

# CHANGES IN DEMOGRAPHIC STRUCTURES OF ED5-6 GRADUATES WITH AN IMPACT ON THEIR ECONOMIC (IN)ACTIVITY

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## ABSTRACT

During past 12 years, the number of university graduates increased nearly threefold. This rapid change has an impact on the labour market and economic activity of the population. Therefore, the paper focus on the analysis of development of the number of university graduates by ISCED-97 classification in relation with the (in)active population of the Czech Republic by the education level. We particularly analyse the changes in the ED5-6 educated population structures based on demographic approaches: the moving of age-and-sex specific demographic structures using the Multi-tree charts. More students in the study programs mean increased number of economically inactive population in the age groups where the population have already been economically active in the past. Extension of studies and getting more degrees increases the economic inactivity in these age groups. We came to the conclusion that current trend worsens the position of young on the labour market.

## KEYWORDS

Economic activity and inactivity, demographic structures, ISCED-97, university graduates

## INTRODUCTION

University education is increasingly popular goal not only for young people. Over past 12 years (and especially since the accession of the Czech Republic to the European Union in May 2004), there has been a significant increase in the number of students at the Czech universities. The number of students in particular branches have increased recently (Fiala, Langhamrová and Průša, 2011) and they are currently filled to the maximum allowed by the directives. Nowadays the Czech universities leave almost three times more graduates, (who have at least one bachelor degree) than 12 years ago. The time until graduation increases as same as the number of students who study more than one program at the same time (or after the graduation at the one university they continue to study at another one). The increase of students and university graduates extends the period of economic inactivity of the population than ever before (Šimková, 2011). According to the classification of the highest attained education ISCED-97, the most frequent age group of economically inactive persons with education ED3-4 (upper secondary and post-secondary non-tertiary education) was 20–24 years. These were the students who successfully gained high school diploma and continued to study at the university (ED5-6, first or second stage of tertiary education) (Mejstřík, 2005). This age group of 20–24 years is now much numerous, but the higher frequencies can be seen in the female population. This is mainly due to higher number of female university students and due to higher numbers of female graduates from high schools who are already on parental leave (Nývlt, 2013a). In addition, together with the increasing of number of economically inactive people in the age group of 20–24 years, also increases the number of persons in the middle age groups (i.e. 25–29, and

mainly 30–34 and 35–39 years). It is caused by studying other study programs, during which the student doesn't work and neither enters economically active population (Nývt, 2013b). Furthermore it is caused by the study in doctoral programs in which the student is depended on scholarship or short-term job agreements, and, of course, the parental leave, which is postponed to the later ages (Dvořáková, Langhamrová, 2013). The birth of the first child is nowadays, more postponed as well (Fiala, Langhamrová and Průša, 2011). Females predominate in the middle age groups (especially 30–34 and 35–39 years) and in the number of economically inactive population. This number has increased almost three times within the past 12 years. The long-term trend is the interruption of studies at the universities with a tendency to graduate later, (this trend is becoming worldwide) (Park, Yu, 2013). In the past 12 years the number of students with interrupted studies in the age group of 20–24 and 25–29 years more than doubled. The main reasons for the interruption include short-term jobs, working abroad and short-term internships, maternity leave and also lack of e-learning opportunities (for detailed discussion see e.g. Jindrová et al., 2013). In this paper we analyse the changes in the ED5-6 educated demographic structures of the Czech population based on selected demographic approaches: the analysis of economic age-and-sex specific demographic structures using the “Multi-tree charts” (Šimpach, 2013). These changes are captured in time and are connected to the development of economic activity and inactivity of the population in the relevant age groups. The important consequences are evaluated. We determine the gender and age group with the largest proportion on the number of economically inactive population with specific education and which factors influence this proportion. In the same manner as the numbers of university students increase (and also the numbers of graduates increase), the risk that freshly graduated are unemployed is higher than before (Miskolczi, Langhamrová and Fiala, 2011). Labour market with these positions is slowly filled and staff fluctuation is not so frequent as e.g. before the crisis period (Potužáková, 2009). We describe how the labour market of ED5-6 educated persons has developed and evaluate the risks for fresh university graduates on the labour market.

## MATERIALS AND METHODS

We use the database of the Institute for Information in Education (IIE), particularly the performance indicators (IIE, 2012) obtained by the Ministry of Education, Youth and Sports (MEYS). The dataset include the numbers of students who have not yet graduated by age and sex and numbers of students with interrupted study, who have not graduated yet. We also use the number of first time university graduates by age and sex (*FTUG*) and university graduates in total (*UG*). The full data matrices are available from 2001 to 2013. Given that the estimates of economic-statistical indicators of labour market surveys, provided by Eurostat, are published later, we have currently available data matrices of these indicators by the end of 2012 only. Therefore, we use the data matrices from the IIE until 2012. Given that the population (*POP*) according to the methodology of International Labour Organisation (ILO) is divided into the population economically active (*ACT*) and economically inactive (*INACT*), using the known time series from the Eurostat (2014) database (point estimates from Labour Force Survey) it is possible to calculate the inactive population as

$$INACT_{x,t}^{s,e} = POP_{x,t}^{s,e} - ACT_{x,t}^{s,e}, \text{ where } x \in \langle 20 - 24 ; 40 - 44 \rangle, t \in \langle 2001 ; 2012 \rangle, \quad (1)$$

where  $x$  is the age-group in population,  $t$  is the time,  $s$  is *male* or *female* and  $e$  is the code

of ISCED-97 level. Eurostat database uses 3 groups of ISCED-97 levels, where ED0-2 are persons with pre-primary, primary and lower secondary education (without high school diploma), and groups of ED3-4 and ED5-6 were explained in the introduction of the paper. If a person is economically active, he/she may be classified (again according to ILO) as an employed (*EMP*) or unemployed (*UNEMP*). We calculate the unemployed persons as

$$UNEMP_{x,t}^{s,\theta} = ACT_{x,t}^{s,\theta} - EMP_{x,t}^{s,\theta}, \text{ where } x \in \langle 20-24; 40-44 \rangle, t \in \langle 2001; 2012 \rangle. \quad (2)$$

Inactive and unemployed population by age, sex and highest level of education attained is not published in the Eurostat database in the structure suitable for our analysis. Statistics about the number of students and graduates have the final age interval opened as 40+. We closed the interval as 40–44 years. Given that the number of students and graduates who are 45 years old or older is very small, (almost negligible), we will not make the big mistake if we consider the age interval 40+ and 40–44 as equivalent. The age and sex specific proportions of the first time university graduates (*ixFTUG*) on the numbers of economically inactive population with ED3-4 education level we obtain as

$$ixFTUG_{x,t}^s = \frac{FTUG_{x,t}^s}{INAC_{x,t}^{s,ED3-4}}, x \in \langle 20-24; 40-44 \rangle \text{ and } t \in \langle 2001; 2012 \rangle \quad (3)$$

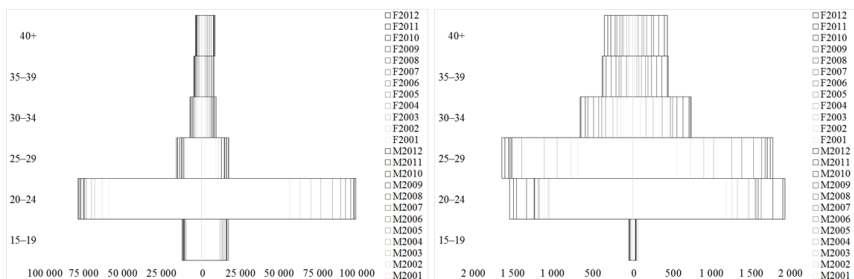
and the age and sex specific proportions of the total university graduates (*ixUG*) on the numbers of economically inactive population with ED3-4 and ED5-6 education level,

$$ixUG_{x,t}^s = \frac{UG_{x,t}^s}{INAC_{x,t}^{s,ED3-4} + INAC_{x,t}^{s,ED5-6}}, x \in \langle 20-24; 40-44 \rangle \text{ and } t \in \langle 2001; 2012 \rangle. \quad (4)$$

Note that in the total numbers of university graduates are included persons who already have at least one university degree). The statistics about students, graduates and persons by economic status are displayed in the population pyramids as Multi-tree charts. Multi-tree (Šimpach, 2013) is a special bar chart, where the bars are displayed in contour without padding. In order to highlight the development in time (males – M2001, M2002 ... M2012 and females – F2000, F2001 ... F2012) it is possible to use the appropriate spectrum of the contours. The resulting stripes represent higher or smaller deviations of observed characteristics over time. On the left side of the zero centreline of each chart there is always displayed the male population, on the right, the female population.

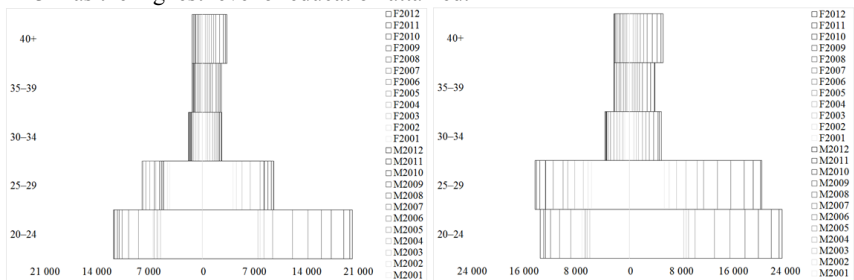
## RESULTS AND DISCUSSION

The long-term trend of increasing number of students at the Czech universities is shown in Fig. 1 (left). The largest absolute increase is evident in the female population in the age group 20–24 years. During the analysed period, the numbers of students in this age group increased by more than 40,000. Development of the students with interrupted study program is shown in Fig. 1 (right). We can see that these numbers have increased in all age groups. The highest increments are evident in the middle age groups (30–34, 35–39 and 40+), where the relative increase was more than several hundred %.



**Fig. 1: Students who have not already graduated by age and sex (left) compared with interrupted, who have not already graduated (right). Source: MEYS, IIE, authors' illustration**

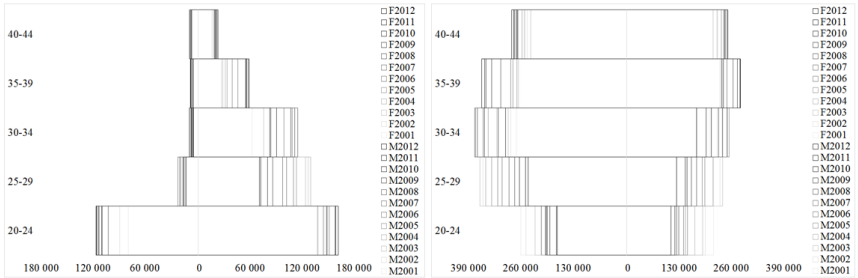
These interrupts are currently popular because some students accept lucrative short term employment considering it an important item in their CVs (see e.g. Nývlt, 2013a). Unfortunately, this interruption often ends with unsuccessful end of their studies. The time expires and sometimes the issues of family planning and parenthood arise. Together with an increment in the numbers of university students, we can also observe a similar increase in the numbers of the first graduates. These numbers are shown in Fig. 2 (left), which indicate a similar trend (especially for the female population) as in the case of university students. There is a significant increase in the numbers of female university graduates over the last 12 years (almost triple). Nowadays especially females study more than one study program and get more degrees. Overview of all university graduates in total is shown in Fig. 2 (right), where the numbers of female graduates (especially in the age groups 20–24 and 25–29), increased also nearly threefold. The economic (in)activity of the population is an important social issue. During the whole duration of university studies, all students who have not yet acquired any degree are classified as persons with ED3-4 as the highest level of education attained.



**Fig. 2: The first time university graduates (ED5-6) by age and sex (left) compared with university graduates in total (right). Source: MEYS, IIE, authors' illustration**

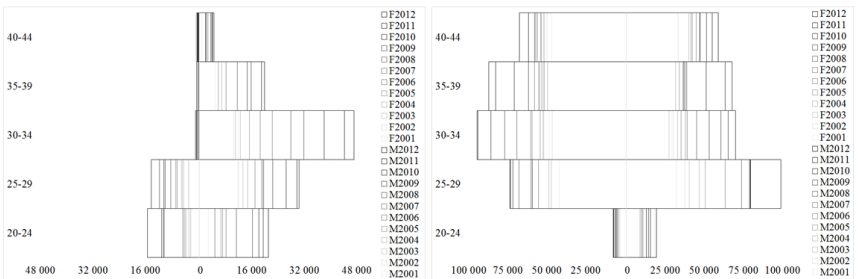
In the conditions of the Czech Republic it is common that many students do not work (especially at the bachelor level). Those students also do not search an employment and therefore they are classified as economically inactive persons. The development of economically inactive persons with the highest education ED3-4 is shown in Fig. 3 (left). The number of economically active persons in the analysed period is shown in Fig. 3 (right), where it is evident, that the absolute numbers of economically inactive persons increased, while the number of economically active persons reciprocally decreased. The significant predominance in numbers of economically inactive females aged 25–29, 30–

34 and 35–39 years is mainly due to parental leave when mothers stay at home to take care of their children.



**Fig. 3: Economically inactive population educated ED3-4 by age and sex (left) compared with active population educated ED3-4 (right). Source: Eurostat, authors’ illustration**

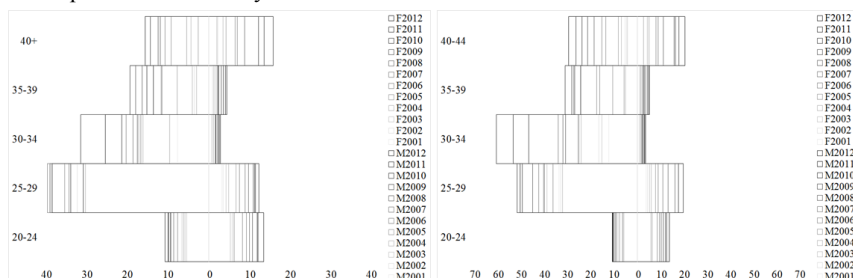
We can see the numbers of economically inactive population with ED5-6 education level in Fig. 4 (left). Since the age of 30 there are almost no economic inactive males with university education. They either work or they are unemployed and consistently and are purposefully seeking new job. High number of economically inactive females aged 30+ with ED5-6 education are females on maternity and parental leave, whose numbers in past 12 years increased more than 2.5 times. The number of economically active persons is shown for comparison in Fig. 4 (right). Before the student can enter the first degree program at the university he/she must have at least the upper secondary or post-secondary non-tertiary education. A large proportion of students who have not yet graduated for the first time is classified as economically inactive. It is interesting to see the proportions (in %) of the first graduates on the economically inactive persons, who until their graduation were registered as persons with ED3-4 education.



**Fig. 4: Economically inactive population educated ED5-6 by age and sex (left) compared with active population educated ED5-6 (right). Source: Eurostat, authors’ illustration**

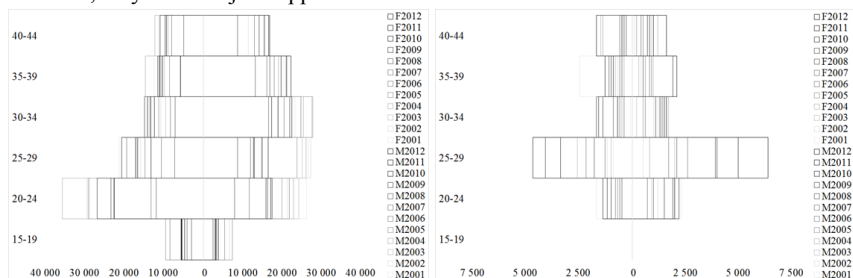
These proportions are shown for each age group and sex in Fig. 5 (left). The proportions of males aged 25–29, 30–34 and 35–39 years are higher. It is due to the fact that especially in 25–29 and 30–34 are females who do not study at the university on the parental leave, and therefore these numbers predominate over males. The proportions in the age group 20–24 and 40+ are equivalent and between 2001 and 2012 they have developed in the same way. On the right in Fig. 5 there are shown the proportions of all graduates in total on the numbers of economically inactive persons with education ED3-4 and ED5-6. It is because the people who study another study program are already classified as persons with tertiary education ED5-6. If they do not work and do not consistently search new

job, they are according to ILO economically inactive. Again, significantly predominate the proportions of males aged 25–29, 30–34 and 35–39 years old. There are no longer equivalent proportions of males and females in the age group 40+ and they have not developed in the same way between 2001–2012.



**Fig. 5: The proportions of first time university graduates on the numbers of economically inactive population educated ED3-4 in % (left) and the proportions of university graduates in total on the numbers of economically inactive population educated ED3-4 + ED5-6 in % (right). Source: MEYS, IIE, Eurostat, authors' illustration**

The situation of unemployed tertiary educated males and females (ED5-6) aged 25–29 is currently dramatic. The numbers of freshly unemployed university graduates enormously increased especially in the years 2010, 2011 and 2012 and from the surveys still rising. See e.g. study of Kubanová, Linda (2013) who is concerned with this topic. While the number of unemployed persons in the education level ED3-4 decreased in almost all age groups during the years 2001–2012, the risk of unemployment has been increasingly shifted to university educated persons (see Fiala, Langhamrová, 2013). This is due to the fact that the labor market with university educated employees is getting overfilled (see Nývtl, 2013b and Dvořáková, Langhamrová, 2013). The development of unemployed males and females with education ED3-4 is shown in Fig. 6 (left), the situation of ED5-6 educated males and females is shown in Fig. 6 (right). For the purposes of the comparison are both of two graphs displayed in the range of 15–19 to 40–44 years. The high number of university graduates causes higher risk of unemployment. On one hand, there is a goal to increase the number of university graduates (Fiala, Langhamrová, Průša, 2011), but on the other, they lack the jobs opportunities.



**Fig. 6: Unemployed population educated ED3-4 by age and sex (left) compared with unemployed population educated ED5-6 (right). Source: Eurostat, authors' illustration**

## CONCLUSION

The aim of the paper was to analyse the development of the number of university graduates by ISCED-97 classification in relation with the (in)active population of the Czech Republic by the education level. We analysed the changes and explained the moving of age-and-sex specific demographic structures. During the years 2001–2012 the number of economically inactive persons educated ED5-6 in some age groups increased almost three times. The reason for this is the extension of study, study more programs at more universities and postponing the birth of the first child to the later ages. Nowadays many young people think firstly about their studies, then of a career and (in the last phase) they plan a family. Females also reassess their behaviour. They do not take care of the household that much, but focus more on their personal and professional growth, which is related to the need of higher education. The number of female university students increased the most in the age group 20–24 years. This increase meant more than 40,000 persons (more than 70 %). In the middle age group, where 12 years ago were almost no female students, this increase was more than 150 %. It is still true that if a young couple decide to have children, it is mostly female, who stay on maternity and parental leave (Nývlt, 2013a). This is evidenced by the high number of economically inactive females (both with the highest education of ED3-4 and ED5-6). The exception is the case of ED5-6 where the proportions shifted by one 5-year age interval later.

The challenges for future research are many. Firstly an economical-population projection can be done and expected future developments of dependency of the population can be described, see e.g. Fiala, Langhamrová, (2013). Their approach could be complemented by a probabilistic model that takes into account the risk of interruption of study and the subsequent unsuccessful termination. The second addition to this approach could be to include the expected level of unemployment based on expected trends (see e.g. Miskolczi, 2010). This addition would improve the current level of projections and could provide the greater information capability.

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## REFERENCES

- Dvořáková, Z. nad Langhamrová, J. (2013) ‘Population Ageing and its Human Resource Management Consequences’, *International Days of Statistics and Economics* [Online], pp. 365–374, Available: <http://msed.vse.cz/files/2013/77-Dvorakova-Zuzana-paper.pdf>
- Eurostat (2014) *Database by themes, Population and Social Conditions*, [Online], Available: [http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search\\_database](http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database) [2014-03-03]
- Fiala, T., Langhamrová, J. and Průša, L. (2011) ‘Projection of the human capital of the czech republic and its regions to 2050’, *Demografie*, vol. 53, no 4, pp. 304–319.
- Fiala, T. and Langhamrová, J. (2013) ‘Vývoj ekonomického a sociálního zatížení a stárnutí populace’, *Politická ekonomie*, vol. 61, no. 3, pp. 338-355.
- IIE (2012) *Odbor analyticko-statistický, Výkonové ukazatele, F: Vysoké školy*, [on-line], Available: [http://dsia.uiv.cz/vystupy/vu\\_vs.html](http://dsia.uiv.cz/vystupy/vu_vs.html) [2014-03-23].
- Jindrová, A., Vostrá Vydrová, H. and Dömeová, L. (2013) ‘The students‘ evaluation of the e-support in the full time form of study’, *Journal on Efficiency and Responsibility*

- in *Education and Science* [Online], vol. 6, no. 2, pp. 119-133, Available: <http://dx.doi.org/10.7160/eriesj.2013.060205>
- Kubanová, J. and Linda, B. (2013) 'Employment of the university graduates', *10<sup>th</sup> International Conference on Efficiency and Responsibility in Education*, pp. 324-332.
- Mejstřík, B. (2005) *Organizace práce a uspořádání pracovní doby (Work Organization and Working Time Arrangements)*, Prague: Czech Statistical Office.
- Miskolczi, M. (2010) 'Trends in unemployment in the Czech republic and region', *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*, Linz: Trauner Verlag universitat, pp. 219-228.
- Miskolczi, M., Langhamrová, J. and Fiala, T. (2011) 'Unemployment and GDP', *International Days of Statistics and Economics*, Prague: VŠE, pp. 407-415.
- Nývlt, O. (2013a) 'Mladí lidé na trhu práce', *RELIK Reproduction of the Human Capital* [Online], Slaný: Melandrium, pp. 1-7, Available: <http://relik.vse.cz/download/pdf/128-Nyvlt-Ondrej-paper.pdf>
- Nývlt, O. (2013b) "The models of estimated development of labour market in the Czech Republic up to 2050", *Statistika* [Online], vol. 93, no. 4, pp. 46-55, Available: [http://www.czso.cz/csu/2013edicniplan.nsf/engc/4600438B60/\\$File/180213q4046.pdf](http://www.czso.cz/csu/2013edicniplan.nsf/engc/4600438B60/$File/180213q4046.pdf)
- Potužáková, Z. (2009) "The Czech Labour Market and Flexicurity", *Journal on Efficiency and Responsibility in Education and Science* [Online], vol. 2, no. 2, pp 20-29, Available: [www.eriesjournal.com/\\_papers/article\\_91.pdf](http://www.eriesjournal.com/_papers/article_91.pdf)
- Park, Ch. and Yu, J. (2013) "Life-cycle income hypothesis and demographic structure: a semi-nonparametric analysis using a panel of countries", *The Singapore Economic Review*, vol. 58, no. 1, pp. 1-18.
- Šimková, M. (2011) 'Vývoj ekonomicky aktivního obyvatelstva v České republice', *Forum Statisticum Slovacum*, Vol. 7, No. 7, pp. 239-244.
- Šimpach, O. (2013) 'The use of Multi-Tree charts in education of economic demographers', *IMEA 2013*, Pardubice: University of Pardubice, pp. 403-410.