How to approach the ex ante employment effects of the Job Market matching platform?

Dr. Heikki Räisänen, Research Director, Adjunct Professor

Ministry of Economic Affairs and Employment of Finland

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Ministry of Economic Affairs
and Employment of Finland

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1. What is Job Market Finland?

Job Market Finland is a modern digital platform of the Public Employment Service. The first phase came into effect on May 1st, 2022. It replaced the former platform.

Basically: new digital platform, **new matching technology** and services with AI

A jobseeker can get e-mail alerts on job opportunities based on applicant profile or browse job postings.

An employer can create job postings, check applicant profiles matching the specifications and send messages to potential candidates. Potential candidates can be searched even without job posting.
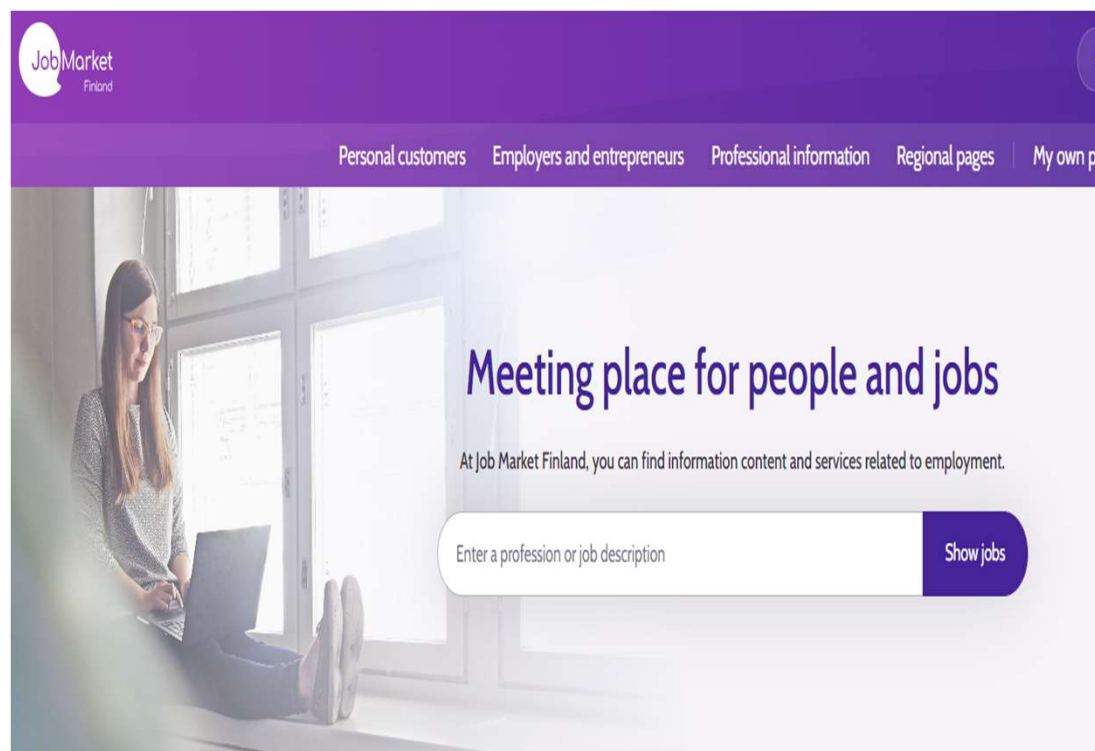
AI based matching system in more technical terms

- The aim is to improve matching applying AI technology. The AI algorithm creates a list of most suitable vacancies for the jobseeker, and for the employer, a list of most suitable jobseekers

- The AI matching calculation takes advantage of **grading algorithm using both structural information** on job titles, skills, language skills, education and location, and **natural language processing** (NLP) on descriptions of job postings and jobseeker skills

- Job postings are imported into the system via relevance model summarising the most vital information

- NLP based search is a combination of three independent search algorithms. E.g. job seeker profile text is taken for all three searches, and they grade the most suitable job postings, combine the outcome and send it to the jobseeker. Grading tells how good the matching is in relation to search text.

- Vacancy wording is first changed into numeric vectors, then feeded into recurrent neural network, which calculates grading for the relevance of each word. Finally, the relevance model gives the highest graded words as an outcome. The shorter the posting text is, the larger share of it is given as feedback

- The relevance model has been trained with vacancy postings in Finnish, Swedish and English

2. The role of ex ante evaluations

- Ex ante evaluations are commonly used at two stages:

    1) For **policy planning** and designing purposes

    2) As **part of legislation** proposal for the Parliament

    -several types of effects are considered when relevant, employment effects is one of the types

The Government gives its assessment of the employment effects as part of the proposal.

Ex ante evaluations are usually based on literature analysis, scientific reasoning and calculations based on these. Sometimes, calculations based on microdata are used, or a specific research work is done.

3. What does literature tell us?

- **Literature analysis generally proves, that there is employment potential in improved matching technology and labour market information**
    - Belot, Kircher and Muller (2019) analysed an alternative job search technology in the UK PES
    - Horton (2017) analysed algorithmic job seeker recommendations for employers using a matching platform for freelance emploees
    - Altmann, Falk, Jäger and Zimmermann (2018) applied a field experimental study for improved labour market information in Germany
    - Farm (2018) analyses the role of direct matching without vacancies

    Specifically for Finland:

    - Busk (2014) as well as Huuskonen (2023) have studied recruitment technology at the Finnish PES
    - Matomäki, Leuhu and Alin (2018) analysed the outcome of various matching algorithms using PES data
    - Sundvall and Härmälä (2016) as well as Räisänen (2006, 2013 and 2016) studied the efficiency of different vacancy filling technologies with PES data

4. Specifying the evaluation problem

- First, we have to specify the potential mechanisms for employment effects

  - New matching technology could have an effect on the **vacancy duration** and the whole **recruitment duration**.
  - There could be also an effect on the **direct recruitment**, where the employer contacts directly jobseekers with interesting profiles. There may not be an open vacancy at all in this case.

  - The first mechanism means, that **due to more efficient** (shorter) **vacancy and recruitment durations, employment measured in working days increases**
    - This employment potential included in vacancies can be counted with the help of vacancy inflow and duration. If potential employment is taken into use, it means positive employment effect
  - The second mechanism, direct recruitment, could have positive effects in terms of recruitment duration, but negative effects for other jobseekers due to missing vacancy information

- Next, we try to measure the quantity of the (first) effect

5. How to approach a similar kind of design as the upcoming reform?

- In ex ante evaluation, we **try to create a design that is as similar as possible to the upcoming reform**. We apply the Finnish PES vacancy microdata for the year 2019 and analyse different vacancy filling techniques. The focus is in differences in duration between similar types of vacancies.

- The most relevant different filling techniques from the point of view of this reform are: 1) job referrals, 2) other filling with PES jobseeker, 3) web based filling at PES platform and 4) filling with other applicant (than PES jobseeker)

- We first **try to measure the role of matching technology via these filling techniques**. Then we try to make the jobseeker pools more comparable. And then we compare only wage work vacancies.

- The idea is that the **Job Market reform changes the whole system more towards web filling type of matching**, and the differences in efficiency can be used as basis for reference calculations
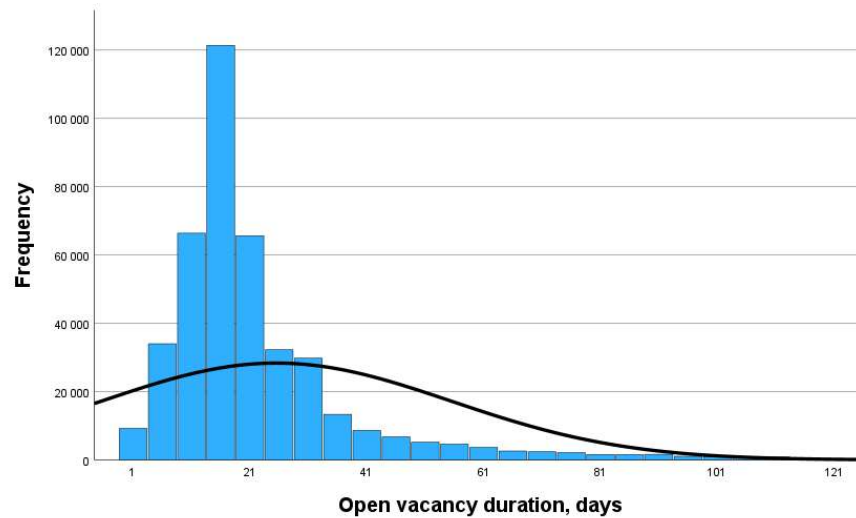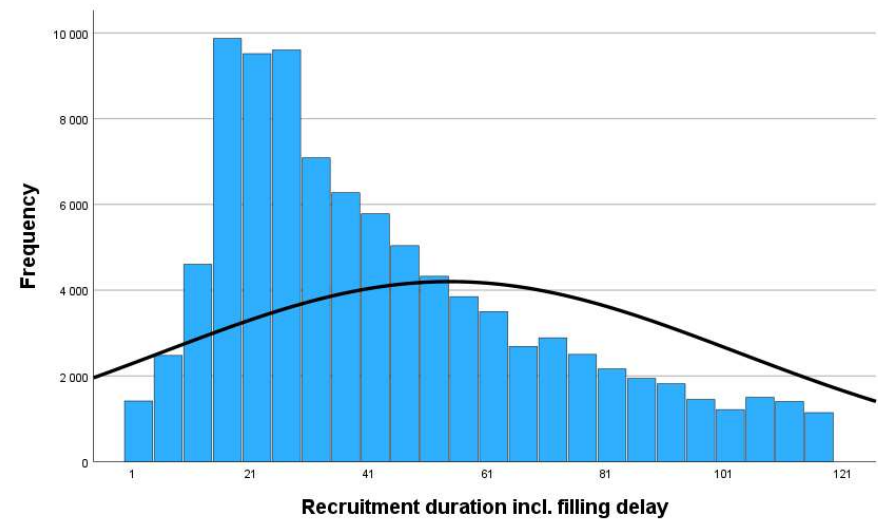
6. Outcome of the ex ante evaluation
Starting point: distributions (2019)
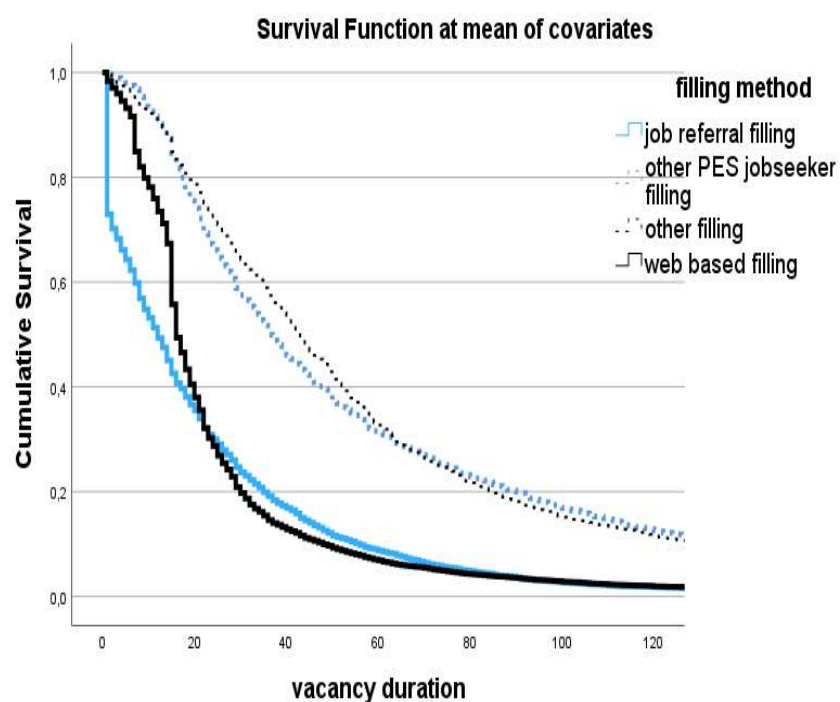
Distribution of open vacancy duration

Distribution of recruitment duration

Open vacancy duration, days

Recruitment duration incl. filling delay

6. Outcome of the ex ante evaluation
Reference calculation is based on Cox regression vacancy survival rates for different filling methods

Survival Function at mean of covariates

In the beginning of the vacancy period, job referral filling is the most efficient method, but later web based filling exceeds it in efficiency

Comparisons with similar jobseeker pools:

for PES jobseekers only;

> job referrals are more efficient than other filling with PES jobseeker

all jobseekers;

> web based filling is more efficient than other filling

A number of survival models were developed. Vacancies from Åland Islands are censored. Covariates in the models are: number of personnel of the employer, big city (one of the 10 biggest), working time and job duration

Outcome of calculations and their interpretation

Main outcome

- After various controls and developing the models, **the main outcome is that an easy-to-use and selective filling method is efficient** both in terms of open vacancy period and recruitment duration
  - **Data does not allow any kind of "perfect" comparison** in relation to the reform

  - Web based filling is 2-44 percentage points more efficient than "other filling"
    - Average increase in vacancy filling efficiency using web based filling is 33 percent

Interpretation in relation to Job Market reform

- **The survival models do not provide a straightforward proof of the expected employment effects** of Job Market reform
- Despite developing the design, comparability and using explaining covariates in the models, there still **remains unexplained selectivity** in the models
- When we choose the **most modest model outcome**, web based filling has an **efficiency advantage of 3-19 percentage points**
  - Most modest outcome is selected, as controlling cannot be perfect between the groups

Turning the survival function outcome into potential employment effect

- **Potential employment** upper limit

= (V duration/365 days) x number of vacancies

Employment $_{\text{potential 2019}}$ =(31/365) x 837,749=71,151

Change of one day$_{2019}$ = 1/31 x 71,151 =2,295 persons

The relative change equals appr. 1-6 days shorter vacancy duration.

- The estimated employment effect is based on supposition that the part of the potential taken into use (shorter vacancy or recruitment duration) means respectively more working days.
  - This is not realistic in many cases (=>the lower limit is a more realistic reference)
  - For fixed-term vacancy periods, the shortening could take place in the "employer's part" of the process
  - If Job Market improves matching efficiency, also the fixed-term vacancy periods could be shortened, as employers notice more rapid candidate finding

7. What about ex post – ex ante comparison?

One intervening factor for **ex post** evaluation is that the new "Nordic Employment Service model" came into force simultaneously with Job Market reform in May 1st, 2022. It has elements which could have an effect on job search and recruitment behaviour. It seems not possible to separate them from each other.

Preminary outcome, with similar modelling as applied in the ex ante evaluation, gives now **3-6 percentage point improved efficiency**. With shorter vacancy duration and increased vacancy numbers (over 1 million new vacancies in 2022), the lower estimate would mean an employment effect of about 2,600 persons. This is preliminary outcome with some cyclical controlling still missing.

Immediately during the first month of Job Market in effect, no effect is found compared to previous month. Comparing the period in effect in 2022 (May-December) with the respective period in 2021, we find positive effect with some reservations. Comparing the 2022 months with Job Market into use and not, systematic positive effect is found.

8. Conclusions

- Based on existing literature, there seems to be **employment potential in matching technology reforms**. This is found both in international and Finnish research literature. Conclusion -> it is worthwhile to assess the potential effects in more detail

- Best available vacancy microdata is applied in **approaching as closely as possible the upcoming 2022 reform design**
  - By comparing the varying vacancy filling methods at the PES it is possible to **create reference calculations** applied in ex ante evaluations
  - Several **reservations** for the ex ante outcome remain
  - It was not easy to finally decide, how to interpret the modelling outcome in relation to the coming reform: **uncertainties** remain in which model outcome to use as basis for effects

  There have been intervening policy changes since the ex ante evaluation, so comparison of ex ante and ex post is not easy. However, they seem to match at least at the lower limit

  After all controls and reservations, there remains **evidence** which **indicates** some **relatively modest employment effects** of the Job Market reform.

Thank you for your attention

heikki.raisanen@gov.fi