ISSN 2392-1641

Economics and Business Review

Volume 2 (16) Number 4 2016

CONTENTS

Poznań University of Economics and Business Press

Paper based publication

ISSN 2392-1641

POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS PRESS
ul. Powstańców Wielkopolskich 16, 61-895 Poznań, Poland
phone +48 61 854 31 54, +48 61 854 31 55, fax +48 61 854 31 59
www.wydawnictwo-ue.pl, e-mail: wydawnictwo@ue.poznan.pl
postal address: al. Niepodległości 10, 61-875 Poznań, Poland

Printed and bound in Poland by:
Poznań University of Economics and Business Print Shop

Circulation: 230 copies

Economics and Business Review

Volume 2 (16) Number 4 2016

CONTENTS

Economics and Business Review, Vol. 2 (16), No. 4, 2016: 25–44
DOI: 10.18559/ebr.2016.4.2

Application of correspondence analysis to the identification of the influence of features of unemployed persons on the unemployment duration[1]

***Jacek Batóg*[2], *Barbara Batóg*[2]**

Abstract: The paper presents the analysis of the influence of selected features of unemployed persons on unemployment duration. Theoretical considerations go along with an empirical study based on individual data from Local Labour Office in Szczecin. The research hypothesis states that features of unemployed persons such as the level of education, sex, work seniority or age have a meaningful influence on unemployment duration. Recent studies usually used event history analysis, inflow-outflow analysis of the labour market or logit models. This research is unique because of the application of one of the methods of multidimensional analysis – correspondence analysis. This method allows analysis of multidimensional relationships between categories of nominal variables. From the results obtained it could be stated that strong relationships between unemployment duration and features of unemployed persons exist (apart from sex).

Keywords: unemployment duration, correspondence analysis.

JEL codes: J64, C38.

Introduction

The level of unemployment in the economy is the function of current labour demand that above all depends on the stage of the business cycle and such factors as the level of development that influences the sectoral structure of the economy and efficiency of the institutional environment. The increase of economic activity in Poland in 2004–2008 caused the decrease of the liquidity ratio of unemployment calculated as the ratio of the number of newly registered unemployed persons to deregistered persons [Batóg et al. 2010]. This phenomenon was also observed in other countries [Corak 1996]. A positive influence

[1] Article received 10 May 2016, accepted 2 November 2016.

[2] University of Szczecin, Faculty of Economics and Management, Institute of Econometrics and Statistics, Mickiewicza 66, 71-101 Szczecin, Poland; corresponding author: jacek.batog@usz.edu.pl.

of sectoral structure on the low level of unemployment is not always the case because an increase of employment (especially in short run) occurs only if the labour market is elastic [Kwiatkowski, Kucharski, and Tokarski 2002]. Labour demand changes strongly more often than labour supply. The characteristic of labour demand is the big diversification according to the sectoral, spatial and professional structures [Batóg et al. 2016]. The share of labour in the national product that depends on the level of labour productivity, minimal wage and hours worked influences the number of employed persons as well as the number of unemployed persons [Beaudry and Collard 2002; Izyumov and Vahaly 2014: 697].

The level of employment and especially difficulties in finding work by unemployed persons is related not only to macroeconomic factors but also to the intensity of seeking work and the probability of accepting a given work offer [Wadsworth 1991; Eriksson, Reija, and Hege 2002]. The latter depends on the individual demographic and socio-economic characteristics of the persons seeking work, their history of occupations and non-observed factors such as the level of motivation for seeking work [Colier 2003; Daras and Jerzak 2005]. The chance of finding work depends on previous periods of unemployment because discrimination against such persons often occurs. Unemployment causes the decrease of human capital and the employers offer lower wages that are not attractive to unemployed persons [Carroll 2006: 306].

The main goal of the research is an analysis of the relationships between unemployment duration and the individual characteristics of unemployed persons such as the level of education, sex, type of work undertaken and age. Previous studies concerning unemployment duration were most often conducted with the application of event history analysis, inflow-outflow analysis of the labour market [Socha and Sztanderska 2002; Wysocki and Kołodziejczak 2007], probit and logit models [Ahn, de la Rica, and Ugidos 1999]. The current study is different from others because it applies a correspondence analysis that is one of the multidimensional methods. Correspondence analysis allows the analysis of multidimensional relationships between categories of nominal and ordinal variables. Most of features of the unemployed person is nominal or ordinal and the rest can be transformed into such variables. They could also be analysed by means of other methods but their level of complication rapidly increases in the case of the increasing number of combinations of categories. Additionally, contrary to other methods, correspondence analysis does not need many assumptions and can be used in the case of poor quality results of other methods.

The paper consists of six sections. The first section is introduction. The second section contains literature review and discussion on previous results. The next section is devoted to methods applied. In the fourth section examined variables are specified. The fifth section deals with empirical results of the research. The paper is closed with conclusions. In the research the data on 25,854 unemployed persons registered in the Local Labour Office in Szczecin and ob-

served for one year were used. The same period of observation of unemployed persons was also suggested by other authors because unemployment duration could be determined by different factors for different length time without work [Grzenda 2012: 124].

1. Literature review

The phenomenon of unemployment including the probability of finding work and unemployment duration was widely studied by many researchers. Their works were both theoretical and empirical. The problem of the intensity of seeking work is more rarely analysed [Taşçı 2008]. Most results of the analyses shows that a higher level of education shortens the duration of unemployment [Kupets 2006, data: Ukrainian Longitudinal Monitoring Survey, 1998–2002, Cox proportional hazard model; Bieszk-Stolorz and Markowicz 2011, data: Local Labour Office Szczecin 2011, 2009, survival analysis for censored data, Kaplan-Meier estimator, Cox regression; Grogan and van den Berg 2001, data: Russian Longitudinal Monitoring Survey, 1994–1996, Cox proportional hazard model; Mavridis 2015, data: British Household Panel Survey, 1991–2006, survival functions, Kaplan-Meier estimator, Cox proportional hazard model]. The same conclusion could be found in Kerckhofes, de Neubourg, and Palm [1994]; Ahn, de la Rica, and Ugidos [1999]; Daras and Jerzak [2005]; Carroll [2006]; Grzenda [2012]; Sasaki, Kohara, and Machikita [2013]; Kołodziejczak and Wysocki [2013]; Rotaru [2014]. More rarely one can find results showing that a lower level of education increases the chances for getting work [Stetsenko, 2003, 2001–2003, Cox proportional hazard model, piecewise exponential models]. The same result with the application of the Cox hazard model was obtained by Dynarski and Sheffrin [1990]; Arntz and Wilke [2009] whereas the lack of a significant influence of the level of education on the probability of finding work is presented in Kerckhofes, de Neubourg, and Palm [1994] and Long [2009].

The analyses of the influence of the health condition on unemployment duration indicate that the average time of seeking work is longer for disabled persons than for persons without disabilities. So disabled people have lower chances of obtaining work [Dànàcicà and Cîrnu 2014, data: National Agency for Employment Romania, 2008–2010, survival function, Cox proportional hazard model; Carroll 2006; *Analiza* 2003].

Short work seniority or no work experience diminishes the chances for getting work [Ahn, de la Rica and Ugidos 1999, data: Spanish Labour Force Survey, 1992–1995, ordered probit model; Batóg at al. 2000; Carroll 2006]. In the case of the influence of sex on unemployment duration quite often it is stated that men have greater chances of getting work [Stetsenko 2003; Daras and Jerzak 2005, BAEL, 1993–2003, logit model]. Some authors found that women have higher chances of getting work [Bieszk-Stolorz and Markowicz 2011; Grogan

and van den Berg 2001; Mavridis 2015; Landmesser 2013]. Quite rarely results confirming no influence of sex on unemployment duration are presented [Grzenda 2012, data: Budgets of Households, 2008–2009, semiparametric Bayesian Cox model].

The majority of publications argue that marital status and family situation have a significant impact on unemployment duration. There is a difference between women and men. Married men have higher chances of getting work and their unemployment duration is shorter [Kupets 2006; Long 2009; Grzenda 2012]. However married women have lower chances for getting work and their unemployment duration is longer [Stetsenko 2003]. The same conclusion for women and men is formulated in Dynarski and Sheffrin [1990], and for women in Sasaki, Kohara, and Machikita [2013]. Having children decreases the unemployment period and increases the probability of getting work [Rotaru 2014, data: ABS Longitudinal Labour Force Survey, 2008–2010, survival functions and models, ordered logit models, random effects models). Carroll [2006] indicates that the unemployment duration is longer for women with children.

In most empirical works opinion on the negative influence of age on unemployment duration dominates – older people have lower chances for getting work than younger ones [Kupets 2006; Stetsenko 2003; Bieszk-Stolorz and Markowicz 2011; Arntz and Wilke 2009, data: Sample of the Integrated Employment Biographies, 2000–2002, Cox proportional hazard model; Mavridis 2015]. The same results are presented in Ahn, de la Rica, and Ugidos [1999]; Sasaki, Kohara, and Machikita [2013]; Daras and Jerzak [2005]; Long [2009]; Kołodziejczak and Wysocki [2013]; Rotaru [2014]. Some authors found a positive correlation between the level of unemployment benefits and the length unemployment [Stetsenko 2003; Bover, Arellano, and Bentotila 2002, data: Labour Force Survey, 1987–1994, discrete hazard model; Røed and Zhang 2003; Arulampalam and Stewart 1995; Belzil 2001; Carroll 2006; Lalive 2007; Røed, Jensen, and Thoursie 2008; Arntz and Wilke 2009; Bieszk-Stolorz and Markowicz 2015b] and in case of disabled people [Dànàcicà and Cîrnu 2014].

The size of the place where the person lives has a marked influence on unemployment duration. Citizens of big cities have higher chances of getting work [Kupets 2006] and the longest time of seeking work characterises small towns [Kołodziejczak and Wysocki 2013, data: BAEL, 2006–2009, input-output analysis on the labour market IOA; Grogan and van den Berg 2001]. Persons that took part in professional activation programmes have shorter duration of unemployment [Bieszk-Stolorz and Markowicz 2015a, data: Local Labour Office in Koszalin, 2011, Kaplan-Meier estimator, uncontinuous regression model], however the reverse phenomenon was observed for women in Korea [Lee and Lee 2005]. Positive effects were observed after 12 months from registration [Richardson and van den Berg 2013]. Some authors obtained results confirming that the ratio of persons deregistered because of getting work diminishes

when the unemployment duration increases [Rotaru 2014; Daras and Jerzak 2005; Long 2009]. Higher qualified persons have greater chances of getting work [Rotaru 2014] and also persons that had higher wage in their previous work [Sasaki, Kohara, and Machikita 2013, data: Japanese Ministry of Health, Labour and Welfare, 2005, adjustment functions, Cox proportional hazard model].

A reverse dependency could be observed in the case of higher benefits obtained without work such as rent allowance, parental allowance or benefits for disabled people [Carroll 2006, data: Household, Income and Labour Dynamics in Australia Survey, 2001–2002, Cox proportional hazard model]. Analyses of the influence of the level of discomfort on account of work loss on unemployment duration are relatively rarely conducted. This subject was examined by Mavridis [2015]. He argues that a higher level of discomfort causes a shortening of the unemployment duration. Other factors that can have an influence on unemployment duration are as follows: time of starting of seeking work, reason for leaving previous work, skills and qualifications, profession practised in a previous job and nationality (ethnicity) [Bosworth 1992].

2. Applied method

Data analysis was conducted by means of correspondence analysis, one of the methods of multidimensional analysis. Correspondence analysis is a statistical technique which is useful to researchers and professionals who collect categorical data. The method is particularly helpful in analysing cross tabular data in the form of numerical frequencies and results in an elegant but simple graphical display which permits more rapid interpretation and understanding of the data [Greenacre 2007; Andersen 1994]. Its main goal is to identify structural relationships between variables (variables and objects) when there are no *a priori* expectations as to the nature of those relationships. An important feature of correspondence analysis is the multivariate treatment of the data through simultaneous consideration of multiple categorical variables. The multivariate nature of correspondence analysis can reveal relationships that would not be detected in a series of pair wise comparisons of variables. Another important feature is the graphical display of row and column points in biplots which can help in detecting structural relationships amongst the variable categories and objects [Greenacre and Hastie 1987]. The table of numerical information is transformed into a graphical display in which each row and each column is depicted as a point. Correspondence analysis has highly flexible data requirements. The only strict data requirement is a rectangular data matrix with non-negative entries. There are several different ways of defining correspondence analysis, usually as a least squares method of data analysis also perceived and applied as a descriptive technique, a formal model, called a „canonical model", using maximum likelihood parameter estimation [Greenacre 2000].

In a simple (classical, standard) correspondence analysis we start from the formulation of contingency table N (called also the primitive table) in which elements n_{ij} reflect the simultaneous occurrence of categories i and j of two variables X and Y (i = 1, 2, …, I; j = 1, 2, …, J) [Panek 2009; Stanimir 2005; Ostasiewicz 1998]. The independence of two categorical variables could be tested by means of the Pearson χ^2 statistic given by formula (1).

$$\chi^2 = \sum_{i=1}^{I}\sum_{j=1}^{I}\frac{\left(n_{ij}-\hat{n}_{ij}\right)^2}{\hat{n}_{ij}}, \tag{1}$$

where:

$\hat{n}_{ij}$ – expected number of occurrences of categories i and j.

Marginal numbers of rows and columns are denoted respectively by $n_{i\bullet}$ i $n_{\bullet j}$:

$$n_{i\bullet} = \sum_{j=1}^{J} n_{ij}, \quad n_{\bullet j} = \sum_{i=1}^{I} n_{ij}. \tag{2}$$

Then we derive a matrix of relative frequencies $P = \left[\frac{n_{ij}}{n}\right]$ called the correspondence matrix. Marginal frequencies of rows and columns are denoted respectively by $p_{i\bullet}$ i $p_{\bullet j}$:

$$p_{i\bullet} = \sum_{j=1}^{J} p_{ij} = \sum_{j=1}^{J}\frac{n_{ij}}{n} = \frac{n_{i\bullet}}{n}, \quad p_{\bullet j} = \sum_{i=1}^{I} p_{ij} = \sum_{i=1}^{I}\frac{n_{ij}}{n} = \frac{n_{\bullet j}}{n}, \tag{3}$$

where: $n = \sum_{j=1}^{J}\sum_{i=1}^{I} n_{ij}$.

We receive vectors of marginal frequencies respectively for rows and columns:

$$r = [p_{i\bullet}], \quad c = [p_{\bullet j}]. \tag{4}$$

Expected numbers are calculated using the following formula:

$$\hat{n}_{ij} = n \cdot p_{i\bullet} \cdot p_{\bullet j}. \tag{5}$$

Then we construct matrices of profiles of rows and columns:

$$\left[\frac{n_{ij}}{n_{i\bullet}}\right] = \left[\frac{p_{ij}}{p_{i\bullet}}\right] = D_r^{-1}P, \quad \left[\frac{n_{ij}}{n_{\bullet j}}\right] = \left[\frac{p_{ij}}{p_{\bullet j}}\right] = D_c^{-1}P, \tag{6}$$

where D_r and D_c are diagonal matrices with elements respectively $p_{i\bullet}$ i $p_{\bullet j}$.

The marginal frequencies respectively of rows and columns in profile matrices D_r and D_c are called average row and column profiles and represent centroids. Distances between row profiles (column profiles) are calculated as weighted Euclidean distances:

$$d(i,i') = \sum_{j=1}^{J} \frac{1}{p_{\bullet j}} \left(\frac{p_{ij}}{p_{i\bullet}} - \frac{p_{i'j}}{p_{i'\bullet}} \right), \quad d(j,j') = \sum_{i=1}^{I} \frac{1}{p_{i\bullet}} \left(\frac{p_{ij}}{p_{\bullet j}} - \frac{p_{ij'}}{p_{\bullet j'}} \right), \tag{7}$$

whereas weights we use respectively show the marginal frequencies of columns and rows.

The above distances are also χ^2 distances which can be used for the calculation of inertia – a measure of differentiation of elements in the data matrix. Total inertia enables the assessment of the dispersion level of row (column) profiles around their centroids, and shows the differences between particular row (column) profiles and their average profiles:

$$\lambda_i = \sum_{i=1}^{I} \chi_i^2 \cdot p_{i\bullet} \text{ (for rows)}, \lambda_j = \sum_{j=1}^{J} \chi_j^2 \cdot p_{\bullet j} \text{ (for columns)}, \tag{8}$$

where:

χ_i^2 – chi-square distance between row *i* and respective centroid,

χ_j^2 – chi-square distance between column *j* and respective centroid.

We can prove that the inertia for rows and columns are equal and they are also equal to total inertia:

$$\lambda_i = \lambda_j = \lambda. \tag{9}$$

Higher values of total inertia indicate a higher dispersion of points which represent profiles around the centre of the coordinated axis.

If we are going to analyse row and column profiles at the same time we have to transform matrix *P* into matrix *A* called the matrix of standardized differences:

$$A = [a_{ij}], \tag{10}$$

where:

$$a_{ij} = \frac{p_{ij} - p_{i\bullet} p_{\bullet j}}{\sqrt{p_{i\bullet} p_{\bullet j}}}.$$

To calculate the coordinates of points representing categories of variables in a chosen dimension we have to provide a decomposition of matrix *A* (decomposition of the total inertia):

$$A = D_r^{-1/2}(P - rc^T)D_c^{-1/2} = U\,\Gamma\,V^T, \tag{11}$$

where:

Γ – diagonal matrix of non-zero singular values of matrices AA^T and A^TA composed in descending order,

$U(V)$ – matrix of singular vectors which correspond with square roots of eigenvalues of matrix A^TA (AA^T).

The relationship between value of χ^2 statistic and singular values γ_k presents formula (12):

$$trA^TA = trAA^T = \frac{\chi^2}{n} = \lambda = \sum_{k=1}^{K}\gamma_k^2. \tag{12}$$

Rows of matrices *F* and *G* are designated respectively for categories of rows and columns whilst their columns for coordinates on consecutive main axes:

$$F = D_r^{-1/2}U\,\Gamma, \quad G = D_c^{-1/2}V\,\Gamma. \tag{13}$$

The real space of the presentation of dependencies between categories for two variables cannot be greater than $min(I - 1; J - 1)$. In the current study the number of dimensions for graphic presentation was established on the base of the share of inertia for consecutive dimensions in the total inertia [Stanimir 2005].

In order to evaluate the results of correspondence analysis one can use such criteria as *Quality* and *Relative inertion*. *Quality* shows the quality of representation of given point on the coordinate plane. *Quality* is equal to the ratio of the squared distance from a given point to the origin of the coordinate space of the chosen dimension and the squared distance from a given point to the origin of the coordinate space of the maximum dimension. *Relative inertion* represents the share of total inertia explained by a given point. It includes the share of a given row point in inertia explained by the given dimension.

3. Specification of variables

The data included 25,854 persons registered in the Local Labour Office in Szczecin as unemployed from 1.01.2014 to 28.02.2015. These persons were observed over 12 months. Unemployment duration is the time from the day of registration to the day of taking the first job after registration. Persons deregistered for other than work reasons (for example retirement) were excluded from the sample.

In the next section the categories of the analysed variables are presented. Their structures can be found in the Tables 1–6.

Unemployment duration

Table 1. Codes and structure of *Unemployment duration*

Category	Number	Percent
UD1 – up to 1 month	2,296	8.88
UD2 – over 1 month up to 3 months	3,027	11.71
UD3 – over 3 months up to 6 months	2,349	9.09
UD4 – over 6 months up to 9 months	1,666	6.44
UD5 – over 9 months up to 12 months	1,037	4.01
UD6 – no work up to 12 months from registration	15,479	59.87

Source: Own calculations on the basis of data of the Local Labour Office in Szczecin.

Sex

Table 2. Codes and structure of *Sex*

Category	Number	Percent
F – female	11,603	44.88
M – male	14,251	55.12

Source: As in Table 1.

Work seniority

Table 3. Codes and structure of *Work seniority*

Category	Number	Percent
WS0 – up to 1 month	10,302	39.85
WS1 – over 1 month up to 1 year	2,786	10.78
WS2 – over 1 year up to 5 years	4,601	17.80
WS3 – over 5 years up to 10 years	3,088	11.94
WS4 – over 10 years up to 20 years	2,222	8.59
WS5 – over 20 years up to 30 years	2,124	8.22
WS6 – over 30 years	731	2.83

Source: As in Table 1.

Age

Table 4. Codes and structure of *Age*

Category	Number	Percent
A1 – up to 24 years	3,443	13.32
A2 – 25 years up to 34 years	8,708	33.68
A3 – 35 years up to 44 years	5,410	20.93
A4 – 45 years up to 54 years	3,724	14.40
A5 – 55 years and over	4,569	17.67

Source: As in Table 1.

Level of education

Table 5. Codes and structure of *Level of education*

Category	Number	Percent
ED1 – primary, lower secondary	6,337	24.51
ED2 – basic vocational	5,649	21.85
ED3 – general secondary	4,481	17.33
ED4 – vocational secondary	3,558	13.76
ED5 – tertiary	5,829	22.55

Source: As in Table 1.

Type of undertaken employment

Table 6. Codes and structure of *Type of employment undertaken*

Category	Number	Percent
EMP0 – no work	13,998	54.14
EMP1 – starting work	9,888	38.25
EMP2 – starting own business	1,185	4.58
EMP3 – starting work with funds for disabled persons	10	0.04
EMP4 – starting work or own economic activity with settlement or employment voucher; starting work with refinancing of wage of unemployed over 55	23	0.09
EMP5 – intervention or public works	750	2.90

Source: As in Table 1.

4. Empirical results

Selected results of the one dimensional and multidimensional correspondence analysis are presented in Figures 1–5 and Tables 7–10. It turned out that in applying the criterion described in Part 3 the two–dimensional space was the most appropriate for the interpretation of the results. All calculations were made by means of STATISTICA.

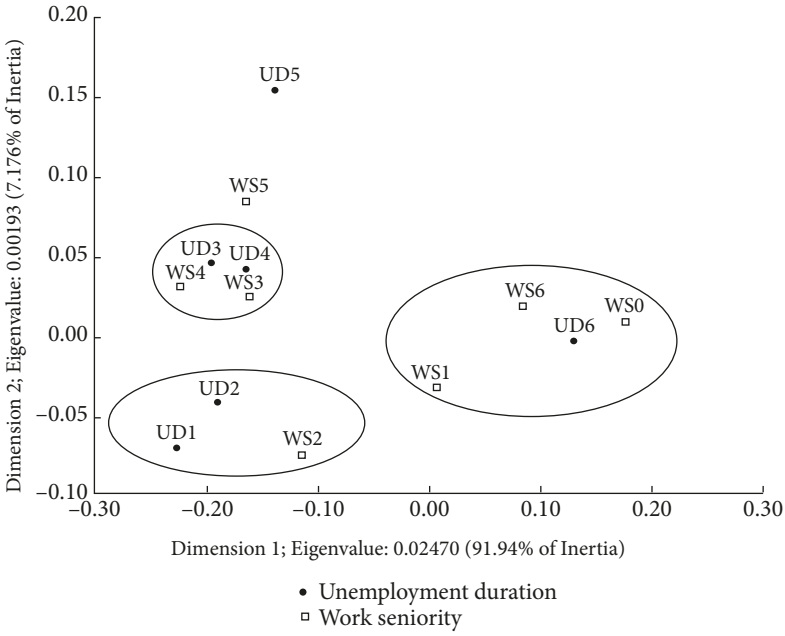

Figure 1. Relationship between unemployment duration and work seniority
Source: As in Table 1

Table 7. Eigenvalues and inertia for all dimensions – unemployment duration and work seniority

Dimension	Singular Values	Eigenvalues	Percent of Inertia	Cumulative Percent	Chi–Squares
1	0.157	0.025	91.94	91.94	638.65
2	0.044	0.002	7.18	99.11	49.85
3	0.013	0.000	0.61	99.72	4.23
4	0.006	0.000	0.15	99.87	1.05
5	0.006	0.000	0.13	100.00	0.89
Total Inertia = 0.02687, $\chi 2 = 694.66$, df = 25, p = 0.000					

Source: As in Table 1.

The value of statistic $\chi^2 = 694.66$ permits the rejection of the null hypothesis about the independence of unemployment duration and work seniority. The shortest unemployment duration (UD1 and UD2) occurred in case of unemployed persons with a quite short work seniority: from 1 to 5 years (WS2). Unemployment duration increases along with work seniority and most often concerns unemployed persons with work seniority up to 1 year (WS0) and with work seniority over 30 years (WS6). The analysis did not prove that a relationship exists between unemployment duration and sex.

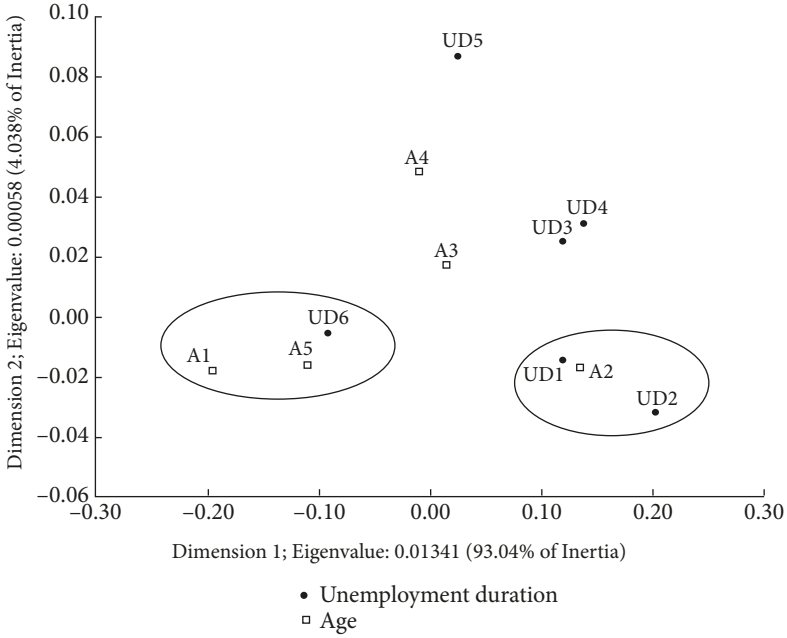

Figure 2. Relationship between unemployment duration and age
Source: As in Table 1

Table 8. Eigenvalues and inertia for all dimensions – unemployment duration and age

Dimension	Singular Values	Eigenvalues	Percent of Inertia	Cumulative Percent	Chi–Squares
1	0.116	0.013	93.04	93.04	346.65
2	0.024	0.001	4.04	97.08	15.05
3	0.020	0.000	2.69	99.77	10.02
4	0.006	0.000	0.23	100.00	0.87
Total Inertia = 0.01441, $\chi^2 = 372.59$, df = 20, p = 0.000					

Source: As in Table 1.

The value of statistic $\chi^2 = 372.59$ permits the rejection of the null hypothesis about the independence of unemployment duration and age. Short unemployment duration concerned unemployed persons aged 25–34 (A2). Amongst persons that did not undertake work for 12 months from the day of registration persons up to 24 years (A1) and persons over 55 years (A5) dominated. Quite different results were obtained in the study concerning the depreciation of human capital of unemployed persons registered in the Local Labour Office in Szczecin in 2012 and observed to the end of 2013. It means that some changes in this relationship occurred [Bieszk-Stolorz 2015].

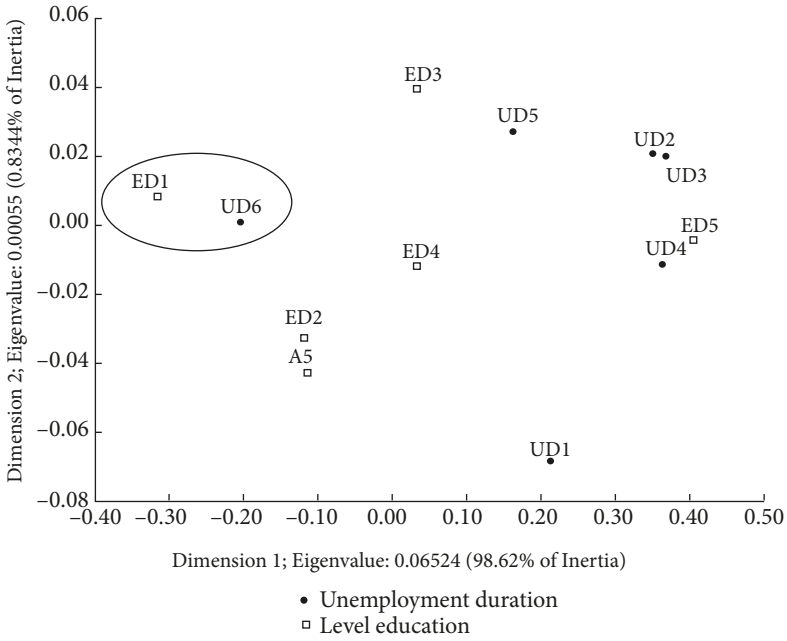

Figure 3. Relationship between unemployment duration and level of education
Source: As in Table 1

Table 9. Eigenvalues and inertia for all dimensions – unemployment duration and level of education

Dimension	Singular Values	Eigenvalues	Percent of Inertia	Cumulative Percent	Chi–Squares
1	0.255	0.065	98.62	98.62	1,686.82
2	0.023	0.001	0.83	99.45	14.27
3	0.015	0.000	0.35	99.80	6.02
4	0.011	0.000	0.20	100.00	3.35
Total Inertia = 0.6616, χ^2 = 1,710.4, df = 20, p = 0.000					

Source: As in Table 1.

The value of statistic $\chi^2 = 1710.4$ permits the rejection of the null hypothesis about the independence of unemployment duration and level of education. It could be observed (Figure 3) that amongst people without employment for 12 months (UD6) the biggest group consisted of persons with a primary or lower secondary level of education (ED1). At the same time the analysis did not prove the positive impact of higher education in the shortening of the period of unemployment. Slightly different results were obtained in the study concerning the depreciation of human capital of unemployed persons registered in the Local Labour Office in Szczecin in 2012 and observed to the end of 2013. Persons with a tertiary level of education were characterized by the high intensity of leaving unemployment at the beginning and by a fast decrease with an increasing duration of unemployment [Bieszk-Stolorz 2015].

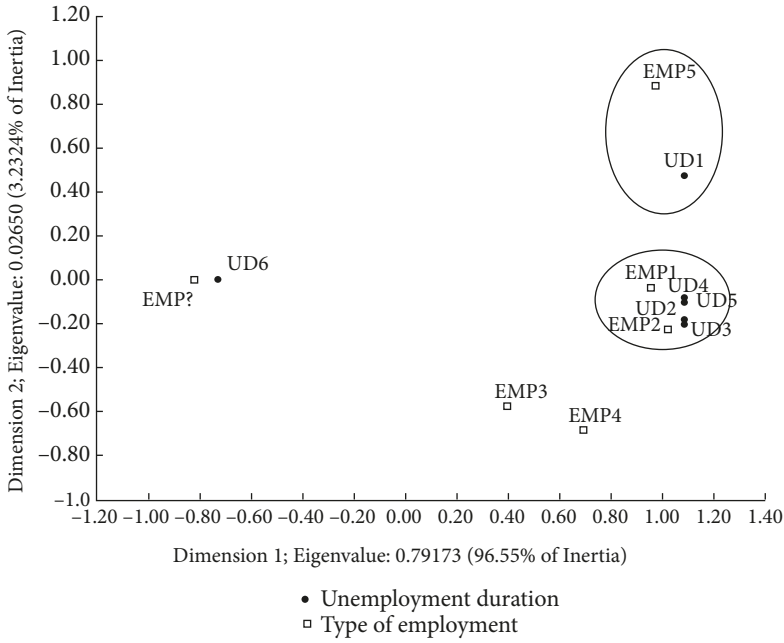

Figure 4. Relationship between unemployment duration and type of undertaken employment

Source: As in Table 1

The value of statistic $\chi^2 = 26{,}692.0$ permits the rejection of the null hypothesis about the interdependence of unemployment duration and type of employment undertaken. The strong relationship between unemployment duration and the type of employment undertaken is visible in Figure 4. Unemployment duration up to 1 month (UD1) is most often linked with intervention or public work (EMP5) or work or own economic activity with settlement or employment voucher or work with refinancing of the wages of the unemployed over

Table 10. Eigenvalues and inertia for all dimensions – unemployment duration and type of employment undertaken

Dimension	Singular Values	Eigenvalues	Percent of Inertia	Cumulative Percent	Chi-Squares
1	1.000	1.000	96.74	96.74	25,820.81
2	0.177	0.031	3.02	99.76	806.77
3	0.037	0.001	0.13	99.89	34.48
4	0.032	0.001	0.10	99.99	27.12
Total Inertia = 1.0338, χ^2 = 26,692.0, df = 25, p = 0.000					

Source: As in Table 1.

55 (EMP4). Persons that started work (EMP1) or work with funds for disabled persons (EMP3) had a longer unemployment duration (UD2–UD5). Persons that started their own business (EMP2) constituted a separate group.

Figure 5 presents the results of the multidimensional correspondence analysis for all analysed variables simultaneously.

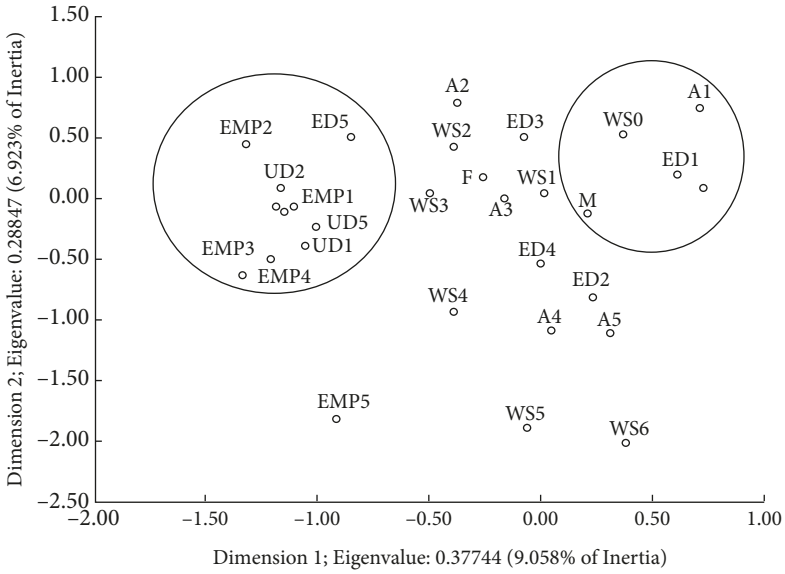

Figure 5. Relationship between unemployment duration and all analysed variables (multidimensional correspondence analysis)
Source: As in Table 1

From the results obtained by means of multidimensional correspondence analysis it is clear that there is a strong relationship between the time from registration and the first employment and the characteristics of the unemployed

persons. The lack of a positive result in seeking work (EMP0 and UD6) characterises young persons (A1 – up to 24 years) with a primary or lower secondary level of education (ED1) and very short work seniority (WS0 – up to 1 month). Over half of these persons were men. Persons with a tertiary level of education (ED5) find work most often but not an intervention or public work (EMP5).

One could also observe that:

- persons with no work seniority very often did not undertake work at all,
- persons with work seniority from 1 to 20 years dominated amongst persons that undertook work or started their own business,
- persons that undertook work were in the age range 25–44,
- persons with a primary, lower secondary, basic vocational and general secondary level of education most often did not undertake work or undertook only intervention or public work,
- persons that most often did not find work were men with no work seniority or work seniority up to 1 year and with a primary or lower secondary level of education,
- persons that undertook intervention or public work most often were persons over 45 and with work seniority over 10 years.

Conclusions

The results obtained proved the existence of strong relationships between the characteristics of unemployed persons and unemployment duration. The most visible associations are between age, work seniority and type of employment undertaken on the one hand and unemployment duration on the other. The study did not prove the influence of sex on unemployment duration.

The most important suggestion for labour offices is the necessity to pay attention especially to the young (up to 24) and older (over 55) persons that have the smallest chances of finding work. It is consistent with the level of employment in Zachodniopomorskie Voivodship which is a little above 20% in the groups mentioned whilst in the rest of the active population this rate exceeds 70%.

In further research it is worth thinking about conducting analyses concerning the relationship between the propensity to change the place of domicile because of undertaking work and the duration of unemployment. Previous studies usually indicate the lack of this kind of relationship whereas the propensity to migrate "for work" increases in case of loss of work of the spouse and in the case of the lack of unemployment benefits [Ahn, de la Rica, and Ugidos 1999]. The regional differences in unemployment duration and the influence of business cycles and professional activation programmes could be also examined. Previous analyses confirm strong influence of place of living on unemployment duration [Rotaru 2014; Mavridis 2015].

The other area of research could be a comparison of the results of correspondence analysis and results obtained by means of other multidimensional methods, for example, classification trees that illustrate the series of relationships between the characteristics of unemployed persons. It would also be possible to conduct an examination over a longer (several consecutive years) period of registered unemployed persons, look for the determinants of unemployment duration according to economic crises and make international comparisons.

References

Ahn, N., de la Rica, S., Ugidos, A., 1999, *Willingness to Move for Work and Unemployment Duration in Spain*, Economica, New Series, 66(263): 335–357.

Analiza udziału osób niepełnosprawnych w rynku pracy na przykładzie województwa zachodniopomorskiego, 2003, Hozer, J. (ed.), Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin.

Andersen, E.B., 1994, *The Statistical Analysis of Categorical Data*, 3rd ed., Springer-Verlag, Berlin, Heidelberg, New York, London, Paris, Tokyo, Hong Kong, Barcelona, Budapest,.

Arntz, M., Wilke, R.A., 2009, *Unemployment Duration in Germany: Individual and Regional Determinants of Local Job Finding, Migration and Subsidized Employment*, Regional Studies, 43(1): 43–61.

Arulampalam, W., Stewart, M.B., 1995, *The Determinants of Individual Unemployment Durations in an Era of High Unemployment*, The Economic Journal, 105(429): 321–332.

Batóg, J., Batóg, B., Mojsiewicz, M., Rozkrut, M., 2010, *System monitorowania i prognozowania popytu na pracę w województwie zachodniopomorskim, zawierający opracowanie 5-letniej prognozy dynamiki i kierunków popytu na pracę oraz projekt i prezentacja rekomendowanego do wdrożenia modelu monitorowania i prognozowania zmian potrzeb kadrowych i popytu na pracę*, Sytuacja i oczekiwania pracodawców w powiatach województwa zachodniopomorskiego. Przewidywanie oczekiwań pracodawców odnośnie pożądanych kwalifikacji, kompetencji i usług szkoleniowych, CRSG, PSDB, Szczecin.

Batóg, J., Batóg, B., Mojsiewicz, M., Rozkrut, M., 2016, *Wsparcie monitorowania i prognozowania rynku pracy przez statystykę publiczną*, Wiadomości Statystyczne, 1: 12–26.

Batóg, J., Gazińska, M., Mojsiewicz, M., Guzowska, M., Bojanowska, J., 2000, *Przyszłość Szczecina. Prognoza rynku pracy 2015. Struktura, uwarunkowania, tendencje*, Raport dla UM w Szczecinie, Szczecin.

Beaudry, P., Collard, F., 2002, *Why Has the Employment-Productivity Trade off among Industrialized Countries Been so Strong?*, NBER Working Paper Series, Working Paper, 8754, Cambridge.

Belzil, Ch., 2001, *Unemployment Insurance and Subsequent Job Duration: Job Matching Versus Unobserved Heterogeneity*, Journal of Applied Econometrics, 16(5): 616–636, DOI: 10.1002/jae.618.

Bieszk-Stolorz, B., 2015, *Zastosowanie modeli czasu trwania do oceny stopnia deprecjacji kapitału ludzkiego*, Studia Ekonomiczne, Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach, 223: 238–246.

Bieszk-Stolorz, B., Markowicz, I., 2011, *Analiza długości okresu bezrobocia według przyczyny wyrejestrowania na przykładzie Powiatowego Urzędu Pracy w Szczecinie*, in: Miłobędzki, P., Szreder, M. (eds.), 4/8: 373–382, *Modelowanie i prognozowanie gospodarki narodowej*, Prace i Materiały Wydziału Zarządzania Uniwersytetu Gdańskiego.

Bieszk-Stolorz, B., Markowicz, I., 2015a, *Ilościowa analiza skuteczności realizacji programu wsparcia bezrobotnych*, Zarządzanie i Finanse, Journal of Management and Finance, 13(4/2): 113–125.

Bieszk-Stolorz, B., Markowicz, I., 2015b, *Influence of Unemployment Benefit on Duration of Registered Unemployment Spells*, Equilibrium. Quarterly Journal of Economics and Economic Policy, 10(3): 167–183, DOI: 10.12775/EQUIL.2015.031.

Bosworth, D.L., 1992, *Duration of Unemployment: an Analysis of the Labour Force Survey*, in: Verhaar, C., Jansma, L.-G., de Goede, M., van Ophem, J., de Vries, A. (eds.), *On the Mysteries of Unemployment. Causes, Consequences and Policies*, part 2, Studies in Operational Regional Science, 10: 129–144, Springer Netherlands, DOI: 10.1007/978–94–015–8080–9_10.

Bover, O., Arellano, M., Bentotila, S., 2002, *Unemployment Duration, Benefit Duration and the Business Cycle*, The Economic Journal, 112(479): 223–265.

Carroll, N., 2006, *Explaining Unemployment Duration in Australia*, Economic Record, 82(258): 298–314.

Collier, W., 2003, *The Impact of Demographic and Individual Heterogeneity on Unemployment Duration: A Regional Study*, Studies in Economics, 0302, Department of Economics, University of Kent.

Corak, M., 1996, *Measuring the Duration of Unemployment Spells*, The Canadian Journal of Economics, 29(special issue, part 1): S43-S49.

Dànàcicà, D.-E., Cîrnu, D., 2014, *Unemployment Duration and Exit States of Disabled People in Romania*, Romanian Journal of Economic Forecasting, XVII(1): 35–52.

Daras, T., Jerzak, M., 2005, *Wpływ cech społeczno-demograficznych osób bezrobotnych na możliwość znalezienia pracy. Badanie na podstawie danych BAEL w latach 1993–2003*, Materiały i Studia, 189: 1–35, Narodowy Bank Polski, Warszawa.

Dynarski, M., Sheffrin, S.M., 1990, *The Behavior of Unemployment Durations over the Cycle*, The Review of Economics and Statistics, 72(2): 350–356.

Eriksson, T., Reija, L., Hege, T., 2002, *Determinants of Job Search Intensity Some Evidence from the Nordic Countries*, paper presented at the EALE 2002 Annual Conference at Sorbonne, September 21, Paris.

Greenacre, M., 2000, *Correspondence Analysis of Square Asymmetric Matrices*, Applied Statistics, 49(part 3): 297–310.

Greenacre, M., 2007, *Correspondence Analysis in Practice, Interdisciplinary Statistics*, 2nd ed., Chapman & Hall/CRC, imprint of the Taylor & Francis Group, LLC, Boca Raton, London, New York.

Greenacre, M., Hastie, T., 1987, *The Geometric Interpretation of Correspondence Analysis*, Journal of the American Statistical Association, 82(398): 437–447.

Grogan, L., van den Berg, G.J, 2001, *The Duration of Unemployment in Russia*, Journal of Population Economics, 14(3): 549–568.

Grzenda, W., 2012, *Badanie determinant pozostawania bez pracy osób młodych z wykorzystaniem semiparametrycznego modelu Coxa*, Przegląd Statystyczny, special issue 1: 123–139.

Izyumov, A., Vahaly, J., 2014, *Recent Trends in Factor Income Shares: a Global Perspective*, Journal of Economic Studies, 41(5): 696–707.

Kerckhofes, C., de Neubourg, C., Palm, F., 1994, *The Determinants of Unemployment and Job Search Duration in the Netherlands*, De Economist, 142(1): 21–42.

Kołodziejczak, W., Wysocki, F., 2013, *Identyfikacja charakteru bezrobocia w Polsce w latach 2006–2009*, Gospodarka Narodowa, 9(265): 29–52.

Kupets, O., 2006, *Determinants of Unemployment Duration in Ukraine*, Journal of Comparative Economics, 34(2): 228–247.

Kwiatkowski, E., Kucharski, L., Tokarski, T., 2002, *Elastyczność zatrudnienia w przekroju sektorowym i regionalnym w Polsce*, Gospodarka Narodowa, 4: 1–20.

Lalive, R., 2007, *Unemployment Benefits, Unemployment Duration, and Post-Unemployment Jobs: A Regression Discontinuity Approach*, The American Economic Review, 97(2): 108–112.

Landmesser, J.M., 2013, *Decomposing the Gender Gap in Average Exit Rate from Unemployment*, Dynamic Econometric Models, 13: 163–174, DOI: 10.12775/DEM.2013.009.

Lee, M.-J., Lee, S.-J., 2005, *Analysis of Job-Training Effects on Korean Women*, Journal of Applied Econometrics, 20(4): 549–562.

Long, K., 2009, *Unemployment Durations: Evidence from the British Household Panel Survey*, Economic & Labour Market Review, 3(10): 48–54.

Mavridis, D., 2015, *The Unhappily Unemployed Return to Work Faster*, IZA Journal of Labor Economics, 4(2): 1–22, DOI 10.1186/s40172–014–0015-z.

Ostasiewicz, W. (red.), 1998, *Statystyczne metody analizy danych*, Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, Wrocław.

Panek, T., 2009, *Statystyczne metody wielowymiarowej analizy porównawczej*, SGH w Warszawie, Warszawa.

Richardson, K., van den Berg, G.J., 2013, *Duration Dependence versus Unobserved Heterogeneity in Treatment Effects: Swedish Labor Market Training and the Transition Rate to Employment*, Journal of Applied Econometrics, 28(2): 325–351, DOI: 10.1002/jae.

Røed, K., Jensen, P., Thoursie, A., 2008, *Unemployment Duration and Unemployment Insurance: A Comparative Analysis Based on Scandinavian Micro Data*, Oxford Economic Papers, New Series, 60(2): 254–274.

Røed, K., Zhang, T., 2003, *Does Unemployment Compensation Affect Unemployment Duration?*, The Economic Journal, 113(484): 190–206.

Rotaru, C.I., 2014, *Transitioning out of Unemployment: Analysis Using the ABS Longitudinal Labour Force Survey File*, Australian Journal of Labour Economics, 17(2): 111–137.

Sasaki, M., Kohara, M., Machikita, T., 2013, *Measuring Search Frictions Using Japanese Microdata*, The Japanese Economic Review, 64(4): 431–451, DOI: 10.1111/jere.12011.

Socha, M., Sztanderska, U., 2002, *Strukturalne podstawy bezrobocia w Polsce*, Wydawnictwo Naukowe PWN, Warszawa.

Stanimir, A., 2005, *Analiza korespondencji jako narzędzie do badania zjawisk ekonomicznych*, Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, Wrocław.

Stetsenko, S., 2003 *On the Duration and the Determinants of Ukrainian Registered Unemployment: A Case Study of Kyiv*, Master of Arts Thesis, EERC, Kiev.

Taşçı, H.M., 2008, *Search and Determinants of Job Search Intensity in Turkey*, METU Studies in Development, 35(4): 399–425.

Wadsworth, J., 1991, *Unemployment Benefits and Search Effort in the UK Labour Market*, Economica, 58(229): 17–34.

Wysocki, F., Kołodziejczak, W., 2007, *Aktywność ekonomiczna ludności wiejskiej w Polsce*, Wydawnictwo Akademii Rolniczej w Poznaniu, Poznań.

Aims and Scope

Economics and Business Review is the successor to the Poznań University of Economics Review which was published by the Poznań University of Economics and Business Press in 2001–2014. The Economics and Business Review is a quarterly journal focusing on theoretical and applied research work in the fields of economics, management and finance. The Review welcomes the submission of articles for publication dealing with micro, mezzo and macro issues. All texts are double-blind assessed by independent reviewers prior to acceptance.

Notes for Contributors

1. Articles submitted for publication in the Economics and Business Review should contain original, unpublished work not submitted for publication elsewhere.
2. Manuscripts intended for publication should be written in English and edited in Word and sent to: secretary@ebr.edu.pl. Authors should upload two versions of their manuscript. One should be a complete text, while in the second all document information identifying the author(s) should be removed from files to allow them to be sent to anonymous referees.
3. The manuscripts are to be typewritten in 12' font in A4 paper format and be left-aligned. Pages should be numbered.
4. The papers submitted should have an abstract of not more than 100 words, keywords and the Journal of Economic Literature classification code.
5. Acknowledgements and references to grants, affiliation, postal and e-mail addresses, etc. should appear as a separate footnote to the author's name[a, b, etc] and should not be included in the main list of footnotes.
6. Footnotes should be listed consecutively throughout the text in Arabic numerals. Cross-references should refer to particular section numbers: e.g.: See Section 1.4.
7. Quoted texts of more than 40 words should be separated from the main body by a four-spaced indentation of the margin as a block.
8. Mathematical notations should meet the following guidelines:
   - symbols representing variables should be italicized,
   - avoid symbols above letters and use acceptable alternatives (Y*) where possible,
   - where mathematical formulae are set out and numbered these numbers should be placed against the right margin as... (1),
   - before submitting the final manuscript, check the layout of all mathematical formulae carefully (including alignments, centring length of fraction lines and type, size and closure of brackets, etc.),
   - where it would assist referees authors should provide supplementary mathematical notes on the derivation of equations.
9. References in the text should be indicated by the author's name, date of publication and the page number where appropriate, e.g. Acemoglu and Robinson [2012], Hicks [1965a, 1965b]. References should be listed at the end of the article in the style of the following examples:
   Acemoglu, D., Robinson, J.A., 2012, *Why Nations Fail. The Origins of Power, Prosperity and Poverty*, Profile Books, London.
   Kalecki, M., 1943, *Political Aspects of Full Employment*, The Political Quarterly, vol. XIV, no. 4: 322–331.
   Simon, H.A., 1976, *From Substantive to Procedural Rationality*, in: Latsis, S.J. (ed.), *Method and Appraisal in Economics*, Cambridge University Press, Cambridge: 15–30.
10. Copyrights will be established in the name of the E&BR publisher, namely the Poznań University of Economics and Business Press.

More information and advice on the suitability and formats of manuscripts can be obtained from:

Economics and Business Review
al. Niepodległości 10
61-875 Poznań
Poland
e-mail: secretary@ebr.edu.pl
www.ebr.ue.poznan.pl

Subscription

Economics and Business Review (E&BR) is published quarterly and is the successor to the Poznań University of Economics Review. The E&BR is published by the Poznań University of Economics and Business Press.

Economics and Business Review is indexed and distributed in ProQuest, EBSCO, CEJSH, BazEcon and Index Copernicus.

Subscription rates for the print version of the E&BR: institutions: 1 year – €50.00; individuals: 1 year – €25.00. Single copies: institutions – €15.00; individuals – €10.00. The E&BR on-line edition is free of charge.

Correspondence with regard to subscriptions should be addressed to: Księgarnia Uniwersytetu Ekonomicznego w Poznaniu, ul. Powstańców Wielkopolskich 16, 61-895 Poznań, Poland, fax: +48 61 8543147; e-mail: info@ksiegarnia-ue.pl.

Payments for subscriptions or single copies should be made in Euros to Księgarnia Uniwersytetu Ekonomicznego w Poznaniu by bank transfer to account No.: 96 1090 1476 0000 0000 4703 1245.