



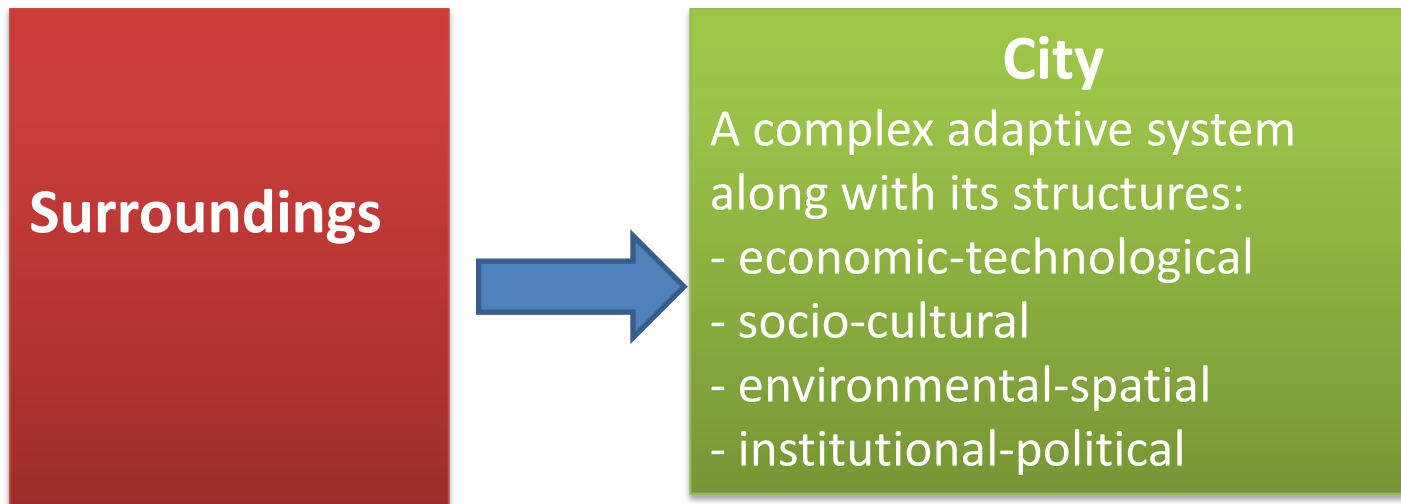
**Cities of change**  
cooperation of cities  
in the field of city development

# Urban resilience concept: the tool for cities' strategic diagnosis and monitoring

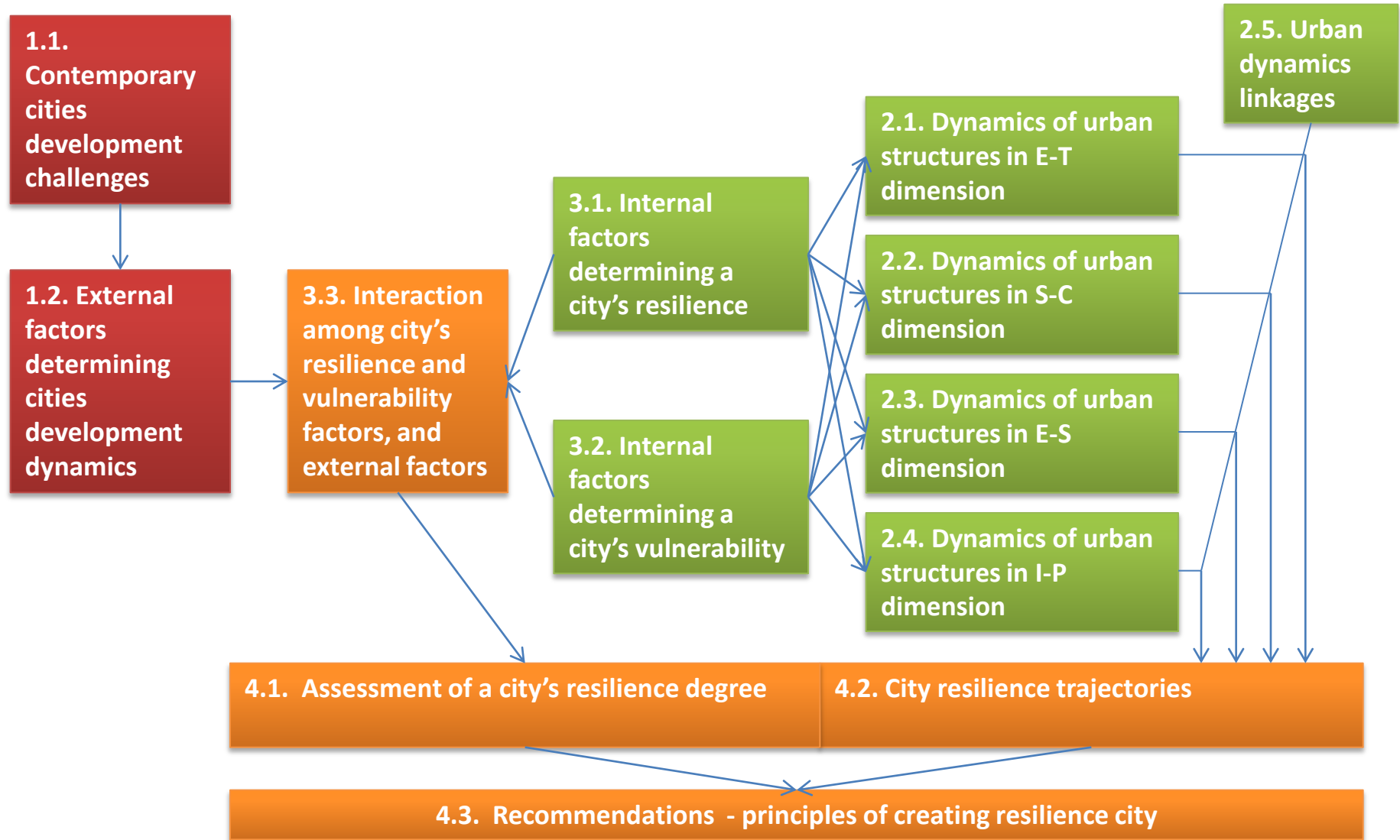
dr hab. Adam Drobniak prof. UO  
University of Economics in Katowice  
University of Opole  
Poznań, 22nd of October 2014

**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



### **urban resilience research approaches** (*Simme and Martin, 2009; Hill et al. 2010*)

- economic equilibrium approach
- evolutionary approach

### **urban resilience definition = ability to:** (*Barnett, 2001; Alberti, et al. 2003; Welter-Enderlin, 2006; Walker et al., 2006; Foster, 2007; Simme and Martin, 2009*);

- (a) stability of a city's systems against disturbances/disruptions,
- (b) recovery of a city's level of growth before experiencing a shock in quick way
- (c) change/re-organise a city's structures in order to reach previous level of growth (before a shock) or higher level of growth

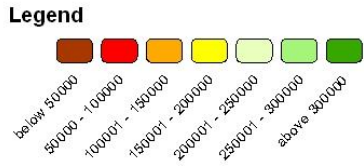
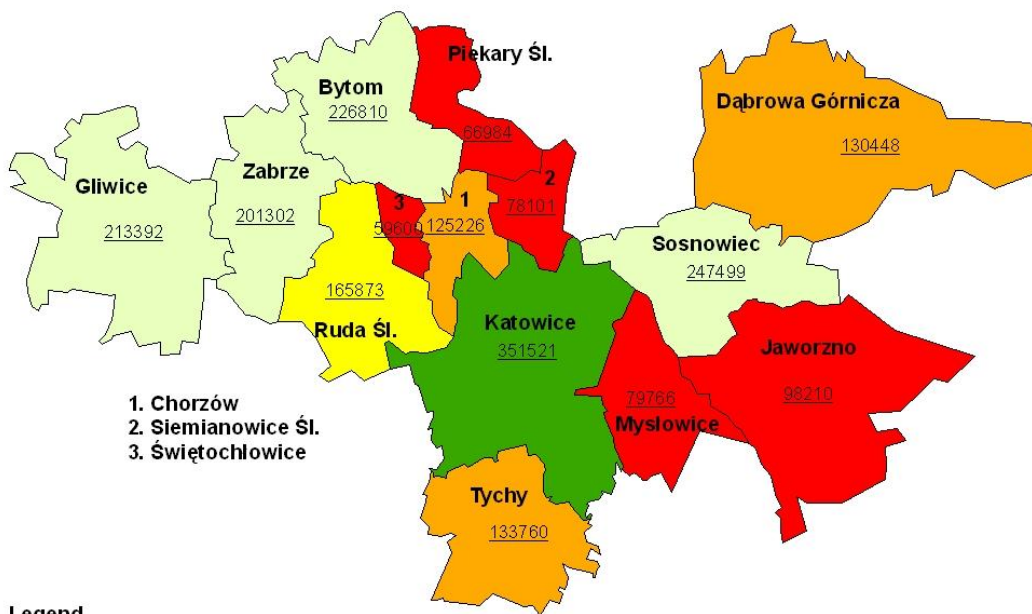
### **disturbances / disruptions / shocks definition** (*Simme and Martin, 2009; Wolfe, 2013*) =

- economic recessions (global, national, sectorial)
- rise of major competitors elsewhere (in other cities/regions)
- unexpected companies, institutions closure
- technological change
- other (like: natural disasters)

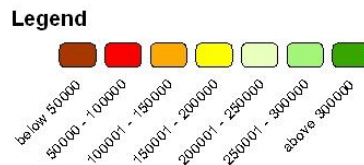
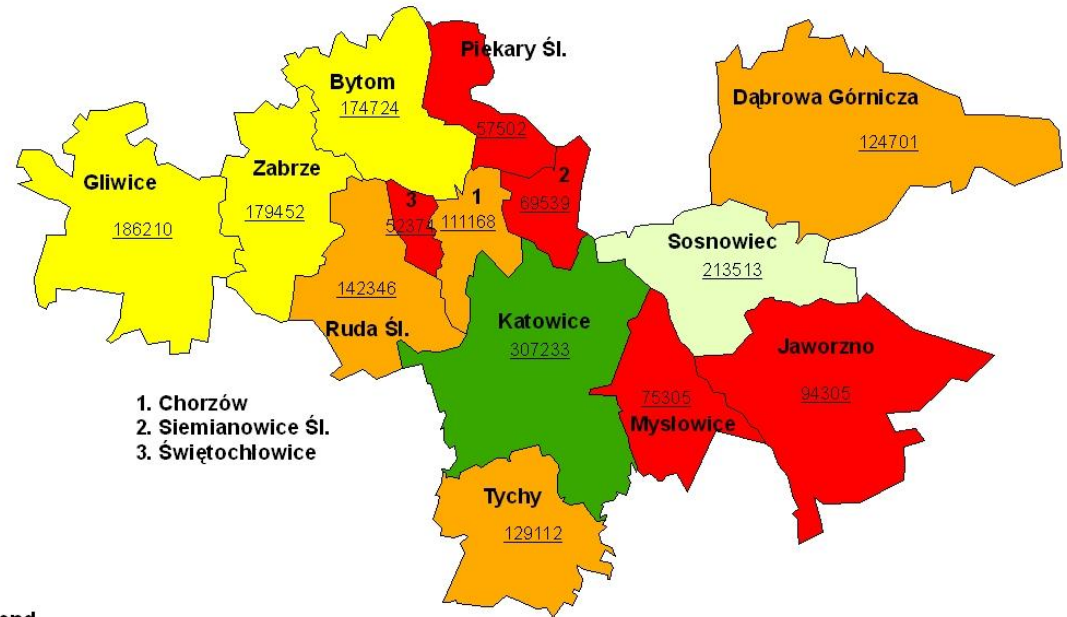
### **Post-industrial cities features** (*Lever, 1987, Jacher and Klasik 2004, Kendall 2010*) =

- serious problems of adaptation arising from:
  - stagnation or restructuring of a city's economic base (large factories closedown)
  - release of large number of low qualified workforce
  - income polarization,
  - living conditions polarisation along with unequal access to public services,
  - de-urbanisation,
  - decrease of tax revenues,
  - ghettoisation,
  - lost of the socio-economic importance of a city in a country and abroad,
  - release of the post-industrial areas in a city's centre and its other districts.
- slow recovery of such areas and their 'fragility' to external disturbances

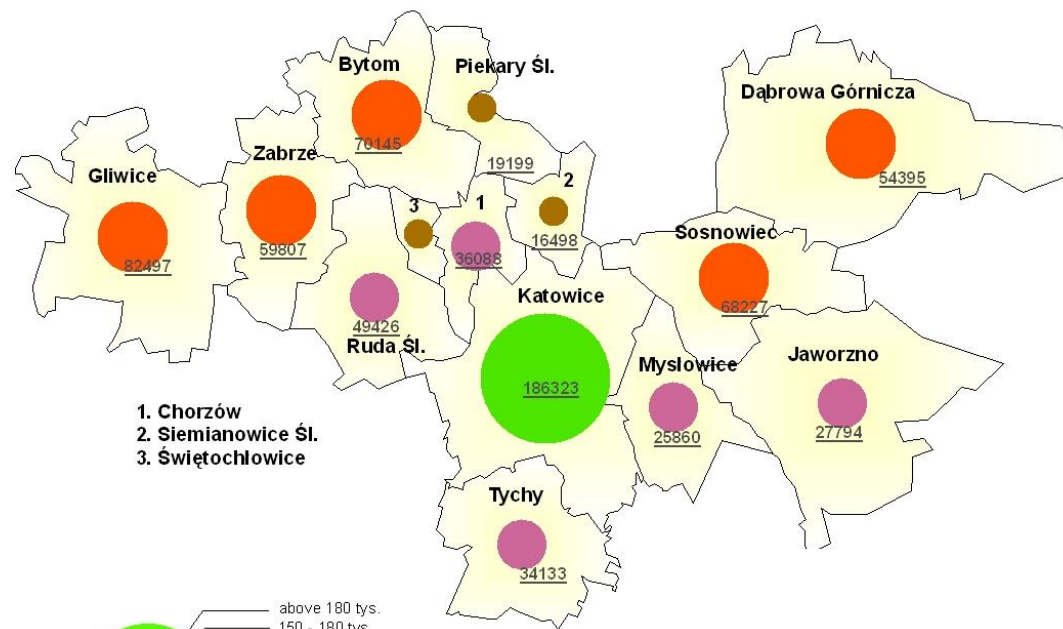
# Basic empirical evidence Population, Upper Silesian Agglomeration



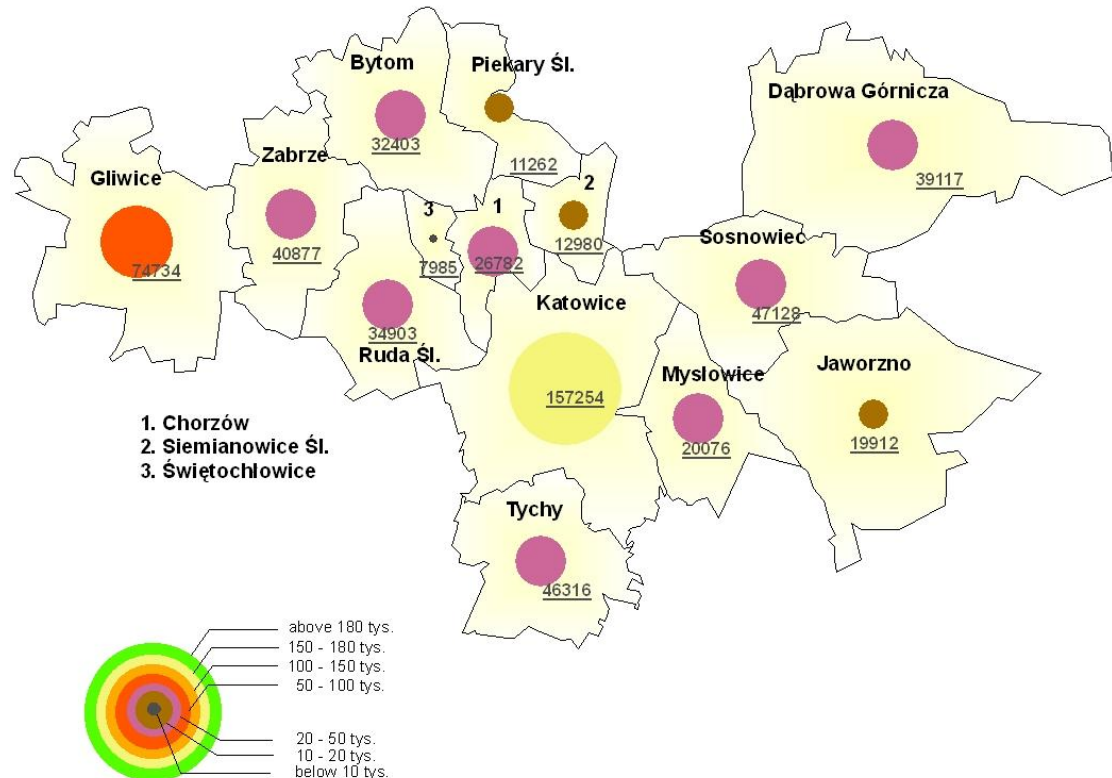
**1995,  
Population = 2,178,492**



# Basic empirical evidence Employment, Upper Silesian Agglomeration



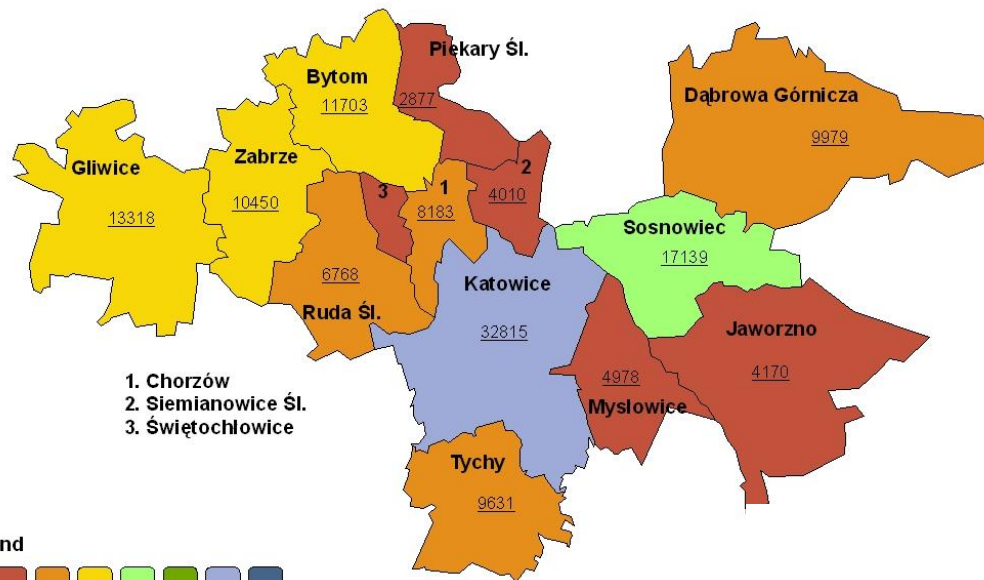
**2012,  
Employment = 571,729**



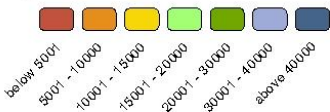
# Basic empirical evidence

## Private sector economic entities, Upper Silesian Agglomeration

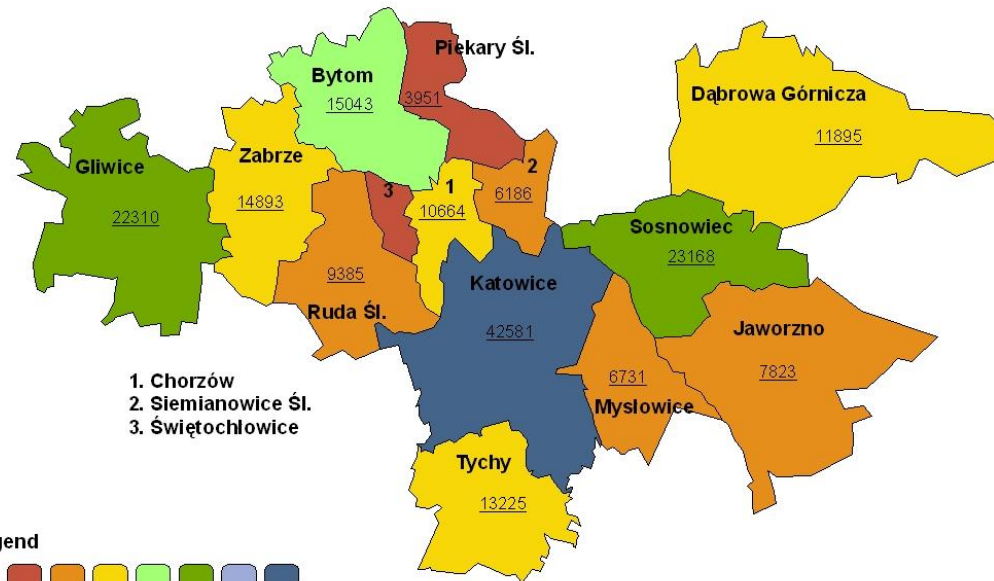
2012: 191,557 entities



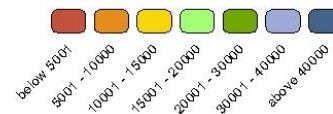
Legend



1995: 139,004 entities



Legend





## 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	- gradual improvement in the mining sector - intensification of out-migration to the EU countries
2006	- Postponing adaptation of the euro by Poland	
2007	- Foundation of Upper Silesian Metropolitan Association, which gather 14 cities of SA	
2008	- Start of worldwide financial crisis	
2009	- Rejection of the Chorzów application as a host town for the European Football Championship EURO 2012	- national economic slowdown
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	
2012	- 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 →
<b>Inadaptability</b> – city's structures are unable to change or to fit into changed circumstances	<b>Adaptability</b> – a city's structures have ability to change or to fit into changed circumstances; they are flexible (adaptable or variable)
<b>Fragmentation</b> – city's structures are separating into fine particles	<b>Connectivity</b> – a city's structures have a property of being connected
<b>(over) Specialisation</b> – city's structures have excessive adaptation capacity but only for one special purpose	<b>Diversity</b> – a city's structures are mixed, have noticeable heterogeneity and are varied
<b>Inefficiency</b> – city's structures are not producing desired results (lack of the ability to perform effectively)	<b>Efficiency</b> – 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
<b>Insufficiency</b> – city's structures (or their parts) have inability to function normally	<b>Redundancy</b> – a city's structures have the ability to provide additional/duplicate/ elements of a system (or its parts) in case it fails.
<b>Discordance</b> – a city's structures along with their elements resulting from a lack of agreement, discord	<b>Interdependency</b> – 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

(Veltz, 2004; Cooke, 2008; Lansford et al., 2010; Eraydin, Tasan-Kok, 2013; Hess, 2013; Wolfe, 2013; Melkas et al., 2013;)

<b>RESILIENCE attributes→</b>	<b>Factors of resilience for economic-technological area (proposals)</b>
<b>Adaptability</b>	<ul style="list-style-type: none"><li>– <b>high entrepreneurship spirit</b></li><li>– <b>high capacity to innovate</b></li><li>– <b>significant local economic and knowledge assets</b> (knowledge base and research infrastructure, transmission of knowledge)</li><li>– <b>significant economic assets (number of companies)</b></li></ul>
<b>Connectivity</b>	<ul style="list-style-type: none"><li>– <b>networks of economic actors</b> (clustering in production and distribution chains)</li><li>– <b>cross-sectoral knowledge linkages</b> (platforms in innovation and commercialisation chain, spill-overs effects)</li></ul>
<b>Diversity</b>	<ul style="list-style-type: none"><li>– <b>diverse specialisation of industries</b> (industrial mix)</li></ul>
<b>Efficiency</b>	<ul style="list-style-type: none"><li>– <b>over-local competitiveness - financial strenght of companies</b></li><li>– <b>high value added in production chains</b> (profitable value chains e.g. knowledge intense industries)</li><li>– <b>recovery quickness</b></li></ul>
<b>Redundancy</b>	<ul style="list-style-type: none"><li>– <b>effective and durable energy sources</b></li><li>– <b>stability of workplaces</b></li><li>– <b>redundant ICT application</b></li></ul>
<b>Interdependency</b>	<ul style="list-style-type: none"><li>– <b>economic cooperation patterns</b></li><li>– <b>complementarities of local industries</b> (external, and internal including agglomeration effects)</li></ul>

# Internal factors determining resilience and vulnerability

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

(Cooke, 2008; Briguglio, et al., 2010; Eraydin, Tasan-Kok, 2013; Hess, 2013; Wolfe, 2013; Melkas, Uotila, 2013)

←VULNERABILITY attributes	Factors of vulnerability for economic-technological area (proposals)
Inadaptability	<ul style="list-style-type: none"><li>– <b>economic inactivity</b> (absence of entrepreneurship activity, unemployment)</li><li>– <b>restructuring failure</b></li><li>– <b>passive attitudes</b> (vacuum of innovation, unemployed without work experience)</li><li>– <b>scarcity of local knowledge assets</b> (weak knowledge base and lack (poor) of research infrastructure, employment in old-technology industries)</li></ul>
Fragmentation	<ul style="list-style-type: none"><li>– <b>separation of economic actors</b> (atomized production and distribution)</li><li>– <b>disconnection of knowledge linkages</b> (knowledge excessive protection and separation)</li></ul>
Over-specialisation	<ul style="list-style-type: none"><li>– <b>single specialisation of industry</b> (industrial single)</li></ul>
Inefficiency	<ul style="list-style-type: none"><li>– <b>non-competitive economic base</b> (outmoded economic structures, unemployed dismissed because of company failure)</li><li>– <b>low value added in production chains</b> (costly/expensive, low-margin products)</li><li>– <b>recovery slowness</b></li></ul>
Insufficiency –	<ul style="list-style-type: none"><li>– <b>traditional energy sources</b> (single not-environmentally friendly source of energy)</li><li>– <b>fragile ICT application</b> (lack or single sensitive ICT application)</li></ul>
Discordance	<ul style="list-style-type: none"><li>– <b>destructive competition patterns</b> (excessive competition)</li><li>– <b>accidental local industries</b> (unrelated businesses unable to gain effects of complementarities)</li></ul>

# Dynamics of a city's structures in the economic-technological dimensions

Selected factors of resilience for the economic-technological area	Exemplary indexes
<ul style="list-style-type: none"> <li>– high entrepreneurship spirit</li> <li>– high capacity to innovate</li> <li>– significant local knowledge assets</li> </ul>	<ul style="list-style-type: none"> <li>– <b>number of companies run by individuals on 1,000 inhabitants</b></li> <li>– <b>number of economic entities on 1,000 inhabitants</b></li> <li>– number of patents on 1000 economic entities in private sector</li> <li>– number of R&amp;D units</li> <li>– employment in R&amp;D units</li> </ul>
<ul style="list-style-type: none"> <li>– networks of economic actors</li> <li>– cross-sectoral knowledge linkages</li> </ul>	<ul style="list-style-type: none"> <li>– number of economic entities participating in clusters' projects</li> <li>– number of spill-overs operating in technological parks</li> </ul>
<ul style="list-style-type: none"> <li>– diverse specialisation of industries</li> </ul>	<ul style="list-style-type: none"> <li>– number and scale of industries</li> </ul>
<ul style="list-style-type: none"> <li>– over-local competitiveness</li> <li>– high value added in production chains</li> <li>– recovery quickness</li> </ul>	<ul style="list-style-type: none"> <li>– <b>number of employees on 1,000 inhabitants</b></li> <li>– value of export in overall value of manufacturing and service</li> <li>– <b>discounted inflow of corporate taxes into a city's budget</b></li> </ul>
<ul style="list-style-type: none"> <li>– effective and durable energy sources</li> <li>– redundant ICT application</li> </ul>	<ul style="list-style-type: none"> <li>– percent of energy supply by renewable sources of energy</li> </ul>
<ul style="list-style-type: none"> <li>– economic cooperation patterns</li> <li>– complementarities of local industries</li> </ul>	<ul style="list-style-type: none"> <li>– number of business association</li> <li>– number of business international events (fairs and exhibitions)</li> </ul>

# Dynamics of a city's structures in the economic-technological dimensions

Factors of vulnerability for economic-technological area (examples)	Exemplary indexes
<ul style="list-style-type: none"> <li>– economic inactivity</li> <li>– failure and closedown attitudes</li> <li>– scarcity of local knowledge assets</li> </ul>	<ul style="list-style-type: none"> <li>– <b>number of unemployed on 1,000 inhabitants</b></li> <li>– <b>persons without work experience registered as unemployed as a proportion of a total employment</b></li> </ul>
<ul style="list-style-type: none"> <li>– separation of economic actors (atomised production and distribution)</li> <li>– disconnection of knowledge linkages (knowledge excessive protection and separation)</li> </ul>	<ul style="list-style-type: none"> <li>– number of firms' with employment up to 3 persons</li> <li>– number of scientific projects rejected from external financing</li> </ul>
<ul style="list-style-type: none"> <li>– single specialisation of industry</li> </ul>	<ul style="list-style-type: none"> <li>– percent of employed in major employer in a city</li> </ul>
<ul style="list-style-type: none"> <li>– non-competitive economic base</li> <li>– low value added in production chains</li> <li>– recovery slowness</li> </ul>	<ul style="list-style-type: none"> <li>– <b>number of employees working in dangerous conditions</b> (noise, vibration, chemical substances, hot and cold microclimate) as a proportion of a total employment</li> <li>– <b>number of employees dismissed because of reasons related to company</b> as a proportion of total employment</li> <li>– number of economic entities in A, B, C sections (agriculture and mining)</li> </ul>
<ul style="list-style-type: none"> <li>– traditional energy sources</li> <li>– fragile ICT application</li> </ul>	<ul style="list-style-type: none"> <li>– percent of energy produces with fossil fuels</li> <li>– number of households without access to ITC solutions</li> </ul>
<ul style="list-style-type: none"> <li>– destructive competition patterns</li> <li>– accidental local industries</li> </ul>	<ul style="list-style-type: none"> <li>– number of economic entities closedown as a percent of all economic entities in private sector</li> </ul>

# Resilience

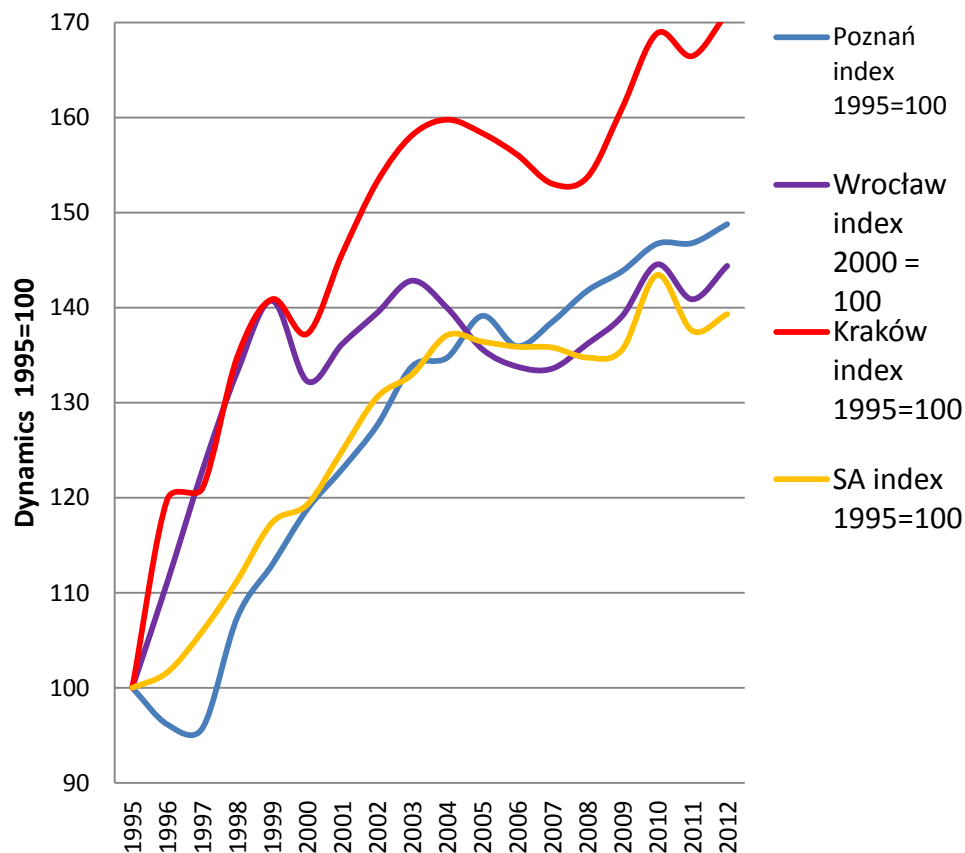
Dimension: Economic-technological

Resilience attribute: Adaptability

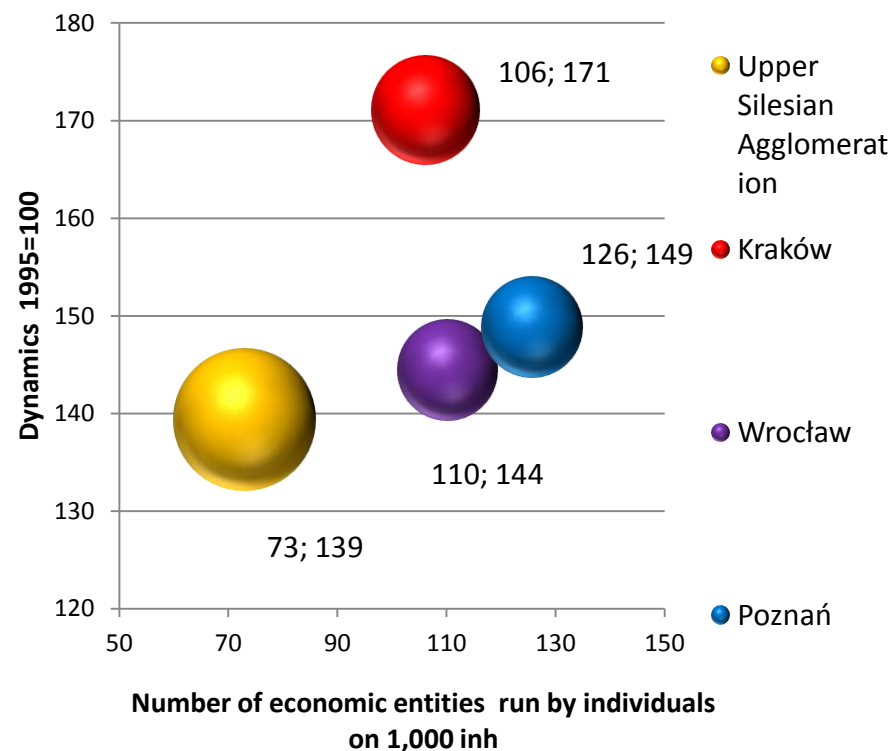
Factor enhancing resilience: High entrepreneurship spirit

Index for the factor: number of companies run by individuals on 1,000 of inhabitants dynamics

Companies run by individuals  
on 1,000 inhabitants 1995-2012



Scale (2012), dynamics (1995-2012) and  
number of companies run by individuals on  
1,000 inhabitants (2012)



# Resilience

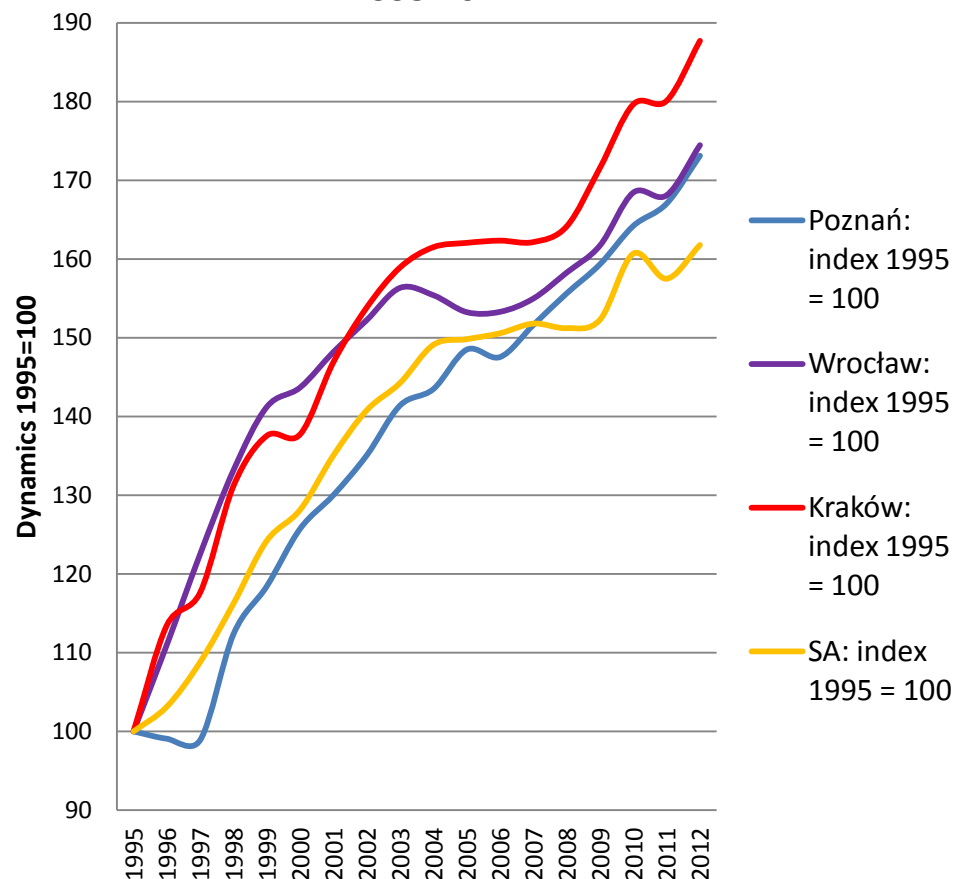
Dimension: Economic-technological

Resilience attribute: Adaptability

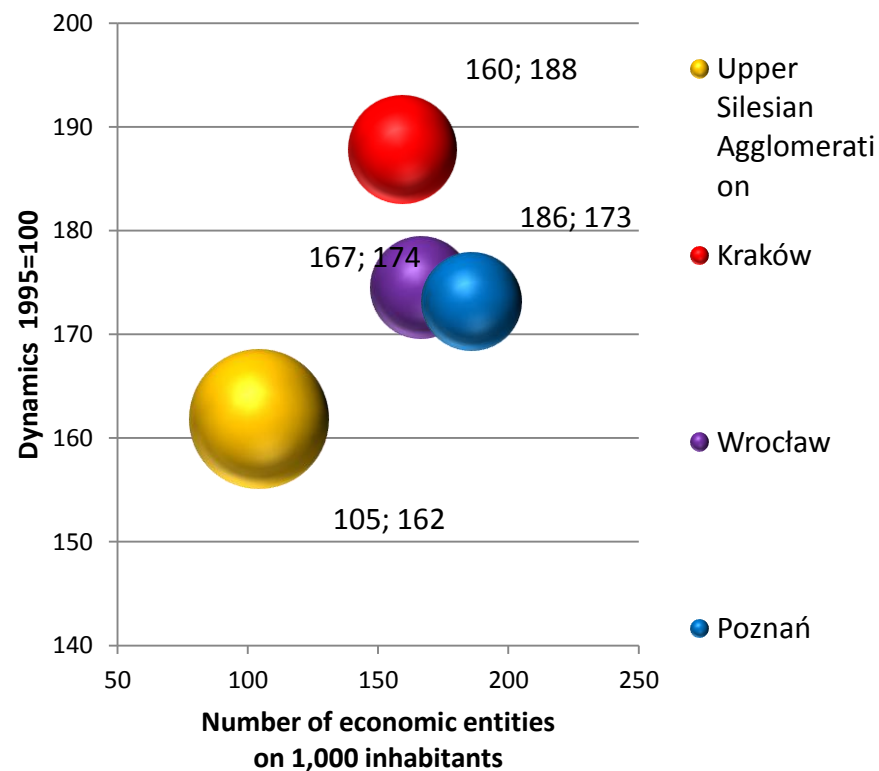
Factor enhancing resilience: Significant economic assets

Index for the factor: number of economic entities on 1,000 inhabitants dynamics

Economic entities on 1,000 inhabitants  
1995-2012



Scale (2012), dynamics (1995-2012) and  
number of economic entities on 1,000  
inhabitants (2012)





## Resilience

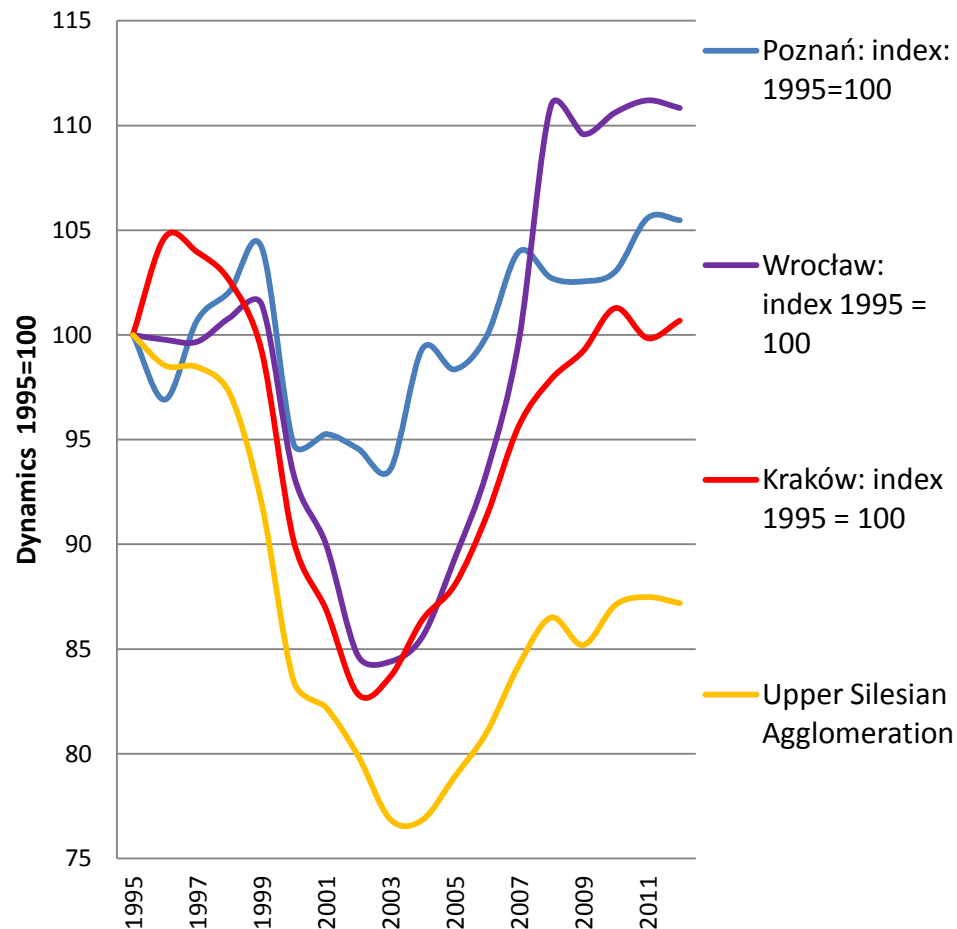
Dimension: Economic-technological

Resilience attribute: Redundancy

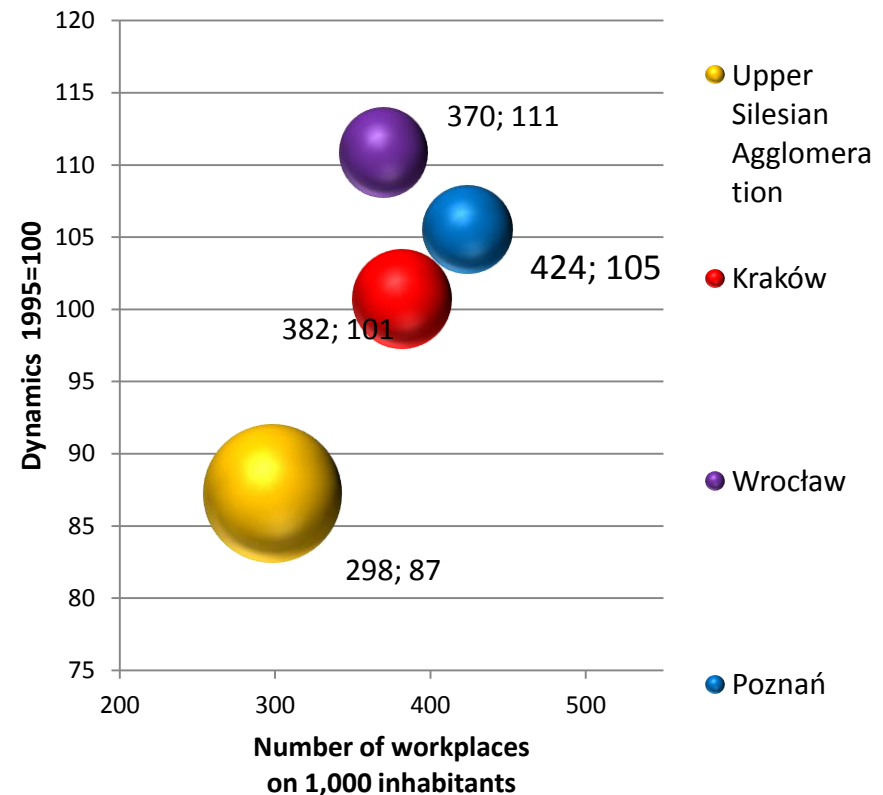
Factor enhancing resilience: Stability of workplaces

Index for the factor: Number of employees on 1,000 inhabitant dynamics

Workplaces on 1,000 inhabitants 1995-2012



Scale (2012), dynamics (1995-2012) and number of workplaces on 1,000 inhabitants (2012)



# Resilience

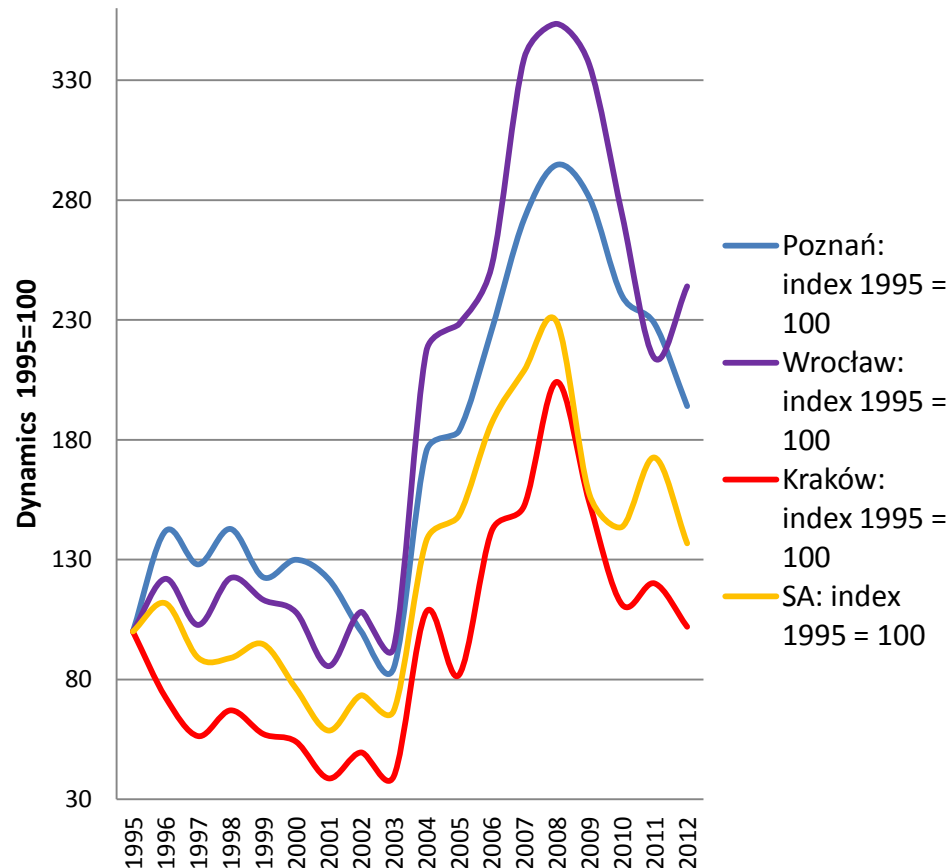
Dimension: Economic-technological

Resilience attribute: Efficiency

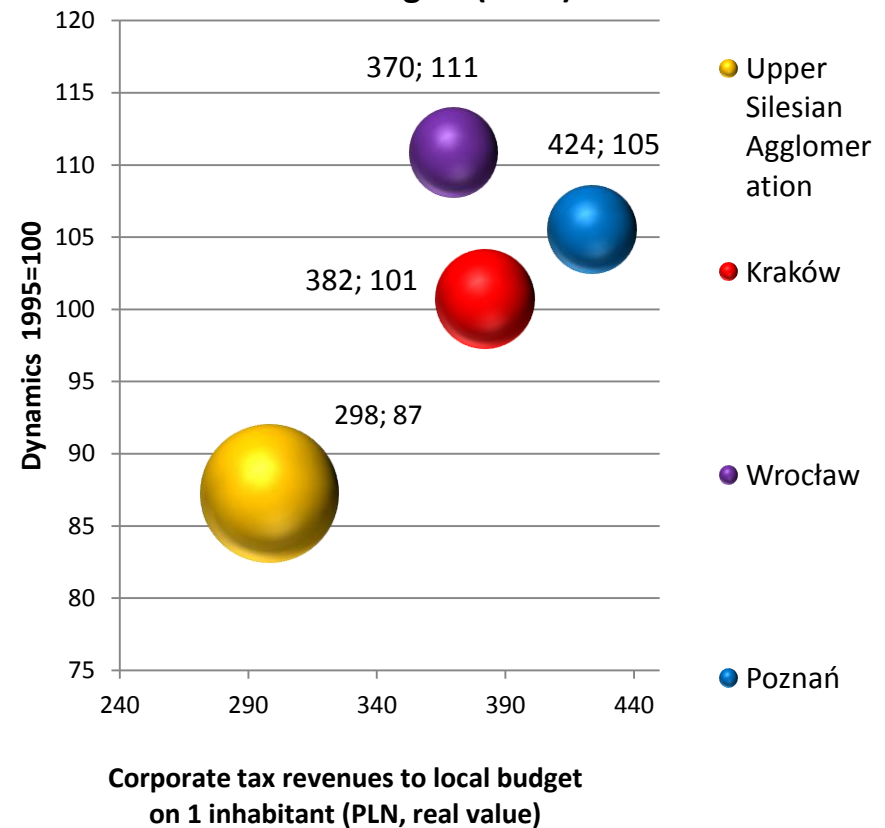
Factor enhancing resilience: Financial strength of companies

Index for the factor: Corporate tax revenues to cities budgets dynamics

Corporate tax revenues to local budgets  
(real value) 1995-2012



Scale (2012), dynamics (1995-2012) and  
volume of corporate tax revenues to local  
budgets (2012)



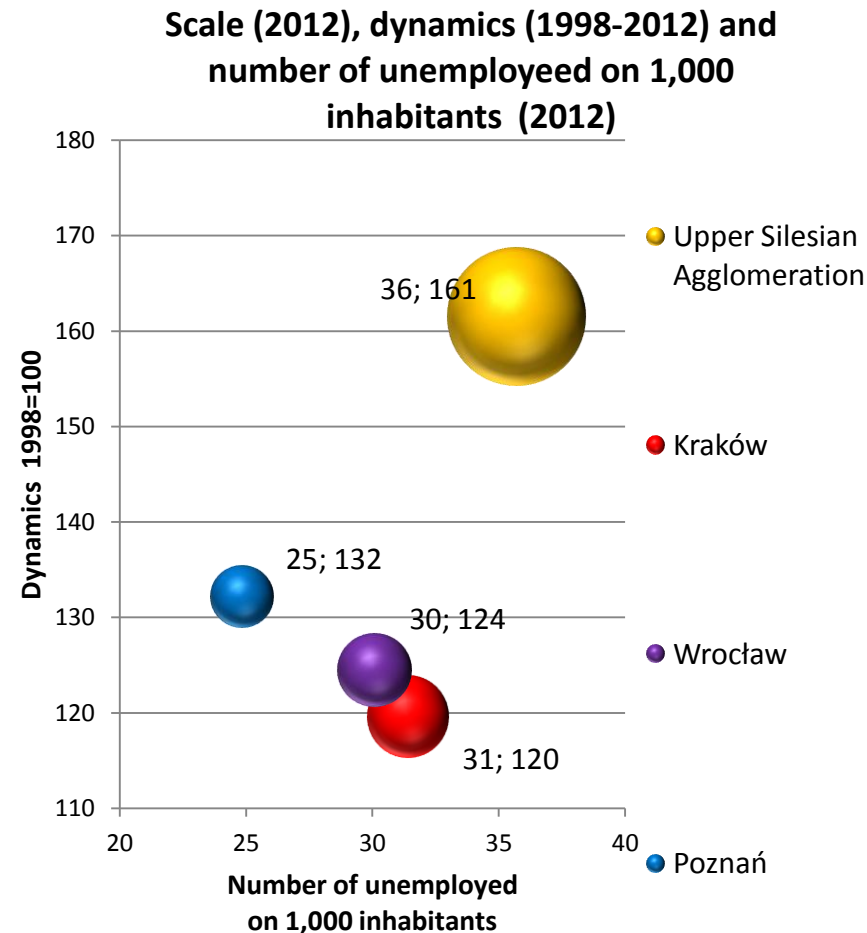
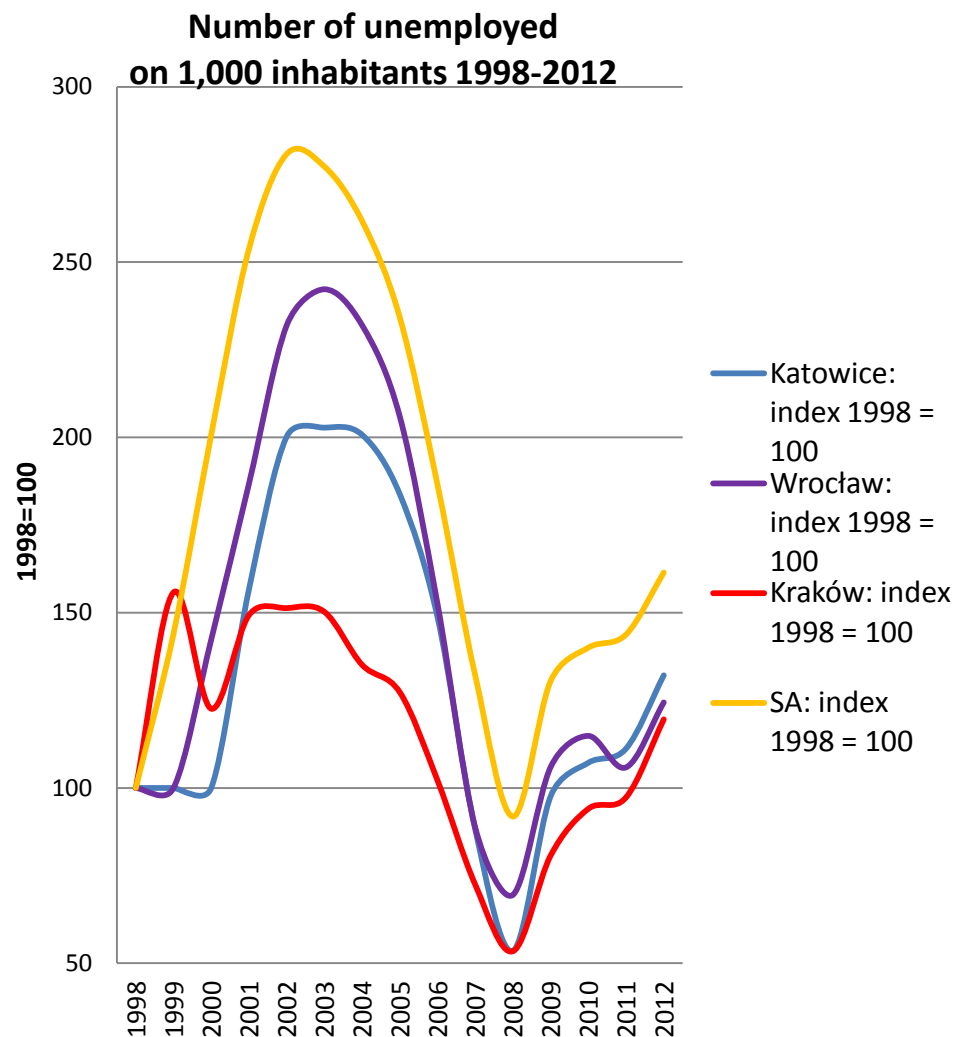
## Vulnerability

### Dimension: Economic-technological

#### Vulnerability: Inadaptability

Factor deepening vulnerability: economic inactivity

Index for the factor: number of unemployed on 1,000 of inhabitants dynamics



# Vulnerability

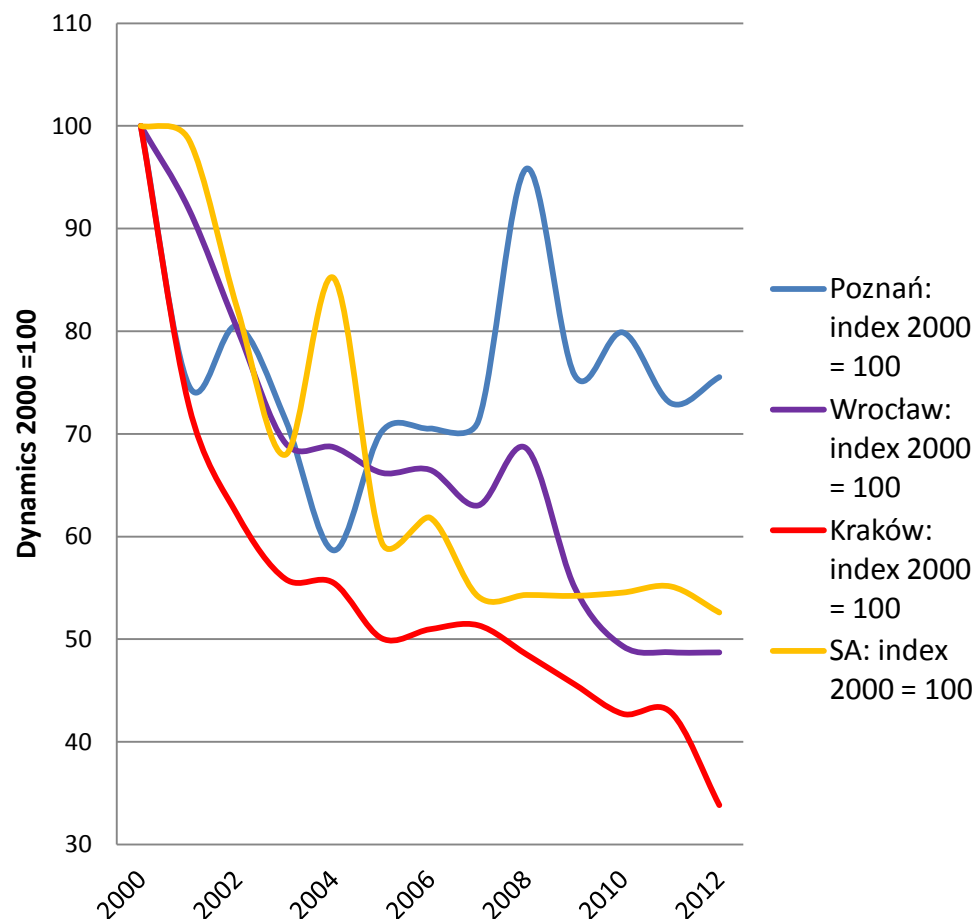
## Dimension: Economic-technological

### Vulnerability: Inadaptability

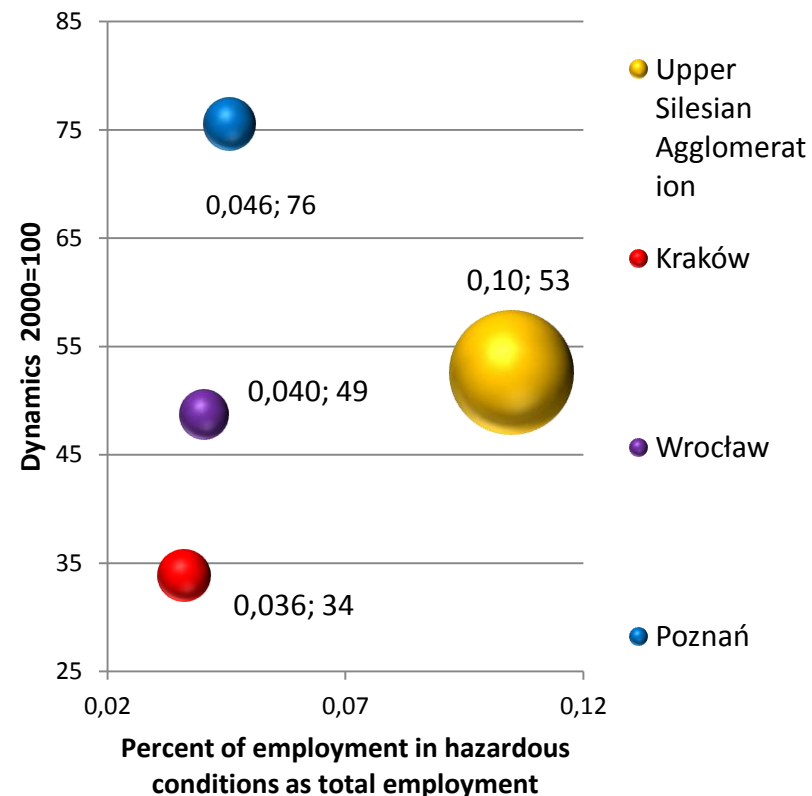
Factor deepening vulnerability: Old technologies employment

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

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



Scale (2012), dynamics (2000-2012)  
and share of employed  
in hazardous conditions (2012)



## Vulnerability

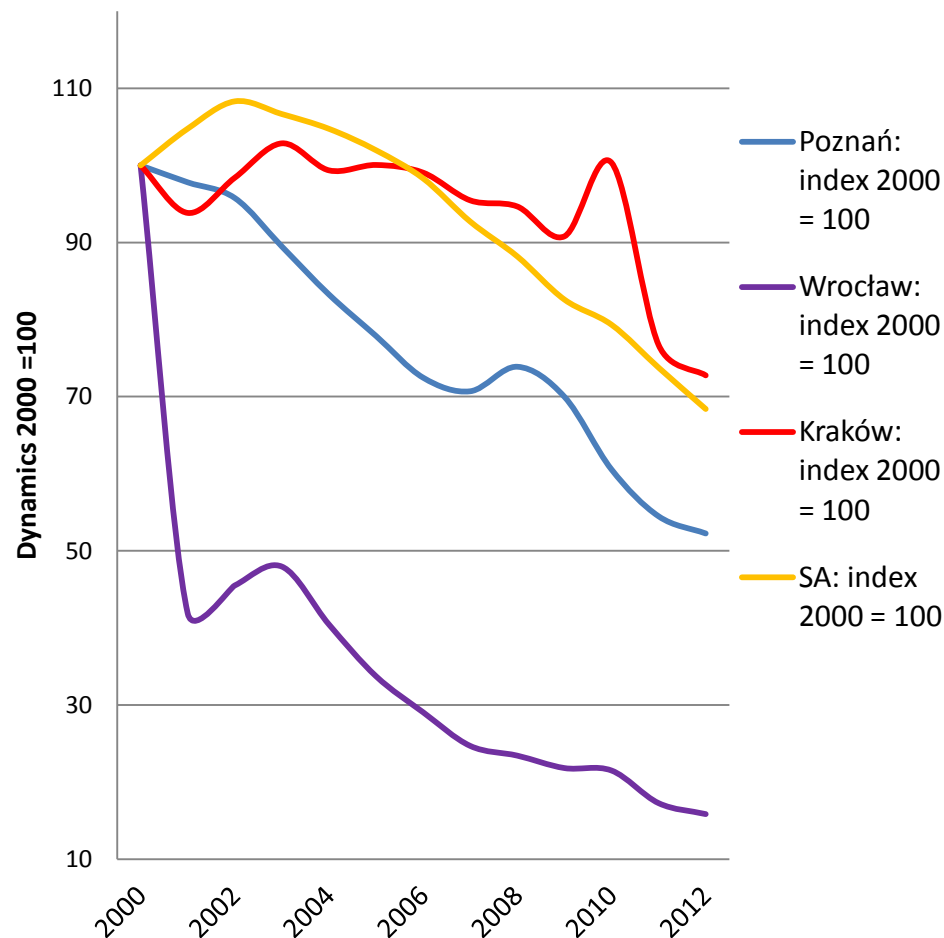
### Dimension: Economic-technological

#### Vulnerability: Inadaptability

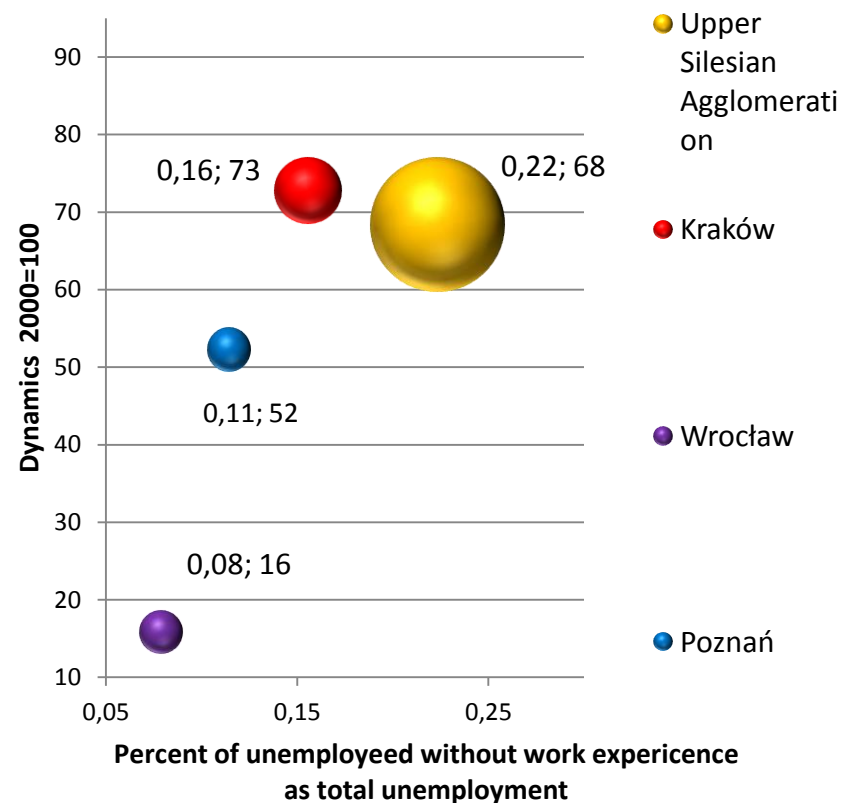
Factor deepening vulnerability: Passive attitudes

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

Percent of unemployed without work experience as total unemployed 2000-2012



Scale (2012), dynamics (2000-2012) and number of unemployed without work experience (2012)



## Vulnerability

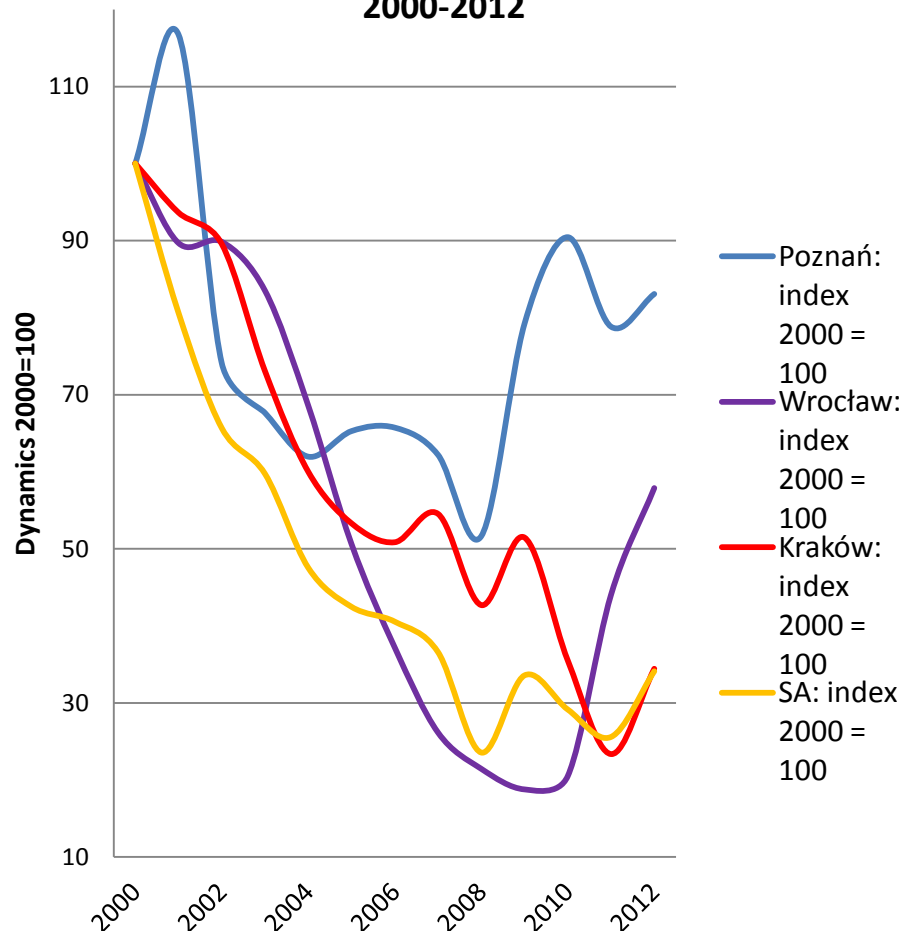
### Dimension: Economic-technological

#### Vulnerability: Inefficiency

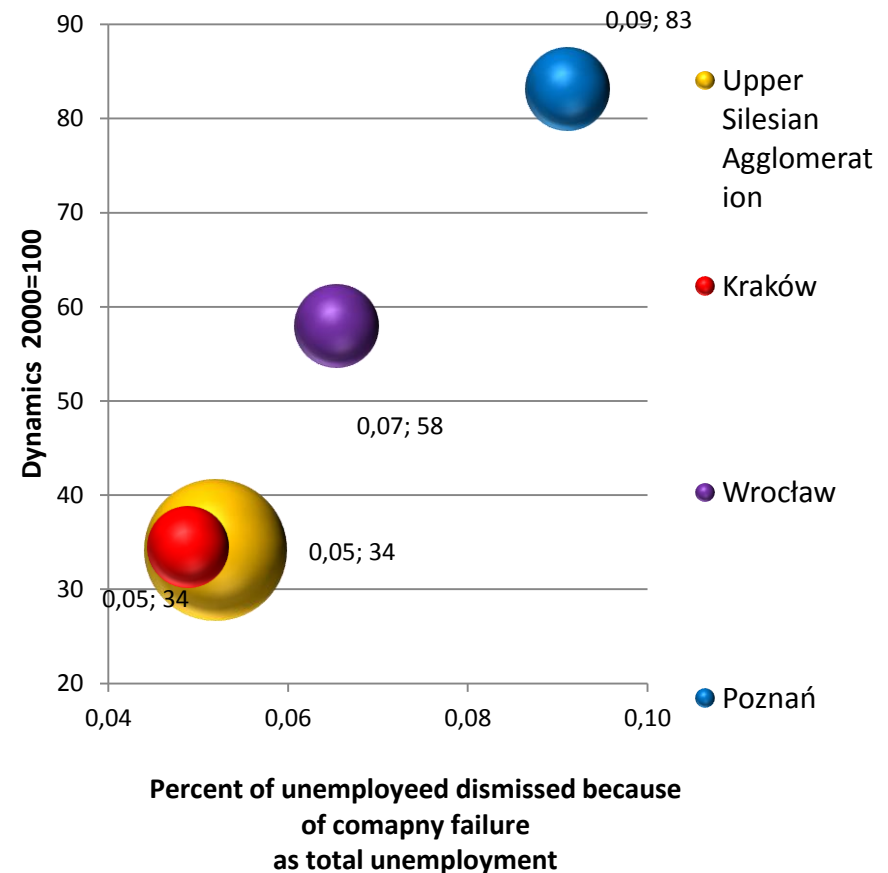
Factor deepening vulnerability: non-competitive economic base

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

Percent of unemployed dismissed because of company failure as total unemployment  
2000-2012



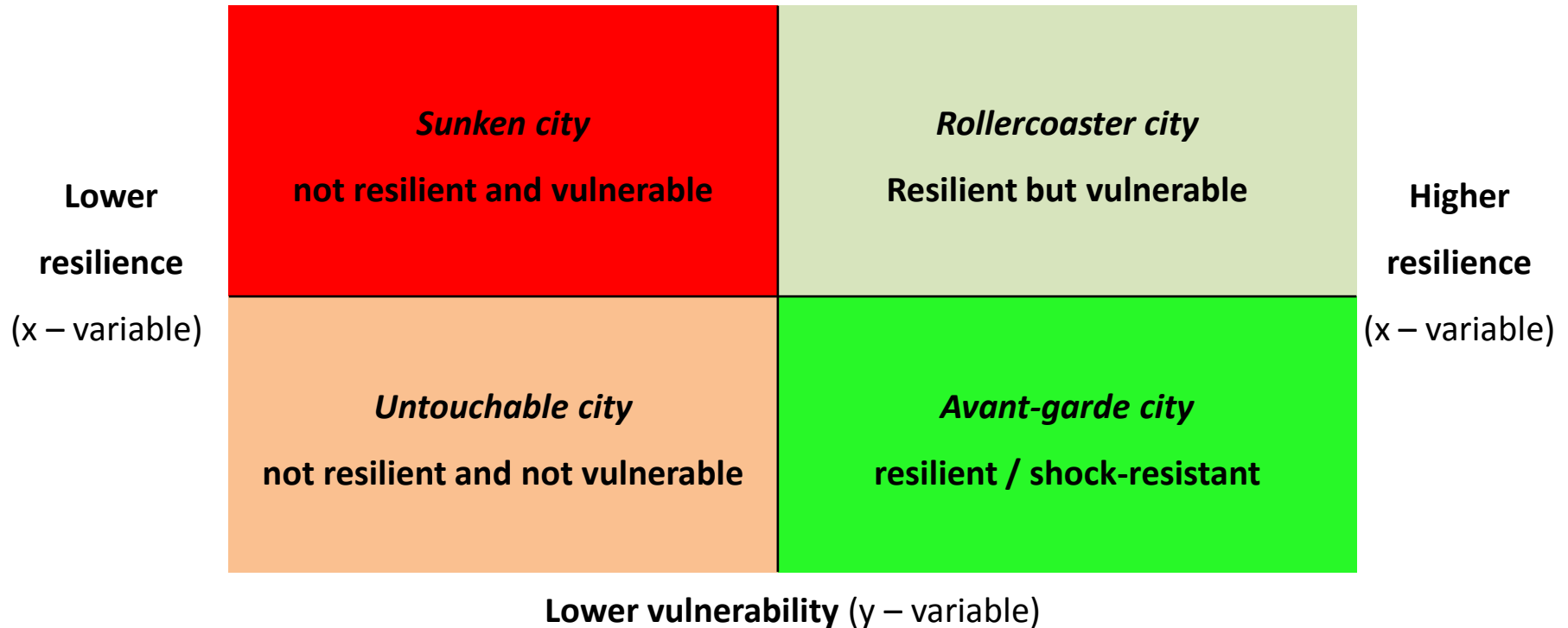
Scale (2012), dynamics (2000-2012) and share of unemployed dismissed because of company failure (2012)



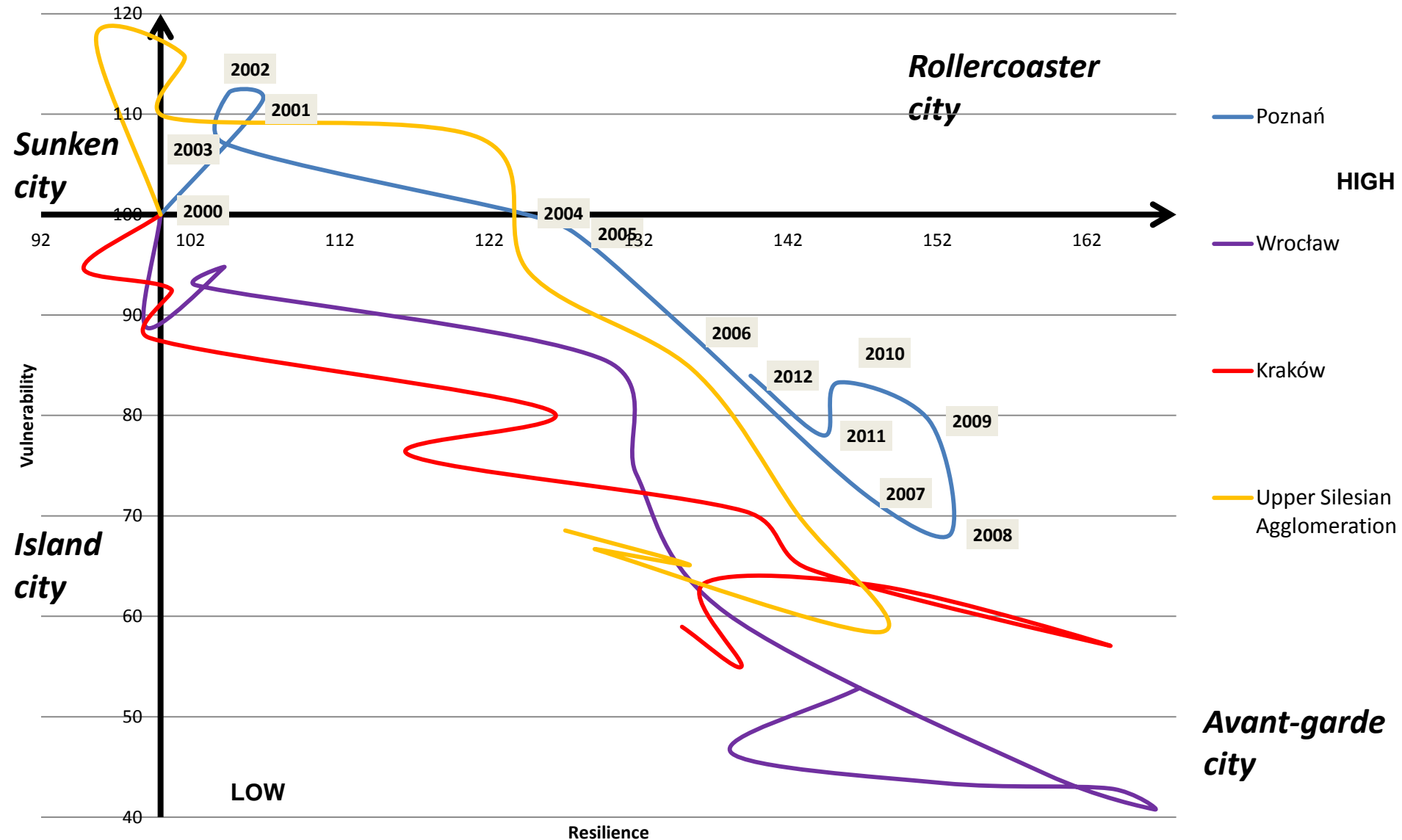
# Assessment of resilience degree – resilience trajectories

## Map of a city's resilience – conceptual form

Higher vulnerability (y - variable)



# Trajectories: economic-technological structure dynamics





- How cities' structures behave in changeable environment
- What kind of a city we are dealing with respect to resilience concept
- What general attributes of a city's resilience should be enhanced
- What general attributes of a city's vulnerability should be weakening?
- How to conduct a quick monitoring and evaluation of a city's resilience?
- What kind of disruptions a city is not prepare for