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Obesity around Retirement Age: International Comparison Using SHARE

ABSTRACT: *In this article, we aim to explain international differences in socio-demographic structure of population among people around retirement age. We further test if transition into retirement is an important factor for obesity. Using Survey of Health, Ageing and Retirement in Europe (SHARE) data, we first document that the Czech Republic has a significant and increasing trend in body mass index (BMI) and obesity (BMI > 29.99) for both men and women aged 50–70 years compared to other countries. Men have much higher level of BMI in comparison to many other European countries, whereas BMI of women is comparable to Estonia and Slovenia. However, we show a little evidence that underlying structure of Czech population with respect to education, occupation, health, age, and so on may explain increasing trend as well as higher level of obesity when compared to other European countries. Furthermore, we show that the transition into retirement is not associated with an increase in BMI. Using fixed effect model, we found that the obesity is directly related to increasing trend in obesity already before entering the retirement.*

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INTRODUCTION

Obesity and overweight is a wide spread phenomenon that affects most of the developed countries, and it is related not only to high public spending costs but also to premature death (Wei Zheng et al., 2011). The World Health Organization refers to obesity as to one of the biggest public health challenges in 21st Century. Obesity is also considered as very costly. Knai et al. (2007) estimated that in Eastern Europe, up to 6% of total healthcare costs may be attributed to obesity and its associated illnesses. Public expenditures on healthcare spending are among the highest in the Czech Republic from countries in the European Union (Antonelli and De Bonis (2018)). Lakdawalla (2005) calculated that obesity is associated with 34% higher Medicare expenditures during elderly on individual basis.

Existing evidence show general upward trend in obesity in Central and Eastern European countries. Obesity rates have been identified mainly among young adults (Vignerova et al, 2007) and also among adults (NCD-RisC, 2017). In this article, we aim to explain international differences and increasing trend in obesity in the Czech Republic by differences in sociodemographic structure and transition into retirement. The research question is motivated by a descriptive picture of how obesity has developed in the Czech Republic in comparison to overall trend in Europe, including other central and eastern European countries. We select the Czech Republic as a country with high increase in childhood obesity, high prevalence of cardiovascular diseases, and high prevalence of colorectal cancer (OECD, 2017). This is a first study that show trends in obesity among older people in international perspective and try to explain cross country differences by taking into account differences in occupational and educational structure.

We specifically analyze body mass index (BMI) and obesity rates by following categories: gender, educational attainment, and occupational categories. This approach has its support in the existing literature that identifies these characteristics as important determinants of obesity, mortality, and other health and labor market outcomes.² We also focus on the analysis of transition into retirement and its impact on BMI. For that purpose, we use fixed effect model that control for individual-specific unobserved characteristics. Using fixed effect model, we find that Czech pensioners are not more likely to become obese after their transition into retirement.

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² For example, Brunello et al. (2013) identified a causal impact of education on obesity. Other articles identified occupation-specific impact of transition into retirement on obesity.

In our analyses, we use a subsample of the Survey of Health, Ageing and Retirement in Europe (SHARE) that covers individuals aged 50–70 years across Europe. Advantage of the data is a detailed focus on labor, social, health, and related issues that allow us to analyze obesity rates across the EU countries in the association with the labor market and health characteristics. For the purpose of this analysis, we use countries that are followed in the period 2007–2015.

Our data also allow us to test if the overall upward trend in obesity can be explained by a change in underlying structure of population with respect to education, occupation, subjective health, and household size. Similarly, we also test if cross-country differences may be explained by different underlying socioeconomic structure of population. The following sections provide literature review, followed by data description and results.

Literature review

Many previous studies document the fast-growing frequency of overweight and obesity in the adult population. However, there is a current literature that provides little international comparison, despite the fact that studies by Godard (2016) and many others point to identify a causal impact of transition into retirement on obesity. This article, in this regards, is a first attempt to provide international evidence on overweight and obesity for individuals in the age of transition into retirement.

Previous evidence mostly focused on analyses in single country. For example, Gutierrez-Fisac et al. (2004) showed 31% prevalence of obesity among men and 41% for women for similar age groups in Spain. Evidence from Germany showed fairly similar results. Eastern European countries are analyzed, for example, in Pikhart et al. (2007) but with no special attention to individuals in retirement age. Compared to them, we did not find similar obesity in the Czech Republic and Poland. In our case, we present statistically higher prevalence of obesity among Czech elderly when compared to Polish elderly. Similarly, we found higher prevalence of obesity than among Spanish elderly as presented in Gutierrez-Fisac et al. (2004). In line with previous literature, we find negative association between BMI and education and occupation. Compared to previous literature, we aimed to explain international differences and recent trends in BMI and obesity using observable characteristics. We showed that controlling for many labor market characteristics does explain some part of cross-country variation, but substantial part of variation across countries prevailed as unexplained in ordinary least square (OLS) regressions.

As Godard (2016) pointed out, transition into retirement may be one source of high obesity among elderly. In this regard, we provide first estimates of a potential effect of transition into retirement for Eastern European countries using fixed effect model. Compare to other studies, we do not use instrumental variable approach as we do have enough country-level observation in early retirement ages. Previous literatures (e.g., Touvier et al., 2010; Dahl et al., 2013; Elias et al., 2003; Cetin et al., 2014; Lakdawalla et al., 2005) also pointed out that transition into retirement may be associated with different type of behavioral changes that may or may not result to increase or decrease BMI. Higher physical activity may decrease BMI; on the other hand, higher social isolation, lower incentives to invest in health, or the loss of a structured use of time may also encourage snacking in-between meal times and sedentary habits and may increase the risk of obesity. Our contribution shows that the transition into retirement in Eastern Europe overall does not drive higher risk of obesity.

Data Description

The SHARE is a multidisciplinary and cross-national panel database of micro data on health, socioeconomic status, and social and family networks of about 140,000 individuals aged 50 years or older (around 380,000 interviews). SHARE covers 27 European countries and Israel.

In our analysis, we use data from SHARE collected between 2007 and 2015. In the data, we observe about 135,000 individual-year observation of at least 50-year-old individuals and their spouses from 12 European countries. In this time period, we use four cross-sectional waves.

In particular, we use 2007, 2011, 2013, and 2015 waves, which allow for the comparison of trends across different European countries during sufficiently long time period. Our sample thus includes the following countries: Austria, the Czech Republic,

Tab. 1: Categories of adiposity according to BMI (adults)

BMI category	BMI (kg/m ²)
Underweight	<18.5
Normal range	≥18.5 and <25
Overweight pre-obese	≥25 and <30
Obese	≥30

Adapted from the WHO.

Germany, Estonia, Slovenia, Sweden, Spain, Italy, France, Denmark, Switzerland, and Belgium. For the purpose of our analysis, we divide these countries into the following groups: East (Slovenia and Estonia), West (Germany, Austria, Belgium, Switzerland, and France), North (Sweden and Denmark), and South (Spain and Italy). Such division of countries is standard in the literature that uses SHARE data for international comparisons (Bakalová et al, 2015).

Our sample contains all individuals interviewed who are 50 to 69 years old.³ We exclude individuals reporting a height below 1.20 m as well as individuals reporting a weight either below 30 kg or above 200 kg. We use the most common indicator of obesity, BMI (kg/m²). It is the most widely used measure in surveys of obesity. In adulthood, the obesity corresponds to a BMI of 30 or more and overweight to a BMI of 25 or more. The term overweight is often used to describe the “overweight pre-obese” sub-classification of BMI 25–29.99 (Table 1, Millstone et al., 2006). BMI is calculated from self-reported weight and height.

Clear advantage of the data is that they targeted on a specific age group. Many questions ask for information about health status and other subjectively reported facts about individuals. On the other hand, data provides very little evidence about income and savings of individuals and little information about members of household in case they are younger than 50 years.

The average BMI of the full sample is 27.38 kg/m² for men and 26.73 kg/m² for women, which is above the overweight threshold in both the cases. Twenty-two percent of men in the full sample were obese, 70% at least overweight, 29% normal, and less than 1% underweight. As for women, 21% were obese, but less than 56% are overweight and 42% have a normal weight. Table 2 shows substantial cross-country differences in our selected sample. Czechs have comparable BMI to Slovenia, Poland, and Spain (both men and women). Obesity rate is, however, much higher among Czech men than in all other countries. Share of obese women is similar to Poland (about 28%), while this share is somewhat higher in Estonia and much lower in other European countries.

In our analysis, we focus mainly on the trends in the prevalence of obesity (BMI > 29.99) because it is considered as the major health risk in the population. We divided the sample with respect to the following categories: gender, education, and occupation (current or pre-retirement). Using the data, we can distinguish following levels of education: elementary, lower secondary or second level of basic education, upper secondary, post-secondary education, first stage of tertiary, and second stage of tertiary. We aggregated them into three groups (low, middle, and high), as shown in Table 4. Occupations are divided according to international standard of occupation based on International standard classification of occupation (ISCO) and aggregated into three groups: professionals (managers, professionals, and technical and associate professionals), manual workers (agriculture, forestry, and fishery, craft and trade workers, plant and machine operators, assemblers, and elementary occupations), and works in services (service and sale workers, clerical support workers). The detailed description is provided in Table 3. Our data also allows us to compare working people to retired pensioners, which defined based on the self-reported economic status. We exploit this advantage in the section that analysis heterogeneity with respect to occupations. The following section describes our main results using graphical analysis.

Graphical overview of trends

This section consists of graphical analysis, which compares overall trends in obesity and BMI across Europe. Each figure shows the level of obesity (alternatively BMI) in four groups of countries and the Czech Republic. An example is provided in Figure 1, showing

³ Sample is restricted in order to at least partially control for different mortality rates across countries. Also SHARE is often used in the health literature for this particular age group.

Tab. 2: International comparison of BMI and obesity rates, pooled sample 2007–2015

Country	Men		Women	
	BMI (kg/m ²)	Obesity rate (%)	BMI (kg/m ²)	Obesity rate (%)
AUT	27.6	24.1	26.6	22.7
DEU	27.6	22.9	26.5	21.2
SWE	26.6	16.6	26.1	18.5
ESP	27.5	21.3	26.9	22.2
ITA	26.7	15.3	25.8	16.9
FRA	26.9	20.8	25.8	18.0
DNK	26.8	17.4	25.6	15.5
CHE	26.4	14.7	24.9	14.1
BEL	27.0	21.1	26.1	19.5
CZ	28.3	30.6	27.6	28.6
POL	27.3	26.7	27.6	28.4
SVN	28.0	26.4	27.0	23.0
EST	27.3	24.9	28.3	34.3

Note: Source SHARE, own computation.

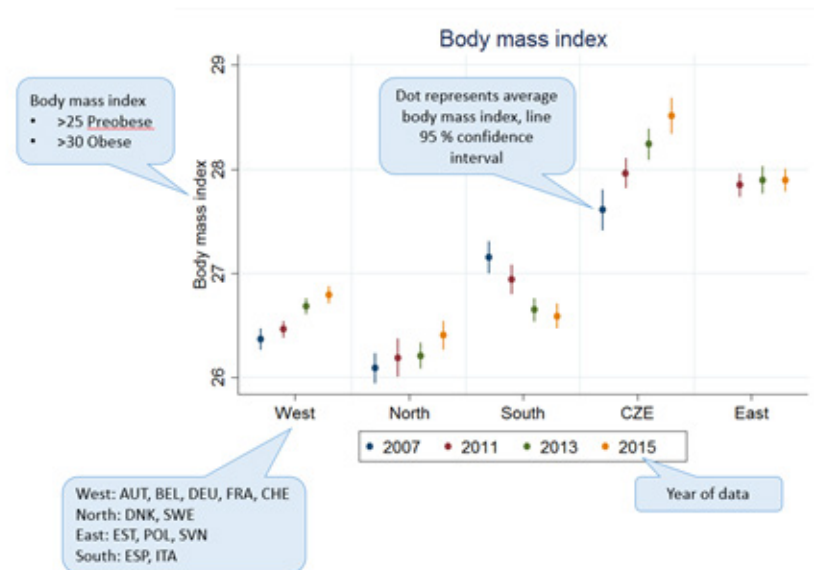
Tab. 3: Classification of occupations

ISCO code	Occupation	Occupation group
1	Managers	Professional
2	Professionals	Professional
3	Technicians and Associate Professionals	Professional
4	Clerical Support Workers	Service
5	Service and Sales Workers	Service
6	Skilled Agricultural, Forestry and Fishery Workers	Manual
7	Craft and Related Trades Workers	Manual
8	Plant and Machine Operators and Assemblers	Manual
9	Elementary Occupations	Manual
0	Army	n.a.

Tab. 4: Classification of education

ISCED code	Education	Education group
0	Pre-primary education	Low
1	Primary education or first stage of basic education	Low
2	Lower secondary education or second stage of basic education	Low
3	Upper secondary education	Middle
4	Post-secondary non-tertiary education	Middle
5	First stage of tertiary education	High
6	Second stage of tertiary education	High

Fig. 1: An example of graph with explanation



level of BMI in 2007, 2011, 2013, and 2015. Compared to traditional descriptive studies, we also provide 95% confidence intervals for a given level BMI or obesity. We thus also provided an information about the quality of measurement in the given year and reliability of given data point.

The Czech Republic has a significant and increasing trend in BMI and obesity for both men and women, which is shown in Figure 2. Men have much higher level of BMI in comparison to other groups of European countries, whereas BMI of women is comparable to that of those in Estonia and Slovenia (East). Average BMI for men has increased by more than 1 point during the past decade, while for women, the increase is just about half of point.

In 2015, the obesity rate for Czech men is 35%, which is almost twice as higher as that for men in Italy and Spain (South) and more than 50% higher than that for men in West. Obesity of Czech men was similar to that for men in East in 2007 (approximately 33%); since then, it increased to 35% in 2015. In the same time, almost 33% of Czech women suffer from obesity in 2015, which corresponds to the obesity rate in Estonia and Slovenia, but is 15 points higher compared to women in Western Europe.

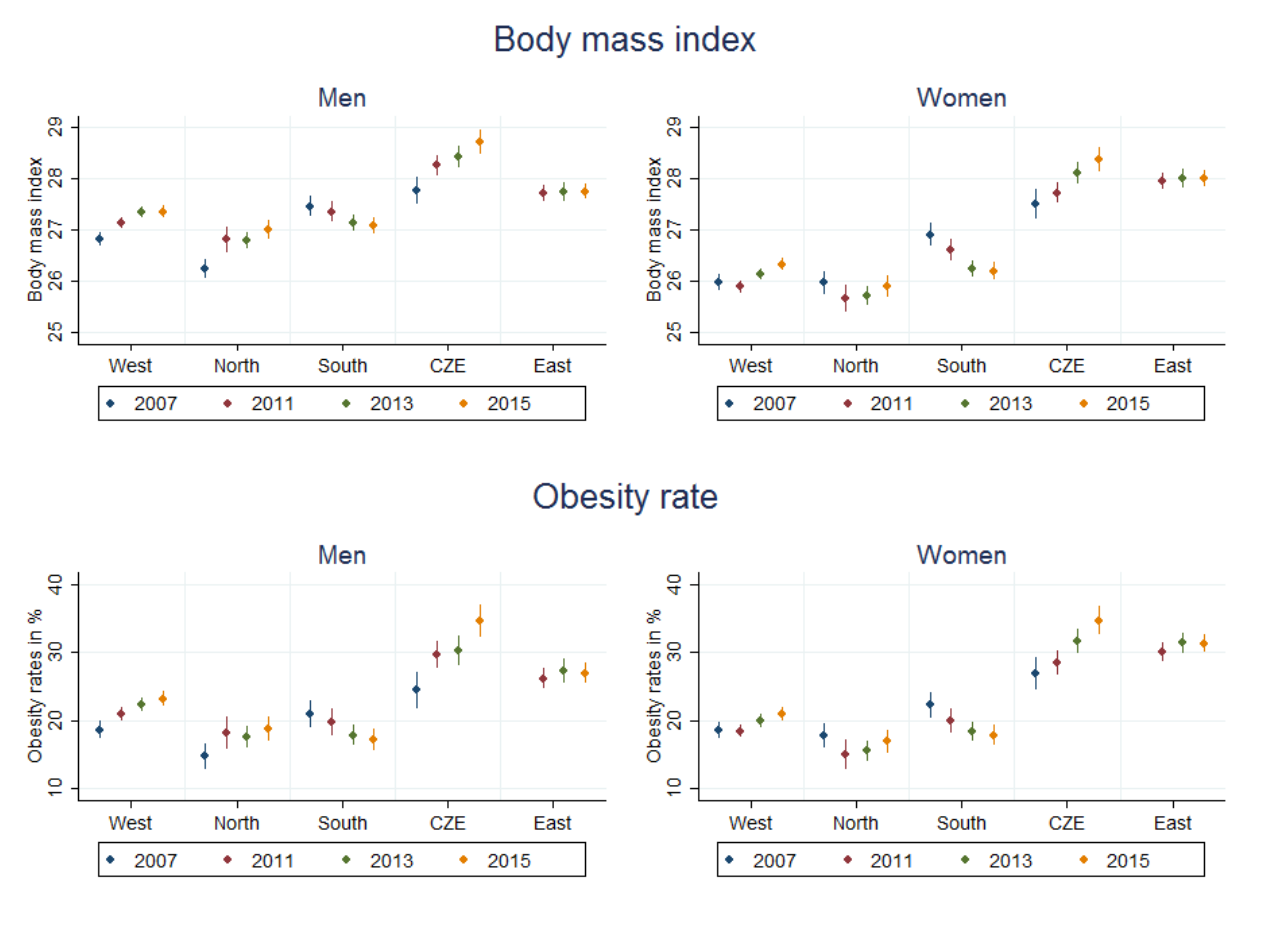
Education and obesity rates

In this section, we focus on the analyses of heterogeneity in the obesity rates with respect to level of education. We distinguish three levels (Table 3): low education (primary, lower secondary), middle (upper secondary) and high education (post-secondary and tertiary). Overall, level of education is consistently negatively associated with obesity rates in all countries. It should be noted that the association between education and obesity has been proven as causal (Brunello et al., 2013). In our analysis, we, however, only descriptively documented the trends in obesity rates across different educational groups.

Figure 3 shows that Czech men suffer from increasing trend in obesity, mainly among the low- and middle-educated men. Highly educated older men have a constant level obesity, which is about 22%. In 2015, the obesity rate for lower-educated men is approximately 42%; in case of middle-educated men, it is about 35%. This means that Czech men with middle and low education have substantially higher obesity compared to all other countries in 2015.

Figure 3 also depicts similar picture for women. It shows that there is remarkably similar increasing trend for women with low and middle education. Highly educated women remain in 2015 on similar level as in 2007. Current level of the obesity rate for lower-educated women is 42%; for highly educated women, it is about 22%. Middle- and lower-educated women are much more similar to other Eastern countries as compared to Czech men who have higher obesity rate even in comparison to other Eastern countries.

Fig. 2: Body mass index and obesity rates in international perspective



Note: Source SHARE, own computation.

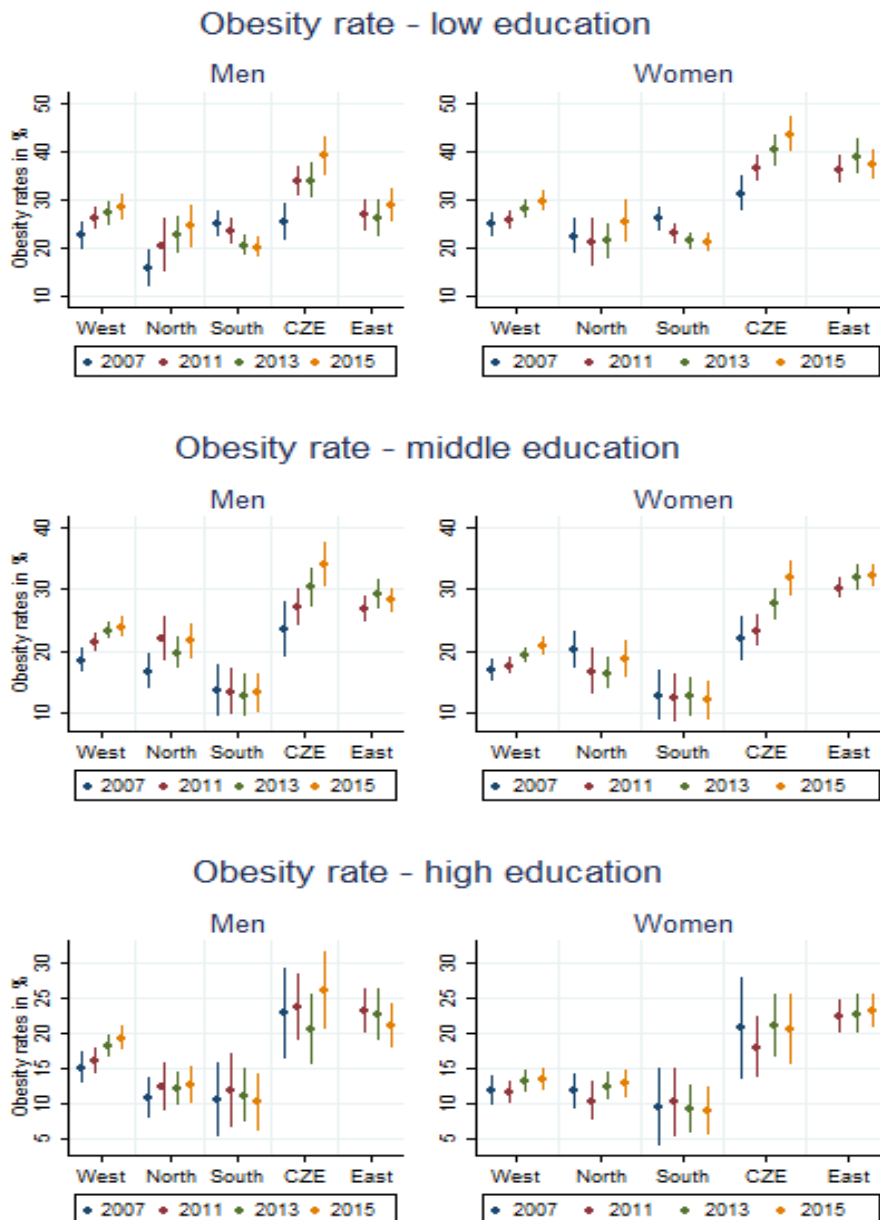
Obesity rates in different occupations

Current literature (Godard, 2016) shows that transition from work to retirement in Western Europe causes an increase in the prevalence of obesity especially for workers in strenuous jobs. For such workers, transition into retirement is associated with a substantial change in physical activity. This motivates us to depict obesity rates separately for working and non-working (retired) individuals in our sample and for different types of occupations. Table 3 summarizes how we divide occupations into three groups: professionals, manual workers, and workers in services. In this section, we thus present the development of obesity rates with respect to working status (workers vs. pensioners) and with respect to their occupation they currently work in, or they worked before they entered retirement.

Workers: professionals versus others

Figure 4 shows the differences in obesity across occupations for current active workers. We observe increasing trend for Czech service and manual occupations for both men and women. Professionals have very modest trend, which is almost insignificant. In fact, workers in services have pronounced upward trend out of all occupational groups. We do not find similar trend in any other European country.

Fig. 3. Obesity rates for men and women with low, middle, and high education



Note: Source SHARE, own computation.

Pensioners: Professionals versus others pre-retirement occupations

Figure 5 depicts the obesity rates for pensioners divided again into three occupational groups as described in Table 3. One can see in Figure 5 that increasing trend in obesity is visible mainly for former manual workers, whereas the obesity rate for former professionals and service workers remain on the same level—approximately 33%. These results show the importance of life style that is often associated with occupational status as described in sociological literature.

Fig. 4: Workers: professionals versus others



Note: Source SHARE, own computation.

Figure 5: Pensioners: professionals versus others pre-retirement occupations



Note: Source SHARE, own computation.

What can explain cross-country differences in obesity?

In this section, we attempt to explain differences in obesity across countries using underlying socioeconomic population structure. We used the OLS model to estimate the propensity to be obese and control for following variables: education, occupation, overall health status, household size, and labor market status. OLS is often used in econometric literature to test for differences across different groups. It has statistically convenient characteristics, and the interpretation is straightforward. As a robustness check, we also used probit models. Occupations are often used in sociological literature to define socioeconomic status. Education was proven to have a causal impact on the obesity rate.

All variables are used also in Godard (2016) who analyzed the transition into retirement and increase in BMI using SHARE data. Health status is measured using a question that asks about overall subjective health on scale 1–5. This is typically used in public health and health economics literature.

Furthermore, household size distinguishes singles and pairs. All regressions are run separately for men and women. We are adding our control variables into our model as shown in Table 5. We focus on the year 2015 with completed set of data and complete weight ready to be used for estimation, and Switzerland is used as a benchmark.

The results show that controlling for education and occupational structure explain only approximately one-fourth of cross-country differences in the obesity rates and other variables (age, household size, and health status) does not change overall picture. In fact, obesity of Czech men remains much higher compared to other countries even if we control for all possible observable characteristics. Similar finding holds also for women, with an exception of Estonia, which has similar obesity rate as in the Czech Republic. It should be noted that we explained only less than 10% of individual-level variation in obesity. It essentially means that there are many unobserved factors potentially determining cross-country differences in obesity rates.

What can explain increasing trend in obesity?

In this section, we aim to explain the increasing trend in obesity using observable characteristics at disposal. We regress the propensity to be obese on year dummies for our sample of Czech older individuals using ordinary least square method. The results are presented in Table 6. The first column shows coefficients without any control variable. The results in the second column controls for education dummies (four levels of education: elementary, lower secondary, upper secondary, and college), the third column controls for occupation dummies (as defined in Table 2), the results in fourth column controls for general health status and labor market status. The coefficient by year dummies may be interpreted as percentage point increase ($\times 100$) in comparison to the benchmark, which is 2007. One can see significant trend in obesity rates for both women and men, which confirms our results from graphical analyses. However, the important take away is that this trend is a substantial one and significant even after controlling for observable characteristics—occupation, education, general health status, and labor market status. This essentially means that increasing trend in obesity cannot be explained by any changes in underlying population structure that we control for in these regressions.

Transition into retirement

In this section, we focus on one particular aspect, which is the transition into retirement. Existing evidence (Godard, 2016) suggests that a transition into retirement is often associated with a decrease in physical activity and subsequent increase in BMI. The increase in obesity and BMI was shown in many research papers with different methodologies. Here we use a panel structure of the data, which allows us to use fixed effect regressions that control for individual time invariant characteristics (Table 7). In practice, we can control for the fact that more obese people are more likely to enter retirement. On the other hand, we cannot control for factors that are changing over time and are associated with entering retirement.

Tab. 5: Can observable characteristics explain cross-country differences in obesity?

Men, 2015

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
CZ	0.183*** (0.020)	0.161*** (0.020)	0.157*** (0.021)	0.154*** (0.021)	0.125*** (0.021)	0.124*** (0.021)
EST	0.097*** (0.020)	0.092*** (0.020)	0.091*** (0.020)	0.091*** (0.020)	0.033 (0.020)	0.033 (0.020)
SVN	0.114*** (0.020)	0.099*** (0.020)	0.096*** (0.021)	0.092*** (0.021)	0.071*** (0.021)	0.069*** (0.021)
DEU	0.089*** (0.020)	0.090*** (0.020)	0.086*** (0.020)	0.085*** (0.020)	0.058*** (0.020)	0.058*** (0.020)
POL	0.115*** (0.024)	0.094*** (0.024)	0.082*** (0.026)	0.083*** (0.026)	0.042 (0.026)	0.040 (0.026)
ESP	0.039** (0.020)	−0.004 (0.020)	−0.008 (0.021)	−0.008 (0.021)	−0.016 (0.021)	−0.018 (0.021)
AUT	0.081*** (0.022)	0.076*** (0.022)	0.074*** (0.022)	0.070*** (0.022)	0.061*** (0.022)	0.063*** (0.022)
BEL	0.074*** (0.019)	0.064*** (0.019)	0.066*** (0.019)	0.065*** (0.019)	0.053*** (0.019)	0.054*** (0.019)
FRA	0.075*** (0.020)	0.056*** (0.020)	0.054** (0.021)	0.051** (0.021)	0.036* (0.021)	0.037* (0.021)
SWE	0.026 (0.021)	0.018 (0.021)	0.024 (0.021)	0.023 (0.021)	0.025 (0.021)	0.025 (0.021)
DNK	0.024 (0.020)	0.022 (0.020)	0.024 (0.021)	0.025 (0.021)	0.035* (0.021)	0.035* (0.021)
ITA	−0.017 (0.019)	−0.055*** (0.020)	−0.048** (0.020)	−0.048** (0.020)	−0.061*** (0.020)	−0.063*** (0.020)
Constant	0.163*** (0.016)	0.249*** (0.019)	0.226*** (0.023)	0.218*** (0.024)	0.319*** (0.027)	0.279*** (0.067)
Observations	14,274	14,274	13,398	13,398	13,397	13,397
R-squared	0.015	0.022	0.024	0.024	0.040	0.041
Education	No	Yes	Yes	Yes	Yes	Yes
ISCO	No	No	Yes	Yes	Yes	Yes
Retirement	No	No	No	Yes	Yes	Yes
Health	No	No	No	No	Yes	Yes
HHsize	No	No	No	No	No	Yes
Age	No	No	No	No	No	Yes

Standard errors are given in parentheses.

*** p < 0.01, ** p < 0.05, * p < 0.1.

Note: Switzerland is a benchmark for presented estimates.

Tab. 5: Can observable characteristics explain cross-country differences in obesity?

Continued

Women, 2015

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
CZ	0.198*** (0.017)	0.172*** (0.017)	0.164*** (0.018)	0.157*** (0.018)	0.128*** (0.018)	0.126*** (0.018)
EST	0.219*** (0.017)	0.242*** (0.017)	0.227*** (0.017)	0.226*** (0.017)	0.150*** (0.018)	0.149*** (0.018)
SVN	0.099*** (0.018)	0.086*** (0.018)	0.072*** (0.018)	0.066*** (0.018)	0.040** (0.018)	0.036** (0.019)
DEU	0.082*** (0.017)	0.092*** (0.017)	0.081*** (0.018)	0.080*** (0.018)	0.045** (0.018)	0.044** (0.018)
POL	0.156*** (0.021)	0.132*** (0.021)	0.124*** (0.022)	0.121*** (0.022)	0.077*** (0.022)	0.074*** (0.022)
ESP	0.059*** (0.017)	-0.006 (0.018)	-0.020 (0.019)	-0.018 (0.019)	-0.034* (0.019)	-0.035* (0.019)
AUT	0.066*** (0.019)	0.061*** (0.019)	0.046** (0.019)	0.040** (0.019)	0.032* (0.019)	0.030 (0.019)
BEL	0.064*** (0.017)	0.059*** (0.017)	0.061*** (0.017)	0.060*** (0.017)	0.043** (0.017)	0.041** (0.017)
FRA	0.067*** (0.018)	0.049*** (0.018)	0.049*** (0.018)	0.046** (0.019)	0.025 (0.018)	0.022 (0.018)
SWE	0.027 (0.019)	0.043** (0.019)	0.044** (0.019)	0.042** (0.019)	0.035* (0.019)	0.035* (0.019)
DNK	0.015 (0.018)	0.039** (0.018)	0.037** (0.019)	0.036* (0.019)	0.040** (0.018)	0.039** (0.018)
ITA	0.004 (0.017)	-0.047*** (0.017)	-0.056*** (0.019)	-0.056*** (0.019)	-0.078*** (0.018)	-0.080*** (0.018)
Constant	0.149*** (0.014)	0.275*** (0.016)	0.218*** (0.023)	0.209*** (0.023)	0.382*** (0.026)	0.450*** (0.060)
Observations	17,931	17,931	16,022	16,022	16,017	16,017
R-squared	0.027	0.047	0.054	0.054	0.081	0.081
Education	No	Yes	Yes	Yes	Yes	Yes
ISCO	No	No	Yes	Yes	Yes	Yes
Retirement	No	No	No	Yes	Yes	Yes
Health	No	No	No	No	Yes	Yes
HHsize	No	No	No	No	No	Yes
Age	No	No	No	No	No	Yes

Standard errors are given in parentheses.
*** p < 0.01, ** p < 0.05, * p < 0.1.

Note: Switzerland is a benchmark for presented estimates.

Tab. 6: Men: Explaining trend in the Czech Republic by observable characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 2011	0.052*** (0.019)	0.056*** (0.019)	0.057*** (0.019)	0.052*** (0.019)	0.051*** (0.019)	0.051*** (0.019)
Year 2013	0.058*** (0.020)	0.067*** (0.020)	0.068*** (0.020)	0.060*** (0.020)	0.054*** (0.020)	0.053*** (0.020)
Year 2015	0.102*** (0.021)	0.111*** (0.021)	0.108*** (0.021)	0.097*** (0.021)	0.087*** (0.021)	0.085*** (0.022)
Constant	0.244*** (0.016)	0.288*** (0.030)	0.251*** (0.044)	0.225*** (0.044)	0.284*** (0.047)	0.212* (0.115)
Observations	5,231	5,230	5,076	5,076	5,073	5,073
R-squared	0.005	0.011	0.013	0.018	0.038	0.038
Education	No	Yes	Yes	Yes	Yes	Yes
ISCO	No	No	Yes	Yes	Yes	Yes
Retirement	No	No	No	Yes	Yes	Yes
Health	No	No	No	No	Yes	Yes
HHsize	No	No	No	No	No	Yes
Age	No	No	No	No	No	Yes
Standard errors are given in parentheses.						
*** p < 0.01, ** p < 0.05, * p < 0.1.						

Women: Explaining trend in the Czech Republic by observable characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 2011	0.016 (0.017)	0.026 (0.017)	0.026 (0.017)	0.024 (0.017)	0.023 (0.017)	0.020 (0.017)
Year 2013	0.047*** (0.017)	0.067*** (0.017)	0.064*** (0.017)	0.060*** (0.017)	0.057*** (0.017)	0.052*** (0.017)
Year 2015	0.078*** (0.018)	0.100*** (0.018)	0.098*** (0.018)	0.091*** (0.018)	0.088*** (0.018)	0.082*** (0.018)
Constant	0.268*** (0.014)	0.385*** (0.018)	0.330*** (0.038)	0.280*** (0.038)	0.404*** (0.042)	0.226** (0.098)
Observations	7,046	7,046	6,865	6,865	6,858	6,858
R-squared	0.004	0.029	0.033	0.039	0.062	0.063
Education	No	Yes	Yes	Yes	Yes	Yes
ISCO	No	No	Yes	Yes	Yes	Yes
Retirement	No	No	No	Yes	Yes	Yes
Health	No	No	No	No	Yes	Yes
HHsize	No	No	No	No	No	Yes
Age	No	No	No	No	No	Yes
Standard errors are given in parentheses.						
*** p < 0.01, ** p < 0.05, * p < 0.1.						

Note: Standard errors are given in parentheses; the omitted year is 2007.

Tab. 7: Fixed effect regressions: Transition in retirement and BMI

	(1)	(2)	(3)	(4)	(5)
	Czech	West	South	North	East
Variables	BMI	BMI	BMI	BMI	BMI
Pension	0.0814	0.0669*	0.142*	0.00461	0.0504
	(0.0986)	(0.0362)	(0.0829)	(0.0618)	(0.0693)
HHsize	0.149***	0.00480	0.0532	0.0304	−0.00209
	(0.0563)	(0.0253)	(0.0454)	(0.0478)	(0.0379)
single	−0.350**	−0.193***	0.0820	−0.286**	−0.522***
	(0.176)	(0.0700)	(0.166)	(0.116)	(0.129)
age					
51	0.524	0.0939	−0.118	−0.266	−0.156
	(0.344)	(0.0983)	(0.231)	(0.174)	(0.202)
52	0.630**	0.222***	−0.173	0.0236	0.0320
	(0.300)	(0.0811)	(0.195)	(0.153)	(0.174)
53	0.796**	0.350***	−0.181	−0.147	0.170
	(0.324)	(0.0919)	(0.217)	(0.165)	(0.179)
54	1.013***	0.463***	0.0720	−0.0365	0.333*
	(0.302)	(0.0845)	(0.199)	(0.155)	(0.176)
55	1.152***	0.553***	0.0402	0.0229	0.399**
	(0.312)	(0.0907)	(0.209)	(0.165)	(0.169)
56	1.374***	0.610***	0.0985	0.129	0.551***
	(0.309)	(0.0885)	(0.202)	(0.159)	(0.178)
57	1.325***	0.722***	−0.0650	0.162	0.417**
	(0.313)	(0.0921)	(0.212)	(0.163)	(0.177)
58	1.464***	0.740***	0.0405	0.223	0.621***
	(0.311)	(0.0909)	(0.206)	(0.161)	(0.177)
59	1.592***	0.847***	0.0663	0.208	0.606***
	(0.316)	(0.0931)	(0.212)	(0.164)	(0.181)
60	1.830***	0.903***	0.0447	0.263	0.695***
	(0.321)	(0.0939)	(0.214)	(0.164)	(0.181)
61	1.928***	0.949***	−0.0240	0.443***	0.862***
	(0.324)	(0.0962)	(0.218)	(0.167)	(0.187)
62	1.911***	1.002***	−0.0680	0.373**	0.948***
	(0.329)	(0.0970)	(0.219)	(0.168)	(0.188)
63	2.026***	1.079***	0.0528	0.522***	0.894***
	(0.332)	(0.0993)	(0.223)	(0.170)	(0.192)
64	2.327***	1.060***	−0.0674	0.432**	0.972***
	(0.334)	(0.100)	(0.224)	(0.172)	(0.195)
65	2.162***	1.149***	0.105	0.392**	1.053***
	(0.337)	(0.104)	(0.229)	(0.176)	(0.198)
66	2.461***	1.152***	−0.150	0.415**	0.928***
	(0.341)	(0.106)	(0.232)	(0.179)	(0.203)

Continued **Tab. 7:** Fixed effect regressions: Transition in retirement and BMI

	(1)	(2)	(3)	(4)	(5)
	Czech	West	South	North	East
Variables	BMI	BMI	BMI	BMI	BMI
67	2.344*** (0.343)	1.223*** (0.107)	0.0937 (0.237)	0.376** (0.181)	0.879*** (0.207)
68	2.581*** (0.348)	1.216*** (0.110)	0.00468 (0.242)	0.337* (0.183)	1.125*** (0.214)
69	2.540*** (0.354)	1.203*** (0.113)	0.0538 (0.248)	0.428** (0.186)	0.962*** (0.221)
70	2.169*** (0.592)	1.167*** (0.219)	0.0706 (0.471)	0.546 (0.356)	1.050** (0.422)
Constant	26.05*** (0.334)	25.80*** (0.110)	26.58*** (0.243)	25.97*** (0.197)	27.30*** (0.201)
Observations	12,277	47,294	19,649	15,887	20,181
R-squared	0.023	0.015	0.002	0.009	0.011
Number of ID	6,416	23,351	10,251	7,804	10,528

Standard errors are given in parentheses.
*** p < 0.01, ** p < 0.05, * p < 0.1.

Our econometric model has the following form:

$$BMI_{i,t} = \alpha PENSION_{i,t} + \beta AGE_{i,t} + \delta HHstatus_{i,t} + X\theta + \gamma_i + \varepsilon_{i,t}$$

where the key right-hand side variable of interest is *PENSION*, which is a dummy variable indicating whether an individual is observed in the data as a pensioner or not. We define pensioner as a person who collect pension and is economically inactive. Our explained variable is the level of BMI. Other variable, such as *AGE*, controls for overall trend in the obesity or BMI that naturally increases with age. Furthermore, we control for other characteristics of household, such as number of household members, or whether individual is single or married. Overall, fixed effect model controls for all observed and unobserved invariant characteristics, which naturally limits the number of variables that are included into the model.

The results show that there is very little evidence for the increase in the BMI in association with entering retirement. We see statistically significant, but small, effect for countries in Western Europe and in Southern Europe. In case of the Czech Republic, there is no significant effect of transition into retirement on BMI. It should be noted that these results cannot be fully interpreted as causal, because of potential unobserved characteristics that may affect both retirement status and BMI. Controlling for fixed effect may, whoever, substantially limit this source of endogeneity.

Conclusion and Discussion

In our analysis, we used SHARE data to document a substantial trend in obesity among Czech citizens aged 50–69 years during 2007–2015. We documented increasing trend for both Czech women and men. In particular, men and women with low and middle education are affected, while obesity rate among highly educated is constant over time. An analysis of occupational heterogeneity gives similar findings.

We aimed to test if the increasing trend is related to the changes in the socio-demographic structure of population, and we found that it is not the case. Simply speaking, the increasing trend in obesity is driven mainly by the change in life style rather than change in the composition of population in the 50–69 years age group.

Furthermore, we tested if there is an effect of entering retirement on BMI. We performed fixed effect regressions and showed that transition into retirement in the Czech Republic is not associated with an increase in BMI. This essentially means that high prevalence of obesity cannot be attributed to a change in life style when individuals switch from employment to retirement. Our result is in this respect different to Mazzonna and Peracchi (2017), who found negative effect of retirement on various health outcomes including obesity.

Compared to previous literature, we find similar results in terms of association between education and obesity.

Our findings open up important questions that need to be further researched. First problem is whether there is a similar trend also for other age categories (younger than 50). This has to be analyzed with a different data source than SHARE. Furthermore, in our analysis, we do not answer an important question whether there was any qualitative change in life style. Is there a shift in social norm related to life style and obesity? Is it the result of economic growth, higher income, and thus higher consumption? How is this trend related to the quality of food consumed? These and other questions should be subject to further research.

We claimed that higher public health expenditures may be expected in upcoming years in the Czech Republic. We also showed that any future intervention should target low educated and blue-collar workers. However, we are not able to suggest any particular policy intervention that may reduce the prevalence of obesity in the Czech Republic. Further research is needed to provide true causes of the increase in obesity in the Czech Republic.

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Annex

Tab. A.1: Descriptive statistics

Variables	Mean	Standard deviation	Min	Max
BMI	26.96	4.68	10	59.48
basic_educ	0.15	0.35	0	1
low_sec	0.17	0.38	0	1
high_sec	0.38	0.48	0	1
college	0.28	0.45	0	1
IscoWhit	0.3	0.46	0	1
IscoBlue	0.33	0.47	0	1
vek	60	5.4	50	69
hhszise	2.29	1.02	1	14
ZdraviCelk	2.99	1.06	-2	5
duchodceS1	0.41	0.49	0	1
male1	0.44	0.49	0	1