Using data from the web to shape next-generation labour market and skills analysis
Brussels, 1st April 2025

How much to offer?

Offered income and OJA attractiveness.

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OJA data processed

- Database of OJAs from a dominant OJA provider in Slovakia
  - 77% of the online job searches based on Google Trends
    - second most popular OJA provider (13%)
    - third most popular OJA provider is the public employment service (6,6%), based on Google trends

- The provider is general, not focusing on any segment of the labour market

- One-provider data comparable to OJA aggregators

Aggregated OJA data

- Aggregated (quarterly) number of newly published OJAs.
- A potential predictor of the main statistical labour market indicators:
  - the number of vacancies, employed and unemployed persons.
- Predictions of all observed periods (one to four quarters ahead) are significantly improved if OJA data are used in the autoregression equations
  - prediction error improvement is more observable in the later periods.

Štefánik, M., Lyócsa, Š., & Bilka, M. (2022). Using online job postings to predict key labour market indicators. *Social Science Computer Review*, *41*(5), 1630-1649. https://doi.org/10.1177/08944393221085705

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Individual OJA data

- Data include complete information published in 355 k OJAs (after cleaning) between March 2022 and March 2023
  - Coded and semi-coded:
    - Economic sector, region, occupation, skills, and additional information ...
    - Offered salary and non-financial benefits
  - Text information:
    - Job title, job description, job requirements, ...

- Measures of OJA attractiveness
  - Number of OJA views (during the first week)
  - Number of reactions to the OJA
  - $The\ reaction\ rate = \frac{Number\ of\ reactions\ to\ the\ OJA}{Number\ of\ OJA\ views}$

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Predicting OJA attractiveness – modelling strategy

Table 3. Forecasting errors: Predicting OJV attractiveness.

	Views		**Reactions**		**Conversions**	
Panel A: Mean square error						
Benchmarks						
Unconditional historical mean	370.388		499.769		0.214	
Business sector-specific mean	371.311		501.511		0.214	
Job classification	318.946		457.153		0.184	
Competing models						
OLS	285.097		433.753		0.174	
LASSO	284.323		432.711		0.174	
Ridge	284.550		433.363		0.174	
Elastic net	284.217		432.769		0.174	
Random forest	**187.868**	†	**323.338**	†	**0.139**	†

Košťálová, Z., Lyócsa, Š., & Štefánik, M. (2022). Online job vacancy attractiveness: Increasing views, reactions and conversions. Electronic Commerce Research and Applications, 55, 101192. https://doi.org/10.1016/J.ELERAP.2022.101192

Predicting OJA attractiveness – predictor importance

- Occupation is the strongest predictor
  - Sensitive to the level of aggregation/clustering
- Text morphology (title length, length of job description, ...)
- Job-related benefits

- Occupation-specific predictors (esp. skills)
- Offered wage is important only in the case of some occupations

Offered wage and OJA attractiveness – Work in progress!

- **Classical search and matching model (Mortensen-Pissarides)** struggles to explain shorter vacancy duration in offers with higher wage (Mueller et al. 2023).
- **Theory of directed search:** higher wage attracts more applications (Moen, 1997).
- **Theories of random search:** higher rate results into a higher acceptance probability (Burdett and Mortensen, 1998).

- Our data allow us to add evidence to this discussion, by estimating the function of offered wage/OJA attractiveness:
  - the number of views during the first week
  - the reaction rate

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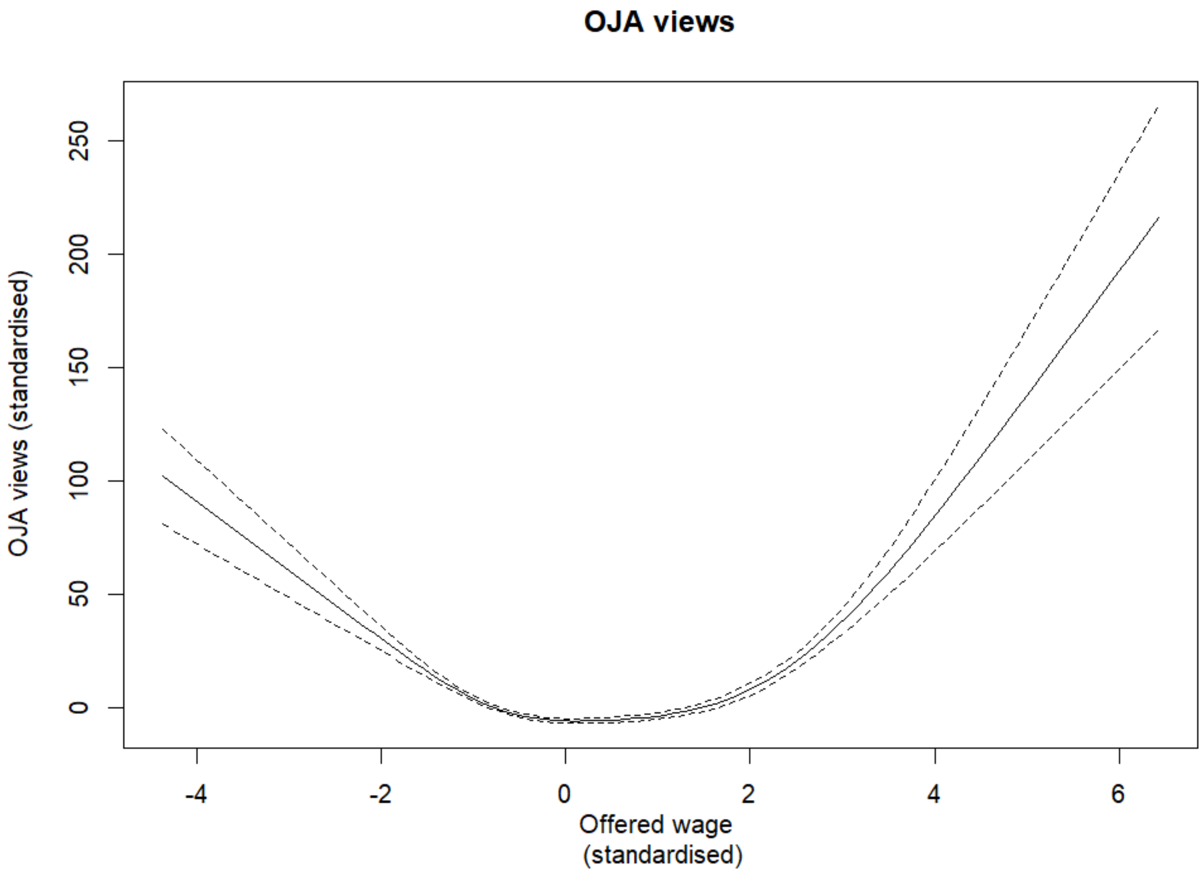
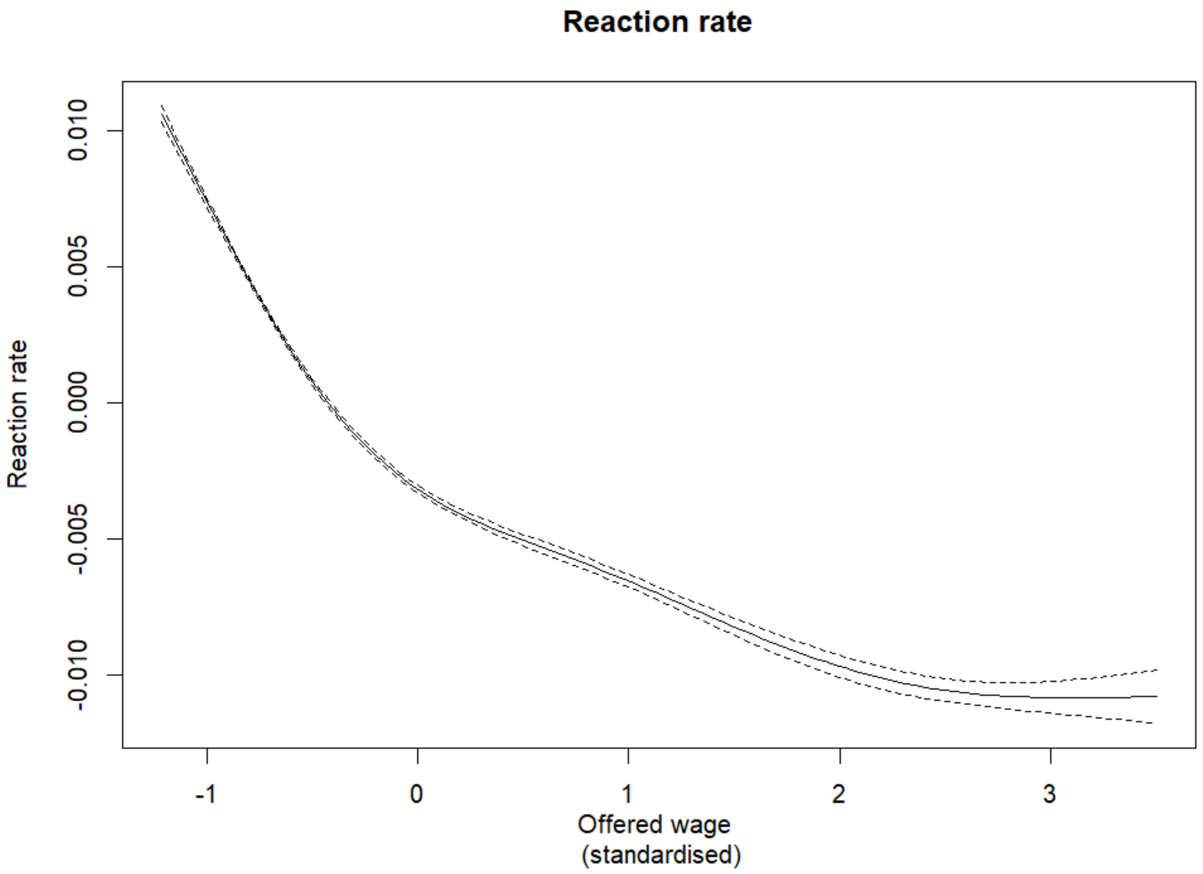
Estimation strategy

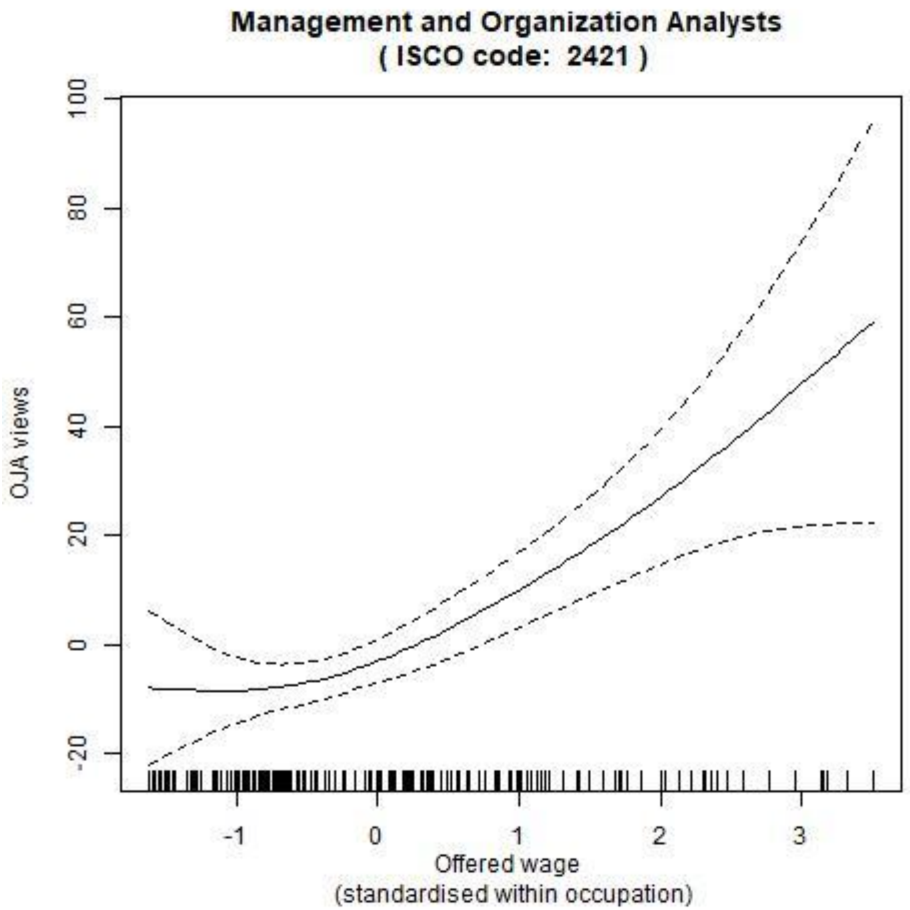
- Aggregation to ISCO 4-digit (occupations with over 750 OJAs)
- Controlling for an occupation-specific list of predictors
- Generalized Additive Models

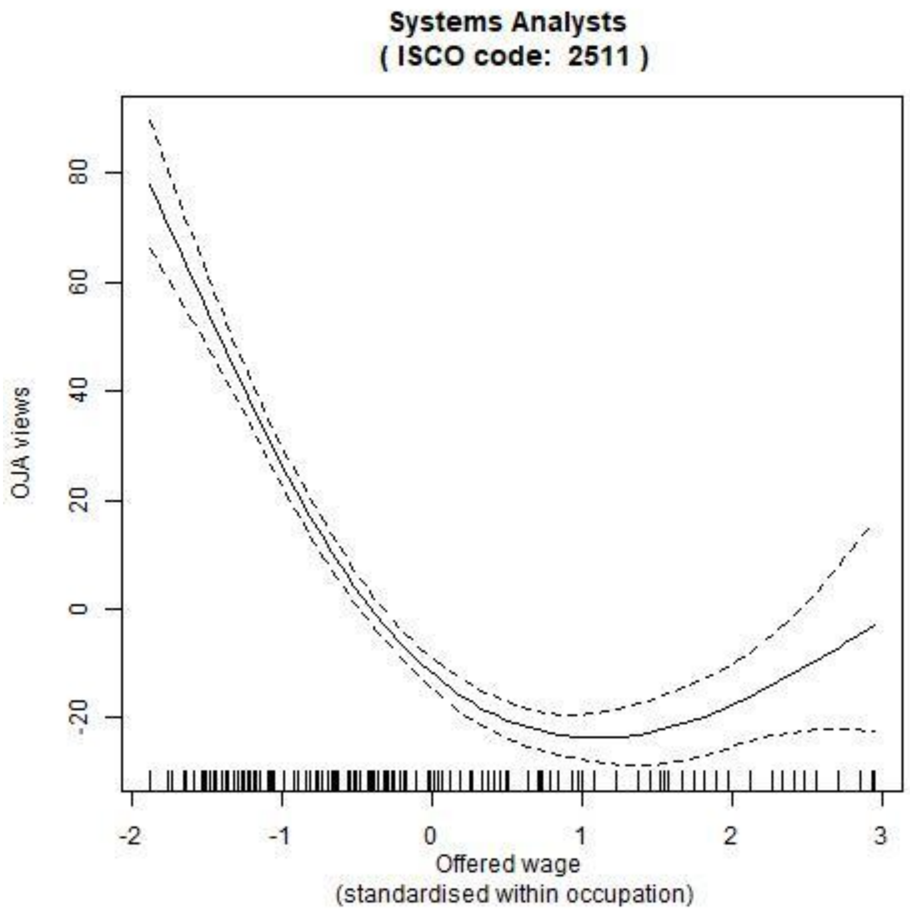
Offered wage and OJA attractiveness - model with no covariates





Offered wage and OJA views (Occupation-specific estimations)





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Next steps

- Refine the estimation technique
- Try to explain the differences in the occupation-specific patterns of the offered wage/OJA attractiveness function through:
  - Supply-side factors
  - Demand-side factors (hiring strategies)
  - Adding contextual predictors (through geo/time information)

Thank you/Ďakujem

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Predictive potential of aggregated OJA data (on job vacancy statistics)

	h = 1			*h* = 2			*h* = 3			*h* = 4		
	M1	**M2**	**M3**	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**
Intercept	2107*	3139†	4355*	3660*	5194‡	3561*	7143†	5150*	4420*	13451‡	9477*	9499*
Trend	−32	−81	−91	−34	−107	−91	34	−255	−247	211	−188	−188
JVSt-1	0.92†	0.50*	0.49*	0.84†	0.22	0.23	0.57	0.03	0.03	0.01	−0.41	−0.41
JVSt-1 × Q1,t+h	0.05†	0.09‡	0.08†	0.01	0.06†	0.07†	−0.01	0.11†	0.11†	−0.02	0.13*	0.13*
OJVt		0.15†	0.15†		0.23‡	0.23‡		0.36†	0.36†		0.40†	0.40†
UIt			−0.03			0.04			0.02			0.00
R2	76.2%	83.8%	84.0%	61.7%	75.6%	79.7%	41.0%	75.6%	75.7%	41.0%	71.0%	71.0%
adj. R2	74.3%	82.0%	81.8%	58.6%	72.8%	76.8%	35.9%	72.8%	72.1%	35.9%	67.5%	66.6%

Notes.Values in the table correspond to regression coefficients. h = 1, 2, 3, 4 corresponds to prediction horizons; for example, *h* = 4 means that the regression models predict the JVS value realized in 4 quarters' time. *, †, and ‡ denote statistically significant coefficients at the 0.10, 0.05 and 0.01 levels. M1, M2, and M3 correspond to models as defined in the Methodology section.

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