

# Spatial Matching of Online Job Vacancies and Training Provision Data

*Evidence from Bosnia and Herzegovina*

**Nermin Oruc · Aleksandar Kostadinov**

*A big-data approach integrating online vacancy signals with web-based training catalogues to map skills demand–supply alignment across BiH municipalities.*

OJV

ISCO

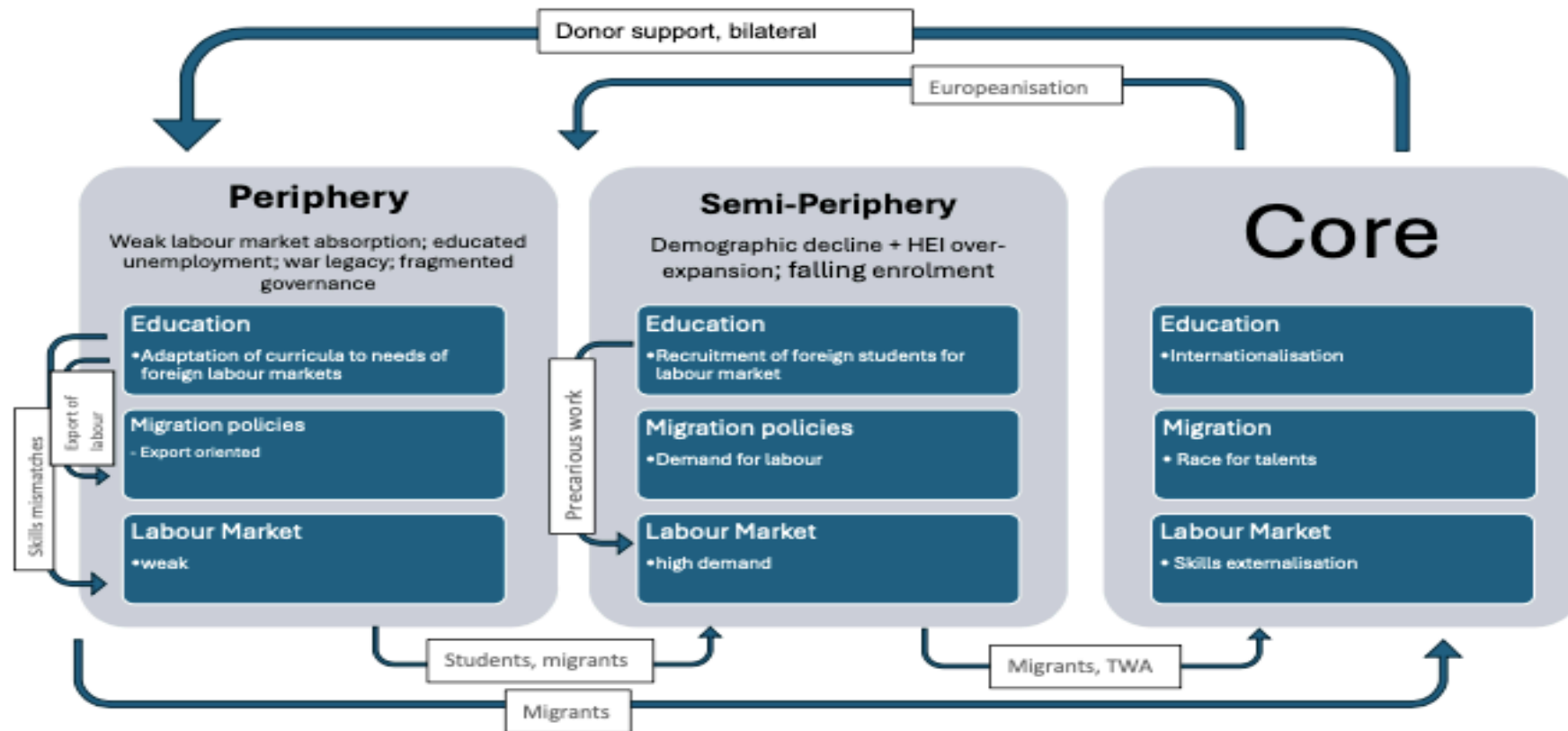
Spatial Mismatch

Skills Ecosystem

# Background

- Low activity, high unemployment, gender gap, long-term unemployment, youth, ...
- Low labour mobility within country
- High emigration (and immigration)
- Increasing skills gaps
- Increasing provision of training programmes for international labour markets
- No labour market information system developed. Training catalogues are scattered across registries and provider websites. No systematic spatial comparison of where training is offered vs. where demand exists.

# Migration-education nexus in periphery



# Three research questions on a common spatial grid

RQ1

How is OJV-signalled demand distributed across BiH municipalities and ISCO occupational groups?

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RQ2

How aligned is the spatial and occupational composition of training provision with this online vacancy demand?

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RQ3

Is training provision oriented toward the local economy, or does it implicitly target labour markets abroad?

*Built on skills-ecosystem theory (Finegold, 1999; Buchanan et al., 2017), labour-market signalling (Spence, 1973) and spatial mismatch theory (Kain, 1968; Gobillon et al., 2007).*

# From ecosystems and signals to spatial mismatch

## Skills ecosystems

Skills formation as the emergent outcome of interactions among employers, providers, learners and regulators within a defined geography.

Training provision is meaningful only relative to the demand environment in which it is embedded.

## Labour-market signalling

Qualifications and course participation are costly signals of productive characteristics. When providers and learners optimise toward signals valued in foreign markets, the signalling system becomes **spatially decoupled** from the local economy.

## Spatial mismatch

Beyond distance, mismatch can be compositional (local supply vs local demand) and structural (training shaped by extra-local markets via remittances and migration networks). In small open economies, mismatch is also cross-border.

# Two web-based sources

## Online Job Vacancies

*mojposao.ba — regional portal*

Postings (unique)	<b>2,967</b>
BiH-located	<b>594 (20%)</b>
Abroad	<b>2,373 (80%)</b>
ISCO-08 codes	<b>225 four-digit unit groups</b>
Classifier	<b>LLM + 200-record manual validation</b>

## Training provision

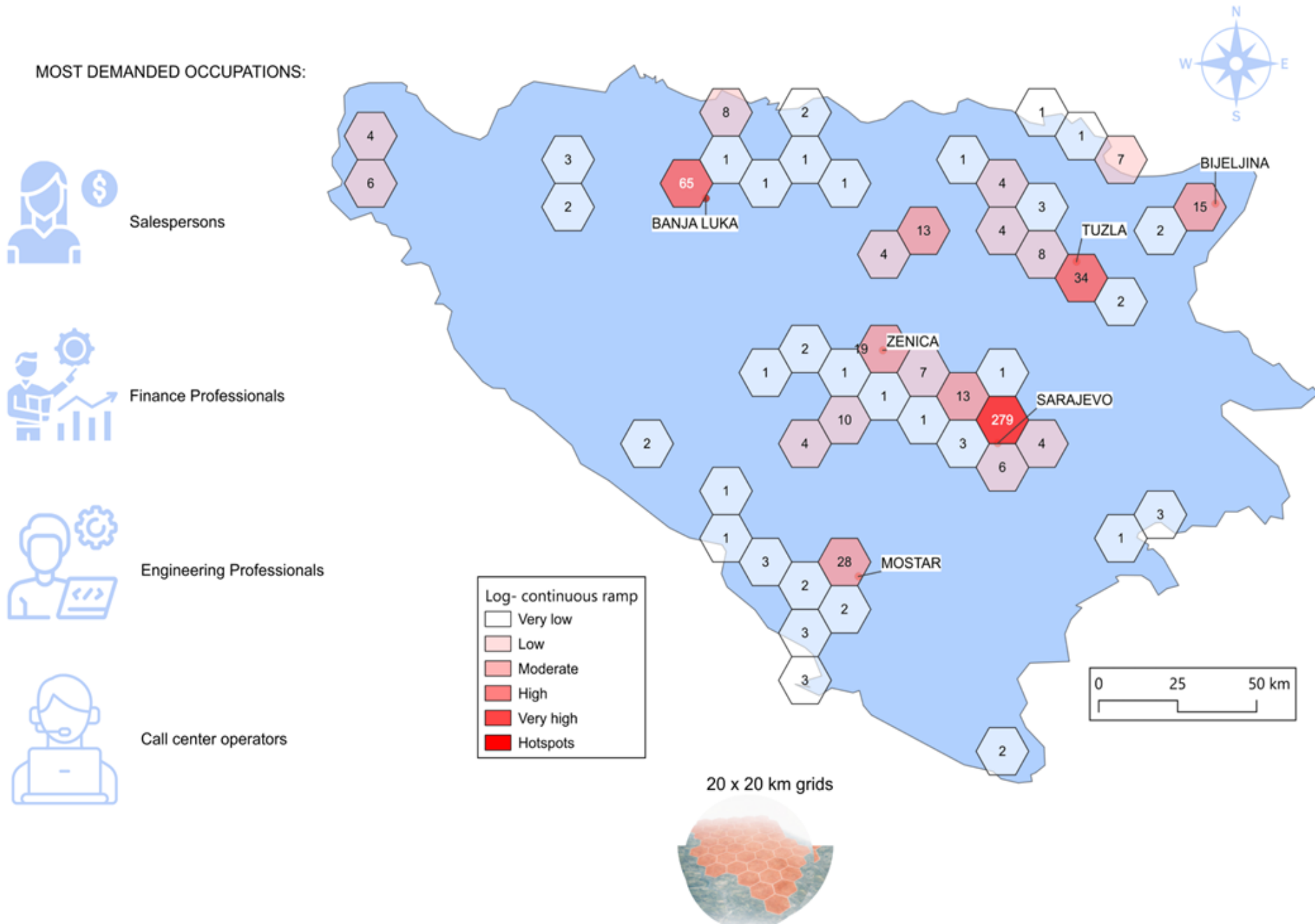
*obuke.ba — national aggregator*

Programmes	<b>513</b>
Providers	<b>83</b>
Municipalities	<b>32</b>
Categories	<b>19 (collapsed to 12 for matching)</b>
Missing duration / price	<b>64% / 78%</b>

# **National portals that are, in operational terms, regional**

- Majority of postings on the BiH-anchored portals refer not to workplaces inside BiH municipalities but OUTSIDE BiH
- Most important locations of postings are Croatian cities (Zagreb, Split, Rijeka, Zadar)
- Sectors with higher emigration propensity dominate

# Density Map of Online Job Vacancies Demanded by Employers in Bosnia and Herzegovina



# Density Map of Online Job Vacancies Demanded by Croatian Employers in Bosnia and Herzegovina

MOST DEMANDED OCCUPATIONS:



Waiters and Bartenders



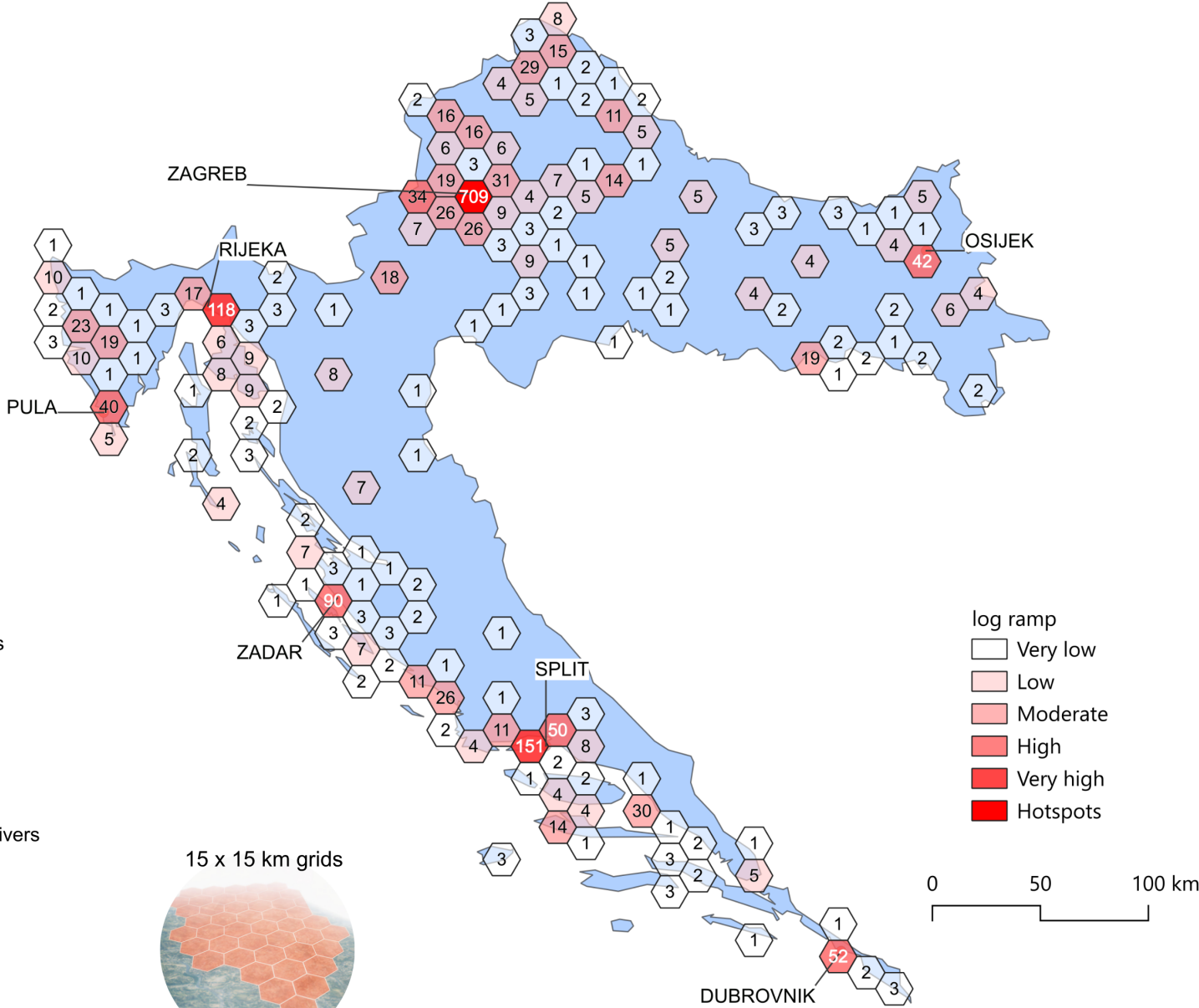
Salespersons



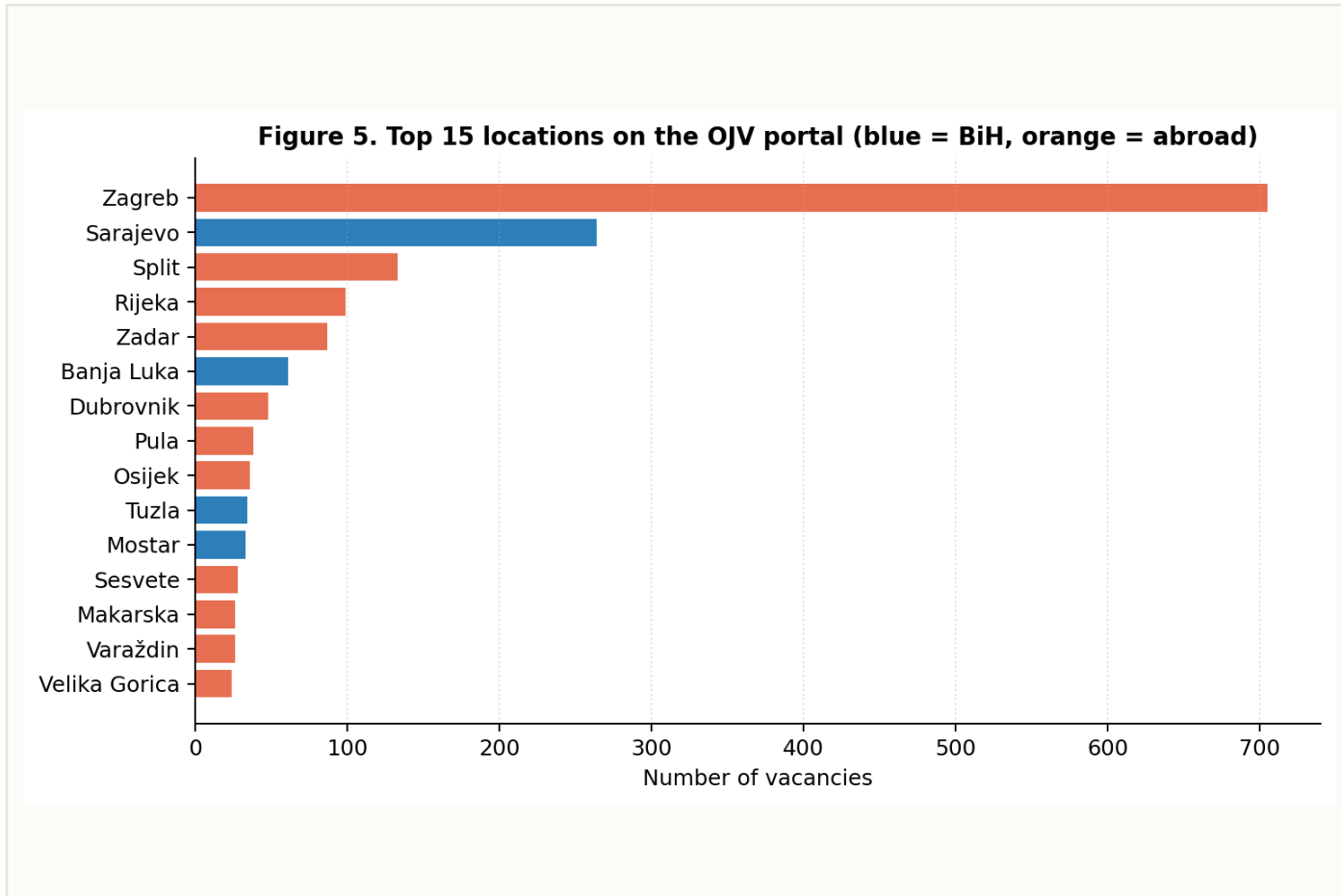
Food Preparation Assistants



Car, Van and Motorcycle Drivers



# Demand is concentrated in five urban poles



## 69.2%

of BiH-located postings concentrated in Sarajevo, Banja Luka, Tuzla, Mostar, Zenica

## 705

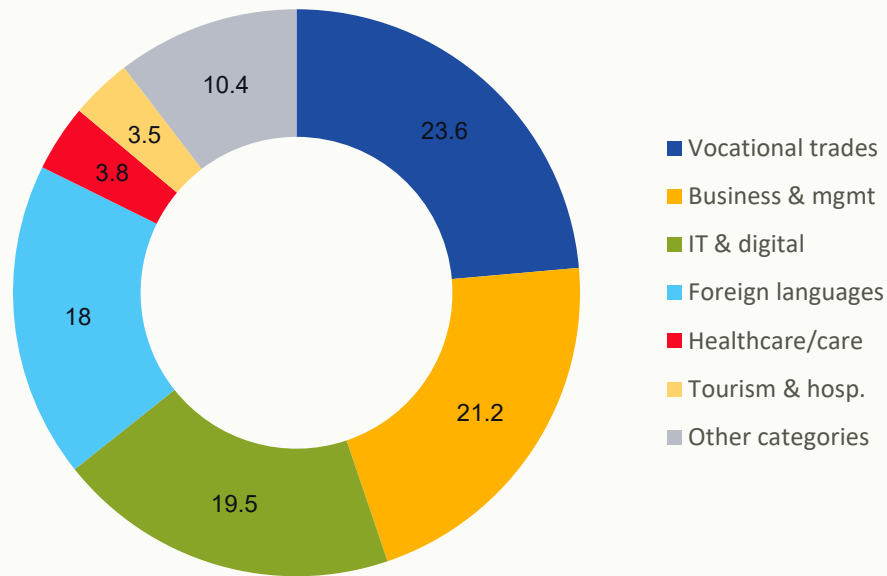
postings reference Zagreb alone — more than twice all BiH cities combined (Sarajevo & Banja Luka aside)

## TOP-5

ISCO unit groups: waiters, sales reps, cooks, salespersons, drivers — low/medium-skill service

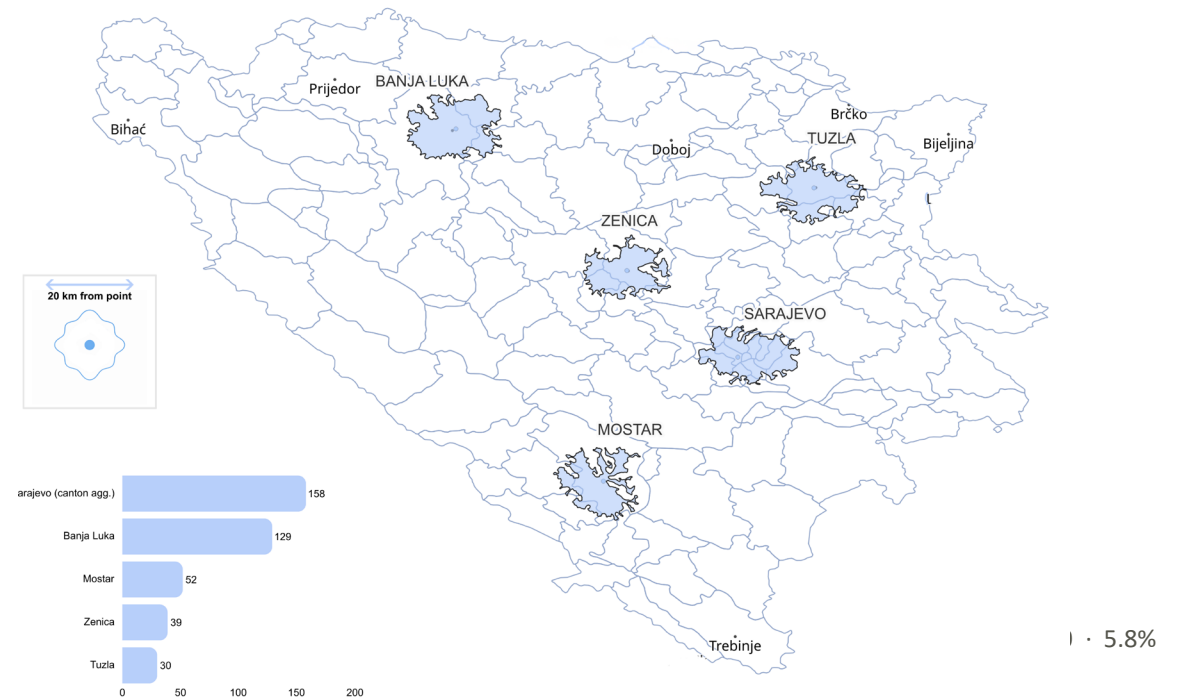
# Four broad clusters dominate the training catalogue

Training programmes by category (% of 513)



## Geography of provision

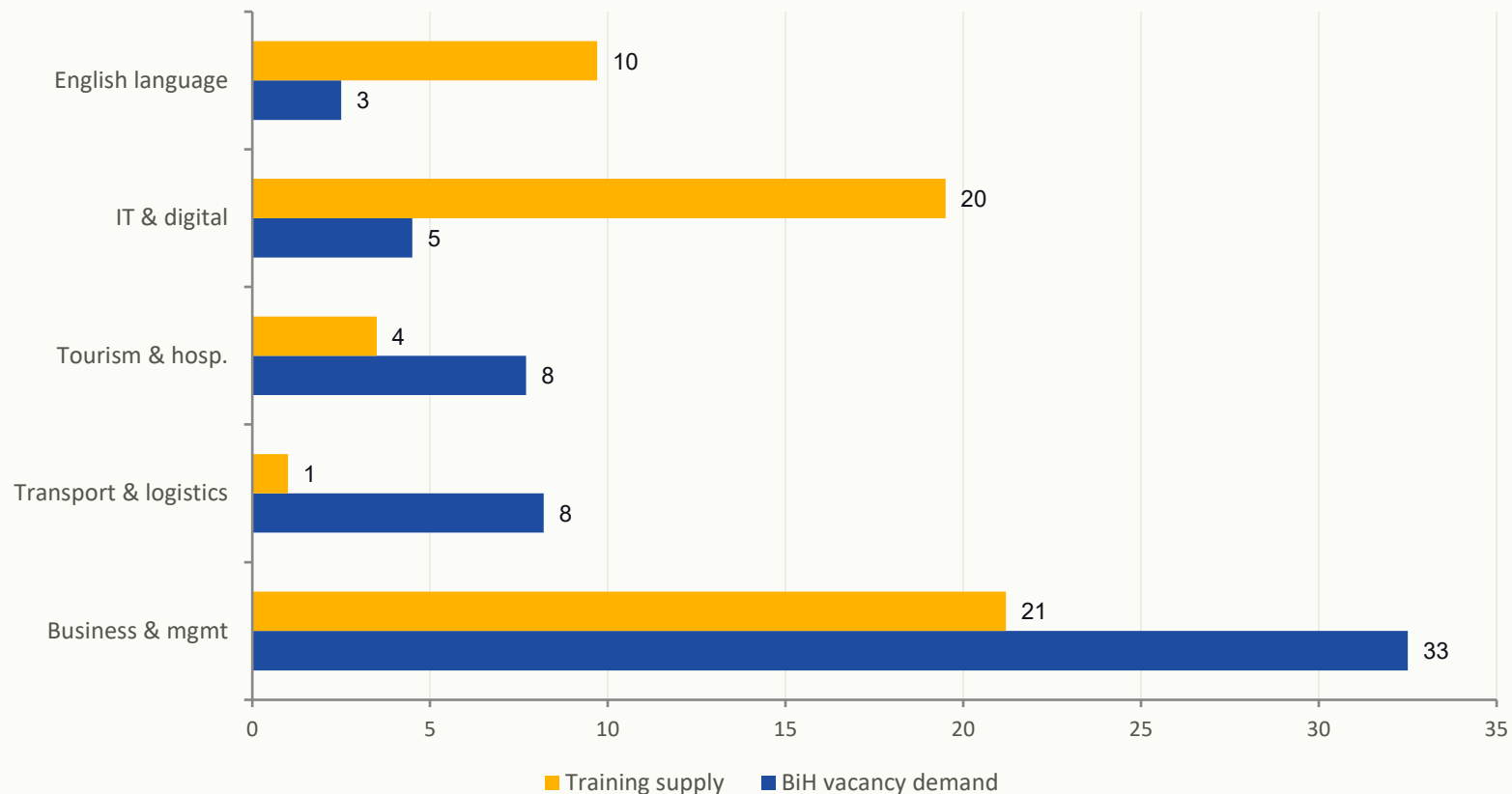
NUMBER OF TRAINING PROGRAMMES IN THE TOP 5 CITIES AND ISOCHRONE CALCULATING A 20 KM CAR DRIVE FROM THE CITY CENTRE



83 providers operate the system; the top 15 organisers account for the majority of programmes.

# Training over-represents portable skills; under-represents local demand

Share of demand vs supply by category (%)

**0.620**

K\_cat — category-level Krugman dissimilarity (12 cats)

**0.526**

K\_muni — spatial Krugman dissimilarity across municipalities

**+15pp**

IT surplus over local vacancy demand

**-11pp**

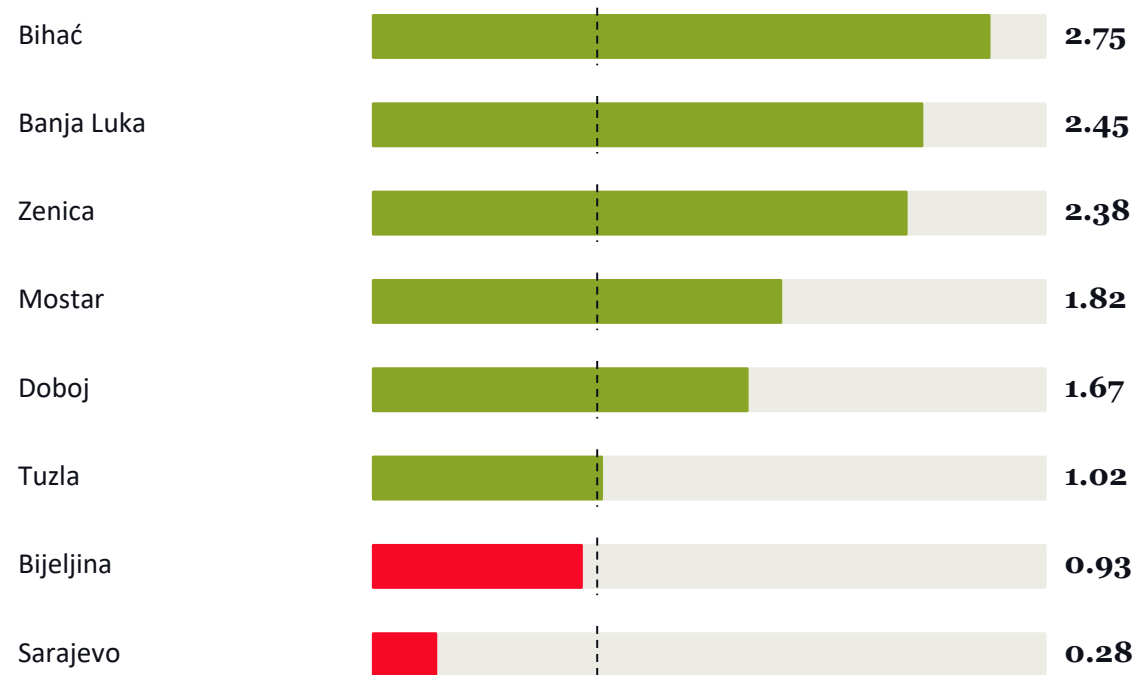
Business &amp; management deficit relative to demand

≈62% of training would need reallocation across categories to mirror BiH demand.

# Training is outward-oriented — most pronounced in Tuzla and Zenica

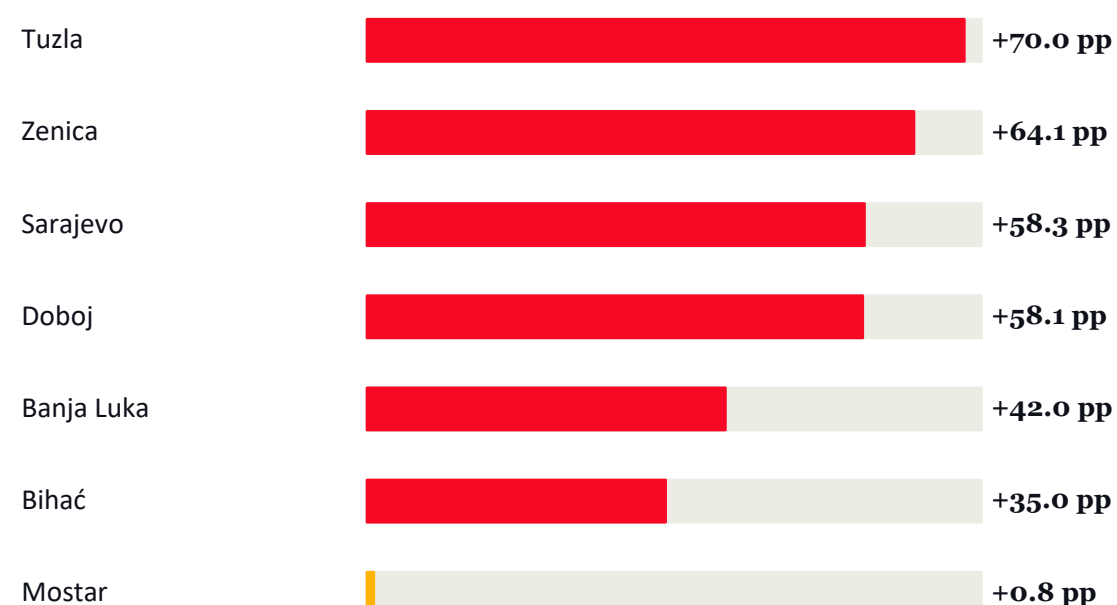
## Training-intensity location quotient

$LQ < 1$ : under-supply ·  $LQ > 1$ : over-supply (relative to local vacancies)



## International orientation gap

$Intl\_T - Intl\_V$  (foreign-lang + IT/digital, pp)



**40%** of BiH training falls into foreign-language or IT/digital categories vs only **~4%** of mappable BiH vacancies — a 36-pp differential.

# Key takeaways

## International orientation dominates

Vacancies on BiH's main portal are strongly geared toward foreign labour markets — 80% of postings refer to jobs located abroad.

## Supply mirrors international demand

Training programmes predominantly offer internationally portable skills — foreign languages and IT account for 40% of provision vs only 4% of mappable BiH vacancies.

## Spatial mismatch is real

$K_{\text{muni}} = 0.526$  — half of the training stock would need reallocation across municipalities to mirror domestic vacancy demand, with Sarajevo most undersupplied ( $LQ = 0.28$ ).

## Compositional gaps cut both ways

Foreign languages and IT are oversupplied (+10 to +15 pp). Business and management, tourism and transport are undersupplied (-7 to -11 pp).  $K_{\text{cat}} = 0.620$ .

## THE READING

*The "mismatch" is not inefficiency — it is a coherent response.*

Training composition (English, German, Norwegian, IT) mirrors the occupational demand of destination countries: customer service, healthcare, hospitality and software development.

# Recommendations

## FOR SKILLS GOVERNANCE

### Principles for governance

- 1 Recognise the dual-market reality**  
Skills governance frameworks must explicitly acknowledge that BiH training serves both domestic and foreign labour markets.
- 2 Calibrate instruments accordingly**  
Investment, quality assurance and information instruments should be tuned to dual-market reality rather than a single domestic baseline.
- 3 Close the Sarajevo gap**  
Expand training in business and management, customer service and ICT–business interfaces in the country's largest demand pole.

## APPLICATIONS OF THE INTEGRATED DATASET

### Next-generation skills intelligence

- Improve occupational forecasting**  
Extend administrative-data forecasting models by integrating migration data and OJV signals from regional portals.
- Map the migration–education nexus**  
Adapt the education system to a labour-export-oriented growth strategy where appropriate, and to returnee reintegration elsewhere.
- Replicate in other open economies**  
Method transfers to small Western-Balkan and EU-peripheral economies with porous borders and similar OJV ecosystems.

# Q & A

**Nermin Oruc**

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**Aleksandar Kostadinov**