Youth unemployment and mental health: dominance approach. Evidence from Poland

In this paper we present evidence on the relationship between mental health and unemployment among Polish youth. The literature establishes links between mental health and unemployment, but the evidence concerning youths is scarce. We utilize 2010/2011 World Mental Health Survey that contains detailed information on the prevalence of psychiatric diseases and mental disorders in Poland. We compare health distributions in terms of both inequality and welfare relying on methods for ordinal data developed recently. We find that youth employed generally have better health status than youth unemployed, but the differences are very small when it comes to more detailed questions concerning mood (i.e. sadness, anxiety, anger). To observe substantial differences between two populations, one needs to ask even more detailed questions concerning personal feelings. Clear differences, however, emerge for social interactions and undertaking own initiative. Here employed present unambiguously better than unemployed.

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Youth unemployment and mental health: dominance approach. Evidence from Poland.

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Abstract

Economics research on mental health and youth unemployment is sparse. We fill this gap by analyzing the relationship between mental health and unemployment among Polish youth, also in comparison to adults. It is widely acknowledged in the literature that there is a strong association between economic situation and health, therefore Poland which has underwent dramatic economic changes in the last decades is a particularly interesting case. Utilizing 2010/2011 World Mental Health Survey we compare various health distributions in terms of welfare and inequality according to methods proposed by Allison and Foster (2004), Kobus and Miłoś (2012), and Sonne-Schmidt et al. (2014) i.e. using dominance relations and inequality indices for ordinal data. In general, we find that there are more health differences along the age dimension than employment status. Although young employed exhibit better self-reported mental health status than young unemployed, when one looks at more detailed questions concerning mental health one observes that there are not many differences between young employed and young unemployed in terms of feeling of sadness, discouragement, being tired or angry. To spot differences, one needs to ask an even more detailed questions concerning these feelings. On the other hand, clear dominance of young employed over young unemployed emerges for questions related to social interactions and independent activity (e.g. traveling).

Keywords: youth unemployment; mental health; stochastic dominance; ordinal data; inequality measurement
JEL codes: J20, J22, I10

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1 Introduction

The relationship between health and unemployment has been well-established in the literature (e.g. see Goldman (2001) for a review). These studies mostly document strong negative correlation between the experience of unemployment and health, or more generally, between health and low income. As to the causal relationship between unemployment and health, the evidence is mixed (Salm 2009; Schmitz 2013; Sullivan and von Wachter 2009; Eliason and Storrie 2009; Gathergood 2013; Riphahn 1999; Garcia-Gomez et al. 2010).

Research into labor market consequences of youth unemployment is more widespread in psychology, medicine and epidemiology than in economics (Winefield at al. 1991; Creed and Reynolds 2001; Fergusson et al. 2001). To the best of our knowledge there are not many economic studies that analyze mental health and unemployment with respect to age. This paper fills this gap by studying the relationship between unemployment and mental health in Poland in various age groups, with a particular emphasis on younger population. Poland is a particularly interesting country to study since it has underwent profound economic changes in the last decades and the relationship between health and economic situation (e.g. unemployment, incomes) has been widely documented in the literature (Wilkinson 1996, Wagstaff et al. 1991). Since 1990 Poland has experienced an unprecedented, more than 100 percent increase in GDP, on the other hand, the Gini index of income inequality went up too, from 0.27 in 1992 to 0.33 in 2011.[1]

We are interested in whether youth unemployment is related to worse mental health condition and to more unequal mental health distribution. Furthermore, we decompose observed inequality by population groups. We distinguish four groups, young unemployed, young employed, adult unemployed and adult employed. We utilize 2010/2011 World Mental Health (WMH) Survey for Poland. The study is a general population epidemiologic survey of mental, substance use, and behavioral disorders in Poland. It aims to obtain accurate information about the prevalences and correlates of these disorders. The surveyed population is between 18 and 65 years old; 10 000 individuals were surveyed. The tool used to detect disorders is the Composite International Diagnostic Instrument used by the World Health Organizations in epidemiological and cross-cultural studies as well as for clinical and research purposes. The questionnaire contains very detailed questions related to mood, anxiety, daily routines as well as demographic data. Most of these questions are in the form of an ordinal variable. For example, "How often was your worry so strong that you could not put it out of your mind no matter how hard you tried - often, sometimes, rarely, or never?" i.e. this way we get an ordinal variable with four categories that can be ordered from the worst to the best outcome.

Most of measurement approaches in health economics have so far assumed the existence of a ratio-scale variable (Wagstaff, 2002), whereas health indicators and in particular

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[1]World Development Indicators, World Bank

mental health indicators are typically ordinal. Recent advances in the field of inequality and welfare measurement for ordinal data allow to fully acknowledge the ordinal nature of health indicators and there is already a few studies that do this (Kobus and Miłoś, 2012; Makdisi and Yazbeck, 2014). In the project we use methodology developed by Allison and Foster (2004), Kobus and Miłoś (2012) and Sonne-Schmidt et al. (2014). We compare various distributions of health indicators between four groups using dominance relations and inequality indices for ordinal data. Dominance relations are more robust in a sense that when the dominance holds conclusions typically apply to the class of inequality indices. On the other hand, dominance comparisons may be inconclusive i.e. dominance curves cross and dominance does not hold. Usually, one needs to resort then to inequality measures. These have the disadvantage of arbitrariness involved in the functional form of an index, yet they do give complete ordering of the studied distributions.

In most exercises we compare four groups. Group 1 is our main interest and consists of young unemployed individuals. Here young stands for individuals who are 18-24 years old. Group 2 are young individuals who are either employed or in education/training. Group 3 are unemployed older than 24 years and Group 4 are individuals older than 24 who are active in the labor market. The comparisons are robust in a sense that a distribution of a given health indicator (e.g. the feeling of anxiety) in population A dominates[2] the distribution of this indicator in population B. If this is true, then - the literature shows - we can assert that mental health of population A is better than mental health of population B and this conclusion is robust in a sense that it applies to a broad class of welfare or inequality measures. This way we are freed from arbitrariness involved in choosing a specific measure of mental well-being and/or inequality.

Firstly, we compare the distribution of physical health status and mental health status between our four groups to decide whether indeed mental health condition is related to the employment status and the age of an individual. Secondly, we compare the same distributions in terms of inequality. It seems that mental health indicators should be more unequally distributed among the young unemployed than among the young employed since, as we mentioned, health itself is an important determinant of youth unemployment. Thirdly, we estimate how much each of the four groups described in the previous paragraph contributes to the overall inequality related to mental health. Fourthly, we analyze the joint distribution of binary mental health indicators. This is necessary as we expect there to be significant association between health indicators and the more association the more likely it is that an individual is deprived in terms of several health indicators (Atkinson and Bourguignon 1982). The literature concerning inequality comparisons of multidimensional distributions is being developed and right now we are only able to compare bidimensional distributions of binary indicators utilizing the recent result of Sonne-Schmidt et al. (2014).

We obtain the following results. There is a clear first order stochastic dominance with

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[2]Types of domination come from welfare and inequality measurement literature e.g. Allison and Foster (2004).

respect to both physical and mental health status. The two indicators are both more related to age than employment status and the dominance is more pronounced for physical health than for mental health i.e. physical health is more polarized along the age dimension than mental health. Younger groups dominate older ones, and within these groups employed dominate unemployed. Also for more detailed questions concerning mental health young employed tend to dominate young unemployed although for indicators such as being nervous or tired no clear dominance emerges, apparently these are generally shared feelings. The values of inequality indices within the four groups are similar when inequality above and below the median are weighed equally. When more weight is put on the inequality in the lower end of the distribution (e.g. below the median) then older groups exhibit more inequality, and young unemployed are distributed more unequally than young employed. The highest contribution to inequality comes from the adult group and then from the young employed. This is, however, due to significant differences in population sizes; apparently inequality values are not so diversified to reverse the ranking of groups according to their population sizes. This ranking changes when more weight is put on the inequality above the median. In general, the changes to inequality values and group contributions show more similarity along the age dimension than along the employment status dimension. For bidimensional distribution of various mental health indicators, it is typically the case that employed first order dominate unemployed i.e. young employed dominate young unemployed, and adult employed dominate adult unemployed. There are, however, some indicators (e.g. related to feeling tired) that show no dominance patterns, again these are probably too general feelings to differ with the employment status. Furthermore, for indicators of social interactions dominance results are typically different than for the more detailed questions about an individual's mood e.g. there is clear dominance of young employed over young unemployed whereas there is no dominance of adult employed over adult unemployed. Also whereas young people typically dominate adults (both employed and unemployed) for questions concerning one's mood, no such dominance emerges for questions concerning social interactions and in case it is adult who dominate the youth.

The paper is organized as follows. In Section 2 we summarize briefly received literature on the topic. In Section 3 we describe the youth situation in Poland. In Section 4 we describe the dataset and variables that we use. In Section 5 we present the methodology. Section 6 contains results. Finally, we conclude.

2   Related literature

As to the causal relationship between unemployment and health, Salm (2009) finds no causal effect of unemployment on various objective and subjective health indicators. Recently Schmitz (2013) uses plant closures in Germany as exogenous entries into unemployment and finds no causal effect of unemployment on health. On the other hand,

Sullivan and von Wachter (2009) and Eliason and Storrie (2009) find strong negative effects of involuntary job loss on subsequent mortality. Using instrumental variable method Gathergood (2013) finds a sizeable decrease in health due to unemployment. Negative health shocks are associated with subsequent exits out of employment (Riphahn 1999, Garcia-Gomez et al. 2010).

As to the relationship between unemployment and psychological health, the evidence usually refers to self-assessed health. Namely, in surveys individuals are asked the following question "How would you rate your health status? Would you say it is very bad, bad, fine, good or very good?". This question reflects subjective psychic evaluation of one's health status. Unemployment is related to substantial decreases in subjective well-being (e.g. Doland et al. 2008 for a review). Clark and Oswald (1994) find that the unemployed are unhappy according to standard subjective measures of well-being. Bockerman and Ilmakunnas (2009) show that the event of being unemployed does not matter for self-assessed health. It is the selection of people with poor health to the pool of unemployed that explains the cross-sectional negative relationship between unemployment and self-assessed health. Mental health, however, is a broader concept than self-reported health status. It relates to stress, anxiety, depression, relationship problems, addiction, mood disorders and other aspects of psychological well-being. Bjorklund (1985) is the first application of panel data to study the effects of unemployment on mental health. He cannot reject the hypothesis that there are no effects, but sensitivity tests indicate low precision of the estimates. Green (2010) analyzes Labor Dynamics in Australia Survey that contains information on mental health in a form of self-completion questionnaire. The questionnaire contains questions such as "Have you been a nervous person?", "Have you felt so down in the dumps that nothing could cheer you up?", "Have you felt calm and peaceful?", "Have you felt down?". Responses are on a six-point scale from "All of the time" to "None of the time". He finds that the average impact of unemployment on mental health is negative and that higher prospects of employability increase mental well-being when unemployed. Virtanen et al. (2013) analyze whether mood and problems with sleeping predict the occurrence of unemployment and prolonged unemployment. Poor health status and answers "rather often" to a question "How often have you felt sad and down-hearted during the last 12 months?" are the most strongly associated with the occurrence of unemployment and prolonged unemployment. In general, however, there is not much research in economics on the relationship between mental health and unemployment.

Likewise, labour market outcomes of youth are more widely studied in psychology than economics. Winefield et al. (1991) suggest that there is a causal connection between employment status and psychological well-being. The employed show higher self-esteem, less depressive affect, less externality, and less negative mood than the unemployed. Caspi et al. (1998) study childhood and adolescent predictors of early failure in the labor market. They find that lack of high school qualifications, poor reading skills, low IQ scores, and limited parental resources increase the risk of unemployment. With respect

to social capital, family conflict and single-parent family are factors that are conducive to unemployment whereas in the personal capital domain it is antisocial behavior. Youth unemployment causes psychological distress, anxiety and depression (Creed and Reynolds 2001). Young unemployed are also more likely to engage in behaviors that are detrimental to health e.g. alcohol and drug abuse (Fergusson et al. 2001). Exposure to unemployment is significant in suicidal ideation, substance abuse and criminal behaviors. Creed and Reynolds (2001) show that the unemployed have high levels of economic deprivation which is related to levels of psychological distress and social loneliness. Those who never experienced paid work report the highest levels of such feelings. Not only does lack of job or inactivity outside education affect youth health, but also good health increases the probability of being unemployed. Young people suffering from health issues have 40 percent higher chance of being not in education, training or employment than those with good health (Eurofound 2010). This is one of the "scars", namely, long term consequences of being unemployed when young.

The prevalence of psychiatric morbidity in Poland was studied by Kiejna et al. (2004). The national health interview survey covered over 39000 respondents. Psychiatric morbidity was noted almost one fourth of women and one fifth of men. Every tenth women reported such complaints up to the age of 25 and every second above 75 years old. Higher psychiatric morbidity was associated with divorce or being widowed, being out of work or disabled. Lower morbidity was associated with a higher level of education. The impact of mental health on the workplace was studied in the International Labour Organization study "Mental health in the workplace, situation analyses: Poland" (Czabala et al. 2000). The authors write "It appears that, in a situation where unemployment is a constant threat, some employers feel free to exploit workers mercilessly. Regulations about working hours and paid holidays are notoriously neglected, and pressure to work is exerted on employees whose inability to work has been diagnosed by a physician. All these factors contribute to considerable psychological stress for employees, which is often neglected by the occupational medical services, whose training in this field has been unsatisfactory for a long time." They cite sociological analyses made by the Department of Analyses and Prognoses of the Prime Minister's Office according to which the anxiety related to the threat of unemployment grew by almost 50 percent compared to the 1997 level. Poland has occupational therapy workshops and centers for work activities for people with moderate and severe mental health disorders. Their organization and activities are regulated by The Act on Employment and Occupational Rehabilitation of Disabled People of 1991 (with several later amendments). They provide temporary occupation and a small stipend for people with mental illness who have lost their jobs. Yet the authors stress that effective measures to activate mental people with mental health disorders on the labor market are hampered by general difficulties of the labour market i.e. limited job opportunities.

3 The situation of the youth in Poland

For two decades Poland has been experiencing "educational boom", namely, the rising proportion of individuals with higher education degree e.g. enrollment ratio has risen from 12 percent in 1990 to 53 percent in 2011. Therefore Poland has one of the lowest shares of youths with at most a lower secondary education who are not in further education or training e.g. 6 percent vs. 14 percent for the EU 27 (Polakowski 2012).

Up until 2008 Poland has experienced a much higher youth unemployment ratios than the rest of Europe. In the first years of the 2000s the number reached more than 40 percent in Poland while in EU 27 it was less than 20 percent (Figure 1). Then, the unemployment level among youth continuously declined until it fell down to 17 percent in 2008. Since then it is on the rise reaching 24 percent in year 2014. Although Poland's economy stood out positively in Europe during the 2008 crisis, the employment conditions of youth deteriorated substantially as evidenced by higher unemployment rate and the growth of precarious employment and in-work poverty (Polakowski 2012). Youth have been particularly hit by the crisis. This is best reflected in the ratio of the youth unemployment rate to the adult unemployment rate which is increasing (Figure 2).

There exists a significant gender gap i.e. women's unemployment is continuously higher than men's in age group 15-24 (Figure 2). The unemployment levels vary significantly by educational attainment. Those with lowest educational level have unemployment rates higher than the best educated by several percentage points (Figure 3).

As mentioned, due to an exceptional educational boom, employment levels of young Poles remain lower than the EU average. A distinctive feature of youth labour market in Poland is the incidence of fixed-term contracts i.e. 66 percent of total youth employment vs. 42 percent for the EU 27 (Polakowski 2012). This mostly concerns individuals with lower education who account for almost half of all temporary contracts for youths. Another type of employment that youth often receive are Civil Code contracts for which social protection rights are significantly reduced. Baranowska et al. (2011) estimate that only 10.7 percent of temporary contract workers move to permanent employment, therefore such contracts do not provide for a transition to more stable employment opportunities.

Figure 1: Youth (15-24) unemployment in EU27 and Poland.

Source: Eurostat
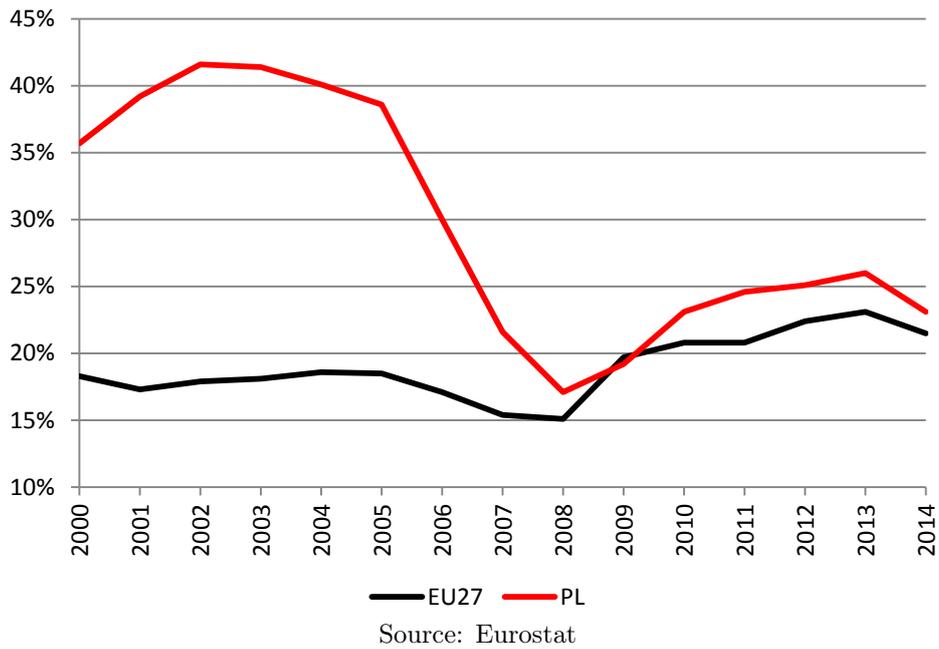
Figure 2: Youth unemployment rate, youth unemployment as a proportion of the youth population, youth unemployment as a proportion of total unemployment, and ratio of the youth unemployment rate to the adult unemployment rate in years 1991-2012
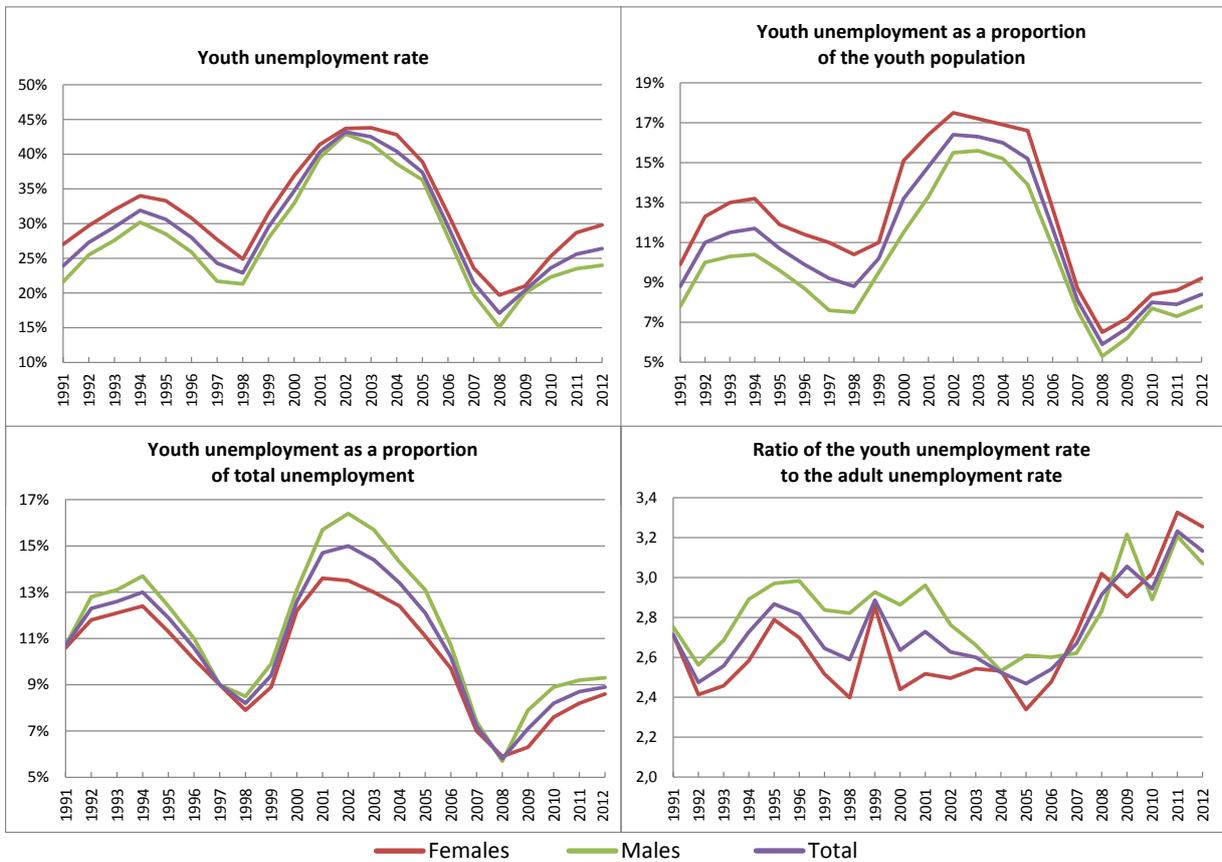
Source: International Labor Organization (Key Indicators of the Labor Market)

Figure 3: Youth (15-24) unemployment in EU27 and Poland by education levels.

Source: Eurostat
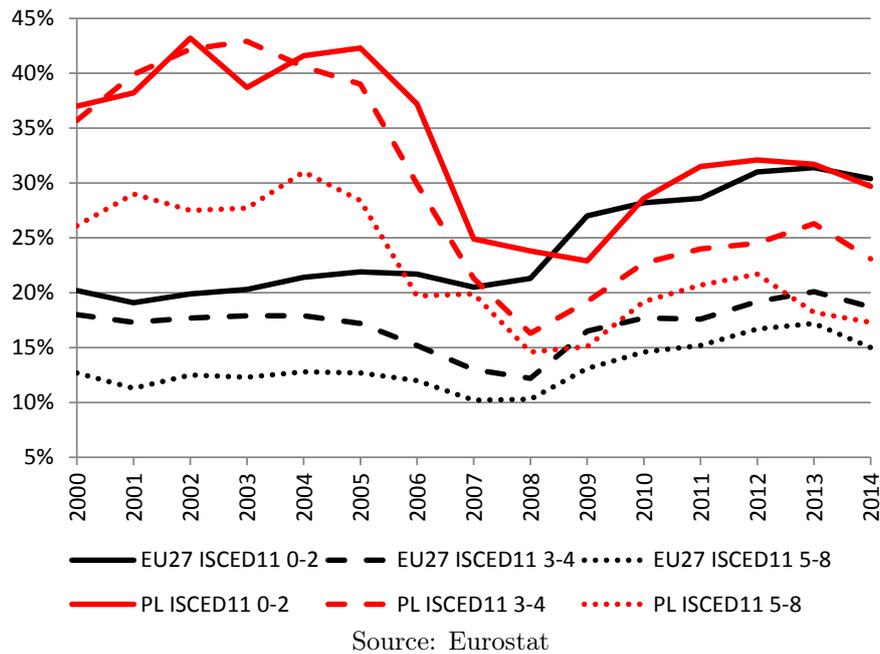
Figure 4: Temporary employment as a percentage of total employment of youth (15-24) in EU27 and Poland.

Source: Eurostat
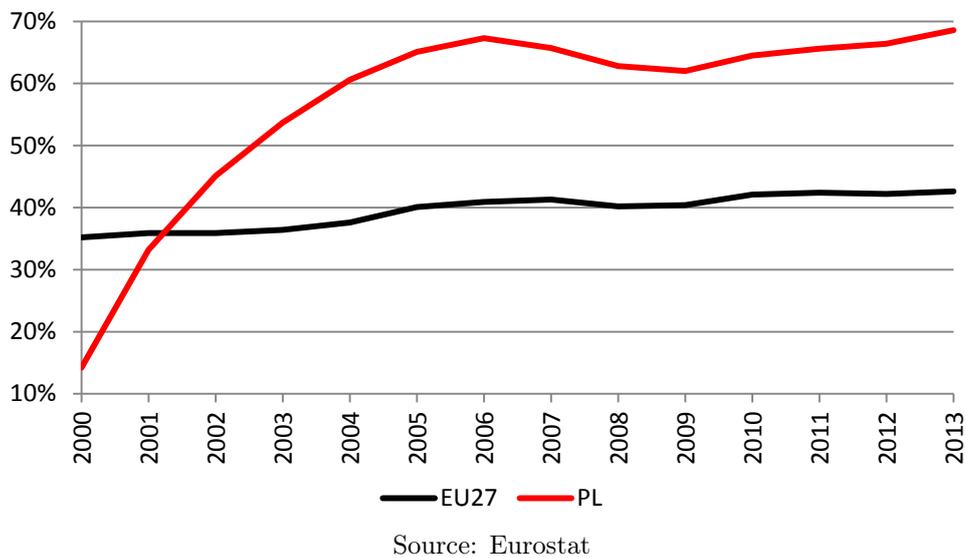
As the Polish population ages and fertility rates decline, the share of the youth population decreases (Figure 5). On the other hand, for the same reasons, today's youth will become more important as they age and become the basis of the labour force. Figure 6 shows that the 18-24 group (i.e. those who were 18-24 years old at the time of the survey, namely, in year 2011) will constitute an increasing percentage of the working age population. Therefore, it is important to study early labor market experiences of this group.

Figure 5: Population aged 15-24 in Poland, historical data 1990-2010 and medium prospects for 2015-2040.

| Historical, percent of total | Prospect, percent of total |
| Historical, in thousands | Prospect, in thousands |
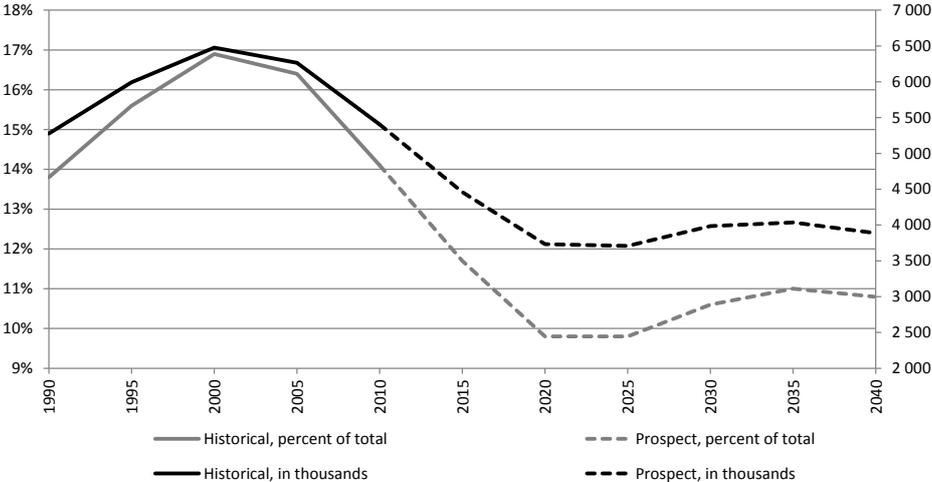
Source: UN, World Population Prospects: The 2012 Revision

Figure 6: Cohort born in 1985-1994 as a % of population aged 15-64, medium fertility prospects for years 2015-2050.
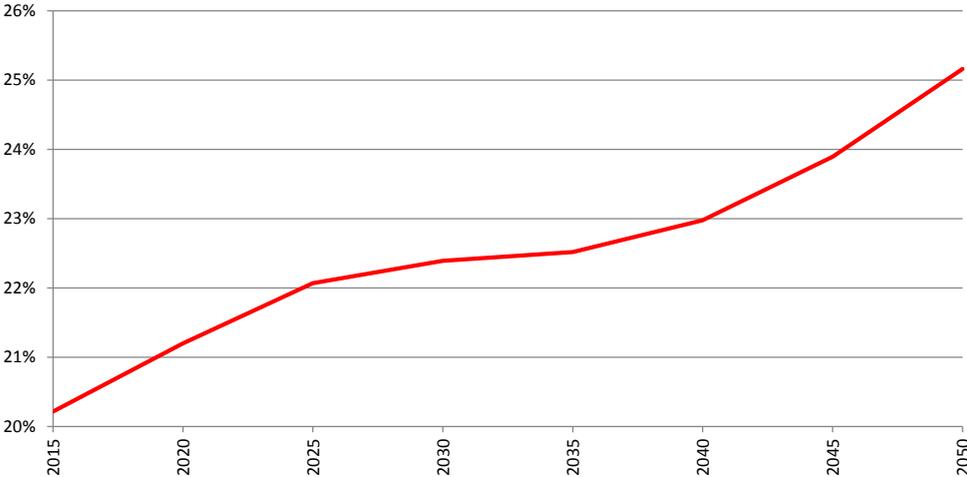
Source: UN, World Population Prospects: The 2012 Revision

4 Data

The data come from 2010/2011 World Mental Health (WMH) Survey for Poland. The study is a general population epidemiologic survey of mental, substance use, and behavioral disorders in Poland. The surveyed population is between 18 and 65 years old; 10 000 individuals were surveyed. As mentioned, we distinguish four groups; 1) young unemployed individuals (261 individuals in the sample) 2) young individuals who are either employed or in education/training (1492 individuals in the sample) 3) unemployed older

than 24 years (769 individuals in the sample) 4) individuals older than 24 who are active in the labor market (7559 individuals in the sample).

The questionnaire, the Composite International Diagnostic Instrument contains questions related to general health, mood, anxiety, depression and other disorders in the form of an ordinal variable. The variables we use is physical health status (Figure 7) and mental health status (Figure 8). These questions are typically in the form "How would you rate your physical (mental) health? Is it ...". We removed answers "I do not know" and "I do not want to answer" from analyses; in each case it was not more than 1 percent of the sample.

5 Methodology

5.1 Definitions and notation

In what follows we compare univariate and multivariate distributions of mental health indicators. Behind these comparisons is the following formal model.

Unidimensional objects are typed in bold. We define $\mathbb{I} := \{1, \ldots, n_1\} \times \{1, \ldots, n_2\} \times \ldots \times \{1, \ldots, n_k\}$, where n_j denotes the number of categories for j-th dimension; higher category number corresponds to higher value of the ordinal variable (e.g. better health status). Throughout our article $\mathbb{I}, k, n_i$ are fixed unless we explicitly state otherwise. Now let $\mathbb{p}$ be a probability distribution on the set $\mathbb{I}$; Λ is the set of all such distributions. Obviously we require

$$\sum_{\mathbb{i} \in \mathbb{I}} \mathbb{p}(\mathbb{i}) = 1 \quad \text{and} \quad \forall_{\mathbb{i} \in \mathbb{I}} \mathbb{p}(\mathbb{i}) \geq 0.$$

For $j \in \{1, 2, \ldots, k\}$ we define marginal distribution in the following way

$$\mathbf{p}^j(\mathbf{i}) := \sum_{\mathbb{i} \in \mathbb{I} \text{ such that } \mathbb{i}_j = \mathbf{i}} \mathbb{p}(\mathbb{i}), \quad \mathbf{i} \in \{1, 2, \ldots, n_j\}. \tag{1}$$

For $\mathbf{p}^j$ we can define the cumulative distribution function by

$$\mathbf{P}^j(k) = \sum_{h \leq k} \mathbf{p}^j(k), \quad j \in \{1, 2, \ldots, k\}.$$

In a similar manner we define a multidimensional cumulative distribution function by

$$\mathbb{P}(\mathbb{i}) = \sum_{\mathbb{h} \in \{1, 2, \ldots, \mathbb{i}_1\} \times \ldots \times \{1, 2, \ldots, \mathbb{i}_k\}} \mathbb{p}(\mathbb{h}).$$

For each dimension j we define a median m_j which is the number for which $\mathbf{P}^j(m_j - 1) \leq 1/2$ and $\mathbf{P}^j(m_j) \geq 1/2$. When it is explicit that there is one dimension, the median is denoted simply by m. Let us note that the median does not need to be unique. For example, such is the case when some atoms of the distributions are 0. In the distribution

(0.25, 0.25, 0, 0, 0.25, 0.25) (one fourth of individuals is in the first category, one fourth in the second etc.) the conditions in the definition of the median are fulfilled by the second, third and fourth category.

Finally, let inequality index by denoted by $I : \Lambda \times \mathbb{C} \mapsto \mathbb{R}$.

5.2 Comparing univariate discrete distributions in terms of welfare and inequality

The first criterion under which health distributions can be compared is known as first order dominance. Suppose that the fraction of the overall population in the worst health category is lower for distribution $\mathbf{p}_1$ than for $\mathbf{p}_2$. Furthermore, suppose that the same holds for the second lowest category, the third lowest category and so on. Then, the average health is unambiguously higher for $\mathbf{p}_1$ than for $\mathbf{p}_2$.[3]

Defintion 1. *First order dominance (FOD) (Allison and Foster 2004)*
Fixing $n \geq 1$ and allowing $\mathbf{p}_1, \mathbf{p}_2$ to be two probability distributions on $\{1, \ldots, n\}$. $\mathbf{p}_2 \leqslant_{FOD}$ $\mathbf{p}_1$ if and only if

$$\mathbf{P}_1(j) \leq \mathbf{P}_2(j) \quad \text{for any} \quad j = 1, \ldots, n,$$

where $\mathbf{P}_1$ and $\mathbf{P}_2$ are the cdf's corresponding to $\mathbf{p}_1$ and $\mathbf{p}_2$ respectively.

Another criterion concerns the spread of the distribution and was proposed by Allison and Foster (2004) to measure inequality in ordinal data, but was present earlier in statistical literature too (Blair and Lacy 2000).

Defintion 2. *AF relation (AF) (Allison and Foster 2004)*
Fixing $n \geq 1$ and allowing $\mathbf{p}_1, \mathbf{p}_2$ to be two probability distributions on $\{1, \ldots, n\}$. $\mathbf{p}_1 \leqslant_{AF}$ $\mathbf{p}_2$ if and only if the following three conditions are met:

(AF1) $\mathbf{p}_1, \mathbf{p}_2$ *have a unique and common median m,*

(AF2) $\mathbf{P}_1(j) \leq \mathbf{P}_2(j)$ *for any $j < m$,*

(AF3) $\mathbf{P}_1(j) \geq \mathbf{P}_2(j)$ *for any $j \geq m$,*

where $\mathbf{P}_1$ and $\mathbf{P}_2$ are the cdf's corresponding to $\mathbf{p}_1$ and $\mathbf{p}_2$ respectively.

Interpretation of this ordering is intuitive, in particular, $\mathbf{p}_1 \leqslant_{AF} \mathbf{p}_2$ when $\mathbf{p}_1$ is more concentrated around the median than $\mathbf{p}_2$. In other words, looking from below median categories $\mathbf{p}_1$ has more probability mass pushed towards the median than $\mathbf{p}_2$ and similarly for above median categories.

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[3]The average here means that there is a sequence of numbers assigned to categories e.g. $(1, 2, 3, 4, 5)$. Let $\mathbf{p}_1 = (0.2, 0.3, 0.2, 0.1, 0.2)$, then the average is computed in the following manner $1 \times 0.2 + 2 \times 0.3 + 3 \times 0.2 + 4 \times 0.1 + 5 \times 0.2$.

5.3 Decomposing inequality by population subgroups

One of our goals is to trace the sources of observed inequalities, that is, we would like to evaluate what are the contributions of various groups to overall inequality. Kobus and Miłoś (2012) prove a theorem showing that inequality indices that are decomposable by population subgroups necessarily belong to the particular class of functions. The decomposition axiom is the following.

Defintion 3. *DECOMP (Kobus and Miłoś 2012)*
There exists a function $f : Ran(I) \times Ran(I) \times (0,1) \mapsto \mathbb{R}$ that is continuous and strictly increasing with respect to the first two coordinates such that for any $\mathbf{p}_1, \mathbf{p}_2 \in \Lambda, \alpha \in (0,1)$

$$I(\alpha \mathbf{p}_1 + (1-\alpha)\mathbf{p}_2) = f(I(\mathbf{p}_1), I(\mathbf{p}_2), \alpha), \tag{2}$$

where $\alpha \mathbf{p}_1 + (1-\alpha)\mathbf{p}_2$ is a weighted sum of probability distributions.

DECOMP requires that an index is presented as some function of inequality values in subgroups and subgroup sizes expressed in percentages. In order to better understand how DECOMP works we consider the following example. Let $\mathbf{p}_1 := (0.25, 0.25, 0.50); \mathbf{p}_2 := (0.30, 0.40, 0.30)$ and $\alpha = 0.5$. The distribution $0.5\mathbf{p}_1 + 0.5\mathbf{p}_2 := (0.275, 0.325, 0.40)$ can be viewed as two population subgroups of equal size $\alpha = 0.5$ that correspond to distributions $\mathbf{p}_1$ and $\mathbf{p}_2$. Then, if the inequality index fulfills DECOMP the inequality value associated with the distribution $(0.275, 0.325, 0.40)$ can be decomposed into inequality values in groups $\mathbf{p}_1$ and $\mathbf{p}_2$.

Kobus and Miłoś (2012) propose the following decomposable index, which is an extension of the index proposed by Abul Naga and Yalcin (2008).

Defintion 4. *Absolute value index*

$$I^{a,b} = \frac{a \sum_{k<m} \mathbf{P}(k) - b \sum_{k \geq m} \mathbf{P}(k) + b(n+1-m)}{(a(m-1) + b(n-m))/2}; \ \ a, b \geq 0. \tag{3}$$

When $a > b$ the index is more sensitive to inequality below the median, whereas the opposite is true if $a < b$ and more weight is attached to inequality above the median. If $a = 1$ and $b = 1$, then inequality below and above the median is treated in the same way. We will use this index to calculate and decompose inequality.

5.4 Comparing multivariate discrete distributions in terms of inequality

Sonne-Schmidt et al. (2014) propose criteria for comparing bidimensional distributions of binary indicators (2×2 case). Then, the following result holds.

Theorem 1. *Let $\mathbb{I} = \{1,2\} \times \{1,2\}$ and let $\mathbb{p}_1, \mathbb{p}_2$ be two distributions on $\mathbb{I}$. Then, $\mathbb{p}_1$ is ordinally more unequal than $\mathbb{p}_2$ if and only if one of the following six cases holds:*

1. $\mathbb{p}_2$ *and* $\mathbb{p}_1$ *have common median* $(2,2)$, *and* $\mathbb{p}_2$ *first order dominates* $\mathbb{p}_1$;

2. $\mathbb{p}_2$ *and* $\mathbb{p}_1$ *have common median* $(1,1)$, *and* $\mathbb{p}_1$ *first order dominates* $\mathbb{p}_2$;

3. $\mathbb{p}_2$ *and* $\mathbb{p}_1$ *have common median* $(2,2)$, *and* $\mathbb{p}_2(2,1) \geq \mathbb{p}_1(2,1)$, $\mathbb{p}_2(1,2) \geq \mathbb{p}_1(1,2)$, $\mathbb{p}_2(2,2) \leq \mathbb{p}_1(2,2)$, $\mathbb{p}_1(2,2) - \mathbb{p}_2(2,2) \leq \min \mathbb{p}_2(2,1) - \mathbb{p}_1(2,1), \mathbb{p}_2(1,2) - \mathbb{p}_1(1,2)$;

4. $\mathbb{p}_2$ *and* $\mathbb{p}_1$ *have common median* $(1,1)$, *and* $\mathbb{p}_2(2,1) \geq \mathbb{p}_1(2,1)$, $\mathbb{p}_2(1,2) \geq \mathbb{p}_1(1,2)$, $\mathbb{p}_2(1,1) \leq \mathbb{p}_1(1,1)$, $\mathbb{p}_1(1,1) - \mathbb{p}_2(1,1) \leq \min \mathbb{p}_2(2,1) - \mathbb{p}_1(2,1), \mathbb{p}_2(1,2) - \mathbb{p}_1(1,2)$;

5. $\mathbb{p}_2$ *and* $\mathbb{p}_1$ *have common median* $(2,1)$, *and* $\mathbb{p}_1(2,1) \leq \mathbb{p}_2(2,1)$, $\mathbb{p}_1(1,2) \leq \mathbb{p}_2(1,2)$, $\mathbb{p}_1(2,2) \geq \mathbb{p}_2(2,2)$, $\mathbb{p}_1(1,1) \geq \mathbb{p}_2(1,1)$, $\mathbb{p}_2(2,1) - \mathbb{p}_1(2,1) \geq \mathbb{p}_2(1,2) - \mathbb{p}_1(1,2)$;

6. $\mathbb{p}_2$ *and* $\mathbb{p}_1$ *have common median* $(1,2)$, *and* $\mathbb{p}_1(1,2) \leq \mathbb{p}_2(1,2)$, $\mathbb{p}_1(2,1) \leq \mathbb{p}_2(2,1)$, $\mathbb{p}_1(2,2) \geq \mathbb{p}_2(2,2)$, $\mathbb{p}_1(1,1) \geq \mathbb{p}_2(1,1)$, $\mathbb{p}_2(1,2) - \mathbb{p}_1(1,2) \geq \mathbb{p}_2(2,1) - \mathbb{p}_1(2,1)$.

6   Results

In the first step we compare physical and mental health indicators according to criteria defined in Definitions 1 and 2. Figures 7 and 8 show the distribution of declared overall and mental health status. The typical problem of comparing distributions in the first categories is that there are not enough observations for comparisons to be significant, therefore we ignore these categories. With respect to physical health of the age group 25+ there does not seem to be dominance between the employed and the unemployed, whereas the situation is more clear with respect to the 18-24 years old group. The young employed first order stochastic dominate the young unemployed. When mental health is considered, the differences between the employed and the unemployed become more evident. We observe clear dominance pattern; the 18-24 employed dominate the 18-24 unemployed who dominate 25+ employed who dominate 25+ unemployed. It seems that both mental and physical health are more related to age than to the employment status: younger groups tend to dominate older ones.

Figure 7: Cumulative distribution of physical health status in Poland.
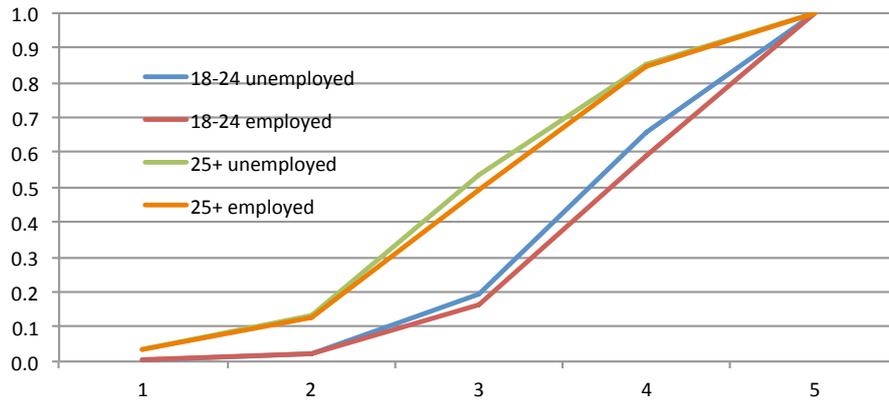
Figure 8: Cumulative distribution of mental health status in Poland.
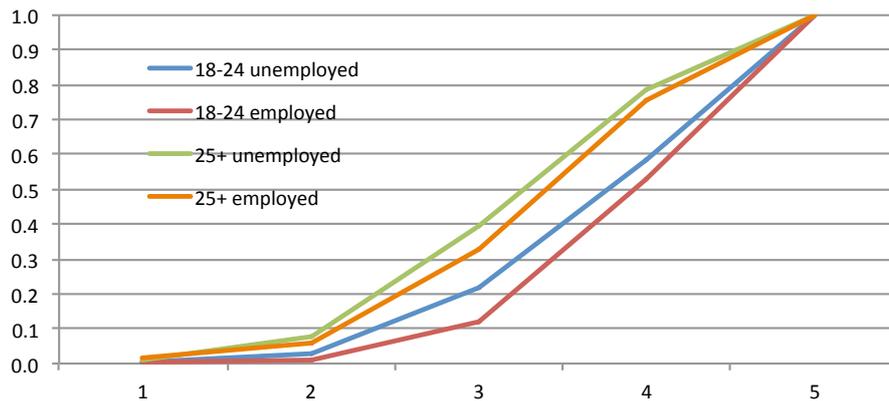
Figure 9 shows the answers to more detailed questions related to how the person felt in the past 30 days. It is difficult to draw conclusions, because distributions overlap for the lowest categories, but this may be due to the small number of observations in these categories i.e. typically not more than 10. For questions (d), (f), (g), (i) the common median is category "4", which in the case of five category variable means that Definitions 1 and 2 are equivalent. Ignoring lowest categories where the number of observations is small, we obtain both FOD and AF dominance of the young employed over the young unemployed. There is no dominance with respect to questions related to whether the respondent felt tired or nervous in the past 30 days. These seem to be general feelings shared by all young people and may be due to the fact that even when employed, young people in Poland, as mentioned, experience relatively high levels of job insecurity. When more detailed question was asked such as "How often did you feel so nervous that nothing could calm you

15

down?", then young employed dominate young unemployed in terms of first order stochastic dominance. The same is true for the feelings of being hopeless, worthless, angry. This indicates that these indicators are more specific to detect psychiatric disorders.

When inequality is measured with the same weights below and above the median, inequality values are similar in all four groups (Figure 10). When more weight is put at the lower end of the distribution, then the inequality is the highest in the adult population which is unemployed, then among employed adults, unemployed youths and employed youths. It seems therefore that lower end variation rises more with age than employment status. When, on the other hand, more weight is put on the higher end of the distribution youths dominate adults in terms of inequality. Contributions (Figure 11) reflect both inequality scores and population sizes. Since the size of the adult employed population is much larger than the size of other groups (75 percent) this group dominates with respect to contributions to overall inequality. Yet the ranking of contributions does not follow the ranking of population sizes precisely. In particular, the contribution of the young employed population changes substantially and is the highest when more weight is put on the distribution above the median. Clearly, substantial part of this distributions is concentrated in the highest categories. Moreover, it is evident that changes to inequality values and to contributions are more similar within age groups (young vs. adult) than within employment groups (employed vs. unemployed).

Figure 10: Mental health status: inequality indices $I_{a,b}$.
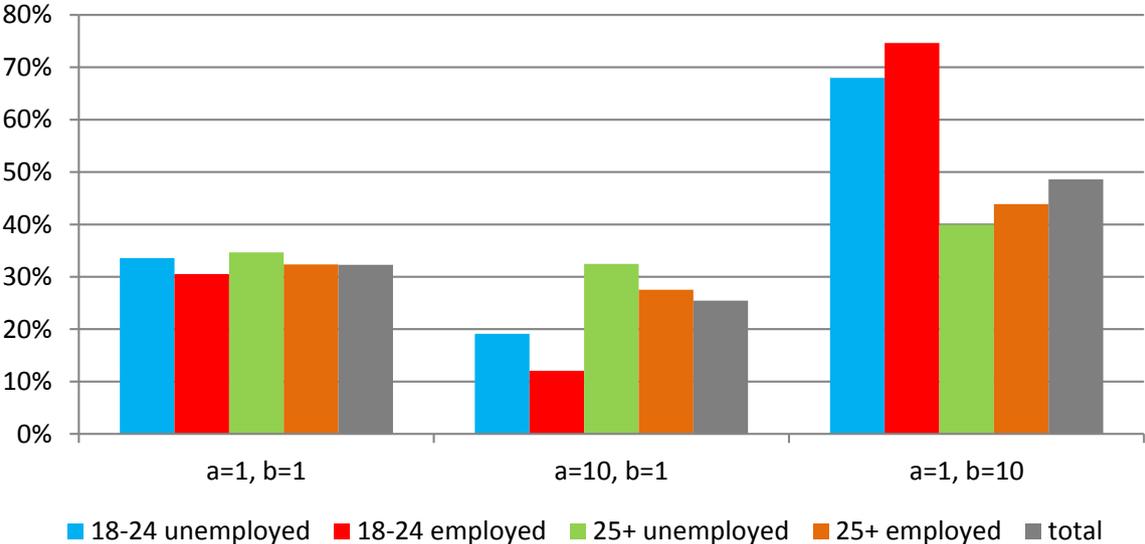
16

Figure 9: The distribution of answers to questions on how the respondent felt in the last 30 days: young unemployed vs. young employed (FOD). How often did you feel ...
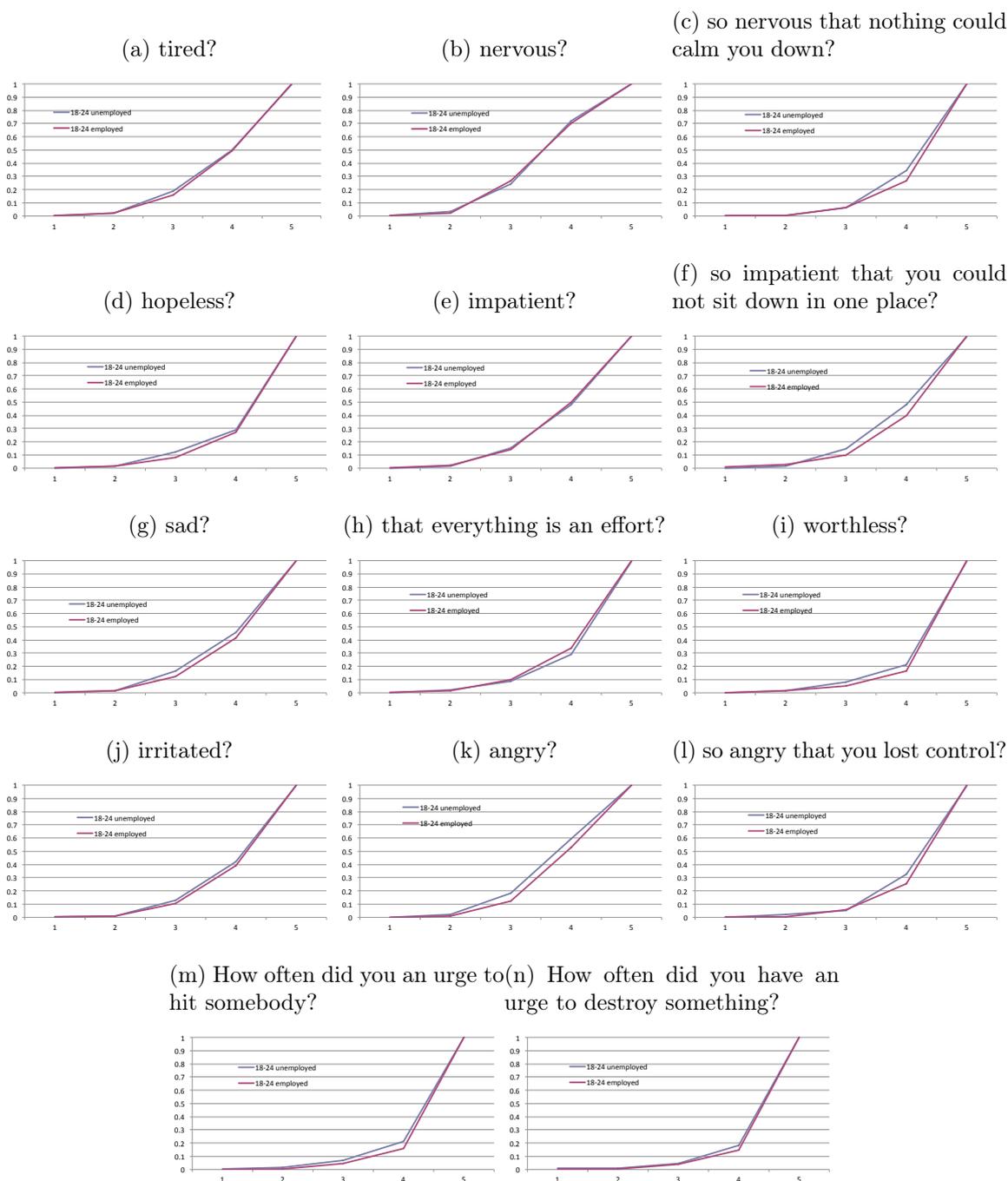
(a) tired?

(b) nervous?

(c) so nervous that nothing could calm you down?

(d) hopeless?

(e) impatient?

(f) so impatient that you could not sit down in one place?

(g) sad?

(h) that everything is an effort?

(i) worthless?

(j) irritated?

(k) angry?

(l) so angry that you lost control?

(m) How often did you an urge to hit somebody?

(n) How often did you have an urge to destroy something?

Source: Own calculations based on the data from the survey "The Epidemiology of Mental Health Disorders and the Availability of Psychiatric Treatment in Poland."

Figure 11: Mental health status: contributions to inequality $I_{1,1}, I_{10,1}, I_{1,10}$
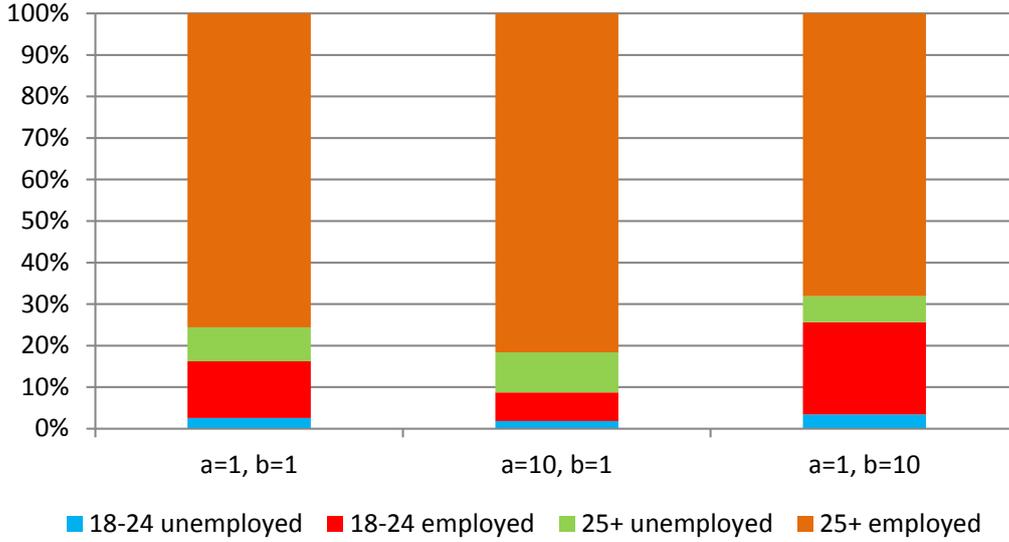
Source: Own calculations based on the data from the survey "The Epidemiology of Mental Health Disorders and the Availability of Psychiatric Treatment in Poland."

When we compare bidimensional distributions of several binary indicators related to mental health status according to Theorem 1 we are either in case (1) or (3), because the median is always $(2,2)$ (Table 1). In most cases we find dominance of employed over unemployed, both for young and adults. There is no dominance between young employed and young unemployed with respect to the distribution of SC20/SC22 (anxiety attack/feeling discouraged) and SC21/SC22 (feeling sad/feeling discouraged). Apparently, these feelings are shared by all young people. The same holds for distributions SC22/SC23 (feeling discouraged/lost interest) and SC22/SC25 (feeling discouraged/feeling annoyed); we find dominance for adults but no dominance for youths. In general, when it comes to questions about individual mood there are fewer differences between young employed and young unemployed than between adult employed and adult unemployed. This picture changes completely for questions related to social interactions and independent activity i.e. SC29 and/or SC30. Here we do not find dominance for adults, whereas young employed clearly dominate young unemployed. To summarize, mental health of youth employed is clearly better than mental health of young unemployed, but this happens too for adult employed and unemployed. What differentiates youth from adults are the differences between employed and unemployed that come from the behavior in social situations, interacting with people and not being feared of independent activity. These indicators (i.e. SC29 and SC30) show different results when the dimension along which we compare different groups is age instead of employment status (Table 2). Typically, young individuals dominate adult individuals, however, for questions related to social interactions (i.e. indicators SC29 and SC30 in Table 2) there is no dominance. Furthermore, for the joint distribution of SC29 and SC30, adults dominate young, both employed and unemployed.

Table 1: Dominance comparisons of bidimensional distributions of binary mental health indicators: young unemployed (yu) vs. young employed (ye) and adult unemployed (au) vs. adult employed (ae).

	SC21	SC22	SC23	SC25	SC29	SC30
SC20	ye, ae	ae	ye, ae	ye, ae	ye, ae	ye
	SC21	ae	ye, ae	ye, ae	ye, ae	
		SC22	ae	ae		
			SC23	ye, ae	ye	ye
				SC25	ye	ye
					SC29	ye

Source: Own calculations based on the data from the survey "The Epidemiology of Mental Health Disorders and the Availability of Psychiatric Treatment in Poland."

Here "ye (yu)" means that young employed (unemployed) dominate young unemployed (employed) "yu (ye)" and "ae (au)" means that adult employed (unemployed) dominate adult unemployed (employed) "au (ae)".

SC20 - Have you ever had an anxiety attack?

SC21 - Have you ever had a period, lasting several days or longer, in which for the most part of the day, you felt sad, empty, or depressed?

SC22 - Have you ever had a period, lasting several days or longer, in which for the most part of the day, you felt discouraged by what was happening in your life?

SC23 - Have you ever had a period, lasting several days or longer, in which you lost your interest in the majority of things that you usually enjoyed (such as work, hobbies and contacts with other people)?

SC25 - Have you ever had a period, lasting several days or longer, in which for the most part of the day you feel annoyed, or were in a bad mood?

SC29 - Have you ever been afraid of other people, or really shy towards people in social situations such as social events?

SC30 - Have you ever been afraid of being in a crowd or in public places, independent travel or trips to places far from your house?

Table 2: Dominance comparisons of bidimensional distributions of binary mental health indicators: young employed (ye) vs. adult employed (ae) and young unemployed (yu) vs. adult unemployed (au).

	SC21	SC22	SC23	SC25	SC29	SC30
SC20	yu, ye	yu, ye	yu, ye	yu, ye		
SC21		yu, ye	yu, ye	yu, ye		
SC22			yu, ye	yu, ye		
SC23				yu, ye		
SC25						
SC29						au, ae

Source: Own calculations based on the data from the survey "The Epidemiology of Mental Health Disorders and the Availability of Psychiatric Treatment in Poland."

SC20 - Have you ever had an anxiety attack?

SC21 - Have you ever had a period, lasting several days or longer, in which for the most part of the day, you felt sad, empty, or depressed?

SC22 - Have you ever had a period, lasting several days or longer, in which for the most part of the day, you felt discouraged by what was happening in your life?

SC23 - Have you ever had a period, lasting several days or longer, in which you lost your interest in the majority of things that you usually enjoyed (such as work, hobbies and contacts with other people)?

SC25 - Have you ever had a period, lasting several days or longer, in which for the most part of the day you feel annoyed, or was in a bad mood?

SC29 - Have you ever been afraid of other people, or really shy towards people in social situations such as social events?

SC30 - Have you ever been afraid of being in a crowd or in public places, independent travel or trips to places far from your house?

Another survey that can be used to study the prevalence of mental disorders in Poland, although in a much less detailed way, is the Social Diagnosis. It is a diagnosis of the conditions and quality of life of the Poles as they report it. It investigates households and their occupants aged 16 and above.The Social Diagnosis is based on panel research; the first sample being taken in the year 2000. The following took place three years later, and since then it has been repeated every two years. The survey contains question related to mood and emotional well-being. We compared young unemployed vs. young employed and old unemployed vs. old employed in years 2000 or 2003 (depending on the question) and 2013 (Figure 12 and 13). There is no clear dominance[4] and the results do not change much in the last decade.

Figure 12: Dominance comparisons of answers to a question "How often do you think about death?" in years 2000 and 2013.
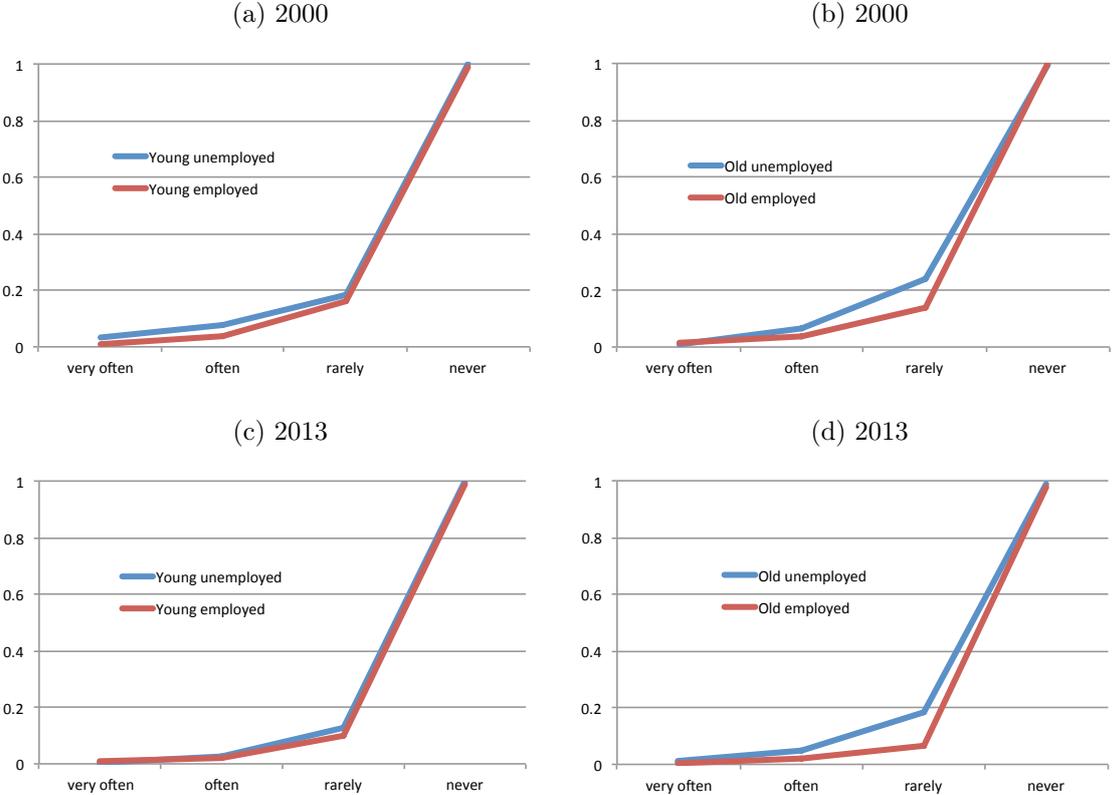
(a) 2000   (b) 2000

(c) 2013   (d) 2013

Source: Own calculations based on the data from the survey "Social Diagnosis 2000-2013: Objective and Subjective Quality of Life in Poland"

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[4]The dominance, if any, is statistically insignificant in each case, although we did not provide confidence intervals for the purposes of clarity of the charts.

Figure 13: Dominance comparisons of answers to a question "Do you feel the enthusiasm to work" in years 2003 and 2013.
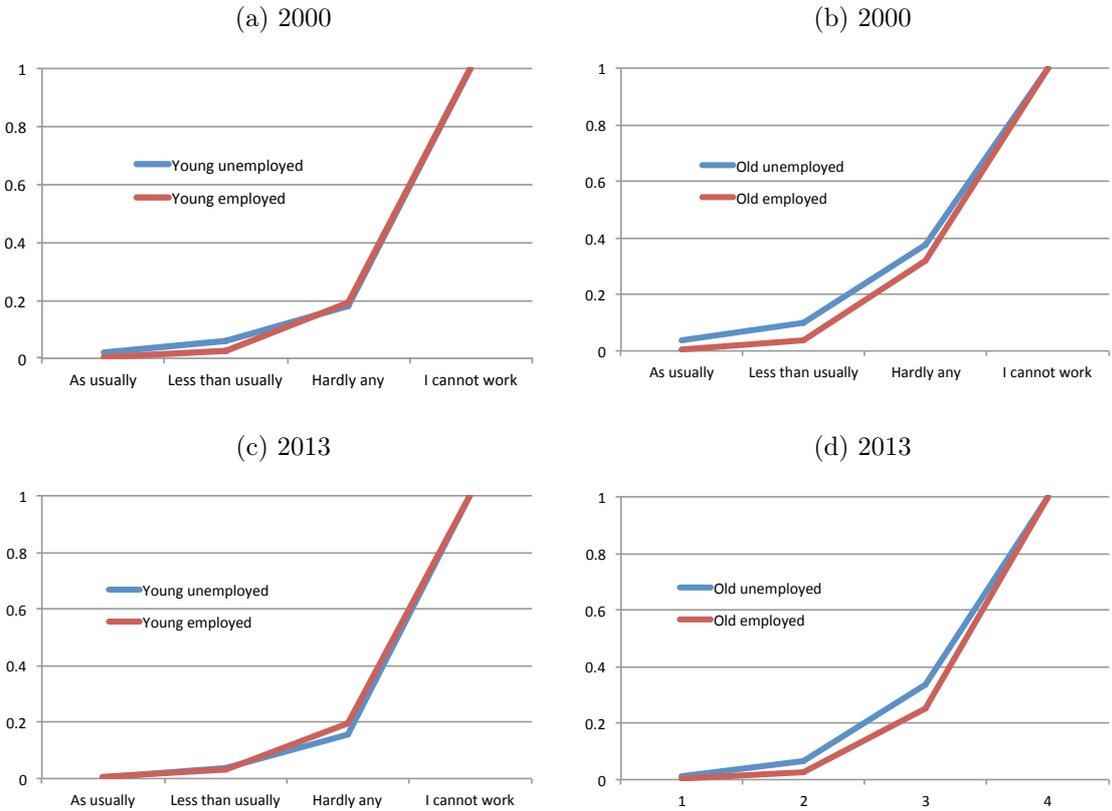
(a) 2000

(b) 2000

(c) 2013

(d) 2013

Source: Own calculations based on the data from the survey "Social Diagnosis 2000-2013: Objective and Subjective Quality of Life in Poland"

7 Conclusions

The results show that mental health of young employed individuals is better than mental health of young unemployed, but this becomes evident with either questions related to social interactions or more detailed questions about the mood. In particular, the feelings of sadness, emptiness, being tired or angry are typical for both young employed and young unemployed. One needs to ask a more detailed question such as "How often did you feel so nervous that nothing could calm you down?" to observe the differences between young employed and young unemployed. This may be partially due to the fact that young people in Poland experience relatively high job insecurity as many jobs are fixed-contract employment.

In terms of inequality, health inequality is similar for all four groups considered but it changes substantially depending on whether the inequality below the median or above the median is more important. In particular, when the inequality below the median is considered, inequality is higher among the adult groups, which indicates that the distribution for adult groups is more concentrated in the lower end. In general, overall mental health status is unambiguously better for young people than for adults. On one hand, this may be typical to this specific cohort of young people and this cohort will matter more as a percentage of working age population in the future. On the other hand, self-reported mental health status may be changing substantially with age.

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