

# Graduates' Characteristics and Labour Market Entry: Polish Experience

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Presentation outline:

Aim and motivations of the study

Data and methodology

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Results – non-parametric approach

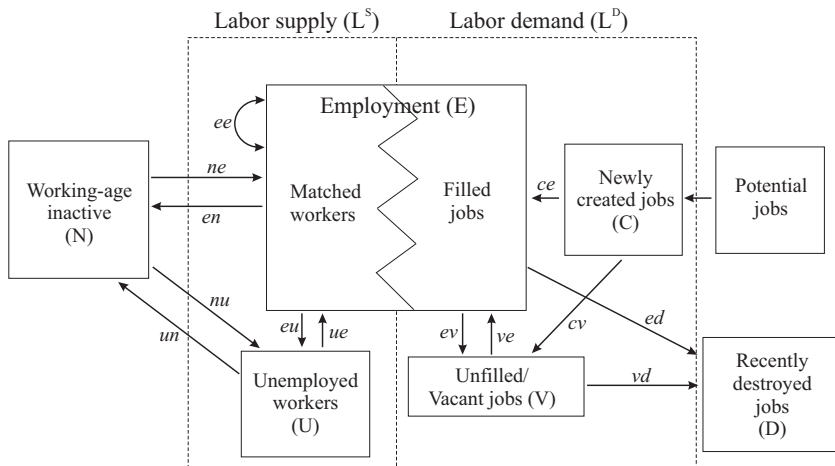
Results – Cox proportional hazards model

## Aim and motivations of the study

- ▶ Successful entry into labour market after graduation is a sign of a good coordination between education sector and labour market requirements
- ▶ Difficulties in finding job soon after graduation can be thought of as a signal of problems in matching labour supply and demand – lasting unemployment results in human capital depreciation and affects future professional career (e. g. wage in the life cycle)
- ▶ This study focuses on how different personal and other characteristics affect chances in finding first job for graduates

## Data and methodology

- ▶ Central Statistical Office Survey, over 20 000 observations of Polish graduates in the period 1998-2005
- ▶ A graduate – person under 27 in the moment of graduation with gaps in education no longer than 12 months
- ▶ First job – any job not controlled for the quality of job (natural extension of the research in future)
- ▶ Job search and matching theory insights: labour demand and supply interplay
- ▶ Very rich labour supply characteristics, little is known about the demand side (serious drawback)
- ▶ Survival analysis of the first job search – nonparametric and semiparametric approach



What is a survival analysis used for?

It aims at answering a question what fraction of population survives past a certain point in time. In our context the variable under study is the time of first job search, so actually we are examining unemployment duration. Survival here means being still unemployed and event called in the survival analysis terminology a 'failure' means here termination of search by successfully getting a job.

## Methodology (1)

Crucial concept in the analysis is the concept of survival. Survival  $S(t)$  is simply the probability of surviving beyond time  $t$ . Or differently – it is the probability of no failure up to the time  $t$ . Let  $T$  be a nonnegative random variable denoting time to occurrence of an event (failure).

$$S(t) = 1 - F(t) = Pr(T > t)$$

Most widely used estimator of the survivor function  $S(t)$  is the Kaplan-Meier estimator:

$$\hat{S}(t) = \prod_{j|t_j < t} \frac{n_j - d_j}{n_j}$$

where  $n_j$  is the number of individuals at risk at time  $t_j$  and  $d_j$  is the number of failures at time  $t_j$ .

## Methodology (2)

Another important concept in survival analysis is the hazard rate. Hazard function  $h(t)$  – conditional failure rate, intensity function – instantaneous rate of failure, measured in  $1/t$  units. It is the probability of a failure occurring in a given infinitely small interval of time, provided that a subject has survived until that interval, divided by the length of the interval.

For instance, if the hazard rate of some event is 3 and time is calculated in days, then if the hazard were to remain constant, we would expect 3 failures (or events) during a day.

## Methodology (3)

There exists mathematical relationship between hazard function  $h(t)$ , survivor function  $S(t)$ , distribution  $F(t)$  and probability density function  $f(t)$ :

$$S(t) = 1 - F(t) = Pr(T > t)$$

$$f(t) = \frac{dF(t)}{dt} = \frac{d}{dt} (1 - S(t)) = -S'(t)$$

$$h(t) = \lim_{\Delta t \rightarrow 0} \frac{Pr(t + \Delta t > T > t \mid T > t)}{\Delta t} = \frac{f(t)}{S(t)}$$

## Methodology (4)

### Cox proportional hazards model

It assumes that the covariates  $x_j$  multiplicatively shift the baseline hazard function  $h_0(t)$ :

$$h(t|x_j) = h_0(t) \exp(x_j\beta)$$

where the regression coefficients,  $\beta$ , need to be estimated from the data. The vector  $x_j$  is a set of personal characteristics that describe an individual and are believed to have an impact on the hazard function.

The most convenient feature of this model is that the baseline hazard function,  $h_0(t)$ , can be left unestimated and needs no particular functional form. The only thing that is assumed is that the baseline hazard function is the same for every individual in the sample. Each subject's hazard is therefore treated as a multiplicative replica of the others.

## Control characteristics

|                         |   |                        |
|-------------------------|---|------------------------|
| Sex                     | 0 | Woman*                 |
|                         | 1 | Man                    |
| Education               | 1 | Basic vocational*      |
|                         | 2 | Secondary              |
|                         | 3 | Technical secondary    |
|                         | 4 | Upper secondary        |
|                         | 5 | Tertiary undergraduate |
|                         | 6 | Tertiary graduate      |
| Period of graduation    | 1 | 1998-2001*             |
|                         | 2 | 2002-2003              |
|                         | 3 | 2004                   |
|                         | 4 | 2005                   |
| Settlement class        | 1 | Town 100 th. +         |
|                         | 2 | Town up to 100 th.     |
|                         | 3 | Village*               |
| Foreign language skills | 0 | Basic knowlege*        |
|                         | 1 | Advanced               |
| Practical experience    | 0 | Low to medium*         |
|                         | 1 | High                   |

## Control characteristics

|  |   |                |
|--|---|----------------|
| School grade average                     | 1 | Less than 3.0* |
|  | 2 | 3.1 – 3.5      |
|  | 3 | 3.6 – 4.0      |
|  | 4 | 4.1 – 4.5      |
|  | 5 | 4.6 – 5.0      |
|  | 6 | Over 5.0       |
| School type                              | 0 | Public*        |
|  | 1 | Non public     |
| Driving license                          | 0 | No*            |
|  | 1 | Yes            |
| High computer skills                     | 0 | No*            |
|  | 1 | Yes            |
| High leadership skills                   | 0 | No*            |
|  | 1 | Yes            |
| Contacts in the professional environment | 0 | No*            |
|  | 1 | Yes            |

## Control characteristics

|                                 |   |  |
|---------------------------------|---|--|
| Marital status                  | 1 | Single*  |
|                                 | 2 | Married  |
|                                 | 3 | Divorced   |
|                                 | 4 | Widow  |
| Physical disability             | 0 | No*  |
|                                 | 1 | Certified disability   |
| Social capital: culture         | 1 | At least once in a month attendance: cinema, theater, concerts, exhibitions etc.           |
|                                 | 0 | Less frequently than above*  |
| Social capital: community       | 1 | At least once in a week attendance: family meetings, parties, meeting with other people    |
|                                 | 0 | Less frequently than above*  |
| Social capital: intellectual    | 1 | At least once in a week reading a book, using Internet                                     |
|                                 | 0 | Less frequently than above*  |
| Social capital: public activity | 1 | At least once in a month attendance: social, charity and local organizations and societies |
|                                 | 0 | Less frequently than above*  |

## Control characteristics

|   |     |                      |
|---|-----|----------------------|
| Aid of non-public job search intermediaries | 0   | No*                  |
|   | 1   | Yes                  |
| Aid of public job search intermediaries     | 0   | No*                  |
|   | 1   | Yes                  |
| State programs                              | 0   | None*                |
|   | 1   | 'First job'          |
|   | 2   | 'First business'     |
|   | 3   | Other public program |
| Region/Voivodship                           | 2   | dolnośląskie*        |
|   | 4   | kujawsko-pomorskie   |
|   | ... |                      |
|   | 14  | mazowieckie          |
|   | 32  | zachodniopomorskie   |

## Basic results – job search time distribution

|                        | Mean | SD   | Coeff. of Var. | Q1 | Median | Q3   |
|------------------------|------|------|----------------|----|--------|------|
| Women                  | 8.6  | 11.3 | 1.3            | 2  | 4      | 12   |
| Men                    | 7.6  | 10.6 | 1.4            | 1  | 3      | 10   |
| Basic vocational       | 9.6  | 13.1 | 1.4            | 1  | 4      | 12   |
| High school            | 8.3  | 10.5 | 1.3            | 2  | 4      | 12   |
| Technical              | 8.6  | 11.5 | 1.3            | 2  | 4      | 12   |
| Upper secondary        | 8.0  | 10.4 | 1.3            | 2  | 4      | 11.5 |
| Tertiary undergraduate | 7.9  | 9.9  | 1.2            | 2  | 4      | 12   |
| Tertiary graduate      | 6.1  | 8.0  | 1.3            | 1  | 3      | 7    |
| 1998-2001              | 9.0  | 13.5 | 1.5            | 1  | 4      | 12   |
| 2002-2003              | 9.0  | 12.4 | 1.4            | 2  | 4      | 12   |
| 2004                   | 7.8  | 9.1  | 1.2            | 2  | 3      | 11   |
| 2005                   | 7.0  | 6.8  | 1.0            | 2  | 4      | 12   |
| Town 100+              | 6.0  | 8.3  | 1.4            | 1  | 3      | 6    |
| Town $\leq$ 100        | 8.5  | 11.2 | 1.3            | 2  | 4      | 12   |
| Village                | 9.6  | 12.3 | 1.3            | 2  | 5      | 12   |
| Total                  | 8.2  | 11.0 | 1.3            | 2  | 4      | 12   |

## Results – non-parametric approach

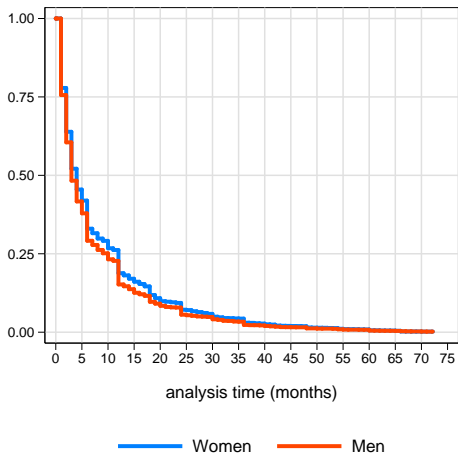


Figure 1. Kaplan-Meier estimator for survivor function: Men and Women

## Results – non-parametric approach

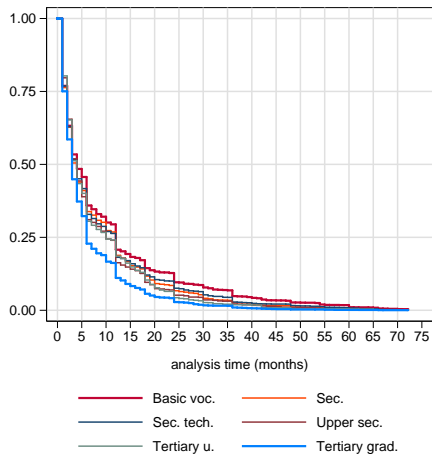


Figure 2. Kaplan-Meier estimator for survivor function: Education

## Results – non-parametric approach

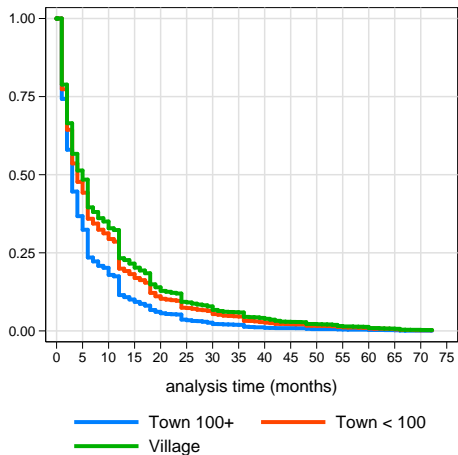


Figure 3. Kaplan-Meier estimator for survivor function: Residence

## Results – non-parametric approach

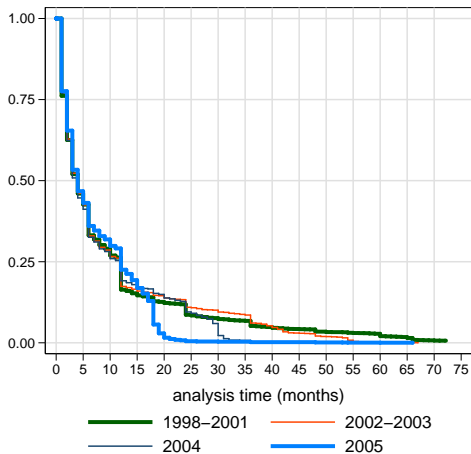


Figure 4. Kaplan-Meier estimator for survivor function: Graduation cohorts

## Results – non-parametric approach

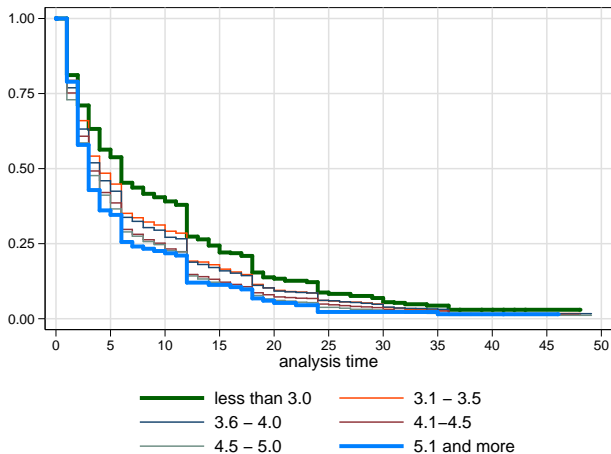


Figure 5. Kaplan-Meier estimator for survivor function: school average grades

## Results – Cox proportional hazards model

- ▶ Men have statistically significant higher hazards of finding their first job than women (12.4%)
- ▶ Tertiary graduate education level gives higher hazards by 11.3%. Other levels of education – not statistically significant
- ▶ Practical and professional experience gained during schooling is also important factor in determining chances of finding first job – hazards higher by 9.2%
- ▶ Important role of the class of settlement – largest cities imply higher hazards by 35.2%
- ▶ Married graduates face higher hazards by 6.6% than singles

## Results – Cox proportional hazards model

- ▶ Better pupils perform better on the first job search – higher average grades imply higher hazards (averages over 4 imply higher hazards by 13%)
- ▶ Non public schools are a negative factor of the first job search time. Graduates of this type of schools face hazard of finding first job that is only 88% of the baseline hazard
- ▶ Possessing a driving license gives higher hazards by 10.8%
- ▶ Computer skills make no difference and neither do the leadership capabilities
- ▶ Very strong positive influence of contacts in the professional environment (+24.7%)

## Results – Cox proportional hazards model

- ▶ Strong positive impact of cultural (13%) and intellectual (16%) social capital and of public activity (8.8%)
- ▶ Registration in local labour office reduces the hazard of finding first job (adverse selection?) but this effect is statistically significant at 10% level only
- ▶ Program 'First job' started by the Ministry of Labour and Social Policy in 2002 appears to be statistically significant covariate of the hazard function (+97%) – however this result needs caution and further investigation of the quality of jobs
- ▶ Statistical test (Linktest and Schoenfeld residuals test) show that there is no support for rejecting the hypothesis of proportional hazards assumption which is crucial for the model

Thank you for your attention