Smart Innovation Capacity: The Experience of Croatian Large Cities

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The Institute of Economics, Zagreb

HR EXCELLENCE IN RESEARCH

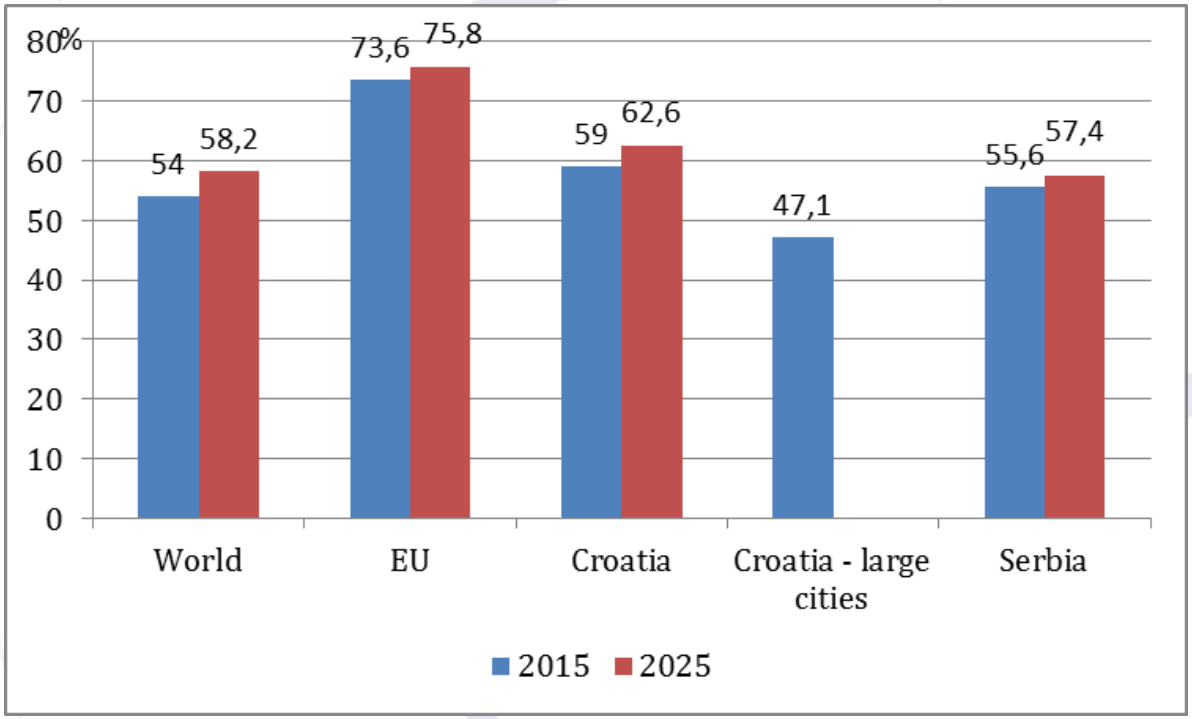
Structure of presentation

- Motivation
- Smart City in strategic documents and literature
- Smart City methodology
- Implementation of Smart City methodology for Croatian large cities
- Conclusion and further research

Motivation 1

- More than half of the world's population live in cities and 73 percent of EU inhabitants live in urban areas (EC and UN-HABITAT, 2016)
- Cities, as highly density places, are faced with constant need to increase energy consumption, transportation, buildings and public spaces, etc. (OECD, 2015)
- This is a reason for the creation of „smart" solutions that ensure economic prosperity and social wellbeing for cities' citizens
- The most efficient way to achieve that is by mobilizing a city's resources and actors using new technologies and policies - **Smart City model**

Motivation 2



Source: UN Habitat (2016) World Cities Report 2016

Half of the world's population lives in urban areas with 4,000 to 10,000 inhabitants per km2

Use of space
Environmental challenges
Traffic
...

City of Zagreb population density: 3,800 inhabitants per km2

"Smart" solutions
for economic and social development

SMART CITY MODEL

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Motivation 3

Current practice in Croatian cities

- **Development decisions**
  - Without strategic thinking
  - Based on established ad hoc goals, activities and measures for their realization
- **Development**
  - Not considered long-term
  - All relevant stakeholders are not involved
  - Neglected to address key development challenges
  - Goals, activities and measures are established without relying on key indicators
- **Smart City model**
  - Does not exist
  - Starting to use smart solutions to address urban, environmental and city administration issues
- **The consequence of such development planning**
  - Unnecessary waste of public funds

Smart City model

- **Defining indicators and data** for planning and monitoring of development decisions in **6 dimensions of a smart economy**:
  - Innovative spirit
  - Entrepreneurship
  - Economic image and trademarks
  - Productivity
  - Labour market flexibility
  - International integration/presence
- Start for **future research into other 5 dimensions** of the Smart City model :
  - Smart people
  - Smart governance
  - Smart mobility
  - Smart environment
  - Smart living

to monitor and control the development of large cities on the basis of smart development indicators

Smart City in EU strategic documents

- A Smart City is a part of **Smart Specialization Strategies** (OECD, 2013)
  - The Smart Specialization approach combines industrial, educational and innovation policies to help cities in recognizing priority areas for knowledge-based investments
- The Smart Specialization Strategies are promoted by the **EU Cohesion Policy** (http://s3platform.jrc.ec.europa.eu/home)
  - In cities are located majority of educational and research institutions, as well as R&D activities (European Parliament, 2014, Mapping Smart City in the EU, http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf)
- The role of a Smart Cities is recognized by the **EU's Smart Cities and Communities Innovation Partnership** (http://ec.europa.eu/eip/smartcities/)
- There is a strong link between Smart Specialization and cities
  - It links cities, industry and citizens to improve urban life through using innovation potential and more sustainable integrated solutions in the crucial areas of energy, transport and mobility
- The **Urban Agenda for the EU** also promote cooperation between Member States, the European Commission and cities in order to stimulate growth, liveability and innovation in EU cities (http://urbanagendaforthe.eu/)

Smart City in Croatian strategic documents

- A Smart City is a component of the **Croatian Smart Specialization Strategy** (Ministry of Economy, 2015)
- It is strongly supported by the Ministry of Economy, Entrepreneurship and Crafts of the Republic of Croatia

Smart City in literature

- Everywhere in the world, cities have been identified as **carriers of development activities in the country**
- Scientific literature gives some attention to:
  - the analysis of the **role of cities in smart specialization** (Smart cities: Ranking of European medium-sized cities, http://www.smart-cities.eu/download/smart_cities_final_report.pdf)
  - the **role of the largest cities, world metropolises, and capitals**
- Unfortunately, in the literature there is no evidence on:
  - **implementation of the Smart City concept in the new EU member countries**
  - potentials of smart specialization of large cities in the new EU member countries in promoting development
- The **UN-HABITAT Report on European Cities in Transition** (UN-HABITAT, 2013) includes several SEE countries, including Croatia
- EC city statistics, the **Urban Audit database**, provides information and comparable measurements on different aspects of quality of urban life in European cities
- the Urban Audit database provides data only for **five Croatian cities** (Zagreb, Split, Rijeka, Osijek and Slavonski Brod) and data for these five cities are deficient

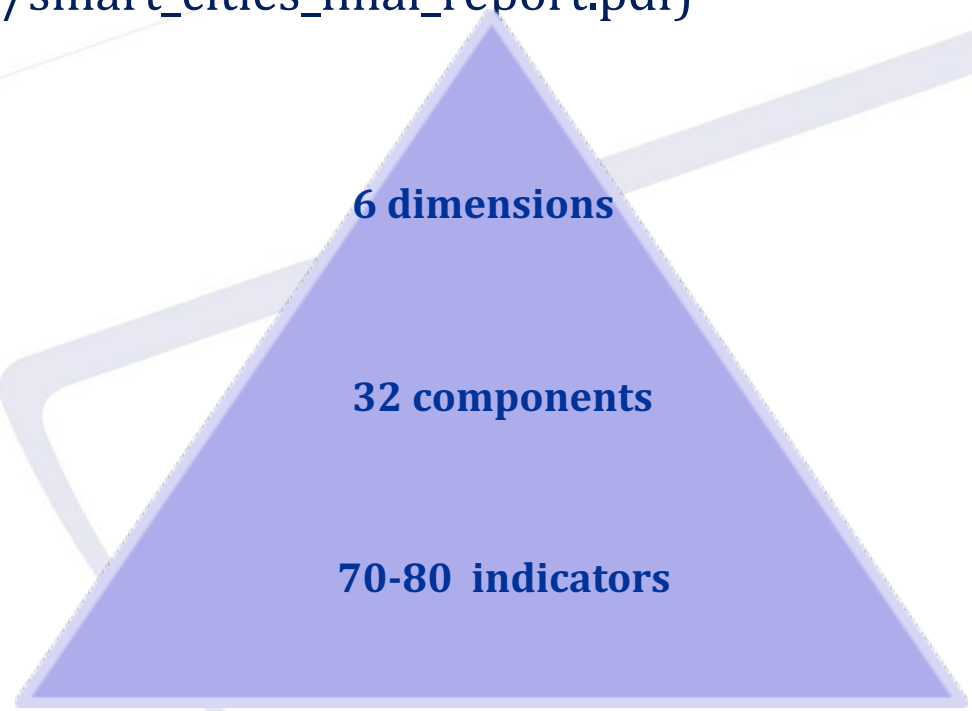
Focus of the research

- **The implementation of the Smart City methodology** and development of the Smart City indicators for the Croatian large cities
- The **comparison** of different Croatian cities in the field of **local innovation capacity**
- The role of large cities in Croatia in smart specialization of the whole country
- Contribution of other Smart City dimensions to local development (education capacity, urban management and governance, social development, and environmental management in particular city)

Smart City methodology

- This research is based on **the methodology developed under the European Smart Cities project**

(Smart cities: Ranking of European medium-sized cities, http://www.smart-cities.eu/download/smart_cities_final_report.pdf)



Smart City model 1

- **Smart economy** (Competitiveness) - innovation, entrepreneurship, trademarks, productivity and flexibility of the labour market and the integration in the national and international market
- **Smart People** (Social and Human Capital) - the level of education of the citizens, the quality of social interactions regarding integration and public life and the openness towards the world
- **Smart Governance** (Participation) - political participation, services for citizens and functioning of the city's administration
- **Smart Mobility** (Transport and ICT) - local and international accessibility, the availability of information and communication technologies, modern and sustainable transport systems
- **Smart Environment** (Natural resources) - natural conditions (climate, green space), pollution, resource management and environmental protection
- **Smart Living** (Quality of Life) - quality of life in different areas as culture, health, safety, housing, tourism etc.

Source: Smart cities: Ranking of European medium-sized cities, http://www.smart-cities.eu/download/smart_cities_final_report.pdf

Smart City model 2

Dimensions	**Smart Economy** (Competitiveness)	**Smart People** (Social and Human Capital)	**Smart Governance** (Participation)	**Smart Mobility** (Transport and ICT)	**Smart Environment** (Natural resources)	**Smart Living** (Quality of Life)
Components	Innovative spirit	Level of qualification	Participation in decision-making	Local accessibility	Attractivity of natural conditions	Cultural facilities
	Entrepreneurship	Affinity to life long learning	Public and social services	(Inter-)national accessibility	Pollution	Health conditions
	Economic image & trademarks	Social and ethnic plurality	Transparent government	Availability of ICT infrastructure	Environmental protection	Individual safety
	Productivity	Flexibility	Political strategies & perspectives	Sustainable, innovative and safe transport system	Sustainable resource management	Housing quality
	Flexibility of labour market	Creativity				Educational facilities
	International presence	Cosmopolitanism				Touristic attractivity
	Ability to transform	Participation in public life				Social cohesion

Implementation of Smart City methodology for Croatian large cities 1

- **25 Croatian large cities**
- **Data collecting** for measuring economic development indicators of cities in 6 dimensions of smart economy
  - **Web scraping technique** for data collection
  - **Surveys and interviews** with relevant stakeholders in 25 cities
- **14 most important indicators** for description of **6 components of smart economy** (innovative spirit, entrepreneurship, economic image and trademarks, productivity, labour market flexibility and international integration) for:
  - Comparison of 25 large cities
  - Evaluation of the comparative advantage of 25 large cities in the international context
  - Ranking of 25 large cities according to the degree of economic development
- **Development index** for every city (25) using the main component analysis
- **Web application** (in Croatian and English) for decision-makers in 25 large cities to use available data and indicators for preparation and implementation of smart development strategies
- **Cooperation between researchers and city experts** in research activities and creation of new knowledge

Large cities

>35,000 inhabitants

43.2% total population of Croatia (Census 2011)

1.	Zagreb	790,017
2.	Split	178,102
3.	Rijeka	128,624
4.	Osijek	108,048
5.	Zadar	75,062
6.	Velika Gorica	63,517
7.	Slavonski Brod	59,141
8.	Pula	57,460
9.	Karlovac	55,705
10.	Sisak	47,768
11.	Varaždin	46,946
12.	Šibenik	46,332
13.	Dubrovnik	42,615
14.	Bjelovar	40,276
15.	Kaštela	38,667
16.	Samobor	37,633
17.	Vinkovci	35,312

County centres

3.9% total population of Croatia (Census 2011)

18.	Koprivnica	30,854
19.	Vukovar	27,683
20	Čakovec	27,104
21.	Požega	26,248
22.	Virovitica	21,291
23.	Gospić	12,745
24.	Krapina	12,480
25.	Pazin	8,638

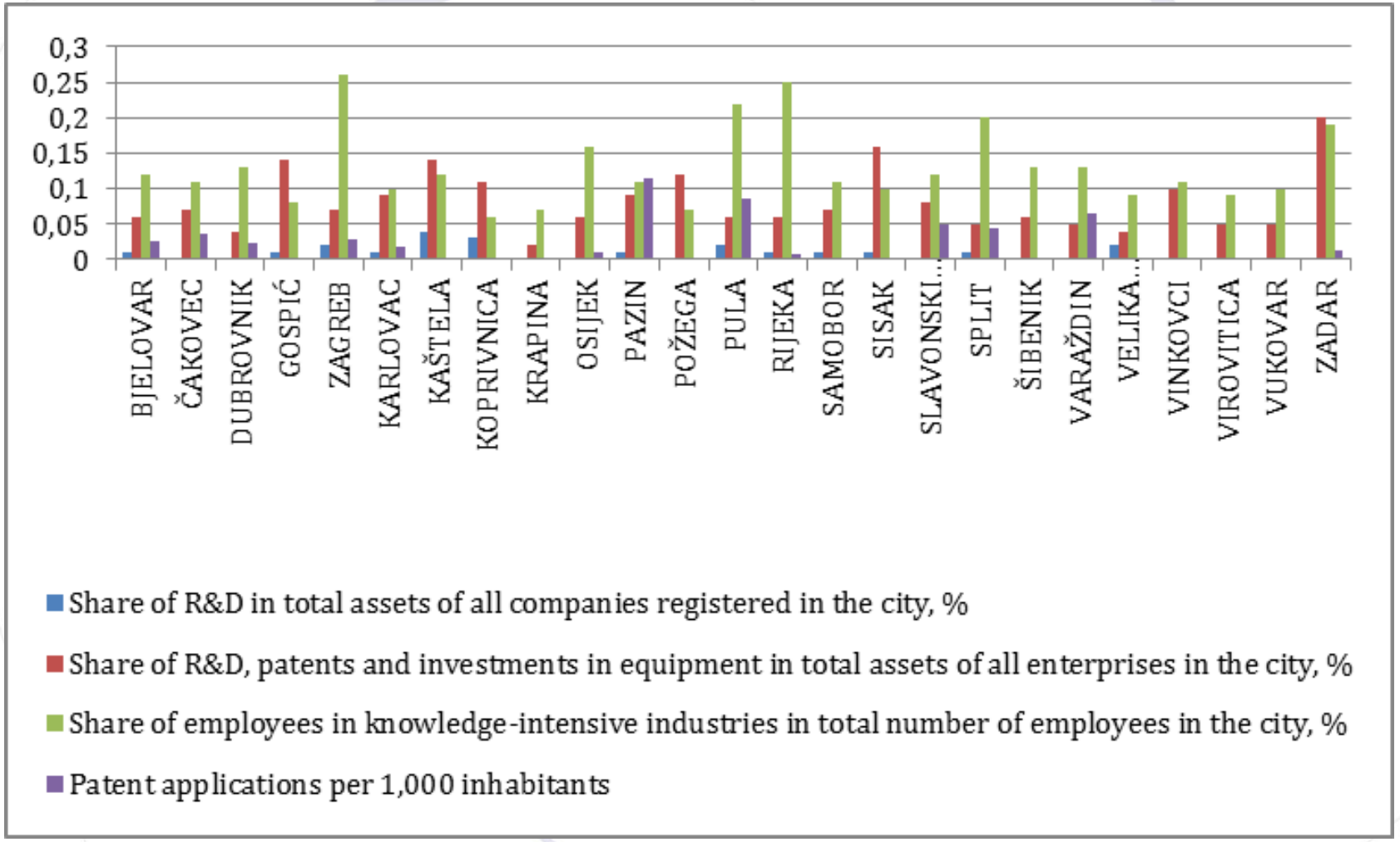
Data sources:

Urban Audit
FINA - Annual Financial Reports (2015)
Croatian Bureau of Statistics, http://www.dzs.hr/
Court Register,
https://sudreg.pravosudje.hr/registar/f?p=150:1
Croatian Pension Insurance Institute,
http://www.mirovinsko.hr/default.aspx?id=4298
Zagreb Stock Exchange,
http://zse.hr/default.aspx?id=26474
Database, 25 Croatian large cities

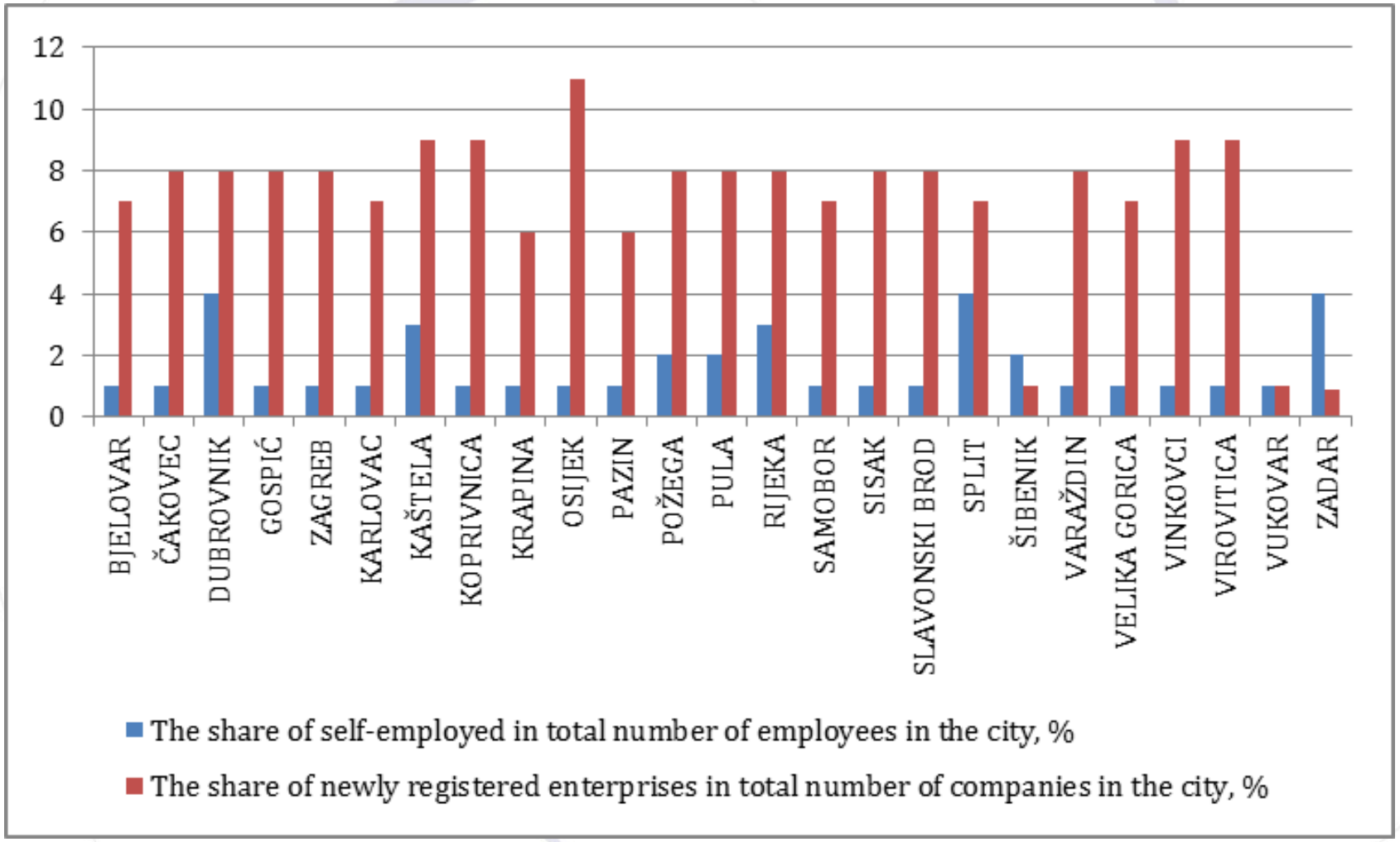
Implementation of Smart City methodology for Croatian large cities 2

Smart Economy (Competitiveness)		
Components	*Indicator*	*Definition*
Innovative spirit	R&D intensity	Share of R&D in total assets of all companies registered in the city
	P&E intensity	Share of patents and investments in equipment in total assets of all enterprises in the city
	Employees in knowledge-intensive industries	Share of employees in knowledge-intensive industries in total number of employees in the city
Entrepreneurship	Self-employed intensity	The share of self-employed in total number of employees in the city
	Newly registered companies intensity	The share of newly registered enterprises in total number of companies in the city
Economic image	Registered enterprises	Total number of registered active enterprises in the city
Productivity	Productivity	The ratio between added value and expenses for employees of all companies in the city
	Part-time employment intensity	The share of paid employees who work part-time and the total number of employees in all companies with headquarter in the city
Flexibility of labour market	Unemployment rate	The share of unemployed persons in the city in the total population according to 2011 Census
	Employment intensity	The ratio of the number of employed and the number of unemployed persons in the city
International presence	Companies quoted on national stock market	Companies with HQ in the city quoted on national stock market
	Export intensity	The share of revenue from exports in the total revenues of all companies with HQ in the city
	Foreign capital intensity	The ratio of revenue of enterprises with a share of foreign capital greater than 49% of total revenues of all companies with HQ in the city
	FDI	The value of FDI is a multiplication of changes in the share of foreign capital and the value of capital at the level of companies with HQ in the city

Croatian large cities, Innovative spirit



Croatian large cities, Entrepreneurship



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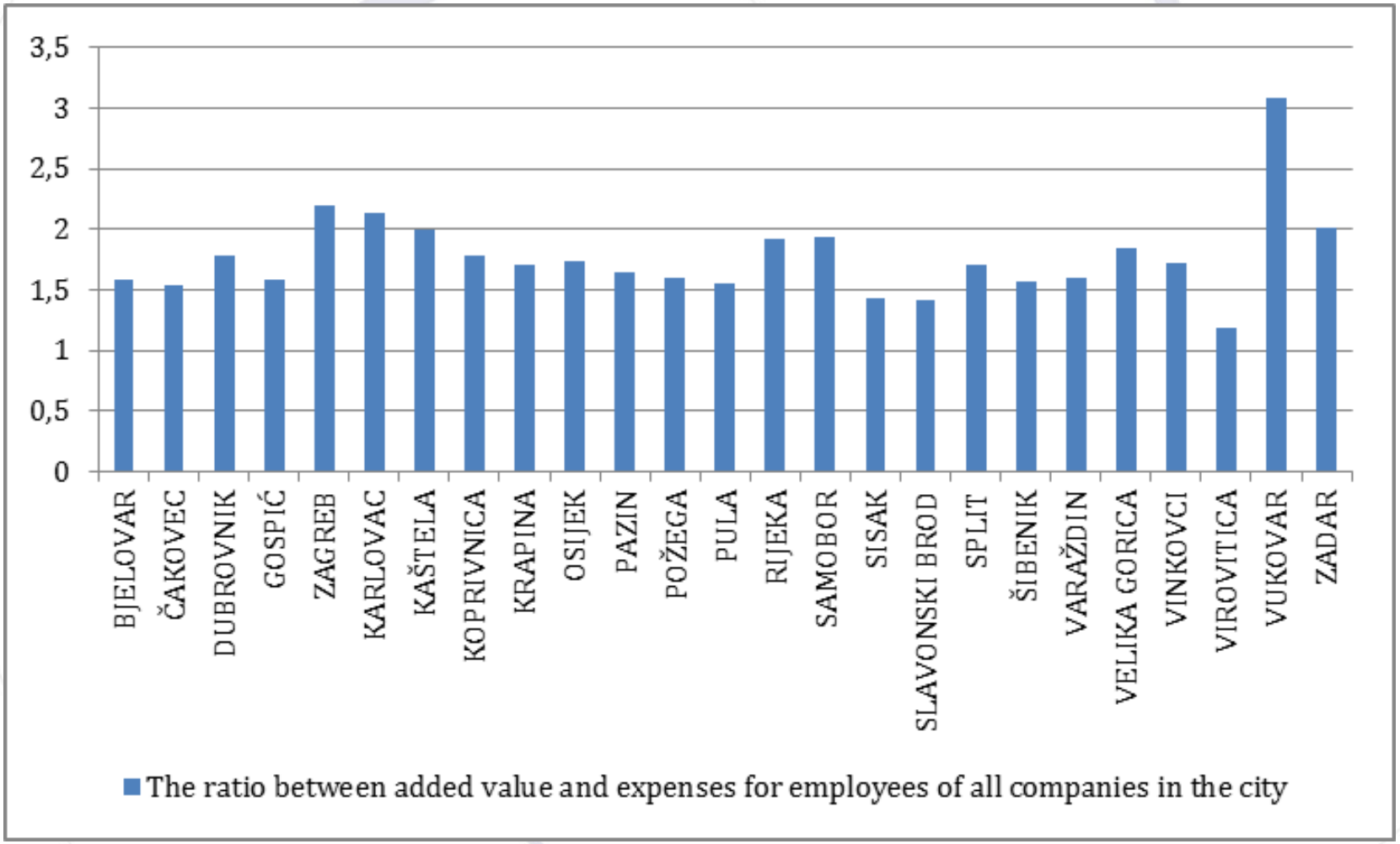
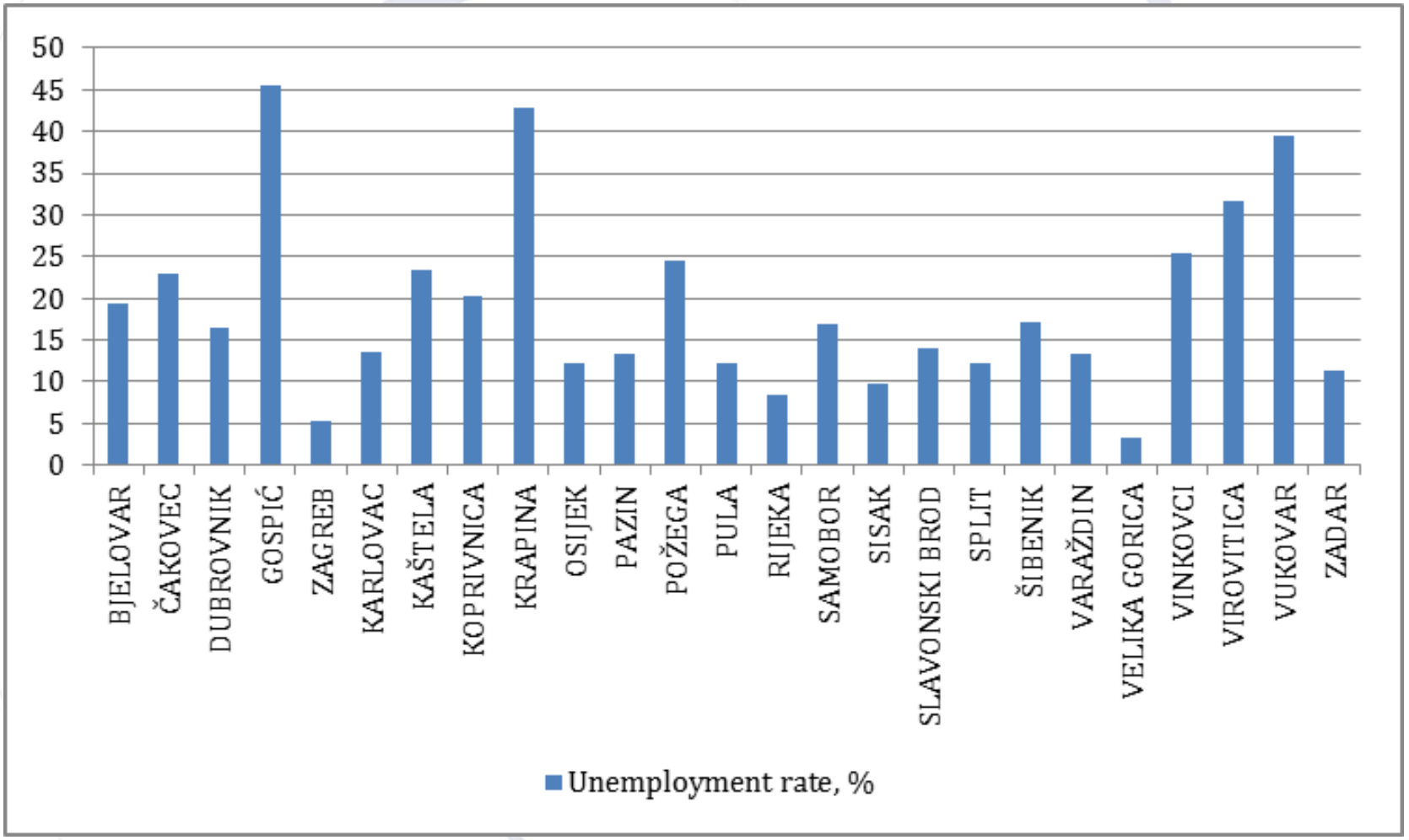
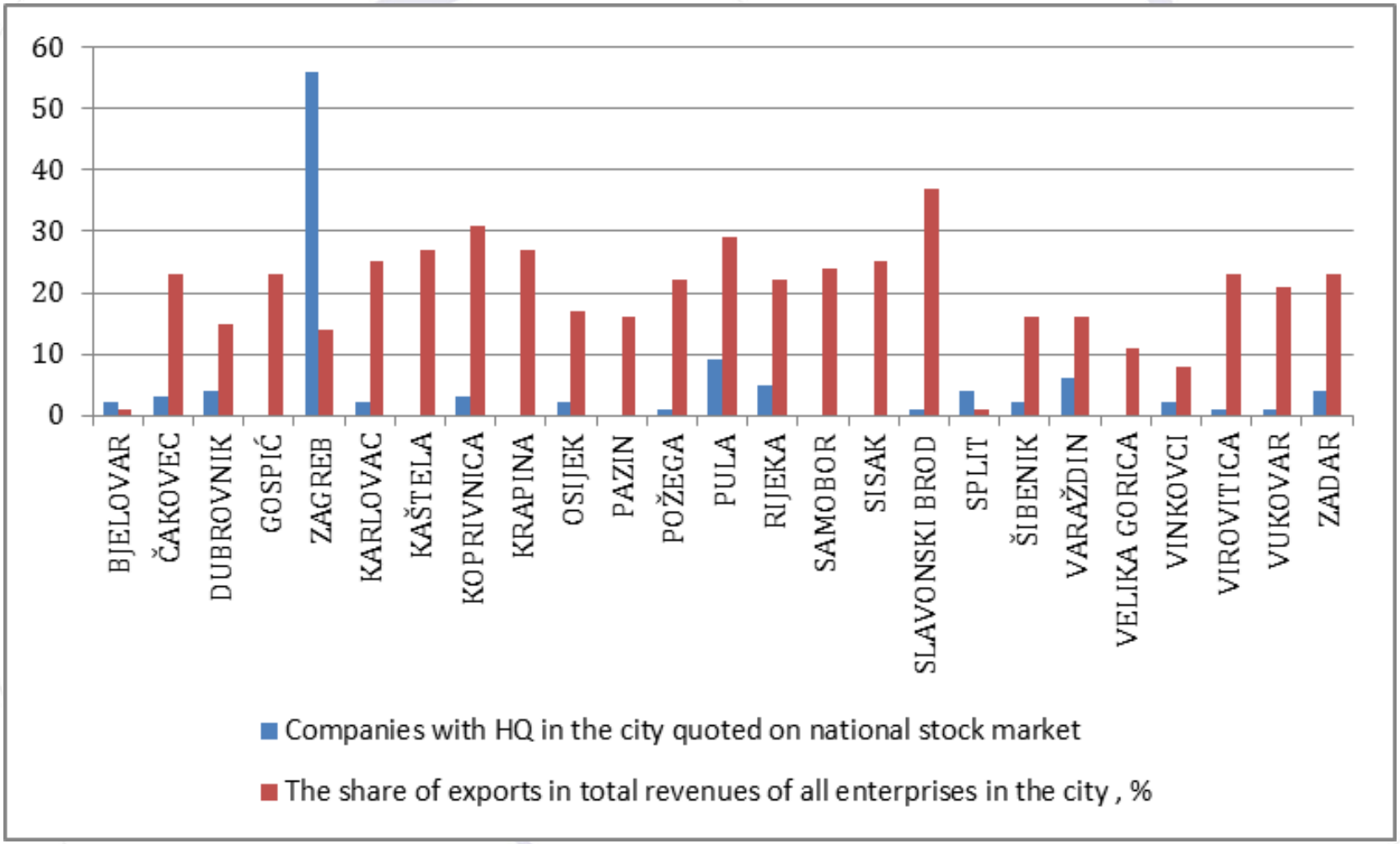
Croatian large cities, Productivity



Croatian large cities, Flexibility of labour market



Croatian large cities, International presence



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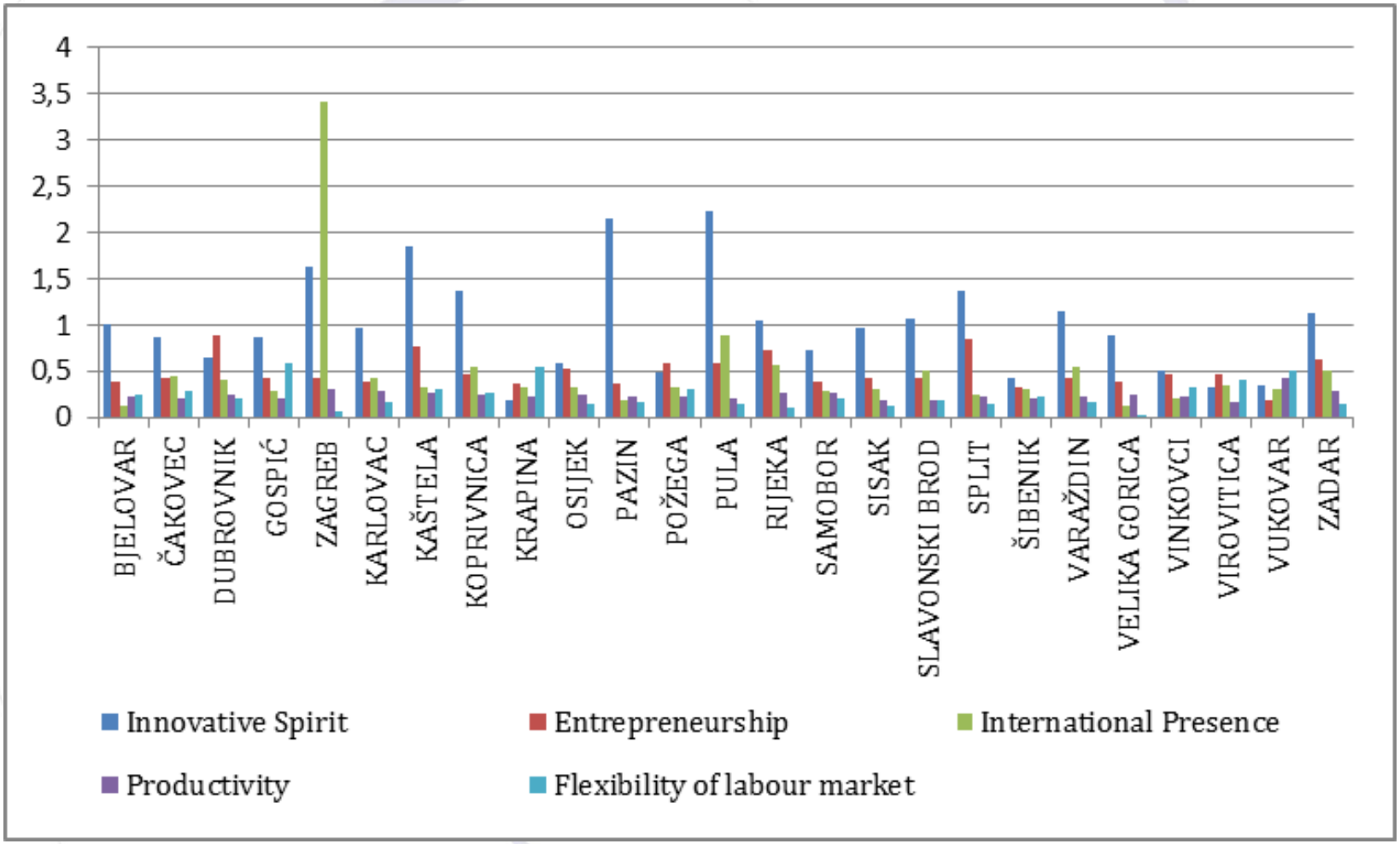
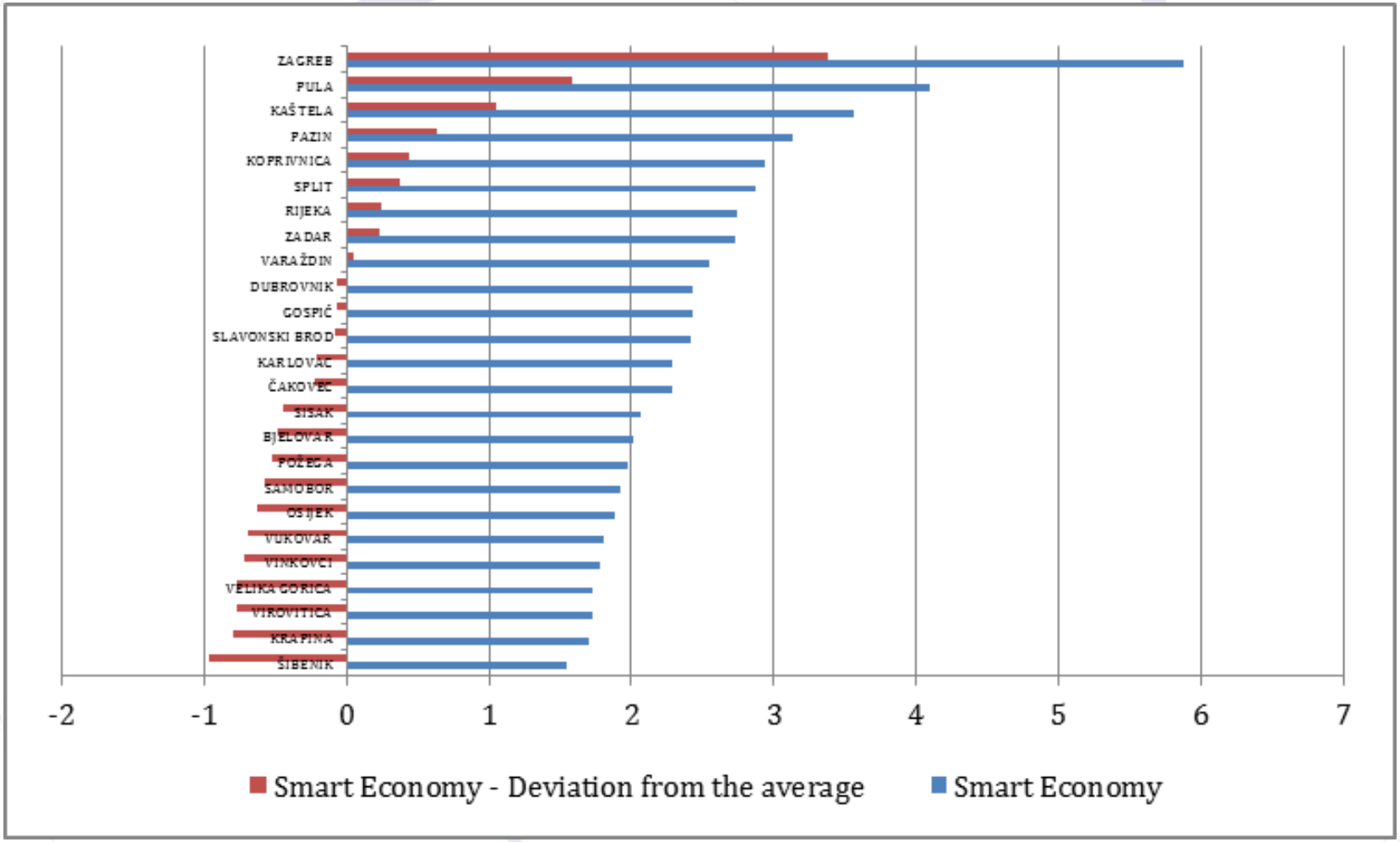
Croatian large cities, Comparison: Smart Economy (Competitiveness) 1



Croatian large cities, Comparison: Smart Economy (Competitiveness) 2



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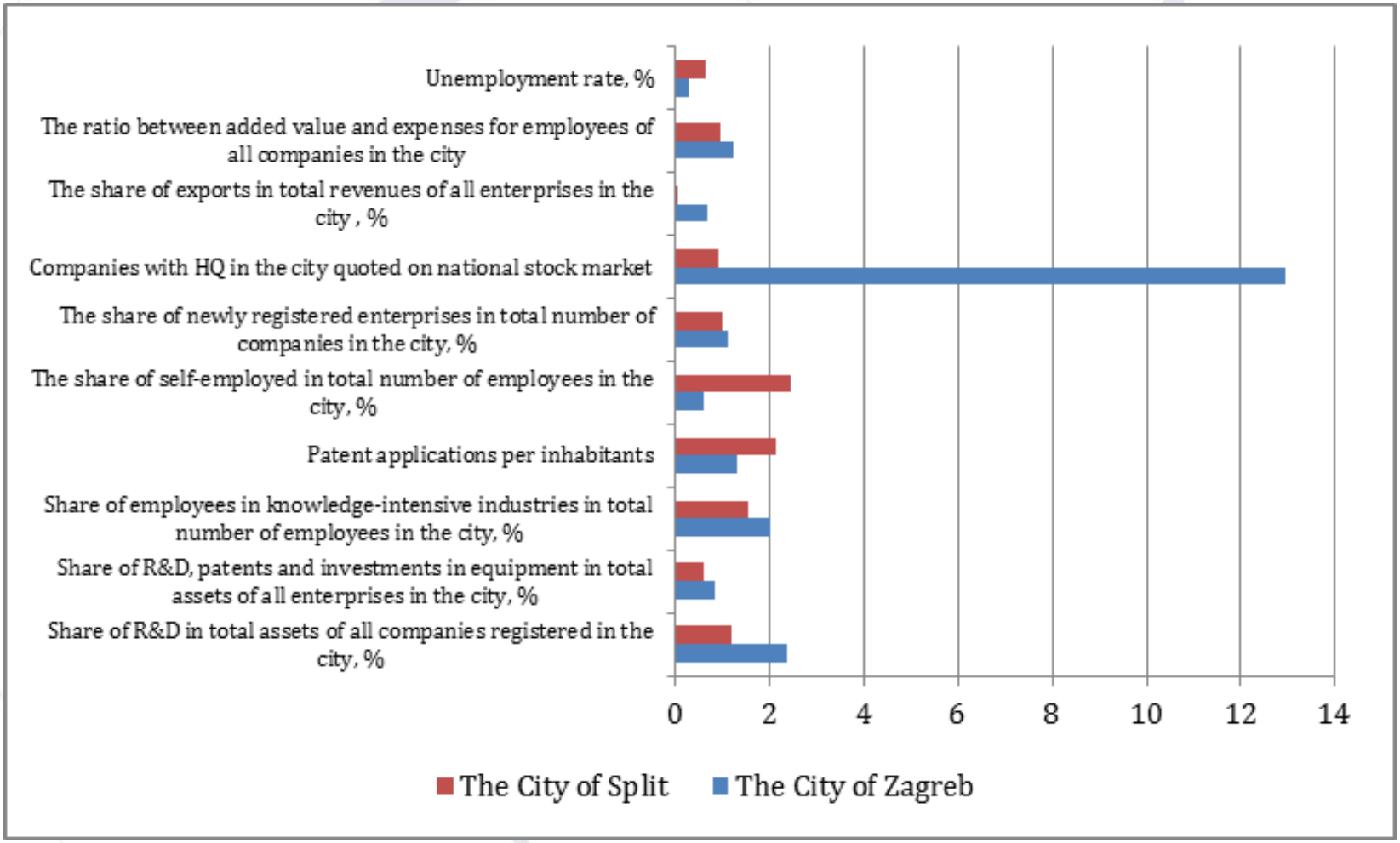
The City Profile, Comparison: The City of Zagreb and the City of Split



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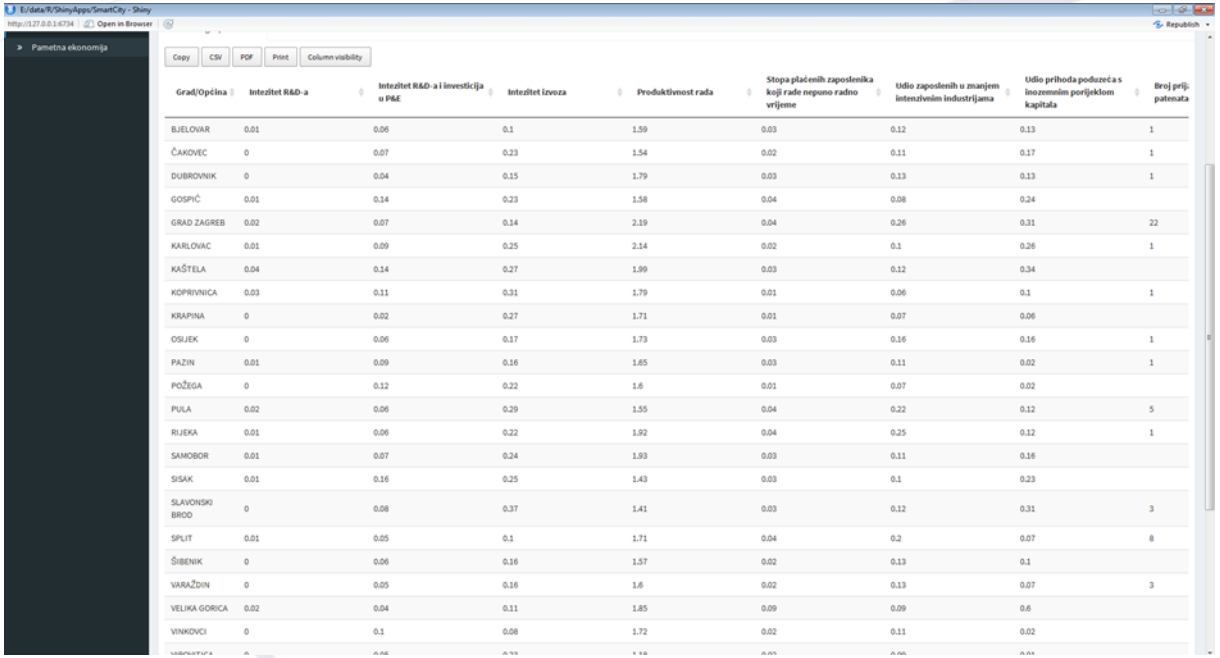
Expected results

- **Web application – Smart City indicators** to manage strategic decisions in 25 Croatian large cities
- **Interpretation and documentation of Smart City model results** for 25 Croatian large cities
- **Smart economy indicators**, https://forensis.shinyapps.io/SmartCity/



Grad/Općina	Intezitet R&D-a	Intezitet R&D-a i investicija u P&E	Intezitet izvoza	Produktivnost rada	Stopa plaćenih zaposlenika koji rade nepuno radno vrijeme	Udio zaposlenih u znanjem intenzivnim industrijama	Udio prihoda poduzeća s inozemnim poriječkom kapitala	Broj prij. patenata
BJELOVAR	0.01	0.06	0.1	1.59	0.03	0.12	0.13	1
ČAKOVEC	0	0.07	0.23	1.54	0.02	0.11	0.17	1
DUBROVNIK	0	0.04	0.15	1.79	0.03	0.13	0.13	1
GOSPIĆ	0.01	0.14	0.23	1.58	0.04	0.08	0.24	
GRAD ZAGREB	0.02	0.07	0.14	2.19	0.04	0.26	0.31	22
KARLOVAC	0.01	0.09	0.25	2.14	0.02	0.1	0.26	1
KAŠTELA	0.04	0.14	0.27	1.99	0.03	0.12	0.34	
KOPRIVNICA	0.03	0.11	0.31	1.79	0.01	0.06	0.1	1
KRAPINA	0	0.02	0.27	1.71	0.01	0.07	0.06	
OSIJEK	0	0.06	0.17	1.73	0.03	0.16	0.16	1
PAZIN	0.01	0.09	0.16	1.65	0.03	0.11	0.02	1
POŽEGA	0	0.12	0.22	1.6	0.01	0.07	0.02	
PULA	0.02	0.06	0.29	1.55	0.04	0.22	0.12	5
RIJEKA	0.01	0.06	0.22	1.92	0.04	0.25	0.12	1
SAMOBOR	0.01	0.07	0.24	1.93	0.03	0.11	0.16	
SISAK	0.01	0.16	0.25	1.43	0.03	0.1	0.23	
SLAVONSKI BROD	0	0.08	0.37	1.41	0.03	0.12	0.31	3
SPLIT	0.01	0.05	0.1	1.71	0.04	0.2	0.07	8
ŠIBENIK	0	0.06	0.16	1.57	0.02	0.13	0.1	
VARAŽDIN	0	0.05	0.16	1.6	0.02	0.13	0.07	3
VELIKA GORICA	0.02	0.04	0.11	1.85	0.09	0.09	0.6	
VINKOVCI	0	0.1	0.08	1.72	0.02	0.11	0.02	

Conclusion – Further research

- Analysis in **Smart Economy** presents:
  - outline of strengths and weaknesses of Croatian large cities
  - ranking of Croatian large cities by different indicators and factors
  - city profile by different indicators and factors
  - comparison between cities by different indicators and factors
- Performance of 25 Croatian large cities in other 5 dimensions:
  - **Smart People** (Social and Human Capital)
  - **Smart Governance** (Participation)
  - **Smart Mobility** (Transport and ICT)
  - **Smart Environment** (Natural resources)
  - **Smart Living** (Quality of Life)
- Urban development is complex process in many dimensions
- Smart City indicators can help decision-makers in making strategic decisions at local level


THANK
YOU