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Health, disability, and labor force participation trends in Poland[1]

Abstract: The article presents the results of the decomposition of the changes in the age profiles of percentages of disabled people and labor force participation rates (LFPR) using the age-period-cohort (APC) decomposition. The aim of the analysis is the separation of long-term (cohort-specific) and short-term (period-specific) tendencies to verify hypotheses about the positive impact of the increasing human capital of new cohorts in the population on health and LFPRs. Calculations have been made on quasi-panel data constructed from the Polish Labor Force Survey (PLFS) database for the period 1995–2017. The results show that the improving health of people of pre-retirement age was very loosely connected with the gains in their labor force participation. The lower share of people with disability benefits and the improving LFPRs of disabled people have played a relatively minor role in explaining the change in the total LFPR in the economy as the vast majority of the positive changes in the labor supply were due to changes in the behavior of people without disabilities. Finally, the results of the APC decomposition do not confirm the hypothesis about the simultaneous generational changes in LFPRs and disability during the analyzed period.

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Introduction

The ageing of the population will have important consequences for the labor supply in Poland. Microeconomic research shows a direct link between the health of people (usually measured by disability) and labor force participation. Over recent decades life expectancy at birth has been steadily increasing [Oeppen, Vaupel, 2002] in developed countries. Thus, gains in healthy life expectancy and a lower share of disabled people in the working age group (15–64) can delay population ageing and contribute to an increase in labor force participation among people of pre-retirement age. The improving ability to work due to better health is generally recognized as an important factor but one which is overlooked in long-term projections of the impact of population ageing on the labor force [European Commission, 2015; Johansson et al., 2012; Saczuk, 2004] or treated as a component of human capital approximated by educational attainment [Stonawski, 2011]. However, there are two issues that create some doubt about the potential positive influence of improvements in health and their positive contribution to the labor supply. First, there is still an unresolved discussion about the impact of advancements in total life expectancy on healthy life expectancy. Second, it is also not clear if better health is actually correlated with higher labor force participation at the macro level.

The standard aggregate measure of the overall health of a population – comparable among countries – is called Healthy Life Expectancy (HALE), which is regularly published by the World Health Organization. It is calculated using the Global Burden of Disease Study and measures the situation in 187 countries around the world [Salomon et al., 2012]. The analysis of the international data suggests that Poland has relatively large potential for improving the average health of its population in comparison with the leading countries. For the period 2000–2016, HALE measured at birth increased in Poland by 3.4 years (from 62 to 65.4) for men and by 2.9 years (from 68.8 to 71.7) for women. HALE measured at the age of 60 increased over the same period by about 2 years for both men and women. This means that significant gains in HALE have been observed in the below-60 age groups despite the fact that the potential for reductions in the incidence of disability in the younger ages is lower than in the post-working age group (65 and over). However, observations regarding the health status of people over 65 in Poland show that, despite the increase in life expectancy, the number of years in relatively good health has remained stable since 2011 [EHLEIS, 2018]. It should also be noted that the prevalence of activity limitations is significantly lower for women in Poland than the average in the European Union.
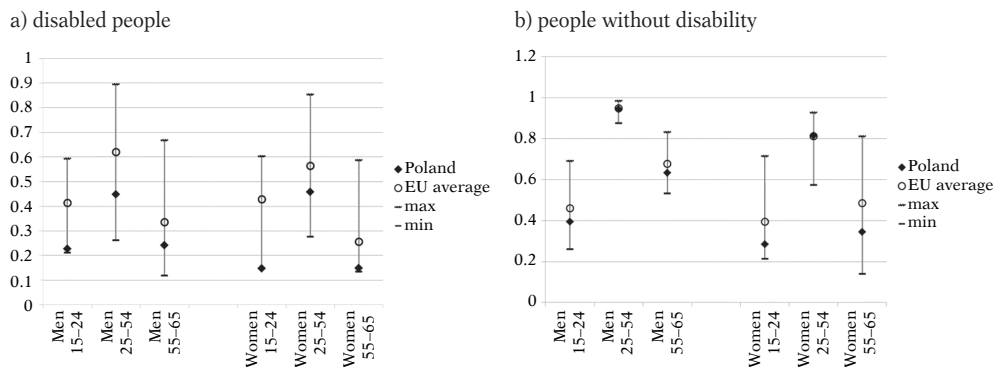
Despite women having significantly higher life expectancy, they generally have a higher probability of becoming disabled in the pre-retirement and retirement periods. This pattern is called the male-female health-survival paradox and it can also be observed in Poland: men who survive until 65 can expect that 48% of their remaining lives will be without disability compared to 39% of women [EHLEIS, 2018]. Łątkowski [2015] confirmed this observa-

tion using the European Household Survey for Poland by also showing that the differences are almost completely due to the probabilities of a transition from good health to disability being higher among women in all age groups, but there are no significant differences between men and women in the probability of returning to good health from a poor health status.

Health status is one of the most important determinants of labor force participation at the micro level. People who report health problems have difficulties working or finding a proper job. The fact that they are usually entitled to disability benefits generally discourages them from entering the labor market. However, at the macro level the impact of health improvement on labor force participation depends also on the share of disabled people in the population and the labor force participation rate (LFPR) of people with disability as well as that of those without disability. International comparisons of the LFPRs in Poland and in the countries of the European Union (see Figure 1) suggest that the LFPRs of people of pre-retirement age without disability in Poland were close to the EU average in the group aged 25–54 but below the EU average among the group of young people (aged 15–24) and people of pre-retirement age (55–64). It can also be noted that in these vulnerable groups the gaps between them and the EU average of LFPRs for women were greater than those for men.

The levels of the participation rate for people with disability in Poland are also much lower than the EU average in all age and sex groups. In fact, Polish young people with disabilities (aged 15–24) and women of pre-retirement age (55–65) with disability had the lowest LFPRs in the EU. These observations lead to the conclusion that, in comparison with other European countries, there is still potential for growth of the LFPR in Poland from improvements in health status as well as from increasing the LFPRs of both those with disabilities and those without.

Figure 1. Labor force participation rates (LFPRs) for people with and without disability in Poland vs. the EU countries

a) disabled people   b) people without disability

Source: author's elaboration, Eurostat data.

In recent decades cohort analysis has become one of the most important methodological approaches in the social sciences as the process of replacing older generations with younger has been recognized as the driver of many changes in modern societies. The conceptual foundation for its development was laid by Ryder [1965]. In this article we aim to discover to what extent those tendencies observed in cohorts that are sometimes called "intrinsic" [Clogg, 1982] can be useful in explaining changes in the share of people with disabilities and in labor force participation in Poland. Our aim here is to address three types of questions about the health improvement of the working age population and about labor force participation in Poland in the period 1995–2017:

1) What have been the cohort-specific ("intrinsic") and period-specific tendencies in health improvement measured by the share of people with disability benefits in Poland since 1995?
2) What have been the cohort-specific and period-specific patterns of labor force participation?
3) Have we observed interdependencies between changes in the shares of disabled people and labor force participation age profiles?

In order to answer these questions, we first analyze the changes in the age profiles of disability and labor force participation observed in the Polish Labor Force Survey data. In this context it is important to measure if the changes are due to simultaneous improvement in all age groups or due to cohort-specific effects. Thus, the main analysis in this article is the age-period-cohort (APC) method of decomposition of the historical changes in disability and LFPRs in Poland.

The article is organized as follows. In the next section the literature review is presented to provide greater theoretical background to the analysis of the trends in health and morbidity as well as the correlation between health and labor force participation. The following section then presents the trends in disability and labor force participation observed in the LFS data, together with an attempt to measure the influence of the decreasing share of disabled people on labor force participation. Then the APC method of decomposition is introduced with the explanation of the specification used in this paper. The main result of the analysis is decomposition of the quasi-panel[1] data about disability and labor force participation by age in the period 1995–2017. The discussion of the results and conclusion are presented in the last section.

Literature review

This paper refers to the theoretical framework of the analysis presented in Case and Deaton [2005] which is based on an earlier model developed by Grossman [1972]. This model is convenient in explaining phenomena from the

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[2]   Deaton [1997] described the time series of age profiles as *quasi-panel* since the indicators calculated for the same age groups are observed over time. It is not a real panel as the units of observation at the micro level (people, households) can change over time in each age group.

standpoint of lifecycle as well as explaining the differences between cohorts. It is assumed that people possess three types of capital: health capital in the form of their corporal health, human capital in the form of education, and physical capital in the form of their assets. The rate at which health capital declines with age is partly a biological process but it is also affected by the type of work: manual work being harder on the body than non-manual work. As the three types of capital are substitutable in generating earnings, people who have less human and financial capital must use more health capital. As a result, less educated and poorer people should experience faster deterioration of their health as they age. In Poland the younger generations have acquired significantly more human capital than older generations because of the significant increase in tertiary education [Strzelecki, 2009]. Technological changes in Poland [Hardy et al., 2018] have also reduced the share of manual work which caused health deterioration. So, the share of people with disabilities should have declined in the younger cohorts and over time. A lower share of people with disabilities and more intensive use of human capital should have contributed to a higher ability to work and thus also to positive cohort effects in the labor force participation of the younger generations.

In addition to the Grossman's model, the so-called "epidemiological transition" should also positively affect the ability to work and to maintain individual productivity [Caselli et al., 2002; Lazear, 1979]. On the one hand, improving health care technology should reduce the share of disabled people in all age groups. On the other hand, changing lifestyle and prevention of disease reduce disability rates more among the younger cohorts. Longer life expectancy can mean a proportional or even over-proportional extension of life in good health but there is also evidence that, in some countries, it is primarily life expectancy in poor health that is increasing.
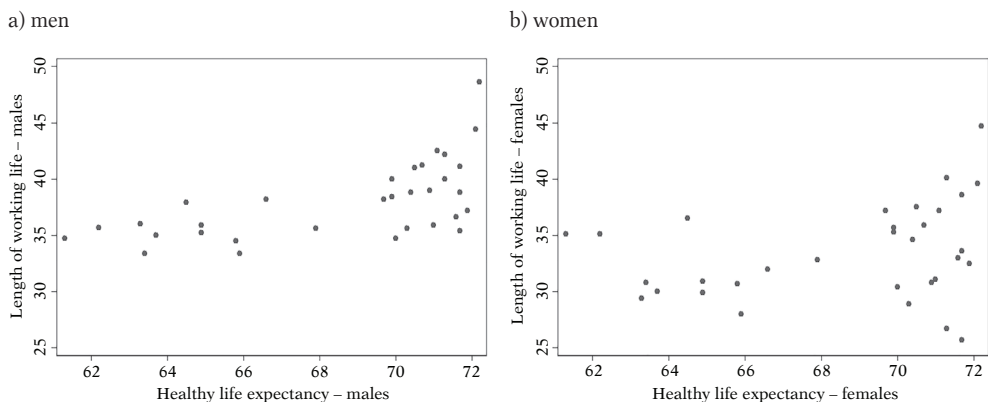
The theoretical predictions mentioned above are only to some extent confirmed by the empirical literature. There is still no definite conclusion about the persistence of the trend of increasing life expectancy without disabilities. The positive correlation between health and labor force participation is intuitive and well-documented at the micro level [Jones, 2008] but may not be so evident at the macro level. This divergence in empirical evidence leads to divergence from the hypotheses that have been put forward to predict possible future interactions of total life expectancy and the prevalence of disability. Firstly, there is the "expansion of morbidity" hypothesis [Olshansky et al.,1991; Verbrugge, 1984], which assumes that the decline in mortality is mainly due to the lower share of diseases that result in early death, rather than due to a reduction in the incidence of disease. Owing to the longer time of exposure to disability, this hypothesis claims that longer total life expectancy is accompanied by an increase in morbidity and disability. Alternatively, according to the "compression of morbidity" hypothesis [Fries, 1980, 1989], disability and ill-health are compressed towards the later period of life because of the prevention of many diseases at an earlier age. The conclusion for predictions is that increasing life expectancy should be accompanied at least by a proportional increase in the

number of years of better health. The third theory, "dynamic equilibrium," claims that "morbidity compression" and "morbidity expansion" can exist at the same time, counterbalancing each other [Manton, 1982].

Empirical observations reflect the differences in the combinations of parameters that not only describe the decreasing fatality of diseases and the increasing prevalence of chronic diseases but also the decreasing severity of chronic diseases. To date, no conclusive evidence has been found to distinguish either of the two divergent hypotheses regarding further changes in the number of years lived without significant incompetence (i.e. in good health). Analyses carried out using SHARE data suggest that an expansion of morbidity is observed in Western European countries [Heger, Kolodziej, 2016]. Generally, international studies into changes in health status suggest that improvements in some diseases (e.g. cardiovascular and chronic respiratory diseases) in the pre-retirement period are accompanied by higher levels of disabling conditions of other diseases (e.g. dementia or musculoskeletal diseases) in later life, usually after retirement age.

Another important research question is to what extent improvements in health and the decreasing share of disabled people are positively correlated with labor force participation. It seems obvious that disability is a clear obstacle to being active in the labor market, so people without disabilities have a higher probability of labor market participation [Jones, 2008]. However, some analyses suggest another direction of causality. An early exit from the labor market can negatively influence health by decreasing cognitive abilities due to a reduction in the extent of the human social network [Börsch-Supan, Schuth, 2014]. In European countries the length of the average working life and health (HALE) seem to be positively correlated (Figure 2), but in general the strength of this relation is not high and the correlation for women is weaker than for men.

Figure 2. The correlation between HALE and the average length of the working life

a) men   b) women

Source: author's elaboration, Eurostat and World Health Organization (WHO) data.

There are many factors that can interfere in the relation between health and labor force participation at the macro level in developed countries as described in the literature [Garibaldi et al., 2010]. The relatively low level of the retirement age can be a limitation on the increase in labor force participation among healthier people, as the health improvement is mainly observed at later ages. The division of family responsibilities in the pre-retirement age can also explain the higher variability of the length of the working life among women than among men. Some studies also find that the gradual shift from routine to non-routine occupations, combined with educational, cultural, and sociological changes, is likely to raise the labor supply among both people with and without disabilities [Blau, Goodstein, 2010; Oshio et al., 2011].

As mentioned in the introduction, cohort analysis is an important tool of assessing the social changes caused by younger generations replacing older generations [Ryder, 1965]. The cohort-specific changes in the joint analysis of health status and labor force participation are frequently reported. However, this concept can be applied using different empirical methods to the quasi-panel of age profiles by age. The variable that identifies the cohort can be added as one of the economic variables in panel regression. This method has been applied to labor force participation [Balleer, et al., 2009; Grigoli, et al., 2018]. Another approach is to decompose the changes in the profiles over time into three main factors: the age pattern, the cohort-specific effects, and the changes that influence all cohorts but at specific moments of time. This age-period-cohort decomposition is one of the main techniques used in demography and epidemiology [Wilmoth, 2006] but since the pioneering work of Agnus Deaton [Deaton, Paxson, 1994], it has also become a popular method of finding cohort-specific effects in economic data.

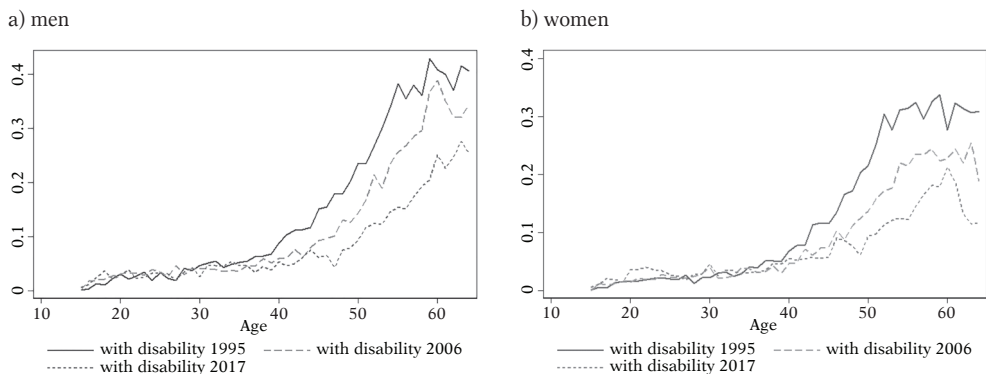## Data on health, disability, and labor force participation in Poland

In this paper the Labor Force Survey (LFS) is the main data source for the analysis in which we use quasi-panel data that are based on single-year age profiles of the indicators. LFS data have been chosen due to the sample size that enables calculation of single-year age profiles of labor force participation and disability which are representative of the entire Polish population. The indicators from the LFS in single-year age groups are not published, so the analyses in this paper required calculations using the microdata. The LFS survey is representative of the entire population of Poland over 15 years of age. The sample covered some 55,000 people quarterly before 2010. Since then, the sample has covered about 100,000 people in selected quarters but, due to a falling response rate in recent years, the sample size is now close to 70,000 per quarter. The representativeness of the results of the survey is assured by application of population weights [CSO, 2018].

The advantage of the application on the LFS data is that its labor force definitions are consistent with the International Labor Organization's standards. The definition of disability (i.e. the measure of the lack of health) comes

from the LFS question about receiving a specific disability benefit. In order to become eligible for this kind of benefit, a health assessment by a doctor is required. It is convenient that the LFS definition is based on this objective assessment of health. However, a person who receives a disability benefit may also be eligible for other possible benefits (particularly, pension benefits). To minimize this problem, the analysis has been limited to people before the retirement age for men (younger than 65 years).

The data confirm that in the years 1995–2017 there have been major changes in the share of people with disability by age (Figure 3). For both men and women, the share of people with disability benefits decreased substantially especially for the group aged 40 and over. People under 40 have relatively very low frequency of disability and there has been minimal change in this low percentage, so only the group of people aged 40–64 years has been analyzed in the next section of this article. It has also been observed that about the age of 50 for women and 55 for men there has been stabilization in the share of disability benefits, which can be linked to the early pensions that were available until 2009. In reality, vulnerability to disease increases with age, so this observation suggests the limitations of the adopted definition of health.
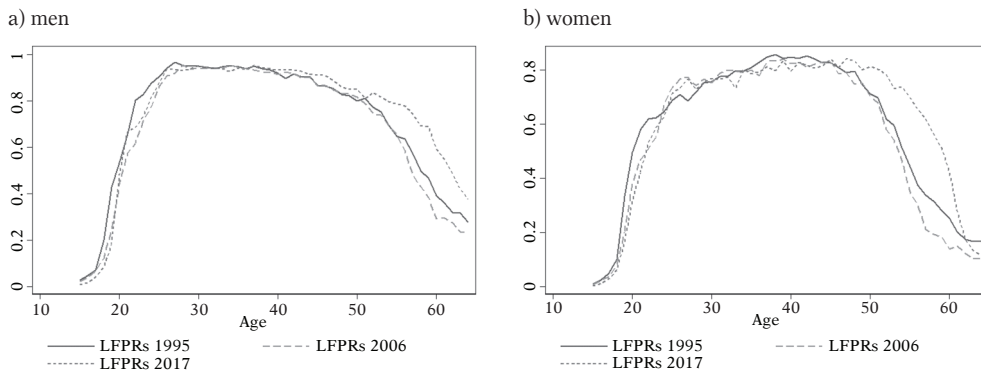
Figure 3. Shares of disabled people in the Polish population by age

a) men

b) women

Source: own calculations, LFS data.

Over the subject period 1995–2017, there has also been an increase in LFPRs – labor force participation rates – (Figure 4), although they were stable or even decreased in the over-55 age groups until the year 2006. Almost all gains in the participation rate appeared after 2007 in the over-50 groups. The age profiles of labor force participation for people with disabilities within the working age are not presented in the figures as their age profiles were relatively flat and stable throughout the analyzed period. On average the labor force participation of men amounted to 40%, which was a bit higher than that for women.

Figure 4. Changes in labor force participation rates (LFPRs)

a) men　　　　　　　　　　　　　　　　　　　　b) women

LFPRs 1995　　　LFPRs 2006　　　LFPRs 1995　　　LFPRs 2006
LFPRs 2017　　　　　　　　　　　　LFPRs 2017
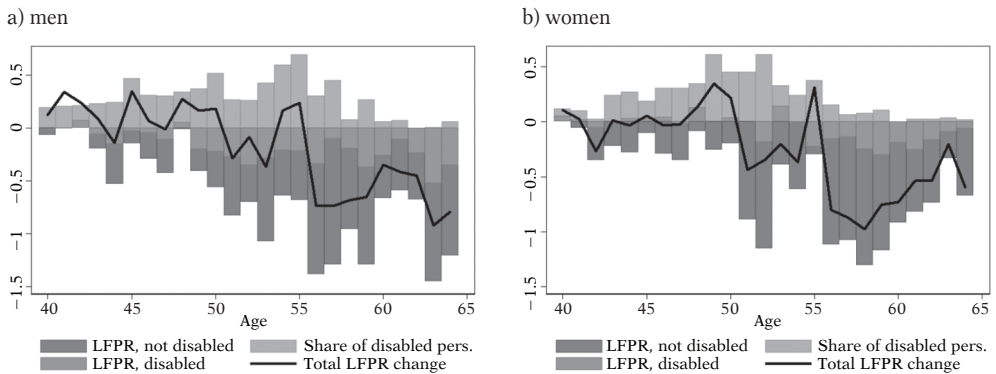
Source: own calculations, LFS data.

The statistical method of assessing the contributions of changes in LFPRs and of the changing share of disabled people to the aggregate change in labor force participation was proposed by Bound, Waidmann [1992] and also used by Bell, Smith [2004]. The total change can be decomposed into the contribution of changes in the participation rates of people without disabilities, of those with disabilities, and the change in the composition of both groups[2]. In the years 1995–2006, the total LFPR of people aged over 15 decreased by about 2.9 pp. (percentage points) which can be decomposed to the decrease due to the lower labor force participation of non-disabled people (–3.0 pp.), the decrease due to the lower participation of disabled people (–0.7 pp.), and the positive contribution of the decrease in the share of disabled people (+0.8 pp.). In the years 2006–2017 the total LFPR has increased by 4.3 pp. and the contributions of all factors were positive: the labor force participation rates of non-disabled people amounted to +3.3 pp., the higher labor force participation of disabled people amounted to +0.4 pp., and the lower percentage of people with disability amounted to +0.6 pp. The contributions can also be presented at a more disaggregated level separately for each age group and sex (Figure 5 and Figure 6). On average during the period 1995–2006, the negative changes of labor force participation (Figure 5) in the over-50 groups resulted from the negative changes in the participation of healthy people and, to some extent, also people with disability. Only the impact of the decreasing percentages of disabled people was positive, and it was observed primarily in the group of men aged 40–60 and women aged 45–55.

3　　　The formula for decomposition is the following:

$$\Delta LFPR = \sum_{j}(w_j^{t_1} - w_j^{t_0})LFPR_j^{t_0} + \sum_{j}(LFPR_j^{t_0} - LFPR_j^{t_0})w_j^{t_0} + \sum_{j}(LFPR_j^{t_0} - LFPR_j^{t_0})(w_j^{t_1} - w_j^{t_0})$$

where j is the subscript of the group in the population determined by age or disability status, t_0, t_1 are subsequent periods, $w_j^{t_0}$, $w_j^{t_1}$ measure the weight of the group j in the total population and $LFPR_j^{t_0}$, $LFPR_j^{t_1}$ the labor force participation of group j in the total population.
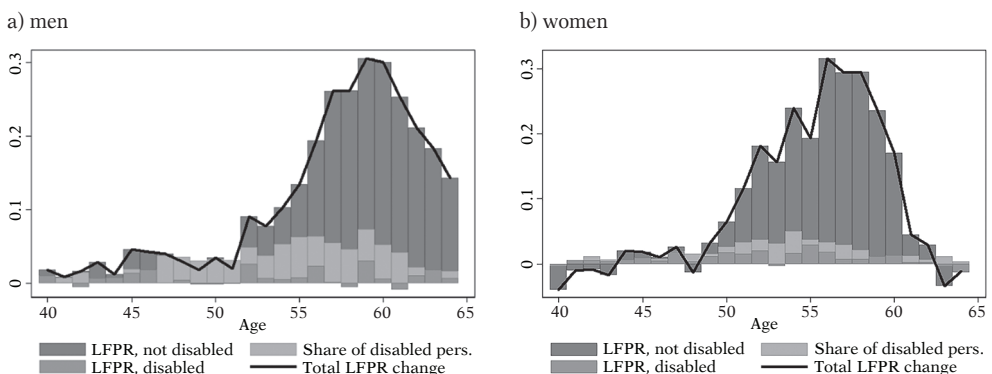
Figure 5. Decomposition of the sources of change in the labor force participation rates (LFPRs)
of people aged 40–65 in 1995–2006

a) men

b) women

Source: own calculations, LFS data.

After 2006 the impact of the decreasing share of people without disability remained positive for men but it was much lower for women (Figure 6). The great majority of the total changes in the LFPRs were due to the increasing labor force participation of men and women without disability benefits. Despite much lower unemployment on the Polish labor market – which should attract more disabled people to find employment as an additional source of benefits – the labor force participation of people with disability made only a marginal contribution to the overall change in LFPRs.

Figure 6. Decomposition of the sources of change in the labor force participation rates (LFPRs) of
people aged 45–65 in 2005–2014

a) men

b) women

Source: own calculations, LFS data.

Age-Period-Cohort method

To answer the question regarding the possible sources of the change in disability frequency and labor force participation by age, one can apply decomposition based on the *age-period-cohort* (APC) method. This method has traditionally had many applications in demography and epidemiology [Siegel and Swanson, 2007] but has also been used in sociology and economic applications [Mason *et al.*, 1973; Deaton, 1997]. The starting point for this analysis are the levels of the demographic or economic variable (e.g. *LFPR$_{ij}$* by single-age groups $i = 1, \ldots,$ as observed for many $j = 1, \ldots,$ p periods of time. The general formula for the decomposition is given by

$$LFPR_{ij} = \mu + \alpha_i + \beta_j + \gamma_k + \varepsilon_{ij} \qquad (1)$$

The μ sign denotes the intercept or adjusted mean pension income; α_i describes the *i*th age effect or the coefficient for the *i*th age group; β_j denotes the *j*th period effect or the coefficient for the *j*th time period; γ_k denotes the *k*th cohort effect or the coefficient for the *k*th cohort for $k = 1, \ldots, (a + p - 1)$ cohorts and $k = a - i + j$; and ε_{ij} denotes the random error with $E(\varepsilon_{ij}) = 0$. The primary issue with the APC model is solving the problem of the perfectly linear relationship between the age period and the cohort: *Year=Cohort+Age*. Due to perfect colinearity, solving that equation calls for additional assumptions that come from theory or additional, side information. If such direct information is unavailable, then the search for the appropriate method is the choice of an APC method that gives intuitive and reliable estimates consistent with the known dimensions of the analyzed phenomenon [Glenn, 2005]. Heckman and Robb [1985] noted that the collinearity of variables in the APC model is not an issue if it is possible to define one explanatory variable by a proxy variable observed in reality. So, the method they proposed focuses on finding proxy variables for expected period or cohort effects. The proxy for the period effects in the LFPR can represent the business cycle but it is harder to find a variable for the similar purpose in the disability analysis. Fortunately, there are many statistical methods of solving the collinearity dilemma without using proxy variables. One of the most often used methods of decomposition is the constrained generalized linear model (CGLIM) – first proposed in Mason et al. [1973]. The assumption required in that method is placing at least one additional identifying constraint on the parameter vector. This can be done by constraining two age, two period, or two cohort effects to be equal. Another approach to decomposition is Deaton-Paxson normalization [Deaton, Paxson, 1994]. In this method, the variables are de-trended and then the restriction is imposed that the time effect dummies are orthogonal to a trend and sum to zero. After initial normalization in both methods, the ordinary least square (OLS) regression is used to obtain parameters. However, both approaches require data with a span long enough to include at least one full cohort cycle [Deaton, 1997: 126]. This condition is not fulfilled by the available data. More

recent publications [Fu et al., 2004] suggest that the small number of periods covered can lead to low robustness and biased estimators of the cohort and period effects. To deal with this issue, two statistical approaches have been proposed. One is the intrinsic estimator (IE) proposed by Fu et al. [2004]. This approach is based on the principal component regression method. Studies that compared that estimator with the CGLIM method showed that the IE is more statistically efficient and is unbiased for the low number of time periods in the data. Another approach that is relevant for data with a relatively small number of periods is the maximum entropy method [Browning et al., 2012]. This approach has its roots in information theory [Shannon, 1948]. It proceeds in representing uncertainty about the coefficient vector of the APC model in terms of a probability distribution where probability describes more the state of knowledge than the limit frequency as in classical statistics. In this approach the entropy function suggested by Shannon [1948] is used as a measure of uncertainty. It is maximized when the probabilities are equally likely and minimized if the probability distribution is degenerated to a particular outcome. In practice the a priori distribution is considered to be a uniform distribution (initially uninformative) but restricted by the maximum possible values defined according to expert knowledge. In this study we have finally elected to use a classical Deaton-Paxson normalization but – in order to check robustness – the other methods of APC decomposition mentioned above have also been applied with relatively similar results. The figures presented in the next section – that also contain 95% confidence intervals (CIs) – have been obtained from application of the APC method in STATA [O'Dea, 2012].
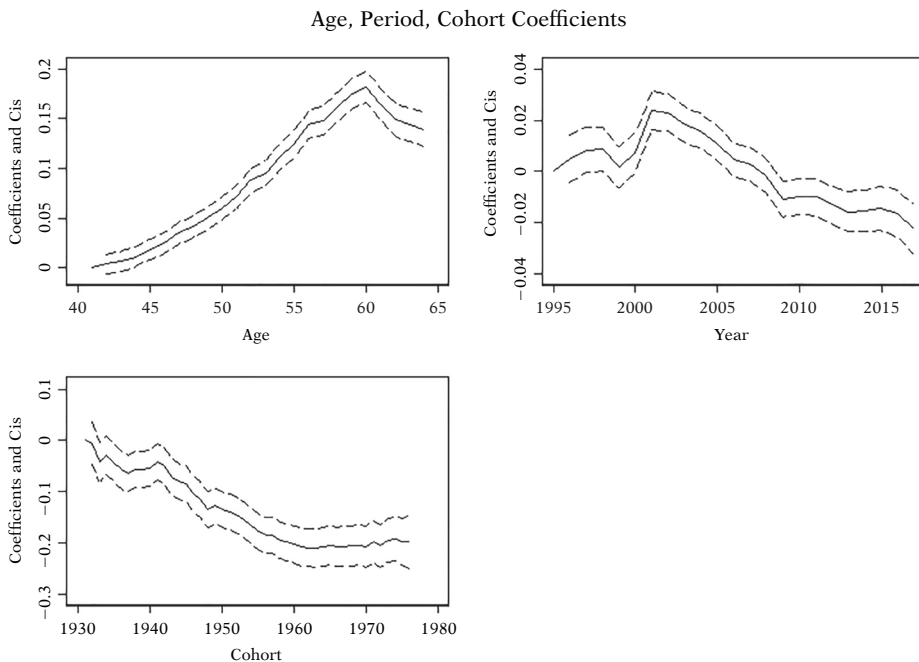
Results of the age-period-cohort decomposition

The results of the APC decomposition are presented separately in three graphics for men and for women (Figure 7). In each the top left figure is the average age profile in the decomposition, the top right panel presents the changes related to the total profile but in specific periods, and the bottom figure presents the effects for specific cohorts by the year of birth.
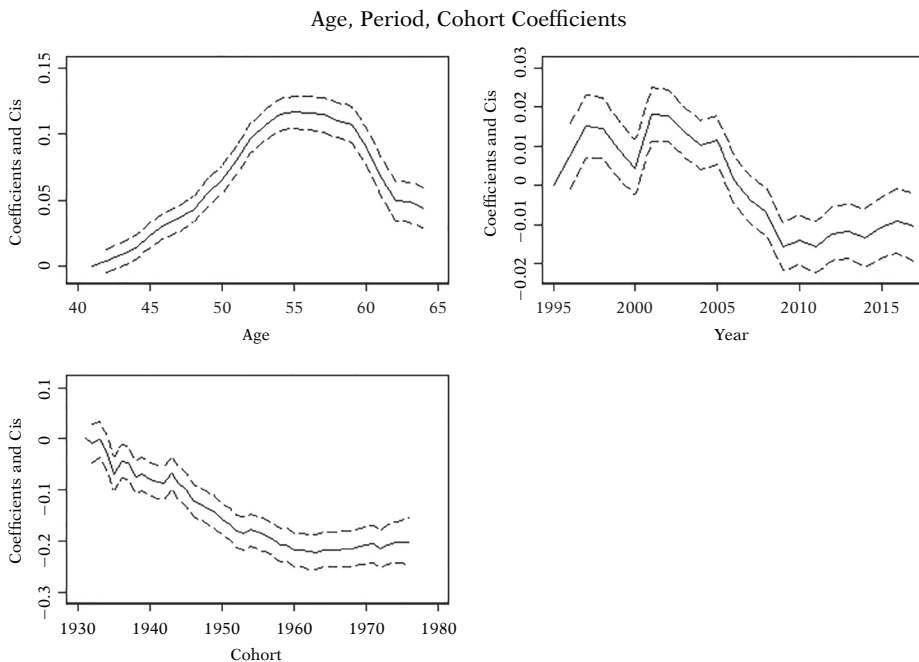
The age profiles obtained from the analysis show that the share of people with disability benefits increases until the age of common eligibility for retirement benefits. Until 2009 – when early pensions were cancelled – this did not exceed 60 for men and 55 for women. Since 2009 the age of pension benefit eligibility has increased and the average age profile in the APC decomposition is the weighted average of observations from the total sample and remains constant over time. Until the eligibility age of the early-pension scheme (i.e. 55 for women and 60 for men), these profiles sharply increased with age, reflecting the higher probability of disability and poor health in later ages.

Figure 7. Results of the APC decomposition of disability

a) men

Age, Period, Cohort Coefficients

b) women

Age, Period, Cohort Coefficients

Source: own calculations, LFS data.

The period-specific changes, both for men and for women, suggest that the frequency of people receiving disability benefits significantly decreased during the 2000–2009 period. Before 2000 disability benefits were granted very frequently when compared with other European countries and sometimes in lieu of active labor market policies for the long-term unemployed. The age-period-cohort decomposition showed that the relatively rapid decline in disability in the first decade of the twenty-first century was a result of both cohort and period effects. The significant negative cohort effects likely reflected the joint influence of a stricter medical examination before considering an individual disabled and the increasing health of the relatively younger generations that entered pre-retirement age. The analysis also showed that, at the beginning of the second decade of the century, the declining trend in disability rates was no longer significant and the cohort effects for the younger generations did not support the hypothesis of further significant improvement in the health of the working age population.

The cohort-effect reflects changes that are characteristic of people of the same generation. The horizontal axis on the figures for men and women represents the birth years of the generations of people (the cohorts). The higher the year of birth, the younger are the generations of people, and the smaller is the number of years of observation. The oldest cohorts in the analysis were born in the 1930s and observed for their entire working lives until they reached age 65. The youngest generation were born in 1970 and reached age 45, so their cohort effects have been calculated on the basis of a relatively shorter period with a relatively wider confidence interval. The decreasing share of disabled people in subsequent generations is quite clear for the generations born between 1940 and 1960. The stabilization in the generations born after 1960 may reflect difficulties with further health improvement but it may also be the statistical effect of the missing (i.e. unobserved) part of their lives during which the changes in the share of disabled people are typically the highest.
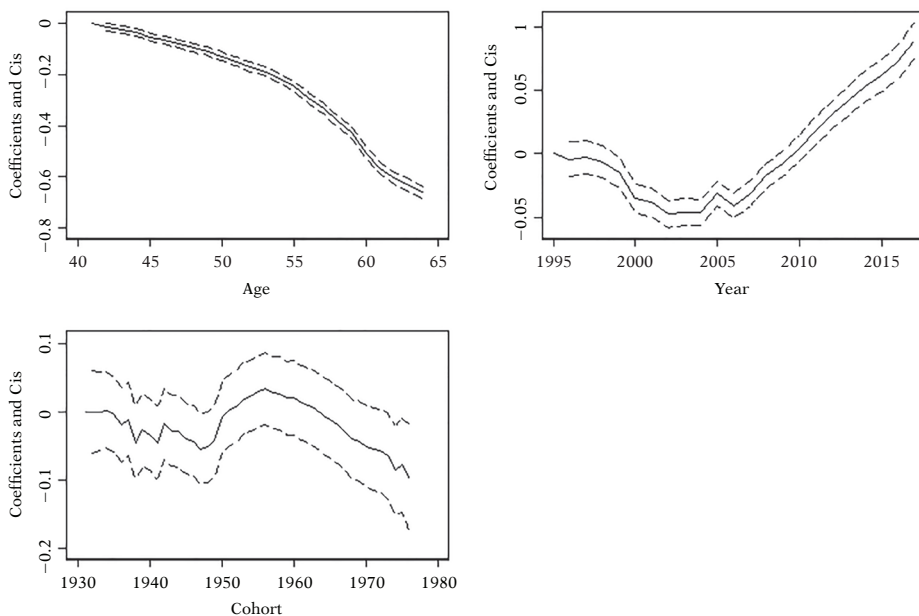
The age profile of labor force participation reflects the share of people who are economically inactive that increases with age. Disability is only one of the potential reasons for inactivity in the working age population. Individuals of pre-retirement age can be eligible for other benefits that cause an exit from the labor market. Other people can be discouraged from the labor market by their long-term unemployment, and there is also a significant group of people who drop out of the labor force due to family responsibilities. The application of age-period-cohort decomposition to the data regarding the labor force participation of healthy people show – in line with expectations – that labor force participation for men and for women declines after the age of 40 (Figure 8).

Regarding the time variable, for both men and women the period effects of labor force participation can be divided into two sub-periods. Until 2006 the contribution of the period effect has a negative trend. It can be explained by the high unemployment rate. After 2007 there is an increasing trend in the period effect for both women and men of all generations. It can be attributed to relatively low and declining unemployment in most years after 2007.

Figure 8. Results of the APC decomposition of the labor force participation among the total population
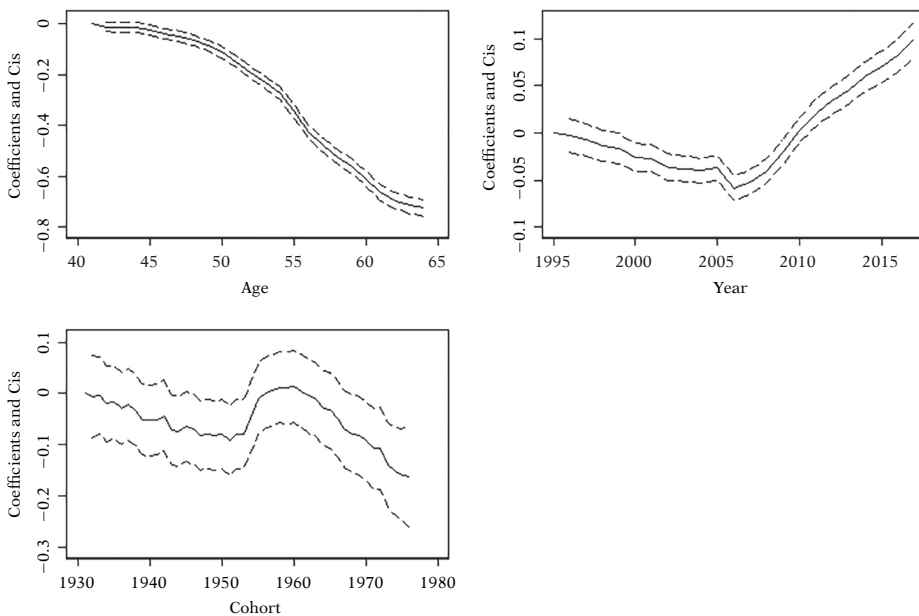
a) men

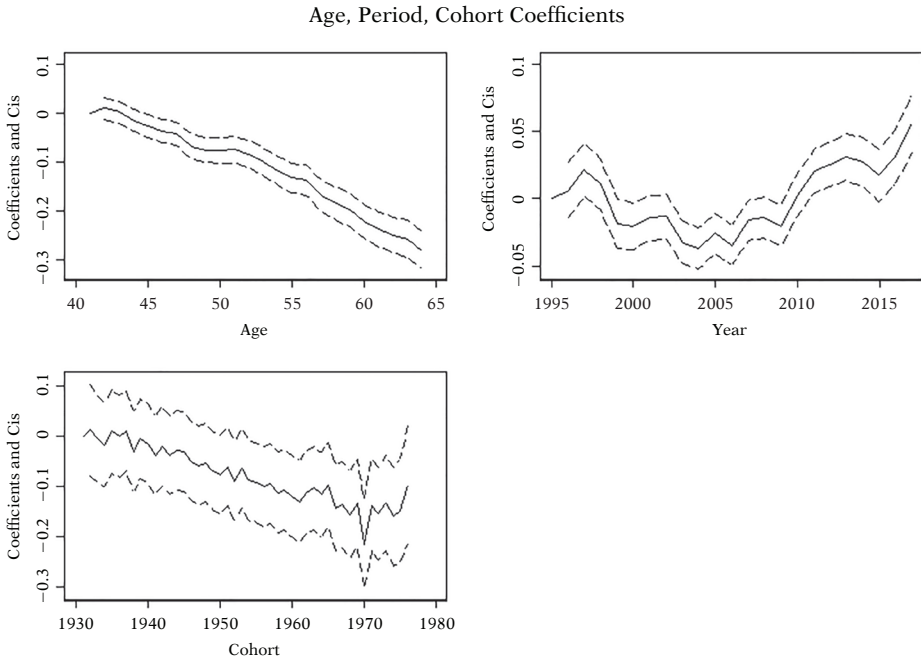### Age, Period, Cohort Coefficients
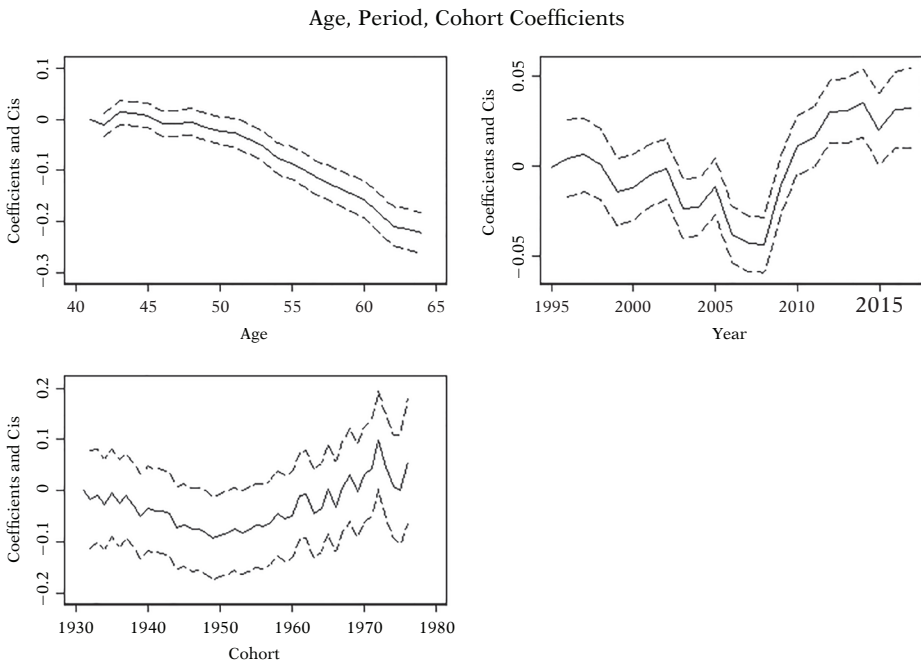

b) women

Age, Period, Cohort Coefficients

Source: own calculations, LFS data.

Figure 9. Results of the APC decomposition of the labor force participation of disabled people

a) men

Age, Period, Cohort Coefficients

b) women

Age, Period, Cohort Coefficients

Source: own calculations, LFS data.

Another dimension of that phenomenon is the probable increase in demand for workers with lower formal skills within the Polish economy. The visible sign of this structural change is the reduction in the risk of unemployment for people without tertiary education. The analysis of the cohort effects shows that, in general, labor force participation observed for subsequent cohorts shows a characteristic jump in labor force participation for the generation of men born around 1950 and women born in 1955. These dates reflect approximately the first generation covered by the 2009 reform cancelling the early pensions and having some positive impact on labor force participation. Before and after the reform, the labor force participation of the younger cohorts tends to be slightly lower than that of the older generations, but – owing to relatively wide confidence intervals for these estimates – most of these changes are not statistically significant. This result is somewhat surprising because it does not confirm the hypothesis as to the positive impact of the younger generations' better human capital on labor force participation.

In an attempt to explain the interdependencies between technological change and the potentially higher chances for the labor force participation of disabled people, it is worth analyzing the trends in labor force participation separately for people receiving disability benefits. The labor force participation of disabled people in Poland is, in general, much lower than that observed among healthy people and, after the age of 40, it decreases with age for both men and women (Figure 9).

The period effects in the decomposition suggested that, in general, labor force participation was declining slightly until 2009, but a significant increase has been observed from 2010. It may reflect the situation on the labor market (lower unemployment, increasing demand for low-skilled people) that encouraged firms to be open to new kinds of employees and changes in the legal regulations regarding the employment of people with disabilities. The changes between cohorts in the labor force participation of disabled people are slightly negative for men and scarcely observable for women. Considering the confidence intervals of these estimates, the cohort effects were not significant. This leads to the conclusion that the labor force participation of disabled people was strongly influenced by labor market conditions but not by long-term, cohort-specific trends.

Discussion of the results and conclusions

The results presented in this paper show that increasing health – measured by the share of disabled people of working age – was very loosely connected with gains in the labor force participation of the entire population in Poland during the 1995–2017 period. The descriptive analysis shows that changes in the proportion of people receiving disability benefits and their labor force participation have played a relatively minor role as the vast majority of the positive changes in the labor supply were due to changes in the behavior of

people without disabilities. The application of the APC decomposition illustrates the discrepancy between the gains in labor force participation after the year 2006 and changes in the share of disabled people which declined until 2010 and then stabilized. Labor force participation increased both due to period effects (the possible positive influence of the business cycle) and cohort effects (the positive influence of the early-pension reform). The share of people with disabilities is not declining among the younger generations and the period effects are almost constant after a significant decline in the first decade of this century.

Do the results suggest that improvements in health have nothing to do with labor force participation in Poland? It seems too early to formulate such a conclusion. Firstly, the definition of health used in this paper is imperfect. The disability benefits of unhealthy people are frequently replaced by other types of benefits in the pre-retirement age, so some trends observed in the past probably result from changes in the functioning of the social security system and not real changes in the health of the population. This issue can be addressed in the future by analysis of other data sources that enables an objective assessment of the disability of all people. Secondly, the analysis presents the juxtaposition of patterns at the macro level. It does not contradict the micro-level observation that disability is an important determinant of labor force participation. The results show only that the increase in the LFPR in the economy was mainly correlated with labor market conditions and probably pension reforms but not with the improving health of the working age population. This result may reflect the fact that, compared with other EU countries, Poland still has much space to improve labor force participation among healthy people of pre-retirement age, who constitute the largest group in the population and react faster to favorable changes on the labor market. The microeconomic study of the interdependencies between disability and labor force participation could be a direction for further research. Thirdly, the APC method used in this paper is relatively less reliable in describing tendencies in the youngest generations with an incomplete work lifecycle. Unfortunately, there is no good solution to this problem other that waiting for new observations and performing an analysis similar to that presented in this paper in the future.

Regarding the meaning of the results in terms of verifying the theoretical model presented in the literature review [Case, Deaton, 2005], it appears that there is still no convincing evidence that the better human capital of the relatively younger generations (now approaching pre-retirement age) increases their ability to be more healthy and more active on the labor market in comparison to previous generations.

The results of this article are consistent with other publications, which strengthens the reliability of the obtained results. First, changes in the health of the working age population are consistent with the healthy life expectancy [EHLEIS, 2018]. The observation of a relatively stable share of disabled people after the year 2005 is consistent with the results of the "Social Diagnosis"

– a large scale panel survey carried out in Poland during 2000–2015 [Kotowska et al., 2014]. Another observation consistent with this publication is the significant increase in labor force participation among people with disabilities after the year 2009. The analysis presented in this paper suggests that this was the result of period effects, similar for all cohorts and likely resulting from the changing size and structure of labor demand in the Polish economy. The most visible changes in labor force participation in the last decade were the cohort effects in labor force participation among the generations affected by the early-pension reform. A positive but relatively low immediate effect of the reform on labor force participation had already been discovered [Komada et al., 2019]. This study shows that an increase in labor force participation was likely gradual and extended over some years.

This article adds to the literature regarding changes on the Polish labor market in three aspects. First, it has attempted to add the health factor to the analysis of total labor force participation among the working age population. It appears that it has some meaning but is rather limited. Secondly, this article presents trends in the labor participation of disabled people which can be determined by factors other than the labor force participation of healthy people. Here a significant role can be played by factors such as regulations regarding benefits, working conditions, support for employers, technological changes, etc. Thirdly, this is one of the few attempts to describe changes on the Polish labor market using a method from the demographic toolbox to separate the intrinsic cohort effects that can be perceived as predictions of long-term future changes and extend the analysis traditionally performed on labor force participation age profiles – e.g. comparisons with other countries [Thévenon, 2013] and the analysis of changes over time [IMF, 2016].

Despite the potential issues discussed at the beginning of this section, the findings presented in this article can be used to formulate policy recommendations. The results of the APC decomposition suggest that it is hard to expect that possible future changes in the LFPRs will be spontaneous due to the increasing share of people with higher human capital or a significant decline in the share of people with disability benefits as during the 1995–2006 period. Recent positive changes in labor force participation involved mainly healthy people and can be linked to the pension reform in 2009 (cohort effects) and improving labor market conditions (period effects). In regard to disabled people and their labor force participation, much more still can be done to reduce the share of people with disabilities in the labor force and to increase their LFPR. The results of the decompositions showed that the decline in the share of people with disabilities is no longer observed after 2011, nor is it seen in cohorts born after 1960. The labor force participation of people with disabilities in Poland is among the lowest in the EU. The positive changes after 2010 which can be linked to a very low unemployment rate are not enough to significantly change the current situation.

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Trendy w zakresie stanu zdrowia, niepełnosprawności i aktywności zawodowej w Polsce

Streszczenie: W artykule przedstawiono wyniki dekompozycji zmian w profilach wieku dla odsetka osób niepełnosprawnych i współczynników aktywności zawodowej (LFPR) z wykorzystaniem rozkładu wieku–kohorty (APC). Celem analizy jest oddzielenie tendencji długoterminowych (specyficznych dla kohorty) i krótkoterminowych (specyficznych dla okresu) w celu weryfikacji hipotez o pozytywnym wpływie zwiększania kapitału ludzkiego nowych kohort w populacji na zdrowie i LFPR. Obliczenia przeprowadzono na danych quasi-panelowych zbudowanych z bazy danych Polskiego Badania Siły Roboczej (PLFS) za lata 1995–2017. Wyniki pokazują, że polepszenie zdrowia osób w wieku 40–65 lat było bardzo luźno związane ze wzrostem ich udziału w sile roboczej. Niższy udział osób z rentami i polepszającymi się LFPR osób niepełnosprawnych odegrał stosunkowo niewielką rolę w wyjaśnianiu całkowitej zmiany LFPR w gospodarce, ponieważ większość pozytywnych zmian w podaży pracy wynikała ze zmian zachowań osób bez niepełnosprawności. Wyniki dekompozycji APC nie potwierdzają hipotezy o silnych zmianach pokoleniowych w LFPR i niepełnosprawności w całym okresie.

Słowa kluczowe: niepełnosprawność, współczynnik aktywności zawodowej, HALE, dekompozycja APC