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INFLUENCE OF OBESITY AND OVERWEIGHT ON LABOUR MARKET OUTCOMES ACROSS NORTHERN AND SOUTHERN EUROPEAN COUNTRIES – THE CASE OF ELDERLY PEOPLE

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ABSTRACT

This essay investigates influence of obesity on labour market outcomes – earnings per hour and hours worked per week - across two geographical groups of European countries in a sample of elderly people of 50 years old and over. A method of lagged BMI with control for unobserved country specific effects is used. Results obtained are statistically insignificant, which could be due to a small sample and limitations of an empirical method. More countries and respondents should be included into dataset and special attention should be paid to body weight indicators of elderly people. Hence, further research in this area is required.

Keywords: obesity, overweight, BMI, labour market outcomes, SHARE, European labour market, lagged BMI.

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CONTENTS

1. INTRODUCTION

In this paper we study the influence of obesity and overweight on two labour market outcomes – earnings after taxes per hour and hours worked per week - across two groups of European countries of Northern and Southern areas. The aim is to compare estimation results and make conclusions about the difference in the influence of body weight depending on geographical region. As most of previous research is done with focus on gender or race we find it interesting to compare outcomes between countries with warmer and colder climates. We check whether the impact of obesity and overweight on wages and hours worked is similar or different across countries with different natural conditions.

The European Union labour market unites countries with different job market conditions, including differences in legislation and regulation. The EU is also a vast territory of different general living conditions, cultures and languages. All these differences make cross-country comparative analysis a very tricky task. However, a common trend of dramatically increasing level of obesity in Europe is being observed during several past decades. Lundborg et al. (2007) note that the direct health care costs of obesity have been estimated to 2-5 percent of total health care costs in European countries. According to the World Health Organization, the prevalence of obesity in Europe is currently about 10-20 percent in males and about 10-25 percent in females. By these facts we assume that the rise in body weight of the European population contributes to shifts in people's physiology as well as psychology and via these changes influences behaviour of labour market agents. Hence, we assume that the rise in body weight has a negative effect on labour market outcomes.

To identify obesity the Body Mass Index (BMI) is used and it equals body weight in kilograms divided by squared height in meters. We associate the BMI index with variables according to clinical classification as they do it in, for example, Kaushal (2009) – underweight ($BMI<18,5\ kg/m^2$), healthy weight ($18,5\ kg/m^2 =<BMI<25\ kg/m^2$), overweight ($25\ kg/m^2 =<BMI<30\ kg/m^2$) and obesity ($BMI>=30\ kg/m^2$). Despite the fact that BMI suffers from serious drawbacks this is the easiest way to get weight related variable. The limitation of BMI, as it is mentioned in Asgeirsdotter (2011), is that BMI is not capable of distinguishing between fat and other tissues. That is why people whose bodies are high in muscle mass and low in fat content are often classified as overweight while they are not.

The data we use is the Survey of Health, Ageing and Retirement in Europe database (SHARE), which includes more than 45,000 individuals aged 50 or over in fifteen countries.

Because our sample covers individuals of 50 years old and older it is very important to note specific BMI ranges for elderly people. According to recent medical research, people aged 65 years or older who are overweight may not be at increased health risk level, while those with BMI in the low end of the normal range (between 18,5 kg/m^2 and the low 20s) are more likely to have higher risks of health problems. Thus, the normal-weight or, in other words, a low-risk BMI range may be higher and wider (22 – 29 kg/m^2) for elderly people than the range for younger adults (18,5 – 24,9 kg/m^2). Medics in Douketis et al. (2005) even conclude that weight loss by this age group of people, especially loss of fat free mass, is associated with an increased risk of death.

Hence, in this thesis two peculiarities to a common research subject of influence of BMI on labour market outcomes are considered and explored – regression analysis across two groups of European countries covering sample of elderly people only. In this way our study contributes to the previous research.

The limitations of this study include a very small sample, an estimation method of a lagged BMI that relies on very strong assumptions and statistically insignificant estimation results obtained, which do not allow us to draw any trustworthy conclusions.

The paper is organized as follows: Section 2 with theoretical issues including literature and research methods review in this area, Section 3 with data and method description, and presentation of estimation results, Section 4 with results discussed and conclusions made, and a list of references.

2. THEORETICAL FRAMEWORK

In Section 2 of the paper we give a general literature overview of studies devoted to correlations between BMI and labour market outcomes as well as we focus on several research studies specialized in dependences across groups of European countries. We also describe three main estimation methods which are used in scientific research for estimation of correlations.

2.1. LITERATURE REVIEW

The correlation between weight characteristics and labour market outcomes is not a new topic in labour and health economics. The dependence of earnings or/and employment rates on weight parameters became a subject to the U.S. research first most probably due to dramatic increase in level of obesity and overweight among population. According to Conley and Glauber (2007), by the year of 1999 one third of Americans is classified as obese and around two thirds as overweight. An impressive number of papers is devoted to this specific area in the United States: Register and Williams (1990), Hamermesh and Biddle (1994), Averett and Korenman (1996), Cawley (2000, 2004), Behrman and Rosenzweig (2001), Saporta and Halpern (2002), Baum and Ford (2004), Cawley and Danziger (2005), Conley and Glauber (2005, 2007), Grabka and Lillard (2005) etcetera.

For the European labour market similar research started a little bit later and it is carried out for separate countries as well as for the entire region: the United Kingdom – Sargent and Blanchflower (1994), Harper (2000), Morris (2005,2006), Finland – Sarlio-Lahteenkorva and Lahelma (1999), Iceland – Asgeirsdottir (2011), Denmark – Greve (2005), Germany – Cawley, Grabka, and Lillard (2005), over the whole Europe – d'Hombres and Brunello (2005), Garcia and Quintana-Domeque (2006), Lundborg, Bolin, Höjgård, and Lindgren (2007) and many others.

As we are interested in the influence of weight parameters on labour market outcomes in a European geographical framework let us have a closer look on the following two papers by d'Hombres and Brunello (2005) and Lundborg et al. (2007). In the first paper authors conclude that impact of obesity on wages varies across the countries of Europe. As a division they suggest group of countries with relatively warm climate or "olive belt" of Europe – Spain, Greece, Italy and Portugal and countries with relatively cold climate or "beer belt" of Europe – Austria, Ireland, Denmark, Belgium and Finland. In the other paper authors also explore geographical difference in influence of obesity on labour market outcomes. So, the countries are classified into three groups of Northern Europe – Denmark and Sweden, Central Europe – Austria, France, Germany, Switzerland, Belgium and the Netherlands, and

Southern Europe – Spain, Italy, and Greece. According to results in both papers geographical differences exist and it really matters in what country or region a person is obese or overweight. Their outcomes motivate us to conduct a similar kind of research, but we use different geographic division and include different countries.

In a recent paper of Garcia and Quintana-Domeque (2006) authors claim to complement studies by d'Hombres and Brunello (2005) and Lundborg et al. (2007) by conducting a country-by-country analysis across Europe. Their new contribution into this research subject is that they consider the role of labour market institutions and cultural factors to explain dependencies between body weight and labour market outcomes. However, conclusions made in this article differ from those on previous articles as authors find a very low significance of associations between weight and employment and wage rates when country-by-country analysis is applied.

A great number of research studies is done in the area of body mass and job market outcomes and most of them pay attention to gender, race or age differences, while only some focus on differences/similarities across the countries or groups of countries. Moreover, estimation results of these studies bring a lot of contradictions and are ambiguous, hence, this subject requires further thorough research.

2.2. BMI AND LABOUR MARKET OUTCOMES ACROSS EUROPE

Among a great number of articles that study influence of Body Mass Index on employment and wage rates there are only few that explore these dependences across countries or groups of countries and even less articles that cover a particular territory of Europe. As European region is of our particular interest we shortly present estimation results of BMI influence on labour market outcomes over Europe in the papers of D'Hombres and Brunello (2005), Lundborg et al. (2007) and Garcia and Quintana-Domeque (2006).

In study by D'Hombres and Brunello (2005) regressions on 9 European countries are run. The authors employ OLS, fixed effects, and instrumental variables models. All in all they conclude that the impact of obesity on wages is negative and statistically significant in the countries of the "olive belt", but positive and almost always statistically significant in the countries of the "beer belt". In addition they study that independent of city (capital of chosen countries) interaction (which is a product of BMI multiplied by average annual temperature of the capital city expressed as deviation from baseline city of Madrid) effect is negative and statistically significant. Hence, being overweight in Madrid causes a wage penalty but it is an asset and adds to wages in Dublin.

Lundborg et al. (2007) in their paper cover 10 European countries, and use instrumental variables approach to study differences of three groups of countries and their estimation results vary to substantial extend across Europe. The first kind of equations estimates correlations between BMI and employment rate. In Nordic countries the effect of being obese is to lower the employment probability by 5,4 percent; in Central Europe – by 8,4 percent, in South Europe – by 5,5 percent. Then authors also study influence of being obese on hours worked. For Nordic and South European countries the effect is negative and reveals a decrease in working hours by 1,4 and 2,7 percent respectively. In Central European countries they discover a positive effect of obesity that equals 2 percent. However, it is important to note that the effects received are not significant in any of the regressions. The third type of regressions studies correlations between BMI and wage rates. Results are statistically significant only for Central Europe, where obesity is associated with 11,3 percent decrease in wages, for Nordic and Southern countries results are very close – 4,7 and 4,9 percent of decrease in wage rates respectively.

The aim of Garcia and Quintana-Domeque (2006) is to estimate correlations between body size variables and labour market outcomes in nine European countries, without restricting all associations to be equal across countries or groups of countries, and also provid some evidence on the potential role played by labor market institutions and cultural factors in explaining these associations. According to their final results correlations are heterogenous across countries and the authors explain it by the role of some labour market institutions such as collective bargaining coverage and employer-provided health insurance. In contrast to the results of the two above described papers, in Garcia and Quintana-Domeque (2006) the effect of obesity on labour outcomes is the same across countries. Their study also demonstrates that without restricting the relationship between body mass index and labour market outcomes to be equal over groups of countries, the statistical significance of these correlations is very low.

Hence, there is no one common conclusion of influence of obesity/overweight on level of employment and wage level in European countries. Researchers obtain different estimation results and argue that their estimation methods are not perfect, which mean that further work is required.

2.3. RESEARCH METHODS

Several research methods have been used in scientific papers to define correlations between body mass index and labour market outcomes. The most widely applied methods are: regressions with a lagged value of BMI (e.g., Conley and Glauber (2007)), fixed-effects models (e.g., Averett and Korenman (1996), Behrman & Rosenzweig (2001)), and instrumental variables (Cawley (2004), d'Hombres and Brunello (2005), Lundborg et al. (2007)). It can be concluded that none of the methods is strongly preferred to the others as all of them rely on very strong assumptions and often fail to produce consistent results.

Firstly, we focus on a lagged BMI approach where contemporaneous BMI is replaced by its lagged value. For example, in works by Averett and Korenman (1996), Gortmarker et al. (1993), Sargent and Blantchflower (1994) authors use a seven years lagged BMI value and Conley and Glauber (2007) even extend this kind of approach by applying a fifteen years lagged body mass index. However, most of the researchers admit that independence of a lagged variable and residual term is doubtful, so the OLS estimations are most likely to be biased. To correct for this problem fixed-effects strategy or/and first difference method are employed in regressions with lagged BMI values. To illustrate such a kind of combination of methods we use a paper by Behrman and Rosenzweig (2001) as an example. They pair lagged BMI strategy with sibling (or individual) fixed effects strategy to be able to control for unobserved heterogeneity on a family (or individual) level. Authors use dataset on 402 monozygotic twin pairs in the United States and make conclusions. But they question if these twins can be representative for the population on the whole and whether conclusions made can be applicable for the entire U.S. population.

The second method we mention here is fixed-effects approach employed to control for various unobserved parameters – on individual, sibling/twin, family, gender, or even geographically on a country level. In e.g. the paper by Averett and Korenman (1996) sibling fixed effects model is used to control for unobserved family characteristics. Quite many estimation drawbacks are detected when estimating fixed-effects models in Garcia and Quintana-Domeque (2006): required strong exogoneity of regressors, constant unobserved characteristics over time, trade-off between precision and consistency. In Baum and Ford, (2004) to correct for possible biased estimates the fixed-effects model is extended over time so that the first differences are taken. Authors in their wage specification model control for individual and family heterogeneity across time by taking differences between observations.

However, in the paper they mention that if unobserved variables vary over time and the error differences are correlated with the differenced covariates, then the fixed effects estimates are biased, which again makes this approach troublesome.

The third popular strategy in scientific circles is an instrumental variables (IV) approach. It is a very tricky task to find correct instrumental variables because they should be uncorrelated with the error term but correlated with right-hand-side variables that we suspect are endogenous. Lundborg, Bolin, Höjgård, and Lindgren (2007) use the following three different instruments to measure the effect of obesity on employment rate and wages – if any other household member is obese, if respondent is the oldest child, and if respondent (female) has only sisters. In their paper the authors note that these instruments can be correlated with errors. The same problem is present in tests of Pagan and Davila (1997) where such instruments as family poverty level, health limitations, and variable for self-esteem are most probably correlated with the error term in the wage regression.

A combination of methods that unites both a fixed effects model and an IV model is often employed by researchers. In for example, Cawley (2004) he uses individual fixed effects model, which controls for unobserved characteristics on an individual level, and the instrument of sibling's body mass as an exogenous source of variation in an individual's body mass. He succeeds to obtain significant estimation results.

In other words, the three most popular methods of lagged variables, fixed effects and instrumental variables are very troublesome and rely on very strict assumptions that most likely do not hold and the estimation results of these regressions are biased. The other problem that researchers come across is statistical insignificance of obtained results.

3. EMPIRICAL FRAMEWORK

In this section we describe the database in general and the specific variables, which we include into our models. We also give details on a method employed with maximum details as, for instance, variables constructed or STATA commands, and finally we present our estimation results.

3.1. DATA

3.1.1. Dataset

The database we work with is the Survey of Health, Ageing and Retirement in Europe (SHARE) database, which covers more than 45,000 individuals aged 50 or over in fifteen (number varies for different periods of data collecting) countries. A well-balanced geographical representation includes regions of Scandinavia – Denmark, and Sweden; Central Europe – Austria, France, Germany, Switzerland, Belgium, and the Netherlands; the Mediterranean – Spain, Italy, and Greece; Eastern Europe – the Czech Republic, and Poland; as well as Israel and Ireland.

Data have been collected in three waves with a baseline study in 2004-2005 - 1st SHARE wave, 2nd SHARE wave in 2006-2007, and 3rd wave, SHARELIFE, in 2008-2009. The data include health variables, bio-markers, psychological variables, economic variables, and social support variables. All together SHARE provides researchers with quite detailed retrospective life histories of Europeans and gives an overall picture of the European ageing process.

The SHARE version used for this paper is the 2.4.0 release that dates March 17th, 2011 and unites information on wave 1 and wave 2. By the time of writing this thesis the wave 3 data do not contain all necessary parameters needed for the regression models. In order to be able to use data from both waves 1 and 2 we merge the datasets in STATA software with help of "merge" command. This is possible due to coding of all SHARE respondents through all the waves of data collecting in format of "CC-hhhhhh-rr", where "CC" is the country identifier, "hhhhhh" – household identifier, "rr" – respondent identifier within each household.

As we are interested in earnings of employed individuals, we exclude all civil-servants and self-employed from the category of "employed or self-employed" and keep employees only. Observations with missing earnings values are dropped. Then, all unmatched individuals from waves 1 and 2 are excluded as well (the match is conducted in order to assign the BMI values from wave 1 to the variables from wave 2). Thus, our final sample contains 2,132 observations. We divide this sample of eleven available countries into two big subgroups of South with 541 observations (Greece, Italy, Spain, and France) and North with 1591 observations (Austria, Belgium, Germany, the Netherlands, Switzerland, Sweden and Denmark).

3.1.2. Dependent, Independent and Background Variables

Two dependent variables are created, which are logarithmic earnings per hour worked defined as *lne* and logarithmic hours worked per week defined as *lnhrs*.

To calculate *lne* we take logarithm of the value of "Earnings employment per year after taxes" divided by 2080. Here we assume that all the respondents have 260 working days per year and work 8 hours per day (260*8=2080), which of course is not absolutely true for all the observations as respondents are having vacations and sick leaves. Parameter of "Earnings employment per year after taxes" is used because it contains the least number of missing values among all the earning related variables. The data contain earning variables that has been converted into Euro values and for non-Euro countries a fixed exchange rate is chosen. The other dependent variable of *lnhrs* is generated as a logarithm of a given SHARE parameter "total hours worked per week". These both dependent economic outcome variables *lne* and *lnhrs* are logged in order to correct for skewness.

The independent dummy variables *overweight* and *obese* are created under conditions "overweight=1 if bmi>=25 & bmi<30" and "obese=1 if bmi>=30" respectively. To avoid the endogeneity problem of reverse causality the body-mass index variable is taken from wave 1 and refers to the year of 2004 for most countries (for France, Greece, and Belgium – 2004/2005) while all the other variables are taken from wave 2 and refer to the years of 2006/2007.

The control variable of *age* is generated as "year interview"–"year of birth", however, the month and day variables are not considered, which creates some minor inconsistences. We also include the age squared variable *age2* to check for non-linear dependence of *lne* on the respondents' age.

The control variable of *schooling*, which includes years of schooling, is defined in SHARE.

The following indicators are used for descriptive purposes of our sample only – we cannot include them due to many missing values. Indicators for mental and physical abilities include mathematical performance score – *numeracy*, and grip strength – *maxgrip*. Four health indicators are used: self-perceived health (the US version) – *sphus*; number of chronic diseases - *chronic*; number of symptoms – *symptoms*; mobility, arm function and fine motor limitations mobility – *mobility*; depression scale (from 1 to 5 where 5 corresponds to very depressed) – *depression*.

It has already been mentioned that two big geographical groups are created – *south* (541 observations) and *north* (1,591observations). The first one includes countries of Greece, France, Italy, and Spain. One may argue that France does not belong to this group but we include it to make the number of observations in southern group relatively comparable with the number of observations available in the northern group. All together Greece, Italy and Spain do not contain a significant number of observations. We also choose to make two geographical groups only in order to be able to conduct geographical comparison with the help of interaction effects.

We create dummy variables for each of the eleven countries to control for unobserved country-level differences (in logarithmic earnings per hour *lne* and logarithmic hours worked per week *lnhrs*.

As our main focus is to conduct cross-country regression comparisons we also need to construct the interactions between overweight or obesity and the southern region variable.. We perform this by generating south_overweight=south*overweight and south_obese=south*obese.

Therefore, by these manipulations we try not to reduce our sample and keep all 2,132 observations available for the regression analysis.

3.2. ESTIMATION EQUATIONS

As it has already been mentioned the purpose of this paper is to study the correlation between overweight/obesity *(overweight/obese)* and logarithm of earnings per hour (*lne)* and logarithm of hours worked per week (*lnhrs)* within two groups of countries of *north* and *south.* The aim is to compare in a geographical framework the correlation coefficients and make conclusion about the findings.

The base equations are specified as:

$$lne_{it} = \alpha * X_{it-1} + \beta * Y_{it-1} + \gamma_{it} + \delta_{it} + \mu_{it} \quad (1),$$

$$\ln hrs_{it} = \alpha * X_{it-1} + \beta * Y_{it-1} + \gamma_{it} + \delta_{it} + \mu_{it} \quad (2),$$

where

lne_{it} is logarithm of earnings per hour worked for an individual *i* at a time *t;* $lnhrs_{it}$ is logarithm of hours worked per week for an individual *i* at a time *t;* X_{it-1} is the variable for overweight (condition if 25=<BMI<30) for an individual *i* at (*t-1); Y_{it-1}* is the variable for obesity (condition if BMI>=30) for an individual *i* (*t-1*); γ_{it} is a vector of the other explanatory variables (g.e. age, age squared, years of schooling and gender) for an individual *i* at a time *t;* δ_{it} is the country fixed effect (within a group) for an individual *i* at a time *t;* μ_{it} is the error term for an individual *i* at a time *t.*

The extended equations that in addition to the base ones consider also cross-country effects of overweight/obesity are specified as:

$$lne_{it} = \alpha * X_{it-1} + \beta * Y_{it-1} + \gamma_{it} + \omega_{it} + \mu_{it} \quad (3),$$

$$\ln hrs_{it} = \alpha * X_{it-1} + \beta * Y_{it-1} + \gamma_{it} + \omega_{it} + \mu_{it} \quad (4),$$

where

ω_{it} are interaction terms between the weight indicators and the dummy for region for an individual *i* at a time (*t-1) (south_overweight* and *south_obese);* all the other variables are as defined above in eq. (1) and (2).

In order to estimate the equations ordinary least squares (OLS) is used.

Here we use lagged BMI values in order to avoid reverse causality problem. The time lag varies from one to three years depending on when data for each specific country were collected. However, we are not sure whether this time lag is enough to remove endogeneity. In previous research a lag of seven years is most commonly used as in, for example, Cawley (2004), Gortmaker et al. (2003), Averett and Korenman (1996), or even of thirteen-fifteen years as in a study of Conley and Glauber, (2007). All of the mentioned authors conduct their investigations on the US labour market The main disadvantage of this approach is described in economic literature (e.g., Garcia and Quintana-Domeque (2006)) in the following way: the required independence of the lagged BMI variable on the residual term is very unlikely to be true, because the error term is likely to capture some omitted variable related to both past BMI and the log earnings or log hours worked.

The model is specified as a fixed effects model, which controls for potential unobservable country specific differences within the two geographic groups of *north* and *south*. We assume that differences between countries within the groups do matter significantly and non-randomly, so we try to control for these differences. Moreover, in an extended version interaction effects are included. One of the main limitations of the fixed effects model is similar to the one mentioned in a lagged variable paragraph above – all the regressors should be exogenous, which in case of even lagged BMI is highly implausible. At the same time we believe that the other important assumption of the fixed effects model that unobserved characteristics should be remained unchanged over time (2004-2007) is most likely to be true.

3.3. ESTIMATION RESULTS

3.3.1. Data Description

In Table 1 the mean values of the variables that describe our data are presented. For better comparison, results are given for the full sample as well as for each gender. The table contains more variables than are used to build up regression models in order to give a more detailed overall picture of the dataset to the reader.

Table 1. Mean Values.

VARIABLES	MALE	FEMALE	FULL SAMPLE
Lnhrs	3,597	3,365	3,471
Lne	2,116	1,671	1,873
BMI	26,41	25,13	25,71
Overweight	0,511	0,302	0,397
Obese	0,136	0,147	0,142
Weight_oo	0,647	0,448	0,539
Age	57,18	55,82	56,44
Age2	3,284	3,138	3,205
Schooling	11,69	11,59	11,64
South	0,255	0,252	0,253
North	0,745	0,748	0,747
Sphus	2,571	2,554	2,562
Chronic	0,912	0,927	0,920
Symptoms	1,020	1,330	1,189
Mobility	0,419	0,633	0,535
Depression	1,391	2,047	1,748
Numeracy	3,987	3,713	3,838
Maxgrip	46,80	30,72	38,05
Austria	0,0422	0,0293	0,0352
Belgium	0,0772	0,0819	0,0798
Denmark	0,143	0,141	0,142
France	0,112	0,134	0,124
Germany	0,0947	0,0948	0,0948
Greece	0,0628	0,0491	0,0554
Italy	0,0453	0,0448	0,0450
Netherlands	0,133	0,119	0,125
Spain	0,0350	0,0233	0,0286
Sweden	0,203	0,237	0,221
Switzerland	0,0515	0,0457	0,0483

Obs.: 2,132

From the presented results we conclude that on average individuals in our sample are overweight, and BMI of males is higher than BMI of females. The variable of *weight_oo*, which considers both overweight and obese individuals, says that around 65% of men and around 45% of women have weight more than is considered to be normal. As SHARE is a dataset that covers elderly people the average age of respondents is 56,44 (57,18 for males and 55,82 for females). There is no big difference in schooling between two genders and on average individuals obtain 11,64 years of education. 25 percent of respondents belong to the geographical group of South and the rest 75 percent - to the group of North.

A number of self-reported health related variables follows, these variables are included with the purpose of detailed description of the sample. Self-perceived health under the US classification (*sphus*) is almost the same for both genders and equals 2,5 out of 5; number of chronic diseases (*chronic*) out of 16 in the list does not differ for the genders either and is less than one on average; number of symptoms (*symptoms*) reported out of 13 in the list is slightly higher for women but it does not exceed 1,4; number of limitations with mobility, arm function and fine motor function (*mobility*) out of 11 in the list is slightly higher for females but it is lower than 1 anyway; the depression score on EURO-D (*depression*) where high means depressed and is 2,047 for women and 1,391 for men. And two parameters give us overview of cognitive as well as physical abilities. Mathematical performance (*numeracy*), where the higher the score the better, is higher for male respondents than for females; men have higher than women value for maximum of grip strength (*maxgrip*).

Hence, we sum up that respondents in our sample are slightly overweight on average and fraction of those who are overweight and obese is more than 50 percent for both genders. The health parameters report no significance difference between genders, women feel more depressed though. Here specific BMI values for elder population are worth mentioning. According to medical research by Douketis et al. (2005), BMI with values from 22 to 29 at the age of 65 and elder is associated with lower health risks due to physiological changes that body experiences. That is why we assume that being slightly overweight at the age of 50 and elder is a positive sign that brings less health risks.

3.3.2. Descriptive Statistics

Table 2 reports descriptive statistics (mean and standard deviation) for the full sample, separately for males and females in the geographical groups of south, north and combined. In this table we include only dependent, independent variables and some of the controls (age, age squared, schooling) that we use to build up regressions. We pay specific attention to differences between the Southern and Northern region

Table 2. Descriptive Statistics.

		FULL SAMPLE			MALE			FEMALE	
		Obs	Mean	std dev	obs	Mean	std dev	Obs	Mean	std dev
FULL SAMPLE	Lnhrs	2132	3,471	0,567	971	3,597	0,508	1161	3,366	0,592
	Lne		1,873	1,141		2,116	1,067		1,669	1,162
	Overweight		0,397	0,489		0,511	0,5		0,301	0,459
	Obese		0,142	0,349		0,136	0,343		0,448	0,354
	Age		56,412	4,577		57,176	3,899		55,773	4,988
	age2		3203,23	505,461		3284,29	454,587		3135,44	353,214
	Schooling		11,633	4,49		11,693	4,695		11,582	4,312
SOUTH	Lnhrs	541	3,445	0,712	248	**3,535**	0,672	293	**3,369**	0,736
	Lne		1,723	1,188		**2,001**	1,192		**1,483**	1,132
	Overweight		0,41	0,492		**0,519**	0,501		**0,321**	0,468
	Obese		0,155	0,362		**0,153**	0,361		**0,157**	0,364
	Age		55,325	4,831		**56,407**	3,458		**54,41**	5,586
	age2		3089,89	458,345		3193,69	394,902		2991,5	519,328
	Schooling		11,12	4,504		**10,992**	4,723		**11,229**	4,315
NORTH	Lnhrs	1591	3,48	0,509	723	**3,519**	0,437	868	**3,365**	0,536
	Lne		1,924	1,121		**2,153**	1,018		**1,732**	1,166
	Overweight		0,392	0,488		**0,509**	0,5		**0,295**	0,456
	Obese		0,137	0,344		**0,13**	0,337		**0,143**	0,35
	Age		56,781	4,429		**57,44**	4,007		**56,233**	4,684
	age2		3243,72	508,676		3315,37	469,568		3184,03	532,034
	Schooling		11,807	4,473		**11,934**	4,665		**11,702**	4,306

As it can be concluded from Table 2 mean values for obesity and overweight vary across geographical groups and gender. In the South group the percentage of overweight men compared to the percentage of overweight women is higher while percentage of obese men is lower than percentage of obese women. The same tendency is observed in the group of North. In geographical perspective the fraction of overweight and obese people is higher in the South group (for both genders) than in the North group. The individuals of the southern sample are younger than the individuals of the northern sample, respondents in the North obtain more years of education than in the South. Finally, mean of logarithmic earnings is higher for northern countries, the difference becomes even more significant if respondents are females. On the other hand, the mean of logarithmic hours worked per week is slightly higher for southern countries, but the difference is very small.

3.3.3. Regression results

Several types of regression have been tested to make up the finale decision which of them should be included into this paper. The regression equation we finally use here is defined as the one that estimates the correlation between *overweight* and *obesity* and *lne* or *lnhrs* separately (not combined in *weight_oo* variable), when controlling for *age*, *age squared*, *schooling*, *sex*, and country effects. Further we present results for two types of regressions depending on whether the dependent variable is logarithmic hours worked per week *lnhrs* or logarithmic earnings per hour after taxes *lne*.

Earnings per Hour

Here we examine what is the influence of overweight and obesity on earnings.

Base Equation

The first base equation is estimated for the whole sample so that we control for effects of all 11 eleven countries (Austria is the reference category). Then we continue investigate the same kind of correlations but for South and North groups separately. One equation is run for the group of South (Italy is the reference category) and in the other one the influence of weight parameters on *lne* is estimated for the group of North (Switzerland is the reference category).

Cross-country Equation

To capture if there are differences in the *overweight* and *obesity* effects on logarithmic earnings we add the interactions *south_overweight* and *south_obese* to our base equation. This interactions measure what is the additional influence of being overweight and/or obese in the South in comparison to the North (the country of Austria is the reference category).

Final Table 3 reports results on OLS estimations of the above given equations for the full sample, North, South, as well as for the full sample with interaction.

Table 3. Effect of overweight and obesity on logarithmic earnings for North, South and full sample. OLS regression with robust standard errors.

	Full Sample	South	North	Interaction
VARIABLES		Lne		
Overweight	**0.0170**	**0.0647**	**0.00923**	**0.00235**
	(0.0502)	(0.105)	(0.0570)	(0.0573)
Obese	**0.0399**	**0.121**	**0.0203**	**0.0232**
	(0.0687)	(0.137)	(0.0792)	(0.0801)
Age	0.00830	0.0214	-0.0973*	0.00757

	(0.0305)	(0.0398)	(0.0588)	(0.0305)
age2	-0.000142	-0.000170	0.000733	-0.000135
	(0.000276)	(0.000407)	(0.000511)	(0.000277)
Schooling	0.0425***	0.0720***	0.0317***	0.0426***
	(0.00529)	(0.0106)	(0.00610)	(0.00530)
Sex	0.473***	0.575***	0.447***	0.473***
	(0.0468)	(0.0952)	(0.0536)	(0.0468)
Belgium	-0.699***		-0.223*	-0.699***
	(0.146)		(0.128)	(0.146)
Denmark	0.475***		0.924***	0.475***
	(0.134)		(0.118)	(0.134)
France	-0.0542	0.657***		-0.0855
	(0.137)	(0.129)		(0.147)
Germany	-0.585***		-0.0844	-0.585***
	(0.142)		(0.124)	(0.142)
Greece	-0.547***	0.191		-0.590***
	(0.153)	(0.147)		(0.170)
Italy	-0.724***			-0.760***
	(0.160)			(0.171)
Netherlands	-0.640***		-0.152	-0.641***
	(0.137)		(0.119)	(0.137)
Spain	-0.840***	-0.0982		-0.880***
	(0.179)	(0.175)		(0.192)
Sweden	0.0418		0.535***	0.0404
	(0.132)		(0.111)	(0.132)
Switzerland	-0.485***			-0.485***
	(0.159)			(0.159)
Austria			0.443***	
			(0.157)	
south_overweight				**0.0615**
				(0.115)
south_obese				**0.0657**
				(0.154)
Constant	1.368	-0.401	4.194**	1.396
	(0.868)	(1.039)	(1.701)	(0.870)
Observations	2,132	541	1,591	2,132
R-squared	0.185	0.218	0.176	0.185

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

First of all, we should mention that the obtained results for overweight and obese are statistically significant. That is why we cannot trust received coefficients or make any trustworthy conclusions. Nevertheless, we consider it necessary to interpret OLS estimations. Being overweight is positively associated with earnings per hour worked in both regions.

However, in Southern countries overweight is associated with 6,47 percent increase in earnings, in the Northern countries this correlation is much less - 0,923 percent. The same tendency is observed for obesity with 12,1 percent and 2,03 percent increase in earnings in regions of South and North respectively. If we look at the interaction effect we conclude that being overweight in the South relatively to the North adds extra 6,15 percent to 0,235 percent of general positive influence on increase in wages. Similarly, being obese in the South adds extra 6,57 percent of increase to 2,32 percent of general positive influence on increase in earnings. We keep in mind that despite this large difference in estimates between the regions, the difference is not statistically significant.

Hours Worked per Week

In this section we examine the influence of overweight and obesity on earnings.

Base Equation

All the steps are similar to those performed to analyze influence on logarithmic earnings but now we are interested in influence on logarithmic hours worked. The first base equation is run for the whole sample so that we control for effects of all 11 eleven countries (Austria is the reference category in this case).Next equation is estimated for the group of South (Italy is the reference category) and in the last one the influence of overweight and obese variables on *lnhrs* is estimated for the group of North (Switzerland is the reference category).

Cross-country Equation

To measure if there are differences in *overweight* and *obesity* effects on logarithmic hours worked we include additional interaction products of *south_overweight* and *south_obese* to the base equation. A summary of OLS estimations full sample, North, South, and interactions is presented in the Table 4 below.

Table 4. Effect of overweight and obesity on logarithmic hours worked for North, South and full sample. OLS regression with robust standard errors.

	Full Sample	South	North	Interaction
VARIABLES	Lnhrs			
Overweight	**-0.0262**	**0.0496**	**-0.0484***	**-0.0390**
	(0.0264)	(0.0692)	(0.0267)	(0.0301)
Obese	**0.00921**	**0.0349**	**0.00346**	**0.0117**
	(0.0361)	(0.0900)	(0.0371)	(0.0421)
Age	-0.00368	-0.00503	0.0295	-0.00418

	(0.0160)	(0.0262)	(0.0276)	(0.0160)
age2	-6.32e-05	-0.000126	-0.000332	-5.93e-05
	(0.000145)	(0.000268)	(0.000240)	(0.000145)
Schooling	0.00786***	0.0220***	0.00302	0.00793***
	(0.00278)	(0.00696)	(0.00286)	(0.00279)
Sex	0.259***	0.197***	0.281***	0.259***
	(0.0246)	(0.0628)	(0.0251)	(0.0246)
Belgium	-0.0906		-0.0440	-0.0901
	(0.0767)		(0.0602)	(0.0767)
Denmark	0.0266		0.0518	0.0273
	(0.0703)		(0.0553)	(0.0704)
France	-0.0732	-0.124		-0.0888
	(0.0722)	(0.0852)		(0.0774)
Germany	-0.0928		-0.0557	-0.0922
	(0.0749)		(0.0581)	(0.0749)
Greece	-0.195**	-0.215**		-0.221**
	(0.0807)	(0.0967)		(0.0893)
Italy	0.0234			0.00156
	(0.0842)			(0.0899)
Netherlands	-0.254***		-0.219***	-0.254***
	(0.0721)		(0.0556)	(0.0721)
Spain	-0.0276	-0.0204		-0.0544
	(0.0941)	(0.116)		(0.101)
Sweden	0.0998		0.135**	0.100
	(0.0692)		(0.0523)	(0.0693)
Switzerland	-0.0363			-0.0353
	(0.0835)			(0.0835)
Austria			0.0141	
			(0.0738)	
south_overweight				**0.0532**
				(0.0603)
south_obese				**-0.00534**
				(0.0812)
Constant	3.724***	3.862***	2.732***	3.743***
	(0.456)	(0.685)	(0.797)	(0.457)
Observations	2,132	541	1,591	2,132
R-squared	0.088	0.054	0.122	0.089

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

First we should state that obtained results are not statistically significant with the only exception of overweight coefficient in the North group sample (p<0,1). Hence, we still cannot make any trustworthy conclusions. Despite statistical insignificance of coefficients we provide the reader with interpretation of OLS estimations. Being overweight as well as obese is positively associated with hours worked in the region of South – 4,96 percent and 3,49 percent respectively. While in North the situation is different: overweight causes a 4,84 percent decrease in hours worked and obesity causes a 0,346 percent increase in hours worked. In the cross-country regression we observe that being overweight in the South relatively to the North adds 5,32 percent of increase to (-3,9 percent) of general negative influence on decrease in hours worked. At the same time being obese in the South relatively to the North subtracts extra 0,534 percent from 1,17 percent of general positive influence on increase in hours worked.

Being overweight or obese is associated with higher earnings in both groups of the countries, but for the Southern group the estimated coefficients are higher than for Northern group. Influence of being overweight on hours worked per week is different for the geographic areas: the correlation is negative in Northern region but positive in Southern region. Obese respondents in South have lower positive correlation with hours worked in comparison to obese respondents in North. We may be able to explain positive correlation of overweight/obesity with level of earnings due to physiological peculiarities of our "50+" sample. According to medical research, elderly people who are slightly overweight (with BMI in a range from 22 to 29) accumulate lower health risks than underweight people or even people with BMI in a lower range of normal weight (from 18,5 to 21 kg/m^2).

However, we keep in mind that none of our results are statistically significant, therefore, we do not make any final conclusions. The problem of insignificance can be rooted in a very small sample (2,131 observations) and/or method which we use – lagged body mass index values (assumption of no reverse causality).

4. DISCUSSION AND CONCLUSIONS

The purpose of this essay is to study how overweight and obesity among elderly people influence labour market outcomes (earnings after taxes per hour and hours worked) across two groups of European countries of South (France, Greece, Italy, and Spain) of North (Austria, Belgium, Denmark, Germany, Netherlands, Sweden, and Switzerland). The aim is to conduct a comparison of estimation results with respect to geographical differences.

In general, our results contradict the existing study of Lundborg et al. (2007). We obtain that elderly people of both geographic groups with BMI higher than 25 have positive correlation with the level of earnings and the estimated coefficients are increasing for the Southern group. Obese respondents in the North are associated with more working hours than obese respondents in the South. Overweight individuals of North have a negative correlation with hours worked but overweight respondents of South have a positive correlation. The results obtained might be explained with regard to our sample, which covers elderly people only. Medical research notes that for elderly individuals being overweight is associated with lower health risks, hence, we can assume that employees of this age this BMI range are more productive than their colleagues. Many of the respondent in our sample are of pension age and all of them are still employed, which means that the lifestyle of working people with a higher income may lead to slight overweight.

However, as our results are statistically insignificant we do not make any final conclusions about influence of obesity and overweight on labour market outcomes among elderly people. The similar problem is detected in, for example, paper by Garcia and Quintana-Domeque (2006) where they get very low significance of estimation results. In our essay this problem could be caused by a very small sample of 2,131 observations and the limitations of using lagged BMI.

Therefore, it is important to add more European countries and more individuals to the sample in SHARE database. Because elderly people make up a specific group of respondents and the BMI distribution is different for them, further medical research is also required.

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