive protection and separation)	– number of firms' with employment up to 3 persons – number of scientific projects rejected from external financing
– single specialisation of industry	– percent of employed in major employer in a city
– non-competitive economic base – low value added in production chains – recovery slowness	– **number of employees working in dangerous conditions** (noise, vibration, chemical substances, hot and cold microclimate) as a proportion of a total employment – **number of employees dismissed because of reasons related to company** as a proportion of total employment – number of economic entities in A, B, C sections (agriculture and mining)
– traditional energy sources – fragile ICT application	– percent of energy produces with fossil fuels – number of households without access to ITC solutions
– destructive competition patterns – accidental local industries	– number of economic entities closedown as a percent of all economic entities in private sector

Resilience
Dimension: Economic-technological
Resilience attribute: Adaptability
Factor enhancing resilience: High entrepreneurship spirit
Index for the factor: number of companies run by individuals on 1000 of inhabitants dynamics

Companies run by individuals 1995-2012



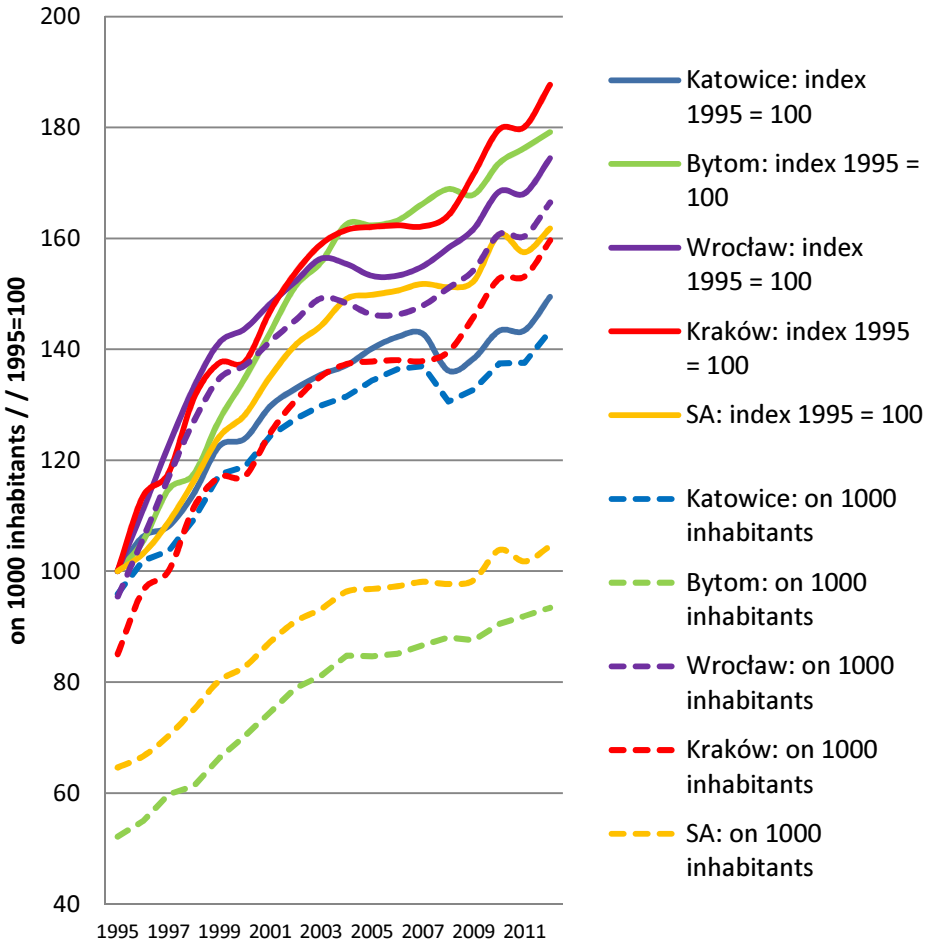
Scale, dynamics and number of companies run by individuals (2012)



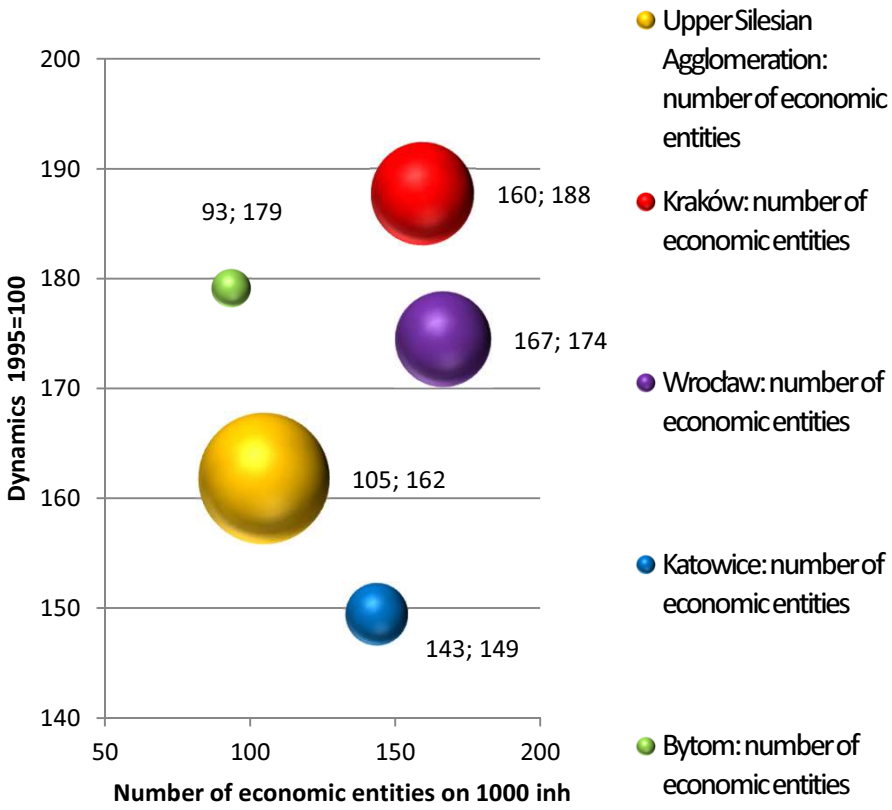
Resilience
Dimension: Economic-technological

Resilience attribute: Adaptability
Factor enhancing resilience: Significent economic assets
Index for the factor: number of economic entities on 1000 inhabitants

Economic entities 1995-2012

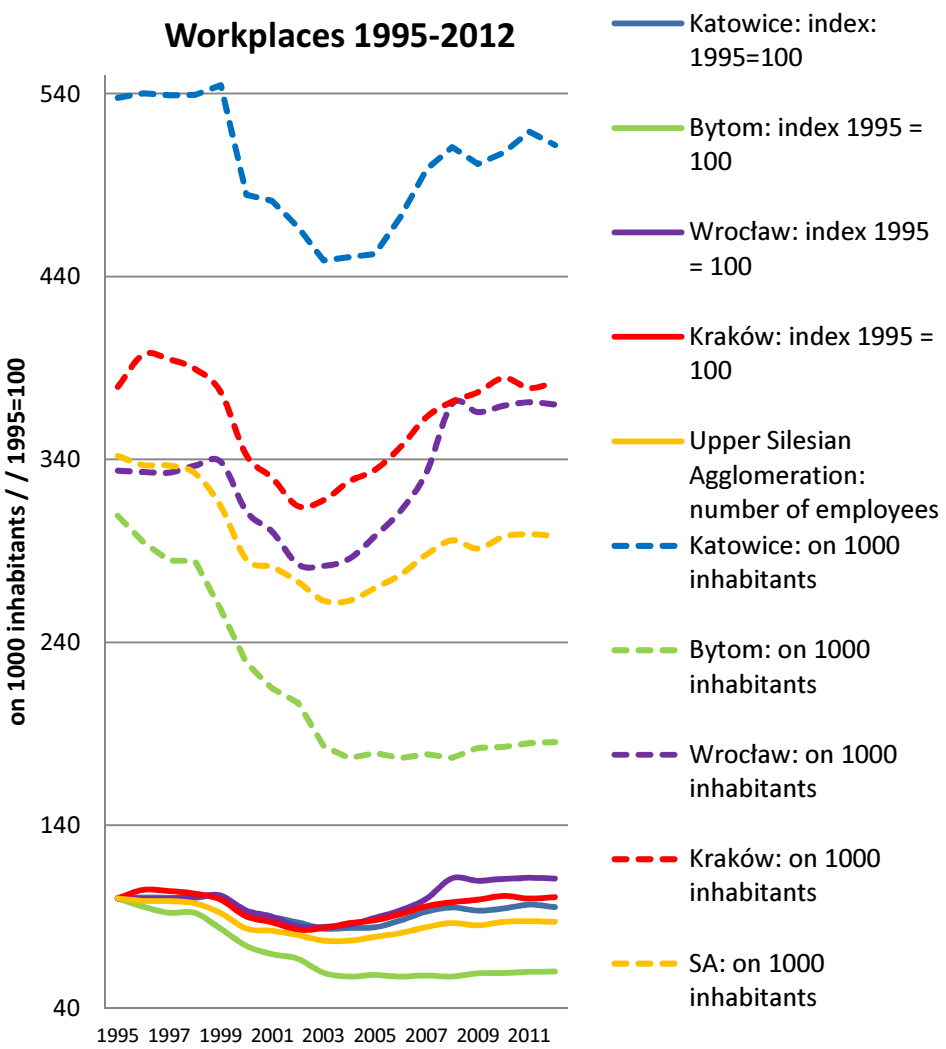


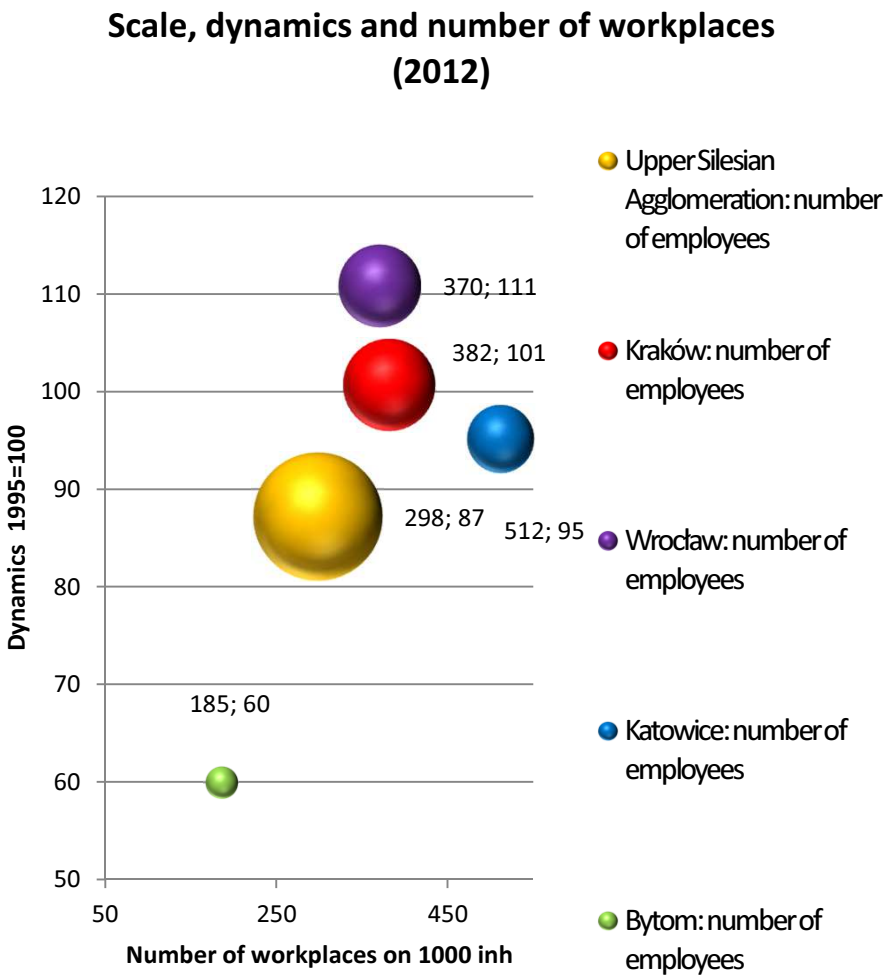
Scale, dynamics and number of economic entities (2012)



Resilience
Dimension: Economic-technological

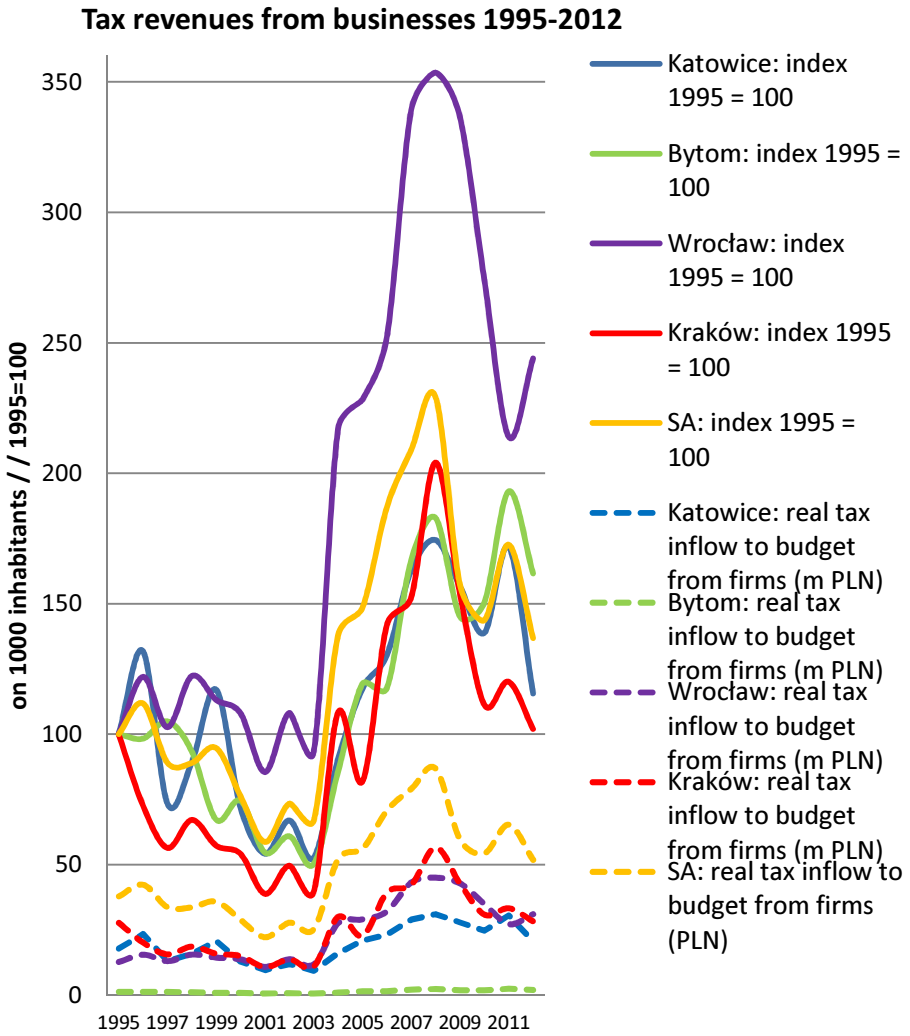
Resilience attribute: Redundancy
Factor enhancing resilience: Stability of workplaces
Index for the factor: Number of employees on 1000 inhabitant

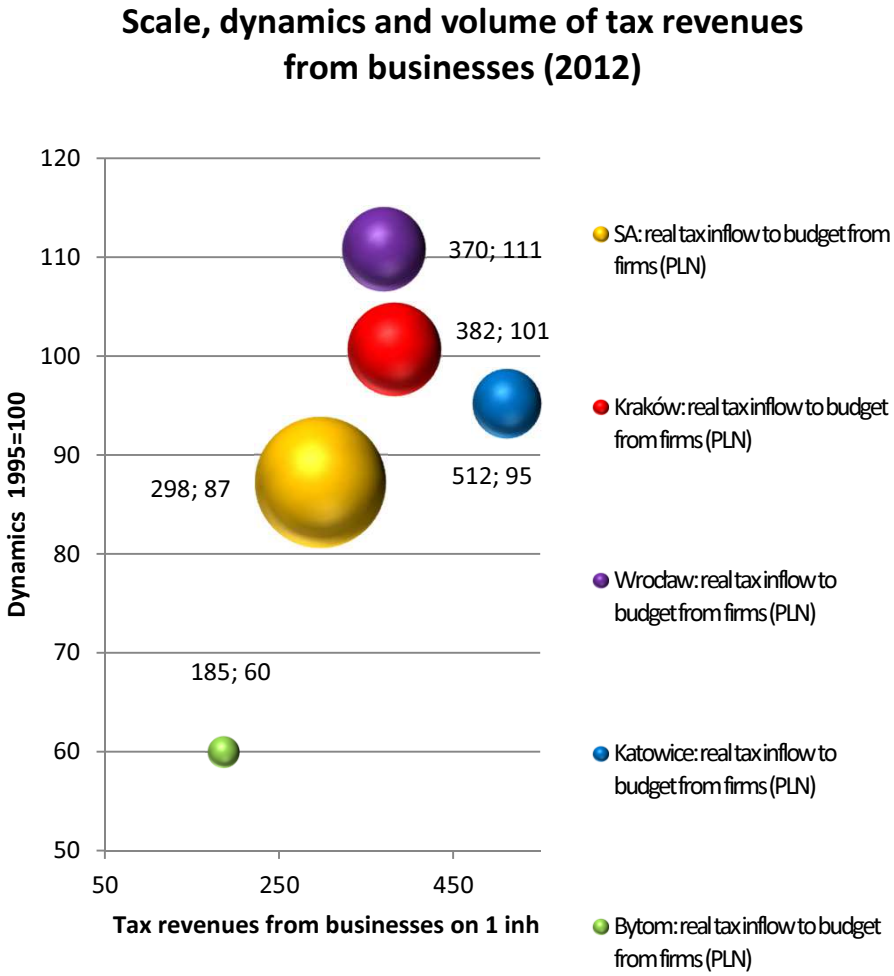




Resilience
Dimension: Economic-technological

Resilience attribute: Efficiency
Factor enhancing resilience: Financial strength of companies
Index for the factor: Tax revenues from business sector





Vulnerability

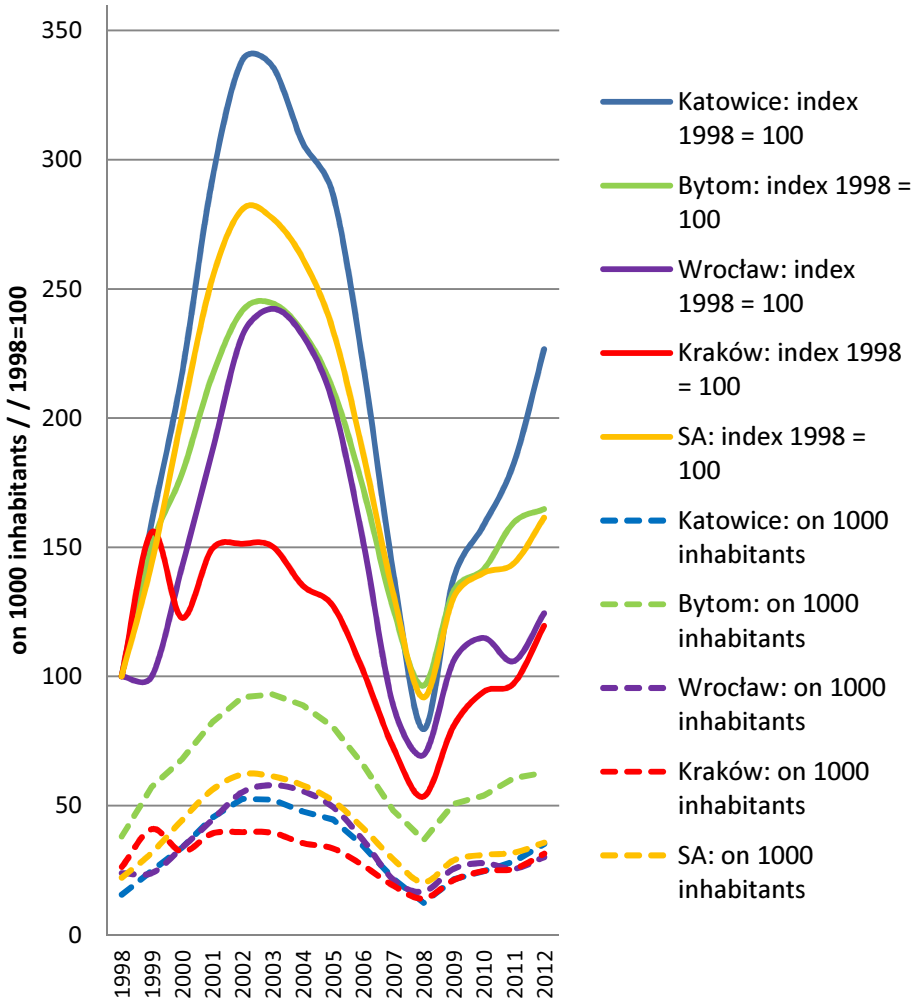
Dimension: Economic-technological

Vulnerability: Inadaptability

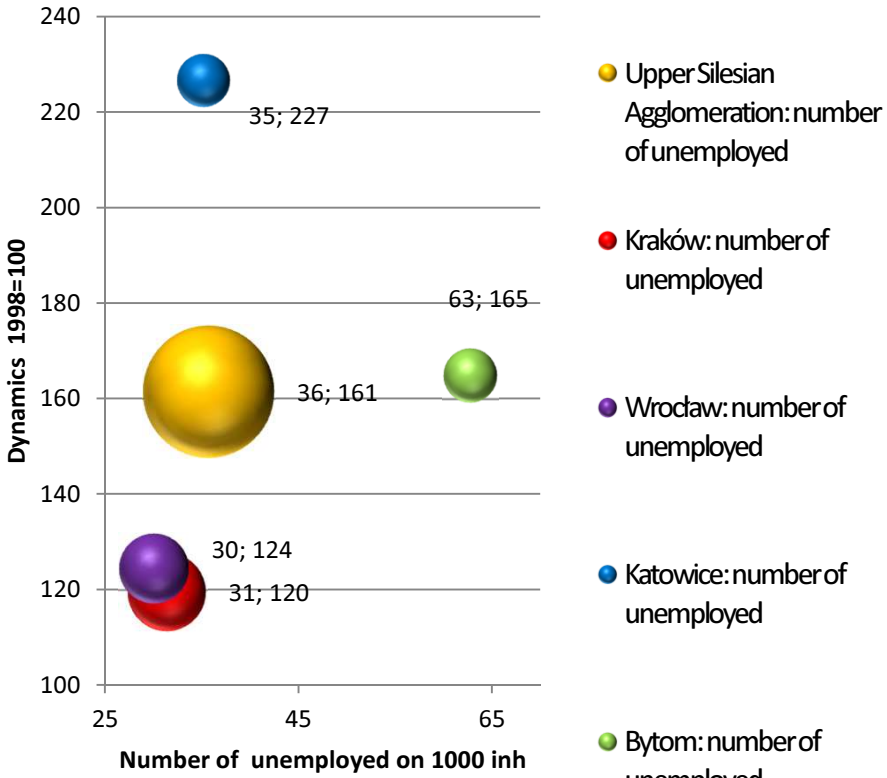
Factor deepening vulnerability: economic inactivity

Index for the factor: number of unemployed on 1000 of inhabitants dynamics

Number of unemployeed on 1000 inhabitants 1998-2012



Scale, dynamics and number of unemployeed (2012)



Vulnerability

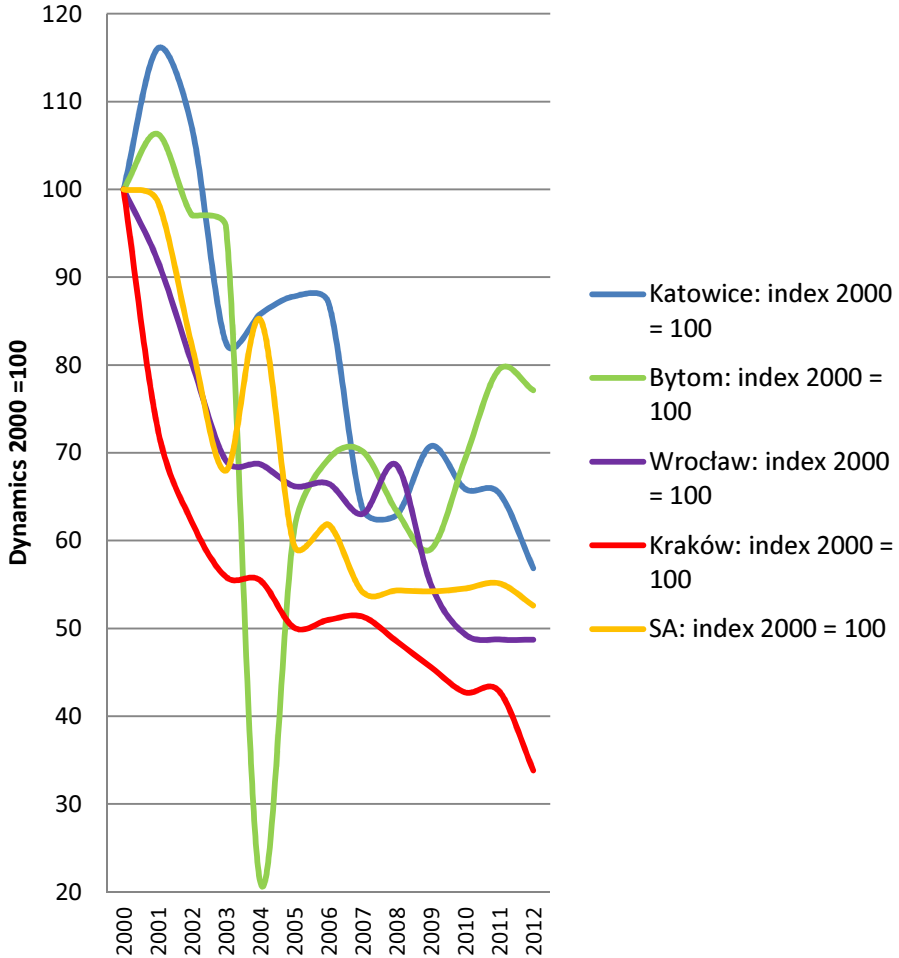
Dimension: Economic-technological

Vulnerability: Inadaptability

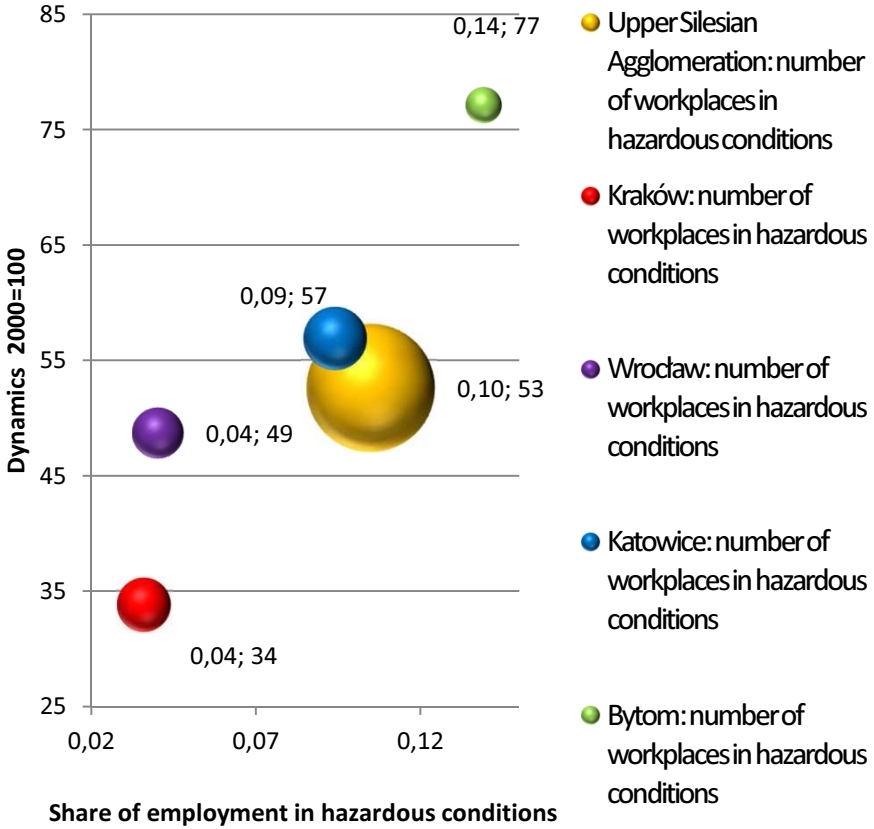
Factor deepening vulnerability: Old technologies employment

Index for the factor: share of employed in hazardous condition as total employment

Share of employed in hazardous conditions in total employment 2000-2012



Scale, dynamics and number of employed in hazardous conditions (2012)



Vulnerability

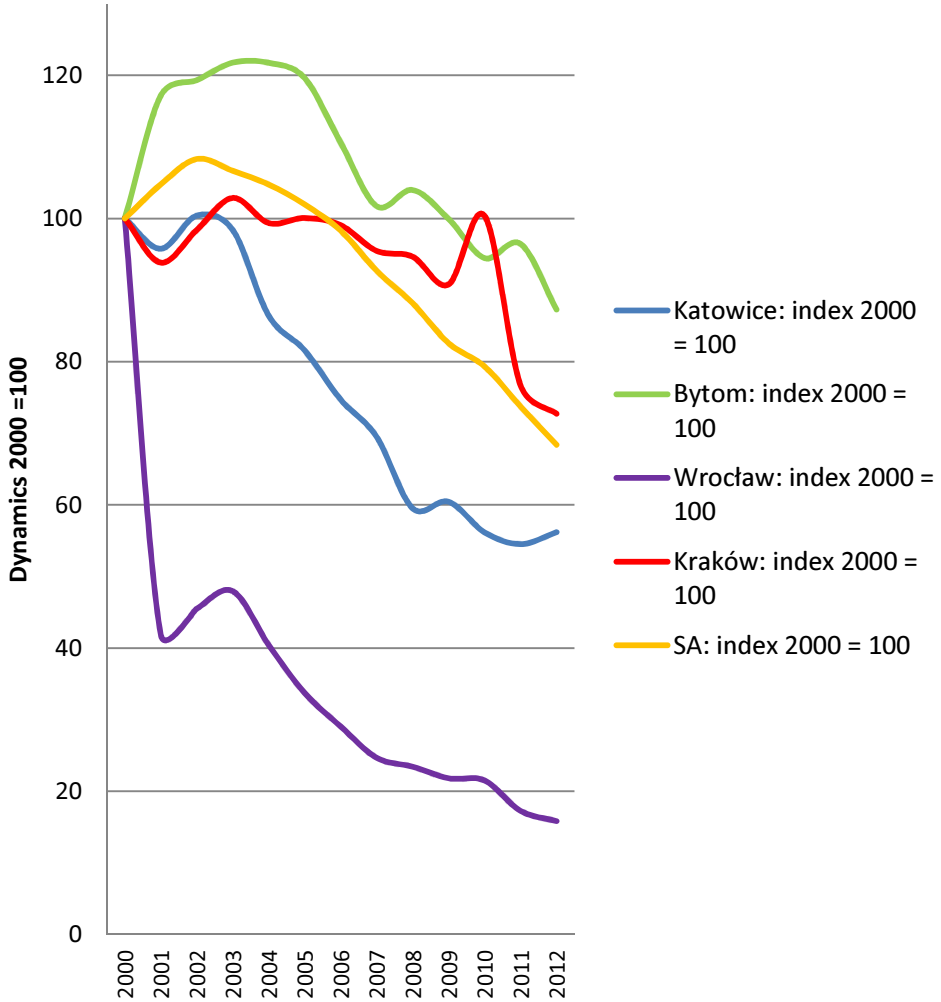
Dimension: Economic-technological

Vulnerability: Inadaptability

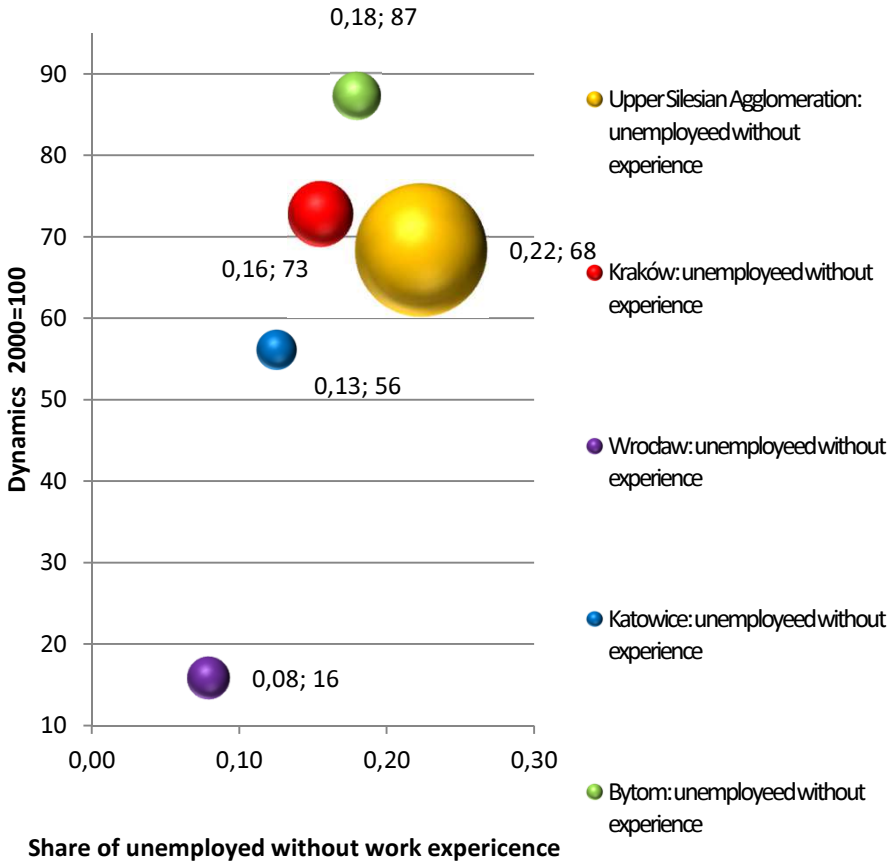
Factor deepening vulnerability: Passive attitudes

Index for the factor: number of unemployed without work experience as percent of total unemployment

Percent of unemployed without work experience 2000-2012



Scale, dynamics and number of unemployed without work experience (2012)



Vulnerability

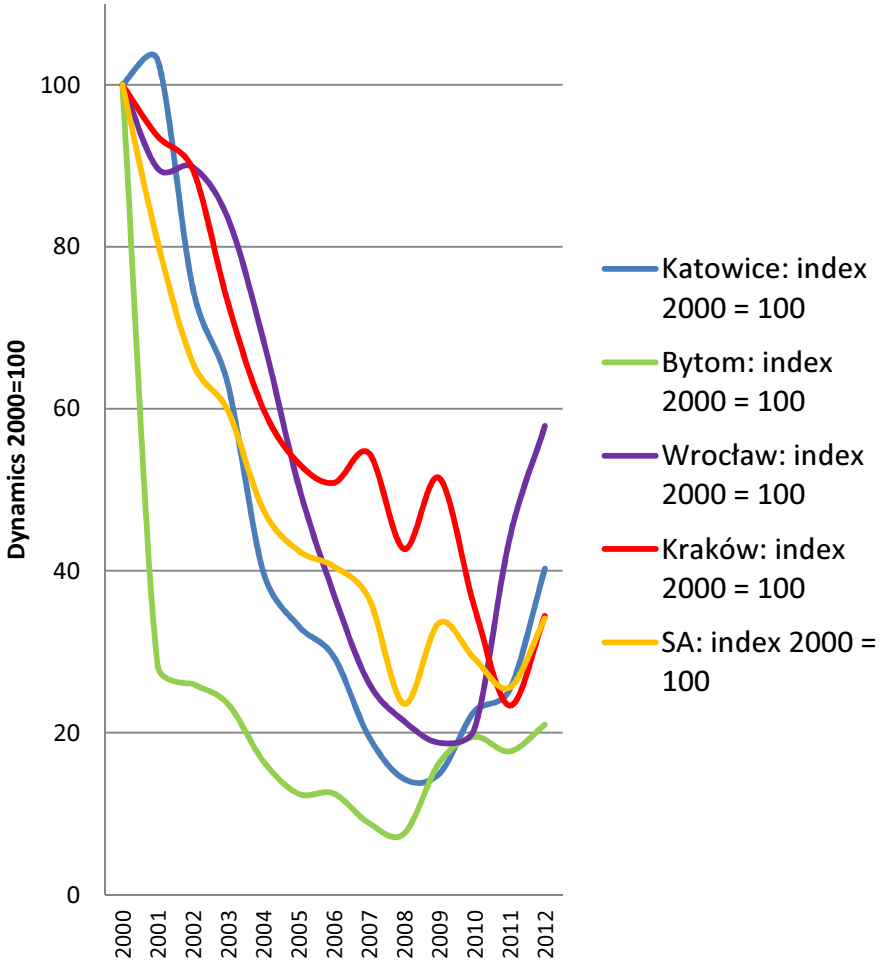
Dimension: Economic-technological

Vulnerability: Inefficiency

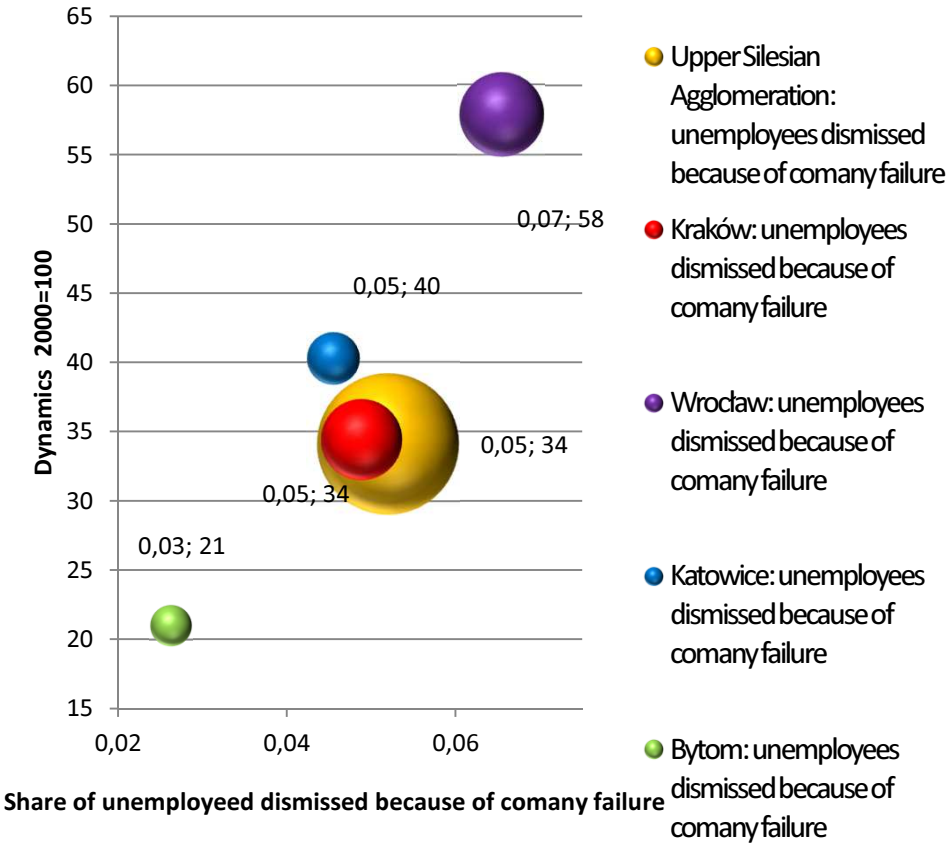
Factor deepening vulnerability: non-competitive economic base

Index for the factor: percent of unemployed dismissed because of company failure

Share of unemployeed dissmissed because of company failure 2000-2012



Scale, dynamics and number of unemployeed dissmissed because of company failure (2012)



Assessment of resilience degree – resilience trajectories

Map of a city's resilience – conceptual form

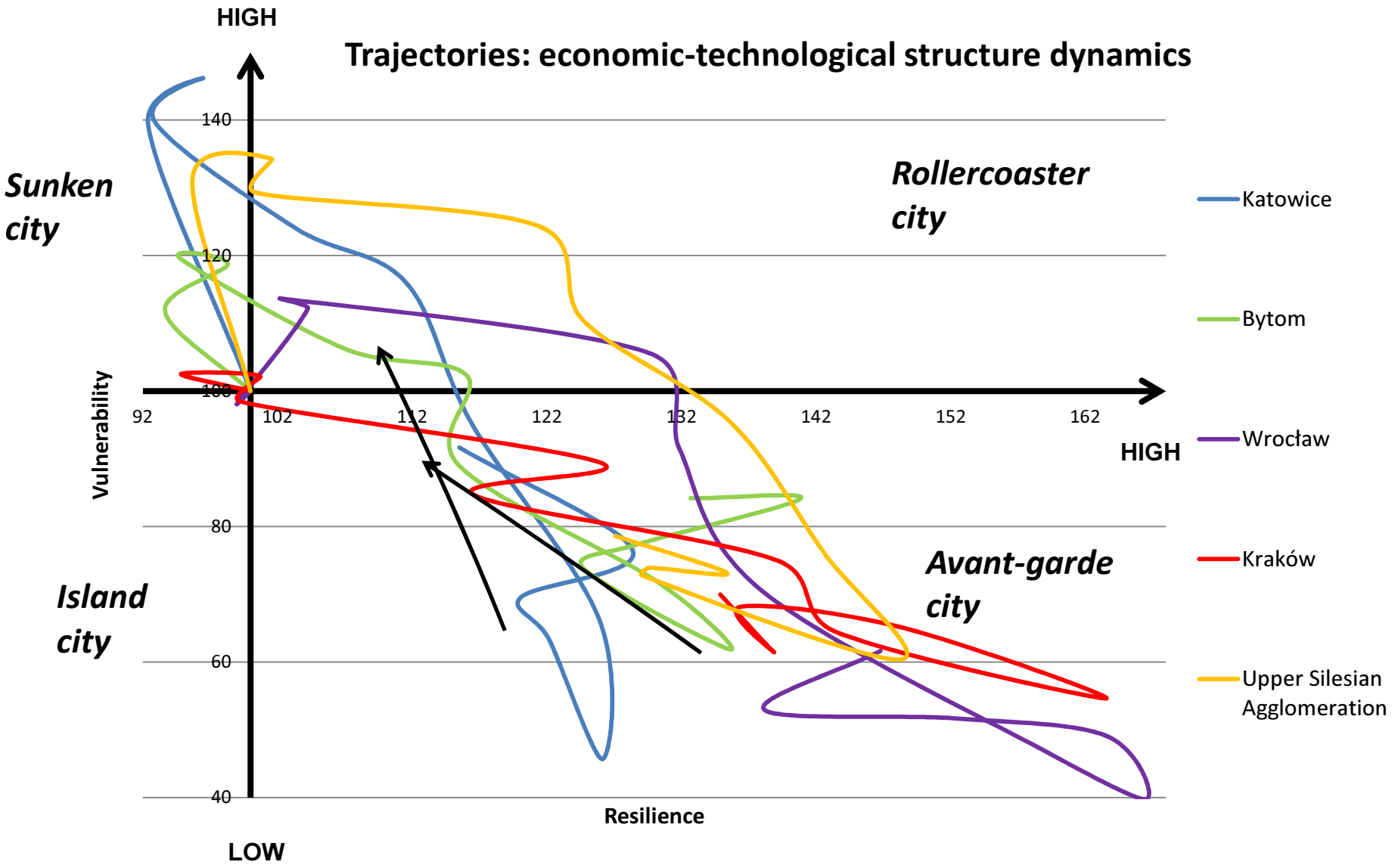
Higher vulnerability (y - variable)

Lower resilience (x – variable)

Sunken city **not resilient and vulnerable**	***Rollercoaster city*** **Resilient but vulnerable**
Untouchable city **not resilient and not vulnerable**	***Avant-garde city*** **resilient / shock-resistant**

Higher resilience (x – variable)

Lower vulnerability (y – variable)


Trajectories: economic-technological structure dynamics
HIGH
LOW
Vulnerability
Resilience
140
120
100
80
60
40
92
102
112
122
132
142
152
162
HIGH
Sunken city
Rollercoaster city
Island city
Avant-garde city
Katowice
Bytom
Wrocław
Kraków
Upper Silesian Agglomeration

Final remarks

- How to survive in changeable environment?
- How to build and reinforce a city's resilience attributes?
- How to undermine a city's vulnerability attributes?
- Post-industrial cities improved their resilience in the period of 2004-2008
- Cities are unprotected to powerful economic forces