Socio-Economic Aspects of Urban Development

Unit 13: Structural Change, City Specialization, and Marketing

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Overview of Unit 13

- Economic specialization vs. economic diversification in cities
  - Factors behind economic specialization
  - Advantages and disadvantages of economic specialization
- Calculating indices of concentration and specialization
  - The Herfindahl-Hirschman-Index (HHI)
  - Exercise: The HHI of Specialization applied to Leipzig
- Structural change
  - Case study of Pittsburgh: Post-industrial decline and transformation
- City marketing: How does the city present itself?
  - Attracting tourists
  - Advantages and disadvantages of a large tourism sector

Economically specialized or diverse cities?

- In some cities, economic activity is highly concentrated in one or two sectors. Other cities are more economically diverse. Why is this the case?
- Duranton and Puga (2000) look at 317 US metropolitan statistical areas.
  - For each city, they compute the employment share of the largest sector and divide it by the sector's share in national employment. Values of this relative specialization index (RZI) above 30 indicate high specialization. The city has an employment share in sector X that is 30 times as high as the national average.
    - ★ E.g.: 60% of all workers in the city work in sector X, but only 2% do so nationally.
  - The list shows the dominating sector. Cities that are highly specialized tend to have natural resources (tobacco, petroleum). But some also specialize in textile manufacturing.
  - The range goes from highly specialized cities such as Richmond, Virginia, to strongly diversified cities such as Chicago, Illinois (where even the largest sector only has 1.5 times the national share).

Economically specialized or diverse cities?

	Specialisation	
Rank	City (sector)	RZI
1	Richmond, VA (tobacco)	64.4
2	Macon, GA (tobacco)	55.0
3	Lewiston, ME (leather)	49.6
4	Galveston, TX (petroleum)	49.1
5	Bangor, ME (leather)	45.6
6	Owensboro, KY (tobacco)	44.4
7	Corpus Christi, TX (petroleum)	37.6
8	Cheyenne, WY (petroleum)	33.4
315	Buffalo, NY (rubber and plastics)	1.6
316	Cincinnati, OH (chemicals)	1.5
317	Chicago, IL (metal products)	1.5

Stylized facts on economic specialization

- Duranton and Puga (2000) provide some stylized facts based on their observation of the economic structure of U.S. cities (which tend to hold for other countries as well):
  1. Economically specialized and diverse cities co-exist.
     - ★ Geographical factors play a role in explaining why a city is specialized in one sector (natural resources, climatic conditions). But institutional factors and economic interactions with other agents (other firms from the sector, government) are important as well.
  2. Larger cities tend to be more diversified.
     - ★ But the correspondence between city size and diversification is weak: Los Angeles is a big city specialized in one sector (entertainment). Smaller cities such as Buffalo can also be economically diverse.
     - ★ There is evidence that large cities are more specialised in services (finance, insurance, and real estate sectors) and less in manufacturing, than medium-sized cities.
  3. More firm relocation occurs from diversified to specialized cities than the other way round. There is persistence in city specialization over time - despite structural change.

Advantages and Disadvantages of Economic Specialization

- Advantages
  - Agglomeration effects arising from the proximity of closely related producers
  - Attracting highly-skilled and specialized workers
  - Tendency towards less urban crowding thanks to fewer firms and workers overall
- Disadvantages
  - Strong dependence: The fortunes of the city rise and fall with one sector
  - Fewer economies of scope, less variety of products, jobs and ideas $\Longrightarrow$ Potentially less innovation

Sectoral Structure in Leipzig 1991 and 2021

Number of firms per sector (note the growth of the economy and the population during this period)

Sector (IHK Classification)	1991	2021
Agriculture/Forestry/Fishery	119	77
Mining/Manufacturing Industry	1003	1388
Energy/Water Supply/Waste	150	427
Construction Industry	575	2174
Trade	6409	8165
Transportation	1737	1339
Hospitality	942	2209
Banking/Finance/Insurance	1844	2274
Real Estate and Housing	648	2752
Scientific, Technical and IT Services	2506	19203
Health Care/Social Work/Education	154	1935
Creative/Entertainment/Personal Services	637	3789
Total	**16724**	**45734**

Largest Employers in Leipzig

Which sectors do the biggest firms/employers come from? Consider the 10 largest employers in Leipzig in 2022

Employer	Sector	Approx. No. of Employees
1. University Hospital	Health Care/Social Work/Education	6000
2. BMW	Manufacturing Industry	5300
3. Leipzig University	Health Care/Social Work/Education	5200
4. Leipziger Versorgungs- und Verkehrsgesellschaft MbH (LVV)	Energy/Water Supply/Waste/ Transportation	5000
5. DHL Hub Leipzig	Trade	5000
6. Klinikum St. Georg	Health Care/Social Work/Education	3500
7. Siemens	Scientific, Technical and IT Services	1700
8. SoftwareONE Deutschland GmbH	Scientific, Technical and IT Services	1600
9. Amazon Logistics Hub Trade	Trade	1500
10. Mitteldeutscher Rundfunk (MDR)	Creative/Entertainment/ Personal Services	1400

Herfindahl-Hirschman-Index (HHI) of Specialization

- The Herfindahl-Hirschman-Index (HHI) is an often-used index to measure either **specialization** (from the city's point of view) or **concentration** (from the national industry's point of view)
- **Herfindahl Index of Specialization: To what extent is the economic activity of a city or region specialized in few sectors?**

$$HHI_i^{(S)} = \sum_{j=1}^{K} (g_{ij}^{(S)})^2 = \sum_{j=1}^{K} \left(\frac{X_{ij}}{\sum_{j=1}^{K} X_{ij}} \right)^2 = \sum_{j=1}^{K} \left(\frac{X_{ij}}{X_i} \right)^2 \quad (1)$$

where

  - $g_{ij}^{(S)}$ is the share of sector j in the total value of city/region i
  - X_{ij} is the gross value added or employment in sector j in city/region i
  - X_i is the gross value added or employment in city/region i

- Only city-level data is necessary (employment or firm numbers in each sector, such as on Slide 7 for Leipzig)

Herfindahl-Hirschman-Index (HHI) of Concentration

- **Herfindahl Index of Concentration: To what extent is a sector concentrated in one or two regions/cities?**
- It does not take the perspective of one city but of the sector (nation-wide).

$$HHI_j^{(C)} = \sum_{i=1}^{N} (g_{ij}^{(C)})^2 = \sum_{i=1}^{N} \left(\frac{X_{ij}}{\sum_{i=1}^{N} X_{ij}} \right)^2 = \sum_{i=1}^{N} \left(\frac{X_{ij}}{X_j} \right)^2 \quad (2)$$

where

  - $g_{ij}^{(C)}$ is the share of city/region i in the total national value of sector j
  - X_{ij} is the Gross Value Added or employment in sector j in city/region i
  - X_j is the Gross Value Added or employment in sector j

- This means that national data for the sector is required.

HHI in Spanish Cities

- With very detailed data employment in 87 (sub-)sectors, Goerlich et al. (2020) calculate the HHI for specialization of Spanish cities:
  - Note the rather low absolute values because of the numerous sectors. Which cities are more or less specialized than others? Why? What about changes over time?

CUADRO 4.8: Índice de Herfindahl, 2009-2016

	2009	2013	2016
Madrid	0,0363	0,0377	0,0377
Barcelona	0,0379	0,0392	0,0392
València	0,0437	0,0474	0,0474
Sevilla	0,0456	0,0486	0,0486
Bilbao	0,0387	0,0422	0,0422
Málaga	0,0486	0,0503	0,0503
Zaragoza	0,0400	0,0421	0,0421
Palma	0,0468	0,0488	0,0488
Las Palmas de G. C.	0,0541	0,0577	0,0577
Murcia	0,0495	0,0527	0,0527
Granada	0,0525	0,0567	0,0567
Vigo	0,0421	0,0423	0,0423
Sta. Cruz de Tenerife	0,0528	0,0605	0,0605
Alicante/Alacant	0,0597	0,0636	0,0636
Valladolid	0,0424	0,0440	0,0440
A Coruña	0,0424	0,0439	0,0439

Exercise: HHI of Specialization in Leipzig 1991 and 2021

- Compute the HHI of Specialization for Leipzig in 1991 and 2021, using the sectoral firm data from Slide 7 and equation (1).
  - Open the excel sheet *Unit13_Sectors* which contains the data.
  - Start with the 1991 data. One way to do it, is to use a new column to calculate g_{ij}, the share of sector i's employment, of Leipzig's total employment. Then use another new column to square these g_{ij} values. Finally, add them up to give the HHI for 1991.
  - Do you expect the sectoral specialization to have increased or decreased from 1991 to 2021? Check your hypothesis by calculating the HHI for 2021, using the same steps as for 1991.

Exercise: HHI of Specialization in Leipzig 1991 and 2021

- HHI in 1991: To calculate g_{ij}, divide the sectoral employment by the total, e.g. Cell C2 = B2/$B14 = 119/16724. In column D, square the entries from column C. Then add them with the *sum()* function and obtain an HHI of 0.2034.

Sector (IHK Classification)	1991	g_(ij)	g_(ij)^2
Agriculture/Forestry/Fishery	119	0.0071	0.000051
Mining/Manufacturing Industry	1003	0.0600	0.003597
Energy/Water Supply/Waste	150	0.0090	0.000080
Construction Industry	575	0.0344	0.001182
Trade	6409	0.3832	0.146859
Transportation	1737	0.1039	0.010787
Hospitality	942	0.0563	0.003173
Banking/Finance/Insurance	1844	0.1103	0.012157
Real Estate and Housing	648	0.0387	0.001501
Scientific, Technical and IT Services	2506	0.1498	0.022453
Health Care/Social Work/Education	154	0.0092	0.000085
Creative/Entertainment/Personal Services	637	0.0381	0.001451
Total	**16724**	1.0000	
		HHI	**0.2034**

Exercise: HHI of Specialization in Leipzig 1991 and 2021

- HHI has increased from a value of 0.2034 to a value of 0.2294 in 2021. This slight increase is primarily driven by the sector of *scientific, technical and IT services*, which, however, is a heterogenous sector itself.
  - Note that HHI values depend a lot on the sectoral classifications - which sub-sectors are bunched together or constitute separate categories? Fewer sectors $\Longrightarrow$ higher HHI values! The HHI of one city can nicely be compared over time. When comparing the HHIs of two cities, make sure the sectoral classifications are the same or adjust your interpretation!

Sector (IHK Classification)	1991	g_(ij)	g_(ij)^2		2021	g_(ij)	g_(ij)^2
Agriculture/Forestry/Fishery	119	0.0071	0.000051		77	0.0017	0.000003
Mining/Manufacturing Industry	1003	0.0600	0.003597		1388	0.0303	0.000921
Energy/Water Supply/Waste	150	0.0090	0.000080		427	0.0093	0.000087
Construction Industry	575	0.0344	0.001182		2174	0.0475	0.002260
Trade	6409	0.3832	0.146859		8165	0.1785	0.031874
Transportation	1737	0.1039	0.010787		1339	0.0293	0.000857
Hospitality	942	0.0563	0.003173		2209	0.0483	0.002333
Banking/Finance/Insurance	1844	0.1103	0.012157		2274	0.0497	0.002472
Real Estate and Housing	648	0.0387	0.001501		2752	0.0602	0.003621
Scientific, Technical and IT Services	2506	0.1498	0.022453		19203	0.4199	0.176303
Health Care/Social Work/Education	154	0.0092	0.000085		1935	0.0423	0.001790
Creative/Entertainment/Personal Services	637	0.0381	0.001451		3789	0.0828	0.006864
Total	**16724**	1.0000			**45734**	1.0000	
		HHI	**0.2034**			**HHI**	**0.2294**

Structural Change: Case Study of Pittsburgh

Ghosh et al. (2019) analyze the case of Pittsburgh, Pennsylvania: Formerly **Steel City**. In the 1970s, it produced 30-50% of all American steel.

- Comparative advantages of natural resources and navigable waterways:
  - Resources: coal, timber, iron, and limestone
  - Waterways: the Allegheny, Monongahela and Ohio rivers



Monongahela Wharf, Pittsburgh riverfront ca. 1900-1927.

Industrial Decline in Pittsburgh

- The combined forces of **de-industrialization** and **globalization** led to a decline in steel manufacturing from the 1980s onwards.
  - Geographical shift of steel-manufacturing activities towards lesser developed countries, such as India and China
  - Steel produced in the U.S. reached a peak of 137 million metric tons (mmt) of raw steel in 1973, sharply declining to 67.7 mmt already in 1982
- Pittsburgh: Continuous trend of decline in its manufacturing-based economy since the 1980s
  - Job losses
  - Population decline as people left the city
  - Declining tax base
  - Vacant and abandoned properties
  - Increasing poverty and crime
- Prime example of a **Shrinking City** in the American rust-belt

Decline and Transformation

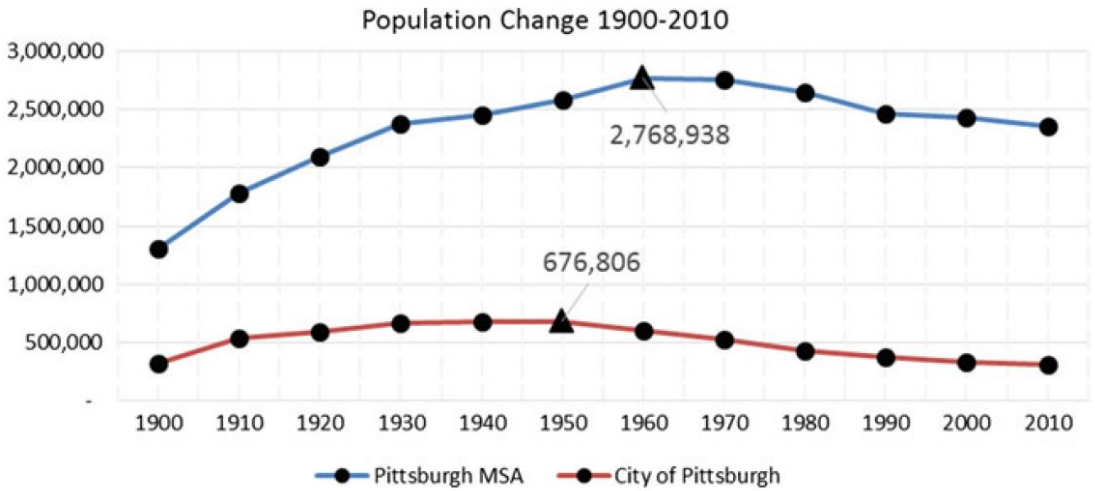


Fig. 17.5 Population change, Pittsburgh city and metropolitan region. *Source* Decennial Census 1900–2010, U.S. Census Bureau

- Primary goals in stopping the decline and transforming the city:
  - Economic diversification
  - Regeneration of brownfields (abandoned industrial sites)
  - Urban greening and green infrastructure practices

Decline and Transformation

Change in the urban planning process of Pittsburgh in the 2000s:

- A more bottom-up approach, driven by neighborhood level community and non-profit organizations
- Clean up and reconvert derelict industrial sites
  - Overcoming the initial stigma of contamination, treating brownfield redevelopment as opportunities
  - New office spaces, research centers, and mixed-used developments
- Progress in the economic restructuring process
  - Heavily relying on growth of hospitals and healthcare services, high-technology industries, centers of research and higher education
  - Many of these sectors are non-profit sectors and are property tax-exempt. $\Longrightarrow$ Cannot ease out the financial challenges for the local governments. Only in the long-run, by attracting new residents that demand housing and pay property tax

Transformation: Brownfield redevelopment in Pittsburgh

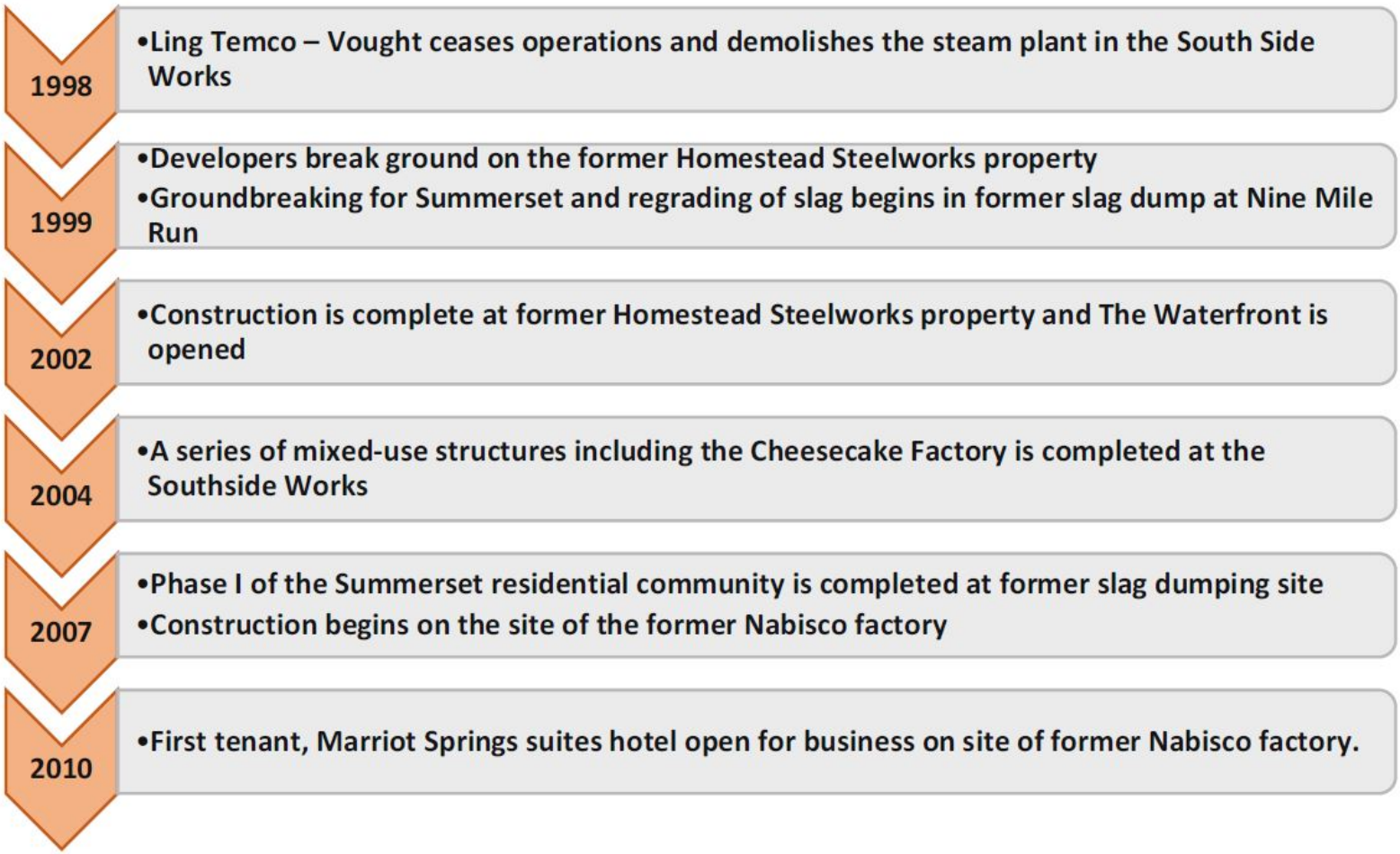


Fig. 17.11 Historic timeline of brownfield redevelopments in Pittsburgh

Transformation: Brownfield Redevelopment in Pittsburgh

Transformation of South Side: East Carson Street Commercial Corridor

- East Carson Street was once the commercial backbone of a flourishing steel worker neighborhood. 1970s/1980s: Abandonment of homes and storefronts
- 1982: Creation of the South Side Local Development Company (SSLDC)
  - 1982: Property values in the neighborhood was 67% of the city's median value. 2008: They were 170% of the city's median value.
  - 1982: 60% of retail space along East Carson Street was vacant. 2010: 4.5% was vacant.
- Between 1982 and 2012, the SSLDC has leveraged $16 million in funding for businesses and housing redevelopment, combining public and private funds.
  - Rehabilitating 225 older Victorian-style buildings. Private developers added 330 lofts and condominiums.
  - The Pittsburgh Urban Redevelopment Authority (URA) bought the 123-acre areal of the LTV Steel South Sides Works, turning it into residential, retail, office, hotel, public parks and sports training facilities. Now generating $6 million a year in property tax.

Current Economic Structure of Pittsburgh

- Pittsburgh is transforming its economy towards **advanced services** and knowledge-based jobs:
  - **Medical and life science research:** University of Pittsburgh Medical Center
  - **Higher education:** Carnegie Mellon University,University of Pittsburgh
  - **AI and robotics:** More than 140 companies in 2025 on robotics and autonomous systems, CMU and Nvidia established a joint research center for robotics, autonomy and AI in 2024
- What about **lower-skilled** former steel manufacturing workers?
  - Some shale-based natural gas extraction activities in the Pittsburgh region. But long-term opportunities and sustainability?
- $\Longrightarrow$ **Uneven transformation and spatial inequality:** In particular, smaller cities of the region are still plagued by abandoned industrial sites, declining and aging populations, lack of skills and lack of sectoral diversity.

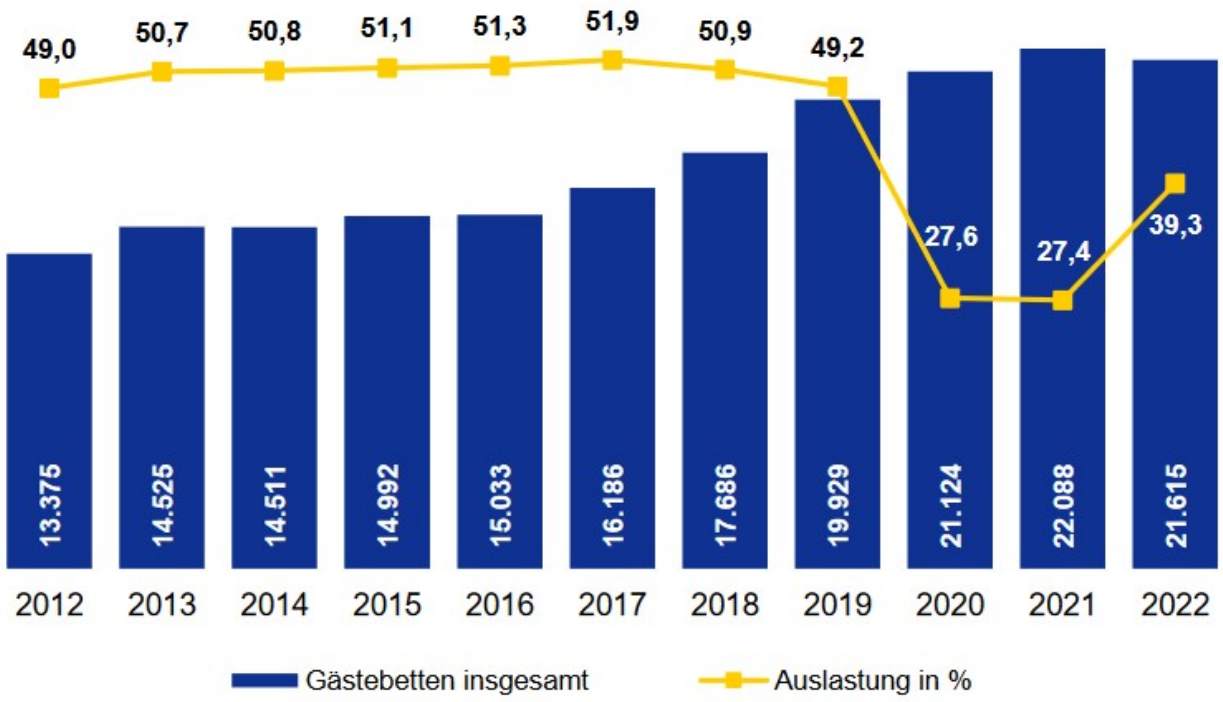
City Marketing

- How does the city position itself and how is it perceived in the public eye?
- This refers to its economy as much as to its culture, history, and places of interest.
- The largest city in a country will often be the economic, political and social center. It might primarily focus on an international audience. Second-tier cities might try to set themselves about from the largest city, highlighting their particularities and competitive advantages, for example:
  - Use unique landmarks (Eiffel Tower in Paris, St. Thomas Church in Leipzig, Elbphilharmonie in Hamburg)
  - Symbols of local culture (cuisine, festivals, events). Think of the Oktoberfest in Munich!
  - (Nearby) nature for recreation and activity

City Marketing: Attracting Tourists

- The increasing numbers of hotel accommodations (bar chart, with capacity utilization as line) show the growth of the hospitality industry in Leipzig

Abb. 2: Gästebetten zum 31.07. und jährliche Kapazitätsauslastung in der Stadt Leipzig



Statistisches Landesamt Sachsen, Amt für Statistik und Wahlen Leipzig, Open Data Portal (Link)

Advantages of a Large Tourism Sector

- Tourism brings in money and stimulates local income
  - Tourists have money to spare and spend in local shops, restaurants, hotels and cultural venues
- Creation of jobs
  - In particular in the hospitality industry, but also more broadly if tourism stimulates demand for other goods and services
- Incentives to preserve historical buildings and the natural environment
  - If tourists value historical buildings and pay to visit them, it provides an incentive for preservation. This also holds for nature (Examples: scenic views unobstructed by urban development, wildlife conservation in Africa).
- Promoting national and international connections
  - Building favorable relations, friendships as well as the basis for business connections

Disadvantages of a Large Tourism Sector

- Dependence on external factors
  - Recession in tourists' home country, geo-political tensions, global health issues etc
- City congestion
  - Tourists add to the strain on infrastructure, in particular crowding historical city centers
- Environmental impact
  - Waste created by tourists, potential damage to green spaces, nature and beaches, noise pollution
- Competition for scarce urban resources, in particular housing
  - Conversion of apartments into short-term rentals (AirBnB)
- Quality of the jobs in the hospitality sector
  - Low-level, seasonal work or jobs with growth prospects?

Wrap-Up of Unit 13

- Some cities are **economically specialized**, while others are more diverse. Geographical as well as institutional factors play a role in explaining economic specialization. Larger cities tend to be more economically diverse, in particular if they are the primary city of a country.
- The **Herfindahl-Hirschman-Index (HHI)** can measure both specialization (from a city or region's point of view) or concentration (from the point of view of a sector). The sectoral classification can influence its magnitude.
- While a city's economic specialization tends to exhibit strong time persistence overall, there are many examples of **structural change** and economic transformation. The case study of Pittsburgh has shown the evolution from post-industrialization and decline to brownfield redevelopment and a focus on high-skilled jobs in health care and IT, while income and spatial inequality remain big issues.
- **City marketing** involves shaping an image of the city, which can play a role in attracting firms, new residents as well as tourists. A large tourism sector comes with advantages and disadvantages for city residents.

Bibliography of Unit 13



Duranton, G. and D. Puga (2000).

Diversity and Specialisation in Cities: Why, Where and When Does it Matter?

Urban Studies 37, 533–555.



Ghosh, S., S. Byahut, and C. Masilela (2019).

Metropolitan Regional Scale Smart City Approaches in a Shrinking City in the American Rust Belt—Case of Pittsburgh, Pennsylvania.

In T. M. V. Kumar (Ed.), *Smart Metropolitan Regional Development*, Chapter 17, pp. 979–1021. Springer.



Goerlich, F., E. Reig, C. Albert, and J. C. Robledo (2020).

Las Áreas Urbanas Funcionales en España: Economía y Calidad de Vida.

Bilbao: Fundación BBVA.