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DEVELOPMENTS OF EMPLOYMENT
BY BROAD AGE-GROUPS IN POLAND IN THE
YEARS 1998–2008. DO THEIR DETERMINANTS
DIFFER?

INTRODUCTION

Ageing and shrinking of population observed and foreseen in Poland and other EU countries creates a need for better utilization of remaining labour resources in order to sustain economic growth in the future. The crucial issue for evidence-based policy aimed at groups underrepresented in the labour market (i.e. the youth, the older workers, women) is to better understand employment determinants of different age groups. In particular, knowledge on possible impact of different factors on employability and work ability is needed. The former is defined as: *‘a set of achievements – skills, understandings and personal attributes – that make graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy’* (Yorke 2004, p. 8), while for the latter a concept developed by Ilmarinen (1999) is used. This concept is explained in the paper.

The aim of this article is to reveal differences in basic determinants of employment for three groups: youth and young adults, prime-aged and older workers in Poland in the years 1998–2008. In this period we can observe both different business cycles and structural changes on the labour market. The determinants selected include individual characteristics (such as: age, sex, education, family and household context) and the contextual factors (general economic conditions and the time-variant situation in the regional labour market). My objective is also to study changes in employment profiles of the identified age groups in the period under consideration. However, longitudinal data on this topic are not available for Poland and thus longitudinal approaches cannot be used in the paper.

The paper is organized as follows. First, theoretical framework is discussed. It refers to a work ability concept (Ilmarinen 1999) over the life course (Reday-Mulvey 2005). In addition, a brief overview of empirical research on employment determinants in Poland is presented. The multilevel models of employment determinants are under focus in the subsequent section, which is followed by empirical results. The paper ends with final conclusions.

THE FRAMEWORK FOR AN EMPRICAL APPROACH

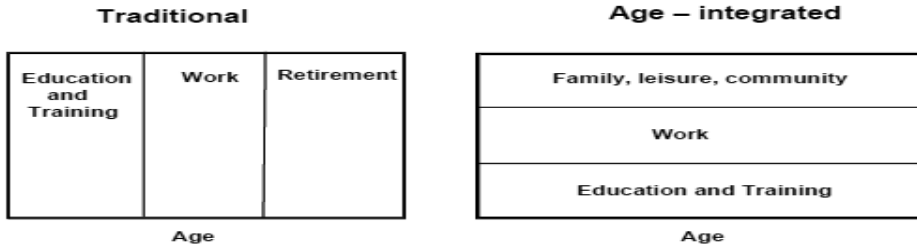
The basic recommendation coming from the literature on the economic activity of working age population states that in order to increase employment policymakers should focus on complex measures aimed at individuals, employers, as well as institutions and organizations having influence on labour market policies. It is essential to take into account besides individual factors also the social context of employment decisions and external factors like the economic performance and employment regulations. Attention should be paid to employability and work ability (Ilmarinen 1999) of the working-age population over the life course (Reday-Mulvey 2005). It is essential to include these two perspectives for designing tailored-made policy aimed at increasing economic activity and employment of all age groups.

The work ability concept (Ilmarinen 1999) integrates a wide range of employment determinants. It concerns not only factors reflecting an individual potential (such as health and functional abilities, human capital, as well as motivation and attitudes towards work), but also it emphasizes the essential role of work conditions for maintaining work ability i.e. work organization, management and physical conditions. Moreover, it highlights importance of external environment outside work, such as family, friends and relatives. Other factors like legislation, infrastructure, and the structure of economy create a broader background for the individual work ability (Grabowska 2012).

Work ability changes over the life course. The driver of change is, inter alia, the stepwise ageing process of an individual and its impact on an individual human capital. In this respect lifelong learning, accumulation of experience, skills and knowledge should also be taken into account. In parallel, organization, methods and tools of work, as well as work intensity change nowadays much faster than individual adaptive capabilities (Ilmarinen, Tuomi 2004, Villosio 2008).

Sustaining work ability demands proper decisions connected with all dimensions of work ability in a life course perspective, not only at later stages of a professional career. Therefore, an adequate approach should focus on economic activity by age placed in a broader context of changing demand for labour, work organisation as well as work-family balance (Chłoń-Domińczak, Kotowska 2012, Redey-Mulvey 2005, Bengtson, Allen 1993). This means a change from the traditional model to the integrated model of life phases (see Figure 1).

Figure 1. Life phases – traditional and integrated approach



Source: Reday-Mulvey G., 2005, Working beyond 60. Key Policies and Practices in Europe, Palgrave Macmillan, London.

The integrated approach implies that different life activities cannot be solely assigned to a particular life stage. On the contrary, they should be considered as parallel activities and constitutive elements of the whole life perspective. A life course approach on a supply side takes into account factors determining employment decisions at each particular life stage while on a demand side it gives employers more information on capabilities of employees at different life stages. However, it is to be stressed that a proper understanding of employment from the life course perspective creates opportunity to establish employment patterns suited to needs of employers and employees.

The paper focuses on a supply side. Different life stages are depicted by broad age: for youth and young adults (15–29 years old) – that stage of life course concerns a transition to adulthood, prime-aged (30–54 years old) – here family formation, a transition to parenthood and stabilization on the labour market are distinctive as ‘makers’ of that life stage, and older workers (55–59 years old for women and 55–64 years old for men) – in that stage of life exits from the labour market start while family life is characterised by the ‘empty nest’ phase. To investigate which factors determine employment of persons from these three subgroups over the years 1998–2008, determinants usually referred to are classified.

The employment determinants and their impacts are broadly discussed in the literature. Firstly, it is to mention that employment determinants are usually considered separately for men and women due to different life and career histories of both sexes (e.g. Kotowska, Sztanderska 2007, Grabowska 2012, Matysiak 2011). Secondly, empirical research concerns mainly groups which are underrepresented on the labour market, such as women (e.g. Matysiak 2011), youth and young adults (Knijn 2012, Kotowska et al. 2010) or older workers (e.g. Grabowska 2012, Chłoń-Domińczak, Kotowska 2012, Ruzik 2004, Kotowska et al. 2010). When it comes to women’s employment attention has been paid to interdependencies between labour market activity and motherhood (Matysiak 2011, Kotowska, Sztanderska 2007). In case of youth and young adults the transition to adulthood has been analysed, including such processes as leaving parental home, finding a first job and starting

own family (Baranowska 2011). In the literature different approaches have been used to define youth and young adults. They refer to the following age groups: 18–34, 15–24, 15–29 (e.g. Billari, Liefbroer 2010, Knijn 2012).

Employment determinants considered usually in the literature could be grouped into a few broad categories:

1. Economic:

- connected with economy and business cycle, as well as with labour market situation (e.g. Strzelecki, Kotowska 2009, European Commission 2005, 2009 and 2011, OECD 2007);
- workplace environment (e.g. Sztanderska 2008, Villosio 2008, Bohacek, Myck 2008);

2. Institutional:

connected with public policy, for example social security regulations (e.g. Blöndal, Scarpetta 1999, Gruber, Wise 1999, Disney, Whitehouse 1999, Casey et. al. 2003), tax policy (e.g. Socha, Sztanderska 2000), family policy (e.g. Kotowska, Sztanderska 2007);

3. Individual (including family determinants):

- health and disability issues (e.g. Currie, Madrian 1999, Lumsdaine, Mitchel 1999, Bound 1991, Anderson, Burkhauser 1985);
- care responsibilities and other family arrangements (e.g. Kotowska, Sztanderska, Wóycicka 2007, Kotowska, Wóycicka 2008);
- human capital (e.g. Vlasblom, Nekkers 2001, Blöndal, Scarpetta 1999, Socha-Sztanderska 2000);

4. Socio-cultural:

- norms and attitudes towards different subpopulations and their economic activity (e.g. Józwiak, Kotowska, Abramowska 2008, Kotowska, Wóycicka 2008, Schoenmaeckres, Callens, Vanderleyden, Vidovicova 2008, Grabowska 2012).

The presented classification is an example of several typologies used in the literature. A commonly used typology distinguishes between push and pull factors. In the grouping proposed here the direction of possible impacts is a key issue. The factor itself can both push out of and pull onto the labour market depending on its construction or a level of analyses.

In this paper, a focus will be mainly on individual determinants and on factors connected with the business cycle and the labour market situation (contextual variables).

DATA AND METHOD

Determinants of employment of three main working age groups in Poland in the years 1998–2008 will be studied on data coming from the Labour Force Surveys (LFS) and regional labour market data. Impacts of individual characteristics, the

general economic situation and other contextual determinants (e.g. regional labour market differences) are to be identified by use of multilevel logistic regressions. Firstly, a model for the whole working-age population was formulated to examine factors affecting the likelihood of being employed. Since they differ by sex (Kotowska, Sztanderska 2007, Matysiak 2011), the model is estimated for women and men separately. Here, the main age groups distinguished are disaggregated into five age groups to get more detailed insights into youth and young adults as well a prime-age population.

Then, the age-specific models were estimated to investigate how employment determinants vary between different life stages. Three age-specific models were considered: for youth and young adults (15–29 years old), prime-aged (30–54 years old), and older workers (55–59 years old for women and 55–64 years old for men). These models have been specified for men and women separately and for agricultural and non-agricultural sectors. That approach allows to seek for an answer to the basic research question: do determinants of employment vary across the main age-groups of population which refer to different stages of the life course?

The method applied is a multilevel logistic regression (i.e. Kreft, De Leeuw 1998, Goldstein 1999, Callens 2005). Multilevel models are used to nested data structures. In our approach two levels are considered: the first level represents n_j individuals ($i = 1, \dots, n_j$), who belong to N groups ($j = 1, \dots, N$). In each group responses y_{ij} are correlated. In the multilevel logistic regression binary responses y_{ij} depend on individual-level explicative variables (x_{ij}), as well as on group-level explicative variables (z_j). In this case a standard logistic regression model is not adequate, because an independence assumption is violated and an inclusion of multiple group-level covariates is impossible.

To illustrate the difference between the standard logistic regression and the multilevel model I present below estimation equations:

- standard logistic regression model

$$\text{logit}(p_{ij}) = \log\left(\frac{p_{ij}}{1-p_{ij}}\right) = \alpha + \beta x_{ij} \tag{1}$$

- random logistic regression models

$$\text{logit}(p_{ij}) = \alpha_j + \beta_j x_{ij} \tag{2}$$

Random intercept: $\alpha_j \sim \mathbf{N}(\alpha, \sigma_0^2)$

Random slope: $\beta_j \sim \mathbf{N}(\beta, \sigma_1^2)$

- extended random logistic regression models

$$\text{logit}(p_{ij}) = \alpha_j + \beta_1 x_{ij} + \beta_2 z_j + \beta_3 x_{ij} z_j \quad (3)$$

It is also worth noting the most important advantages of multilevel modelling. First of all, multilevel models make it possible to analyze complex data structure (nested data), for which individuals are not independent. Moreover, they let to incorporate random effects – when researchers want to draw conclusions on population, from which individuals are taken, and not on individuals themselves. It is also important that multilevel modelling enable us to estimate both individual and group level variations. This method corrects underestimation of standard errors.

To estimate multilevel models of employment the Laplace estimation has been used. It is a good approximation of the maximum likelihood method. It provides also estimates of deviance statistics, which are used to verify the models. Calculations were performed in the R programme (lmer procedure).

The estimation of all models was based on individual data coming from the Labour Force Survey (LFS) database for the fourth quarters of 11 years, from 1998 to 2008. Employment rates in Poland vary strongly across regions (voivodeships). Moreover, they fluctuate with time (Bukowski 2010, Strzelecki, Kotowska 2009). So, it was assumed that the data used in the analysis had a nested structure. A group is constituted by a particular region in a particular year. Taking into account the period covered (11 years from the period 1998–2008) in 16 regions, the number of groups is 176. Therefore, the data set constructed includes:

- on the first level of the model, the standardized LFS data for the period 1998–2008. Data coming from fourth quarters of each year were taken into account to avoid seasonality of employment data;
- on the second level of the model, indicators reflecting changes in the regional labour market conditions in Poland for years 1998–2008 (quarterly data).

The estimated models can be divided into three groups:

- (1) The first class analyses employment determinants focusing on the whole population constituted of men (15–64 years old) and women (15–59 years old). The difference in the upper age limit between men and women results from different statutory retirement age in Poland in the period under considerations (60 years for women and 65 years for men). The binary dependent variable was defined as follows: $Y=1$, if a respondent was in employment and $Y=0$, if a respondent did not work;
- (2) The second class constitutes models for three age groups selected: youth and young adults (15–29 years old), prime-aged (30–54 years old) and older workers

(55–59 years) for women and 55–64 for men). The binary dependent variable was defined as follows: $Y=1$, if respondent worked in non-agricultural sector or $Y=0$, if respondent did not work or the last workplace was in the non-agricultural sector for persons aged 30–54 and 55–59/64 years;

- (3) The third class also concerns models for the three groups selected: youth and young adults (15–29 years old), prime-aged (30–54 years old) and older workers (55–59 years for women and 55–64 for men). However, it takes only agricultural sector into consideration to test how specific are employment determinants for this particular sector. The binary dependent variable was defined as follows: $Y=1$, if respondent worked in agricultural sector or $Y=0$, if respondent did not work or the last workplace was in the agricultural sector for persons at age 30–54 and 55–59/64 years.

For all models the explanatory variables were grouped in two categories:

- individual variables: age, sex, education, household position, place of residence (for models from the third group a place of residence was a control variable);
- contextual variables connected with general economic conditions: time of the survey, time-variant conditions on regional labour markets (employment rate – quarterly data provided for voivodships).

All individual variables and time of the survey (1998–2003, 2004–2008), which reflected the business cycle, were measured on the first level, whereas time-variant conditions on regional labour markets were measured on the second level. Due to the fact that all types of models were estimated separately for men and women, there were altogether 14 models:

- (1) two models general models with all age groups for men and women;
- (2) six models for non-agricultural sector for chosen age groups, those are:
 - two models for 15–29 age groups for men and women;
 - two models for 30–54 age groups for men and women;
 - two models for 55–59/64 age groups for men and women;
- (3) six models for agricultural sector for chosen age groups, those are:
 - two models for 15–29 age groups for men and women;
 - two models for 30–54 age groups for men and women;
 - two models for 55–59/64 age groups for men and women.

To verify impacts of both individual factors (the first level) and determinants associated with the regional labour market situation in particular year (second level variables) a random intercept logistic regression model was chosen. However, at this point I am not interested in testing how a particular explanatory variable varies randomly across groups in the analyzed data structure. The decision about the analytical approach was based on the assumption that the dependent variable was influenced not only by individual characteristics but also by contextual variables, such as the regional labour market situation at the moment of the survey. This assumption led to estimation of the following equation:

$$\text{logit}(p_{ij}) = \log\left(\frac{p_{ij}}{1-p_{ij}}\right) = \gamma_{00} + \beta_{1j}X_{ij} + \beta_{2j}Z_j + u_{0j} \quad (4)$$

where γ_{00} is random intercept and β coefficients are fixed regression parameters.

The procedure to check whether a multilevel approach is correct makes use of an interclass correlation coefficient (ICC), which measures a model variability. The ICC ranges from 0 to 1. If the ICC is small, the question arises: is it justified to use multilevel modelling? To answer this question a design effect defined by the formulae (5) should be taken into account.

$$\text{DEFF (design effect)} = 1 + (\text{average group size} - 1) \times \text{ICC} \quad (5)$$

If its value is over 2, multilevel modelling is reasonable.

The ICC for each model (level 2 variability) was computed on the basis of the empty model (without explanatory variables). It could be interpreted as a measure of an individual independence. Next the DEFF was calculated. Both measures are given in Table A1. Their values allow to conclude that multilevel modelling brings new information for all estimated models.

To test the parsimony of modelling, for each model three submodels have been estimated: the empty submodel (M0), the submodel with only individual level covariates (M1) and the submodel with both individual and group levels covariates (M2). The M0 submodel concerns population of groups, where a success probability is constant in each group. The M1 submodel incorporates individual covariates to the model making a success probability inconstant for individuals in each group. The M2 submodel includes the full set of variables taken into account. In Table A2 basic statistics of submodels used to test the parsimony of the models are presented. According to the Akaike Information Criterion (AIC)¹ as well as chi-square² test based on deviance (for $\alpha=0,05$) the best submodel for all 14 models is M2 with all variables (individual and group-levels).

INDIVIDUAL AND CONTEXTUAL DETERMINANTS OF EMPLOYMENT

ESTIMATION RESULTS OF MODELS FOR THE WORKING AGE POPULATION

The results of the general model (for the entire working-age population and all sectors) presented below (Table 1) are consistent with the evaluation of the labour market in Poland for that period based on aggregate indicators (Strzelecki, Kotowska 2009).

¹ AIC = $-2\log\text{Lik} + 2K$, K - number of parameters in the model, the smallest AIC the better model.

² $\chi^2 = |\text{difference in deviance of both compared models}| \sim \chi^2$ distribution with degrees of freedom = difference in parameters of both compared models. If the χ^2 value is statistically insignificant, the more complicated model is not better.

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Table 1. Estimation results of employment determinants, population aged 15–64 (men) and 15–59 (women) years old

Variables	Coding	Men		Women	
		Odds ratio	Sig.	Odds ratio	Sig.
Age	15–24 years old	5,01	***	7,69	***
	25–29 years old	18,38	***	20,12	***
	30–39 years old	33,87	***	20,10	***
	40–54 years old	8,79	***	12,63	***
	55–64 years old (M)/ 55–59 years old (W)	ref.		ref.	
Household position	head	ref.		ref.	
	partner of the head	0,32	***	0,62	***
	others	0,27	***	0,57	***
Education	primary	ref.		ref.	
	primary vocational	1,80	***	1,56	***
	secondary vocational	2,86	***	3,01	***
	general upper secondary	2,15	***	2,24	***
	tertiary	6,28	***	8,55	***
Place of residence	big cities (above 100k)	0,73	***	0,77	***
	middle-sized towns (20–100k)	0,59	***	0,62	***
	small towns (below 20k)	0,60	***	0,63	***
	villages	ref.		ref.	
Period	1998–2003	ref.		ref.	
	2004–2008	1,22	***	0,99	
Quarterly employment rate by regions		1.07	***	1,07	***
Quarterly employment rate by regions x age	quarterly employment rate by regions x age 15–24	1,00		0,98	***
	quarterly employment rate by regions x age 25–29	0,99		0,97	***
	quarterly employment rate by regions x age 30–39	0,98	***	0,98	***
	quarterly employment rate by regions x age 40–54	0,99	*	0,98	***
	quarterly employment rate by regions x age 55–64(M); 55–59 (W)	ref.		ref.	

Significance level: 0.001: ‘***’; 0.01: ‘**’; 0.05. : ‘*’.

Source: own calculations.

The probability of being employed is significantly higher for those at age 25–29 years for those in the reference group (men aged 55–64 and women aged 55–59). However, the highest probability of being employed is observed among men aged 30–39, who have a significantly better employment outlook than 25–29 year-olds and the reference group. The age profile for women is not so differentiated, presumably due to childcare responsibilities. Both 25–29 and 30–39 age groups have the same relative chance of employment. The household position (defined as the relationship to the head of a household) is also of a paramount importance. In general, heads of households are more likely to be employed than other household members. Wives of household heads work more often than other female household members. Husbands married to household heads are also characterized by higher employment probabilities than other male household members, although it is lower than that of wives'. These relations are attributable to economic and cultural factors and to family patterns of employment with a dominant position of a dual earner model also among families with children under 14 years of age (Baranowska-Rataj, Rynko, 2013). Due to existing gender wage gap, the higher wages of men make them usually a head of a household within a dual earner model. Therefore, should a man not be a household head, it is usually due to his unemployment rather than to lower earnings. Household positions other than a household head limit significantly employment prospects for people aged 15–29 and 30–54. These are usually adult children who have not formed their own household for economic or other reasons (education, health).

For both men and women, more education increases the probability of being employed. The highest sex difference in terms of returns to education is found for the tertiary level. The chances for employment of females with tertiary education are significantly higher than of men (compared to the reference group, i.e. persons with primary education).

The place of residence is another factor influencing on employment prospects. Urban dwellers (especially those living in small towns) have on average lower employment chances than people living in the countryside (although agriculture is the predominant sector offering employment in rural areas).

Men benefited to a greater extent from the economic upturn of 2004–2008. By contrast, female employment prospects did not change much in the two time periods under study, possibly due to occupational segregation with respect to sex as well as to changes in the demand for labour in specific sectors of the economy. Generally speaking, better economic conditions improve the labour market situation for those working in construction and manufacturing, i.e. in male-dominated sectors (BAEL 2008). In the model, differences in the labour market situation between regions are approximated by the quarterly employment rate in each region (voivodeship). The increasing regional employment rate appears to have more impact on the likelihood of being employed for older workers than for persons at prime-age (which is especially true of women). Therefore, a positive demand shock only slightly closes

the employment gap between the oldest group and 30–54 year olds. It should be borne in mind that the disproportion between employment rates in both groups (30–54 year-olds and 55–59/64 year-olds) is still extensive, regardless of the business cycle phase (Kotowska et al. 2010, European Commission 2009, 2011).

ESTIMATION RESULTS OF MODELS FOR YOUTH AND YOUNG ADULTS, PRIME-AGED AND OLDER WORKERS IN THE NON-AGRICULTURAL SECTOR

The different nature of employment in agriculture as compared to the non-agricultural sector may potentially distort the impact of labour supply characteristics and contextual variables on the employment opportunities for the total population. Thus, separate models to identify employment determinants in the non-agricultural sector and agriculture are proposed. Here, our focus is on the model for the former sector. In the previous section, the multilevel regression model described the probability of employment with age as one of the explanatory variables. However, it can be assumed that the impact of other independent variables varies across age groups. To test this assumption subsequent models were estimated for men and women independently for the following age groups: 15–29, 30–54 and 55–59 (women) and 55–64 (men) (see Tables 2, 3, and 4).

It is necessary to explain that the population of the non-employed was defined differently for the youngest and for other age groups. The non-employed population in these models does not include people aged 30–54 and 55–64 who previously worked in agriculture. This was motivated by the fact that in these age groups labour flows between agriculture and other sectors of the economy are very rare, similarly to the flow from agriculture to unemployment (see Strzelecki, Kotowska 2009). For the youngest age group (15–29 years), which register the greatest flows between sectors, the non-employed population included all persons regardless of their last workplace. In the models formulated for agriculture the same definition of the non-employed population was applied.

Table 2. Estimation results of employment determinants, population aged 15–29 years old (non-agricultural sector)

Variables	Coding	Men		Women	
		Odds ratio	Sig.	Odds ratio	Sig.
Age	15–24 years old	0,39	**	0,33	***
	25–29 years old	ref.		ref.	
Household position	head	ref.		ref.	
	partner of the head	0,23	***	0,38	***
	others	0,21	***	0,54	***
Education	primary	ref.		ref.	
	primary vocational	3,08	***	3,43	***
	secondary vocational	4,74	***	6,73	***
	general upper secondary	3,33	***	4,78	***
	tertiary	6,53	***	14,98	***
Place of residence	big cities (above 100k)	0,95		1,47	***
	middle-sized towns (20–100k)	0,77	***	1,1	**
	small towns (below 20k)	0,79	***	1,04	
	villages	ref.		ref.	
Period	1998–2003	ref.		ref.	
	2004–2008	1,31	***	1,06	
Quarterly employment rate by regions		1,06	***	1,02	***
Quarterly employment rate by regions x age	quarterly employment rate by regions x age 15–24	1,00		1,01	*
	quarterly employment rate by regions: age 25–29	ref.		ref.	

Significance level: 0.001: ‘***’; 0.01: ‘**’; 0.05: ‘*’.

Source: own calculations.

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Table 3. Estimation results of employment determinants, population aged 30–54 years old (non-agricultural sector)

Variables	Coding	Men		Women	
		Odds ratio	Sig.	Odds ratio	Sig.
Age	30–39 years old	3,77	***	1,76	**
	40–54 years old	ref.		ref.	
Household position	head	ref.		ref.	
	partner of the head	0,27	***	0,52	***
	others	0,23	***	0,47	***
Education	primary	ref.		ref.	
	primary vocational	2,47	***	1,98	***
	secondary vocational	4,31	***	4,61	***
	general upper secondary	3,16	***	3,32	***
	tertiary	12,12	***	16,87	***
Place of residence	big cities (above 100k)	1,07	**	1,17	***
	middle-sized towns (20–100k)	0,91	***	1,01	
	small towns (below 20k)	0,88	***	1,04	.
	villages	ref.		ref.	
Period	1998–2003	ref.		ref.	
	2004–2008	1,21	***	0,99	
Quarterly employment rate by regions		1,05	***	1,04	***
Quarterly employment rate by regions x age	quarterly employment rate by regions x age 30–39	0,99	.	0,99	*
	quarterly employment rate by regions x age 40–54	ref.		ref.	

Significance level: 0.001: '***'; 0.01: '**'; 0.05: '*'; 0,1: '.'.

Source: own calculations.

Table 4. Estimation results of employment determinants, population aged 55–64 (men) and 55–59 (women) years old (non-agricultural sector)

Variables	Coding	Men		Women	
		Odds ratio	Sig.	Odds ratio	Sig.
Age	55–64 (M); 55–59 (W)	0,86	*	0,58	**
Household position	head	ref.		ref.	
	partner of the head	0,48	***	0,6	***
	others	0,38	***	0,46	***
Education	primary	ref.		ref.	
	primary vocational	1,67	***	1,37	***
	secondary vocational	2,97	***	2,8	***
	general upper secondary	2,96	***	2,63	***
	tertiary	8,5	***	8,48	***
Place of residence	big cities (above 100k)	1,61	***	1,47	***
	middle-sized towns (20–100k)	1,09	*	1,03	
	small towns (below 20k)	1,13	*	0,97	
	villages	ref.		ref.	
Period	1998–2003	ref.		ref.	
	2004–2008	1,2	***	0,92	.
Quarterly employment rate by regions		1,18	.	0,76	
Quarterly employment rate by regions x age		1		1,01	

Significance level: 0.001: ‘***’; 0.01: ‘**’; 0.05: ‘*’; 0,1: ‘.’.

Source: own calculations.

Our findings based on the analysis performed exclusively for the non-agricultural sector are consistent with previous observations. There are, however, certain differences in how strongly age impacts the probability of being employed: people aged 15–24 are still less likely to be in employment than 25–29 year-olds, but the drop in probability of being employed is stronger for women than for men in that age group. Sex differences in education may influence on this situation. Among older

workers the likelihood to remain in employment decreases with age, much more smoothly for males than for females. The household position has a similar effect on employment opportunities in the non-agricultural sector as in the models estimated for the whole economy. Employment returns to education are much stronger in the models for the non-agricultural sector. This proves that additional qualifications and skills are rewarded much more in non-agriculture as compared to agriculture. In effect, a continuously changing educational structure of employment will provide stronger incentives for the better educated young people to leave agriculture. The previous findings concerning employment bonuses for different age groups deriving from educational achievement remain valid, that is, the 30–54 year-olds are better rewarded in this respect than the youngest and older workers, for whom this factor demonstrates a dropping tendency. It is noteworthy that women benefit more from tertiary education, especially those aged 15–29 and 30–54. In the oldest age group, benefits from tertiary education are the same for both sexes (see also Kotowska et al. 2010, European Commission 2009, 2011).

Some of the outcomes regarding the impact of place of residence on employment prospects are worth emphasizing. Among the youngest women, residents of small towns are characterized by almost the same probability of being employed as their village counterparts. However, females residing in bigger cities enjoy much better employment prospects than those living in middle-sized towns. On the one hand, it might be related to different ways of sharing family duties between spouses in large cities and towns or, on the other hand, to differences in absorbing women's labour supply by both types of labour markets. The first interpretation is supported by the fact that women aged 30–54 residing in large cities have a higher likelihood of being employed than their village counterparts, even though the regional differences are markedly lower than those for the youngest women. Even females residing in small towns stand better chances of finding a job than women living in villages. For young men, differences in employment opportunities in the non-agricultural sector by place of residence are not so pronounced. Unlike women, young males from large cities are just as likely to be employed outside the agricultural sector as their counterparts from the countryside, while the probability of being employed for men in middle-sized and small towns in the non-agricultural sector is even smaller. This points to a relatively more difficult labour market situation of young men residing in cities. It may be correlated with their low level of human capital, constituting a strong employment determinant in this sector in cities. Employment opportunities of females aged 30–54 residing in middle sized and small towns are close to those of their counterparts living in villages. The situation of males and females residing in large cities has changed – they enjoy better employment prospects than their village counterparts. Those from middle-sized and small towns are again less likely to find a job outside agriculture than their rural counterparts. As could be expected, chances for employment outside agriculture differ more significantly between older male workers residing in cities, especially the large ones, and those

living in villages. In contrast, older women from middle-sized and small towns show similar probabilities to work in non-agriculture as women of that age residing in rural areas.

The economic upturn of 2004–2008 had slightly different effects on the estimates for the non-agricultural sector than for the entire economy. This can be linked directly to an increased demand for labour outside the agricultural sector. A better economic performance generally raises the chances for men to find jobs outside agriculture. The strongest employment effects of better economic conditions are observed for the youngest age group. In the two remaining groups, employment probabilities for men went up by a comparable amount, mainly due to the fact that employment opportunities in the non-agricultural sector soared also for older workers. For women the effect of the economic upturn is significant only for the oldest group, but the direction of impact is different than for men – better economic performance reduces the probability of finding jobs outside agriculture.

The situation in the regional labour markets matters for employment opportunities of persons aged 15–29 and 30–54 years: the better situation in the regional labour markets the higher probability of employment outside agriculture. For the oldest age group the conclusion is valid only for men.

To sum up, the results of the model for the non-agricultural sector show that there is a stronger impact of specific individual characteristics (especially education levels and place of residence) than this found in the models estimated for the whole economy. Education has a strong positive effect on the work record of women over their life course, which is particularly visible in younger age groups. A place of residence is another factor of paramount importance – females living in large cities (particularly the youngest and the oldest) have greater employment opportunities. Our results also suggest a diversified impact of contextual variables, such as general economic conditions or the labour market situation at the regional markets. The groups that benefit most from the economic recovery are the youngest people (both sexes) and men aged 55–64. The regional labour market situation matters for employment opportunities outside agriculture of persons aged 15–29 and 30–54 (both sexes), and raises the likelihood of older men to remain in employment outside agriculture.

ESTIMATION RESULTS OF MODELS FOR YOUTH AND YOUNG ADULTS, PRIME-AGED AND OLDER WORKERS IN THE AGRICULTURAL SECTOR

The models for the agricultural sector supplement our study on employment determinants in the non-agricultural sector. Like in the previous section, the models were estimated separately for men and women for the following age groups: 15–29, 30–54 and 55–59 (women) and 55–64 (men) (see Tables 5,6 and 7).

Developments of employment by broad age-groups in Poland in the years 1998-2008

Table 5. Estimation results of employment determinants, population aged 15–29 years old (agricultural sector)

Variables	Coding	Men		Women	
		Odds ratio	Sig.	Odds ratio	Sig.
Age	15–24 years old	0,36	.	0,32	.
	25–29 years old	ref.		ref.	
Household position	head	ref.		ref.	
	partner of the head	0,14	***	1,03	
	others	0,19	***	0,63	***
Education	primary	ref.		ref.	
	primary vocational	1,31	***	1,18	*
	secondary vocational	1,4	***	1,16	*
	general upper secondary	0,84		0,78	*
	tertiary	1,24		0,69	**
Period	1998–2003	ref.		ref.	
	2004–2008	1,12		1,05	
Quarterly employment rate by regions		1,12	***	1,14	***
Quarterly employment rate by regions x age	quarterly employment rate by regions x age 15–24	1,01		1,01	
	quarterly employment rate by regions x age 25–29	ref.		ref.	

Control variable: place of residence

Significance level: 0.001: '***'; 0.01: '**'; 0.05: '*'; 0,1: '.'

Source: own calculations.

Table 6. Estimation results of employment determinants, population aged 30–54 years old (agricultural sector)

Variables	Coding	Men		Women	
		Odds ratio	Sig.	Odds ratio	Sig.
Age	30–39 years old	1,04		0,14	*
	40–54 years old	ref.		ref.	
Household position	head	ref.		ref.	
	partner of the head	0,29	***	1,43	***
	others	0,4	***	0,73	***
Education	primary	ref.		ref.	
	primary vocational	1,77	***	2,21	***
	secondary vocational	2,5	***	2,2	***
	general upper secondary	3,57	***	2	***
	tertiary	4,84	***	6,62	***
Period	1998–2003	ref.		ref.	
	2004–2008	1,78	***	1,59	***
Quarterly employment rate by regions		1.1	***	1,08	***
Quarterly employment rate by regions x age	quarterly employment rate by regions: age 30–39	1,01		1,05	**
	quarterly employment rate by regions: age 40–54	ref.		ref.	

Control variable: place of residence

Significance level: 0.001: ‘***’; 0.01: ‘**’; 0.05: ‘*’.

Source: own calculations.

Table 7. Estimation results of employment determinants, population aged 55–64 (men) and 55–59 (women) years old (agricultural sector)

Variables	Coding	Men		Women	
		Odds ratio	Sig.	Odds ratio	Sig.
Age:	55–64 (M); 55–59 (W)	0,87	***	0,82	
Household position	head	ref.		ref.	
	partner of the head	0,64	***	0,87	
	others	0,68	***	0,63	***
Education	primary	ref.		ref.	
	primary vocational	1,12		1,06	
	secondary vocational	1,5	**	1,27	
	general upper secondary	2,32	**	1,03	
	tertiary	2,99	***	4,14	***
Period	1998–2003	ref.		ref.	
	2004–2008	1,19		1,28	*
Quarterly employment rate by regions		1,11	***	1,08	
Quarterly employment rate by regions x age*		not included in the model		1	

Control variable: place of residence

Significance level: 0.001: ‘***’; 0.01: ‘**’; 0.05: ‘*’.

Source: own calculations.

The results confirm that the influence of other variables on the employment probability differs across age groups. The population aged 15–24 years old is less likely to be employed compared to 25–29 years old, both for males and females. Employment opportunities for females aged 30–39 are much smaller than those for females aged 40–54 (approximately 86%). For males there is no effect recorded. The strong effect for females is connected with their family obligations, stronger in rural areas. The likelihood of being employed drops sharply with age. It is the lowest in the oldest age group but in agricultural sector the effect is significant only for men.

As for non-agriculture the impacts of education differ across age groups, however, returns to education are considerably lower in general. Among the youngest men only those having either primary vocational or secondary vocational education are more likely to be employed in the agriculture sector in comparison to persons with primary education. The youngest women reveal a different pattern of influence: those with vocational education (primary or secondary) are more likely to work in agriculture than women with the lowest level of education while general upper secondary and tertiary education reduce remarkably chances to be employed in that sectors. These results are consistent with empirical evidence about young persons' preferences for job – those with better skills, especially women, are seeking for jobs outside agriculture.

For the prime-aged the education effect is more pronounced than for the youth. In contrast to findings for the youngest persons, here the better educated persons have the higher employment opportunities. This gradual improvement of opportunities is clearly visible for men, while for women tertiary education makes the most visible difference. It might be related to the ongoing modernization of agriculture in Poland, accelerated after the EU accession.

Results for older workers show that a selection to employment in agriculture by education is also in place, especially among men. The effect for women is significant only for tertiary education, and stronger than for men.

Being the head of the household increases the probability of employment in agricultural sector, with exemption of women in prime age who are the partner (usually wife) of the head.

Better macroeconomic outlook after 2003 improved employment opportunities for prime-aged respondents (stronger for men) and older women. Other groups of people did not experience positive impacts of the economic recovery.

The higher regional employment rate coexists with employment chances in agriculture significantly higher for all population groups considered, except for women aged 55–59. This effect is generally more pronounced as compared with non-agriculture.

In general, the results obtained are different than for non-agricultural sector. It is related to a specific character of employment in agriculture, which is accompanied by stronger family and cultural influences on labour market behaviours. This seems to confirm that in studies on employment developments in Poland a distinction between changes in agricultural and non-agricultural employment provides valuable insights.

CONCLUSIONS

The work ability concept suggests to study employment from an individual perspective using a wide range of factors and context variables referring to both demand and supply side of the labour market. However, an individual work ability

should be considered within the life course framework, i.e. referring to different stages of both professional and private life, because the impact of particular work ability dimensions can vary with age. That approach was used to search how determinants of employment differ across main age groups, which reflect different stages of the life course.

In the proposed approach three main dimensions of work ability were considered: sex (women – men), age (youth and young adults – prime-aged – older workers) and sector of employment (agricultural – non-agricultural). They defined multilevel logistic models applied to identify main determinants of work ability quantified by a probability to be in employment.

Impacts of basic employment determinants, which reflect both individual and context characteristics, differ by age, sex, and sectors of employment. Results of the general models of employment opportunities show that the prime aged population, both men and women, has better employment outlook. Men, especially 30–39 year-olds, are characterized by much better employment prospects than persons from other age groups. For women of that age do not benefit from such improvements in employment opportunities, mainly due to their childcare responsibilities. The youngest age group (15–24 years old) are characterized by higher employment probabilities than the oldest one (55–59/64), especially for women. Moreover, women reveal higher returns to education than men. The place of residence affects similarly employment of men and women – the bigger cities show better employment opportunities for both sexes. Men benefited more from the economic upturn of 2004–2008.

In-depth analyses of employment opportunities outside agriculture and in agriculture of the youth and young adults, prime-aged persons and older workers illustrate differences of main effects by sex, age, and sector of employment.

The results for the non-agricultural sector reveal a stronger impact of education levels and place of residence. Education has a strong positive effect on the work record of women over their life course, significantly greater than for men of the youngest age and the prime-age. Employment returns to education in agriculture are much weaker than for non-agriculture, however, the positive selection to employment is visible as well except for youth. The youngest population (15–29 years old) with vocational education (primary or secondary) has better employment prospects than youth with only primary level of education. In addition, females at that age with higher education levels are characterized by lower probabilities of employment in agriculture. Young, well educated women inhibiting rural areas search employment outside agriculture. Contrary to that, the better educated prime-age people and older workers benefit from the better employment opportunities in the agricultural sector. For women with tertiary education the employment returns are stronger than for men. These results seem to confirm that skills matter also for employment in agriculture due to on-going modernization, but still there is a considerable gap in demand for skills between non-agriculture and agriculture.

The economic recovery matters for employment opportunities outside agriculture of the youngest people (both sexes) and the oldest men. This effect is smaller in agriculture and refers to the prime-aged persons (especially men) and older women.

The situation on regional labour markets similarly affects employment opportunities in both sectors: the better situation improves the probability to find employment for persons aged 15–29 and 30–54 (both sexes) and raises the likelihood of older men to remain in employment. In the agricultural sector the impact of regional labour market is stronger for the youngest and the prime-aged, while in the non-agricultural sector the effect is stronger for the oldest men.

These findings confirm that the proposed approach with three main dimensions of work ability (sex, age and sector of employment) proved to be right. Differences in impacts of determinants considered across these dimensions allow for a conclusion that effective policy measures aimed at increasing employment should be tailored-made according to patterns revealed.

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APPENDIX

Table A1. Basic statistics for all estimated models (1)

Type of the model		ICC	N	Deff
15–59/64 years old all sectors	Men	0,02	174111	17,13
	Women	0,01	166659	14,34
15–29 years old agricultural sector	Men	0,04	38822	10,37
	Women	0,02	36385	5,17
30–54 years old agricultural sector	Men	0,02	105236	14,01
	Women	0,02	110821	12,86
55–59/64 years old agricultural sector	Men	0,03	30053	5,37
	Women	0,03	19453	4,08
15–29 years old agricultural sector	Men	0,11	16276	11,44
	Women	0,16	19465	18,72
30–54 years old agricultural sector	Men	0,13	17655	13,49
	Women	0,14	15224	12,89
55–59/64 years old agricultural sector	Men	0,13	5442	4,83
	Women	0,09	3171	2,59

Source: own calculations.

Table A2. Basic statistics for all estimated models (2)

Type of the model		Type of the submodel	AIC	logLik	Deviance
15–59/64 years old all sectors	Men	M0	215357	-107676	215353
		M1	179062	-89516	179032
		M2	178787	-89373	178745
	Women	M0	225222	-112609	225218
		M1	208624	-104300	208600
		M2	198558	-99258	198516
15–29 years old non-agricultural sector	Men	M0	47629	-23812	47625
		M1	41891	-20933	41867
		M2	41778	-20874	41748
	Women	M0	49953	-24974	49949
		M1	46000	-22988	45976
		M2	45915	-22943	45885
30–54 years old non-agriculture sector	Men	M0	111779	-55887	111775
		M1	98546	-49261	98522
		M2	98308	-49139	98278
	Women	M0	141997	-70996	141993
		M1	130913	-65444	130889
		M2	130648	-65309	130618
55–59/64 years old non-agricultural sector	Men	M0	39495	-19745	39491
		M1	35607	-17791	35583
		M2	35442	-17706	35412
	Women	M0	22073	-11034	22069
		M1	20693	-10334	20669
		M2	20577	-10273	20547
15–29 years old agricultural sector	Men	M0	17316	-8656	17312
		M1	13029	-6503	13005
		M2	12913	-6441	12883
	Women	M0	14173	-7084	14169
		M1	11480	-5728	11456
		M2	11382	-5676	11352

Type of the model		Type of the submodel	AIC	logLik	Deviance
30–54 years old agricultural sector	Men	M0	10902	-5449	10898
		M1	10157	-5066	10133
		M2	10084	-5027	10054
	Women	M0	10903	-5450	10899
		M1	10338	-5157	10314
		M2	10283	-5127	10253
55–59/64 years old agricultural sector	Men	M0	6747	-3371	6743
		M1	6516	-3246	6492
		M2	6477	-3255	6449
	Women	M0	4296	-2146	4292
		M1	4193	-2084	4169
		M2	4164	-2067	4134

Source: own calculations.

DEVELOPMENTS OF EMPLOYMENT BY BROAD
AGE-GROUPS IN POLAND IN THE YEARS
1998–2008. DO THEIR DETERMINANTS DIFFER?

ABSTRACT

The latest Eurostat projections show that both population and labour force ageing change employment profiles by age in the European Union countries even in case of an increase in labour force participation and employment (The 2012 Ageing Report). My research question is how basic individual (such as age, education, household position, place of residence) and contextual characteristics (such as the business cycle and the regional labour market situation) influence on employment opportunities in Poland. I test whether the impact of different factors varies with age, which has been categorized to reflect different stages of the life course: youth and young adults (15–29 years old), prime aged (30–54 years old), and older workers (for women: 55–59, for men: 55–64). To answer the research question three types of multilevel logistic models were applied: (a) general models with age as one of the basic determinants, (b) models for each age group for non-agriculture and agriculture. The data used come from the Polish Labour Force Survey (BAEL) of the years 1998–2008 and regional labour market data.

The analysis reveals that there are differences in influence of individual and context variables on employment odd ratios between age groups, sex and employment sectors.

Keywords: employment profiles, age groups, employment determinants, work ability.