Gaining weight through retirement ? Results from the SHARE survey.

Mathilde Godard*

November 2012

Keywords : Body Mass Index; Obesity; Retirement; Instrumental Variables

Acknowledgements : I wish to thank Andrea Bassanini, Luc Behagel, Eve Caroli, Clément de Chaisemartin, Brigitte Dormont, Florence Jusot, Claudio Lucifora, Mathilde Peron, Roland Rathelot, Anne-Laure Samson, Jérôme Wittwer and seminar participants at University Paris-Dauphine and the ETEPP winter school in Aussois for useful comments and discussions. I am grateful to Nicolas Sirven for his thorough knowlegde of the SHARE survey.

*mathilde.godard@ensae.fr, CREST and Université Paris-Dauphine, LEDa-LEGOS.

Abstract

In this paper, we use IV-techniques to identify the causal effect of retirement among the 50-69 year-old on Body Mass Index (BMI) and related weight measures. Based on the 2004 and 2006 waves of the Survey of Health, Ageing and Retirement in Europe (SHARE), the identification strategy exploits the European variation in retirement schemes to produce an exogeneous shock in retirement behaviour. Our results show that retirement induced by discontinuous incentives in social security systems causes a 0.20 point increase in the probability of being overweight or obese.

1 Introduction

In its 1998 report, the World Health Organization (WHO) ranked the obesity epidemic among the leading ten global public health issues. Obesity rates in the world have more than doubled over the last 30 years (WHO (2012)). In the European Union 27 member states, approximately 60% of the adult population -260 millions of adults- is either overweight (Body Mass Index (BMI) from 25 to 29.9 kg/m^2) or obese (BMI 30 kg/m^2 and above) (International Obesity Task Force (IASO/IOTF (2010)). Obesity has become a pan-European epidemic (IASO/IOTF (2002)) and prevalence rates in the EU-27 range from 7.9% in Romania to 24.5% in the United-Kingdom (Organisation for Economic Cooperation and Development OECD (2010)).

Obesity is a risk factor for numerous highly-prevalent and costly chronic diseases (cardiovascular diseases, type-2 diabetes, hypertension and certain types of cancer) and for disability. It reduces the quality of life, shortens life expectancy and lowers the levels of labour productivity (Must et al. (1999)). Moreover, it places a heavy financial burden on the individual and on society -particularly on public transfer programmes and private health plans (Finkelstein et al. (2003)). At the individual level, Emery et al. (2007) find -using French data- that healthcare costs for obese individuals are on average twice the costs for normal weight individuals. At the aggregate level, obesity-related healthcare expenditures account for 1.5 to 4.6% of total health expenditures in European countries (Schmid et al. (2005); Emery et al. (2007)).

In most European countries obesity rates reach their peak around age 60.5 (Sanz-de Galdeano (2005)). Recent studies have highlighted the particularly strong impact of overweight, obesity and increased BMI on morbidity and disability among adults aged 50 and older (Andreyeva et al. (2007); Peytremann-Bridevaux and Santos-Eggimann (2008)), thereby attracting policymakers' attention to the substantial burden that obesity places on the general health and autonomy of adults aged over 50.

Understanding the causes of obesity among the elderly is therefore a key issue. Unlike other age groups -such as children or adolescents- it hasn't received much attention yet. The biology of ageing certainly has some importance, as underlined by Guo et al. (1999), Kyrou and Tsigos (2009) and Nooyens et al. (2009). But most importantly, as the elderly are characterised by low labour participation rates, one might wonder whether transitions out of employment have an impact on the weight trajectory of people aged 50 years and older. In this paper, we focus on a particular transition out of employment, i.e retirement.

There are some reasons to believe that retirement might trigger weight changes. The Grossman model of the demand for health (Grossman (1972)) is consistent with the interpretation that individuals are likely to adopt health-producing activities -such as healthier diets or physical exercise for instance- after retirement : although they have a tighter budget constraint, retirees do have more time to allocate to leisure. However, retirement might also increase the risk of social isolation and depression (Friedmann and Havighurst (1954); Bradford (1979)), leading individuals to potentially reduce their efforts in health-producing activities and develop addictive behaviours (alcohol or tobacco consumption). The loss of a structured use of time may also encourage snacking in-between meal times and sedentary habits (television watching). So, retirement might cause behavioural changes that influence either food intake, physical activity, or both and that subsequently affect weight changes (Forman-Hoffman et al. (2008)).

The purpose of the present paper is to estimate the causal impact of retirement on BMI and related weight measures. The identification of such a causal impact is problematic in the presence of cofounding factors and reverse causality. Retirement is indeed often a choice, and often based on unobservable characteristics which may be correlated with weight (time preference[1], health or psychological deteriorations). Reverse causality may also be a concern : overweight and obese individuals are on average paid less and less promoted (Cawley (2004); Morris (2006); Brunello and d'Hombres (2007); Schulte et al. (2007)). Their incentives to retire might thus be higher than normal-weight individuals.

To tackle this endogeneity issue, we use an instrumental variable approach. Our identification strategy exploits the fact that as individuals reach the earliest age at which they are entitled to either reduced pensions or full pensions -conditional on a sufficient number of years of social security contributions- the probability that they retire strongly increases. This discontinuous incentive in the social security system provides a strong exogeneous shock on retirement behaviour, thus solving the major identification problems related to confounding factors and reverse causality. We use the 2004 and 2006 waves of a European panel survey, the Survey of Health, Ageing and Retirement in Europe (SHARE). Our baseline results show that retiring between 2004 and 2006 causes a 0.20 point increase in the probability of being overweight or obese.

This paper relates to several strands of literature. First and foremost, it contributes to the literature on the effects of retirement on weight, which results have been quite consistent so far. Nooyens et al. (2005) find that the effect of retirement on changes in weight and waist circumferences depends on one's former occupation : weight gain is higher among men who retired from an active job. Forman-Hoffman et al. (2008) find no significant relation for men, but a weight gain for women retiring from blue-collar jobs. Gueorguieva et al. (2010) find a significant increase in the slopes of BMI trajectories only for people retiring from blue-collar occupations. These studies however, do not adress the endogeneous nature of retirement behaviour, and can only infer correlations, not causality. To the best of our knowledge, Chung et al. (2009) is the only study tackling the endogeneity issue. Using six waves of the Health and Retirement Study (1992-2002) -the US equivalent of the European SHARE survey- they use IV-methods and conclude that people already overweight and people with lower wealth retiring from physically-demanding occupations suffer from a modest weight gain.
This paper also relates to a substential recent literature that explores the effects of retirement on health by exploiting discontinuous incentives in social security systems as exogeneous shocks in re-

[1]See Smith et al. (2005), Anderson and Mellor (2008) and Ikeda et al. (2010) for empirical evidence of the positive relationship between time preference and BMI.

tirement decisions (Charles (2002); Neuman (2008); Coe and Lindeboom (2008); Coe and Zamarro (2011); Rohwedder et al. (2010); Behncke (2011); Garrouste et al. (2012)). Our identification strategy is similar in spirit, but our objective differs -rather than investigating the effect of retirement on health, we investigate the effect of retirement on an under-investigated dimension of health and a major risk factor for numerous diseases : body weight.
Finally, this paper contributes to a growing body of literature that investigates the impact of various dimensions of professional activity on body weight and obesity, such as papers focusing on unemployment (Marcus (2012)), working conditions (Lallukka et al. (2008b)), occupational mobility (Ribet et al. (2003)), job insecurity (Muenster et al. (2011)), physical streousness at work (Böckerman et al. (2008)), working overtime (Lallukka et al. (2008a)), and income (Cawley et al. (2010), Schmeiser (2009), Colchero et al. (2008)).

Our contribution to the literature is threefold. We identify a causal effect of retirement on weight, while most papers only document a mere correlation. Moreover, our paper is the first one in the literature on the effects of retirement on weight to exploit European data. Most of the above-mentionned studies -except Nooyens et al. (2005)- use US data from the Health and Retirement Survey (HRS). Given the differences in terms of labour markets, social security schemes and social policies, it is not clear whether the results obtained for the USA should hold for Europe. Finally, as underlined by Coe and Zamarro (2011)[2], the European variation in the earliest age at which individuals are entitled to pensions allows us to explore the effect of retirement on weight at different ages, not just ages 63 and 65, as in the US studies (Chung et al. (2009)).

The paper develops as follows. Section 2 presents our empirical approach and Section 3 describes the data (the 2004 and 2006 waves of SHARE). Section 4 presents the results of the study and Section 5 provides some conclusions.

2 Empirical approach

We investigate the impact of retirement on BMI and related weight measures. Given that our dataset contains the 2004 and 2006 waves of the SHARE survey, we would estimate the following equation by Pooled Ordinary Least Squares (POLS) :

$$Y_{it} = \alpha + \gamma D_{it} + X_{it}\beta + \delta_t + u_{it} \tag{1}$$

where Y_{it} is the weight outcome, D_{it} the individual retirement status indicating whether the individual is retired or not at the time of the survey, X_{it} a vector of individual characteristics either time-varying or time-invariant, δ_t a time dummy and u_{it} the error term.

However, the retirement status D_{it} can potentially be correlated with the error term u_{it}, in which case the POLS estimate of γ is inconsistent. Endogeneity may arise from several sources.

[2]Coe and Zamarro (2011) use the 2004 wave of SHARE and use country-specific early and full retirement ages as instruments for retirement behaviour. Their approach is cross-sectional and adresses the question of the effect of retirement on health.

Omitted variables, such as unobservable time preference or health deteriorations may have an impact both on the probability to retire and on weight changes. Similarly, reverse causality may also be a concern : overweight and obese individuals are on average paid less and less promoted. Their incentives to retire might thus be higher than their normal-weight counterparts.

Faced with these endogoneity problems, one could consider to estimate a Fixed-Effects (FE) model such as :

$$Y_{it} = \alpha + \gamma D_{it} + K_{it}\beta + \delta_t + \alpha_i + v_{it} \tag{2}$$

where Y_{it} is the weight outcome, D_{it} the individual retirement status, K_{it} a vector of time-varying individual characteristics, δ_t a time dummy, α_i an individual fixed-effect and v_{it} the error term. The FE model allows regressors to be endogeneous, provided that they are correlated only with α_i, the time-invariant component of the error, but not with the idiosyncratic error v_{it}. If some time-varying characteristics are correlated with v_{it} however, $\hat{\gamma}$ continues to be biased. Moreover, reverse causality is still a concern.

In order to tackle the endogeneity problem, we estimate a Fixed-Effect Instrumental Variable (FEIV) model[3]. Our identification strategy exploits the fact that as individuals reach the Earliest Retirement Age (ERA) in their countries, the probability that they retire strongly increases.

Retirement decisions in industrialized countries depend on a number of institutional features. In particular, the earliest age at which individuals are entitled to pension benefits has been shown to exert a powerful influence on their retirement behaviours (Gruber and Wise (1999)). This ERA is defined as the earliest age at which individuals are entitled to either reduced pensions or full pensions -conditional on a sufficient number of years of social security contributions. The official retirement age is the age at which workers are entitled to either minimum-guaranteed pensions or full old-age pensions irrespective of their contributions or work histories. It appears to be typically less important in predicting retirement behaviour than the ERA (Gruber and Wise (1999)). Few individuals actually work until the official retirement age. This generates a gap between the official retirement age and the average effective age at which older workers withdraw from the labor force.

Earliest, official and average effective retirement ages in Europe are presented in Table 1. As evidenced in columns (4) and (5), the official retirement age varies very little across countries and genders. In contrast, the ERA varies quite a lot across countries and genders (columns (2) and (3)). Effective retirement ages are indeed lower than official retirement ages in every country.

We instrument the retirement status D_{it} by a dummy variable indicating whether individual i's age is above or below the earliest retirement age in his country c. Let age_{it} be individual i's age at

[3] Given the fact that we use two waves of SHARE, we are in the special case where the number of periods equals two and the Fixed-Effect Instrumental Variable estimator and the First Difference Instrumental Variable estimator are numerically equivalent.

time t and age_{c_i} the ERA in i's country c. Our instrument is defined as :

$$Z_{it} = \mathbb{1}_{\{age_{it} > age_{c_i}\}} \quad (3)$$

A good instrument should be strongly correlated with retirement behaviour but should not directly affect weight outcomes. As shown in Table 1, Z appears to be well correlated with retirement status : column (7) and (8) show that the proportion of retirees in 2004 is much higher among individuals above the national ERA than among individuals below. Similarly, as evidenced in column (9), a high proportion of individuals retire when reaching the national ERA. At the same time, once controlling for age, crossing the national ERA threshold is unlikely to be correlated with weight outcomes except through the increased probability of retiring. This exclusion restriction holds if we assume that age does not have a discontinuous effect on weight trajectories at different ERA in different countries.

Equation (2) is then estimated by Fixed-Effect Two-Stage Least Squares (FE-2SLS). In the first stage, the retirement status D_{it} is regressed on Z_{it} and other covariates. In the second stage, equation (2) is estimated by a FE regression where D_{it} is replaced with its predicted value from the first stage. The covariance matrix of $\hat{\gamma}$ is corrected accordingly.
In this setup, $\hat{\gamma}$ is identified on the subset of individuals who decide to retire when crossing the national ERA threshold between 2004 and 2006. It measures the causal effect among this subpopulation of the transition to retirement between 2004 and 2006 on individual BMI as measured over that period.

As Coe and Zamarro (2011) underline, there do exist other ways to exit the labour force, e.g through unemployment or disability programs. However, to the extent that these patterns are stable within countries between 2004 and 2006, the country fixed-effect will pick up this variation and it will not bias our results.

3 Data

3.1 Presentation of the sample

We use the 2004 and 2006 waves of SHARE. SHARE is a multidisciplinary and cross-national panel database of micro data on health, socio-economic status and social and family networks. The 2004 and 2006 waves of SHARE contain more than 55,000 individuals over 50 years old and their spouses-partners (independant of their age) from 13 European countries (Austria, Germany, Sweden, The Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Ireland, Poland and the Chezh Republic). Three "new" countries (Ireland, Poland and the Chezh Republic) joined SHARE in 2006 and participated in the second wave of data collection[4]. Approximately 35,000 individuals were interviewed in the second wave, among whom more than 18,000 had already participated in wave 1. The attrition rate is thus relatively high (9800 individuals lost between the two waves, i.e a 34% attrition rate). Nonetheless, in order to keep a longitudinal dimension, we exclude individuals

[4] http://www.share-project.org

who were not interviewed in both waves.

Our sample contains all individuals interviewed in both waves, aged 50 to 69 years old[5], who declared in each wave being either employed or retired. Transitions from employment to unemployment, invalidity or inactivity are thus excluded. We also exclude transitions from retirement to employment, unemployment, invalidity or inactivity. This is because in the empirical analysis we compare individuals whose job status remains stable across waves (either retired or employed) and individuals who retire between the two waves[6]. Furthermore, only individuals who reported non missing heights, weights and self-declared retirement statuses were included. Finally, as there is no early retirement in Denmark, this country was excluded from the analysis. Overall, our dataset contains 7225 individuals from 10 countries (Austria, Germany, Sweden, The Netherlands, Spain, Italy, France, Greece, Switzerland, Belgium) across the two waves.

3.2 Variables

To assess the impact of retirement on BMI, we need information on both retirement status and BMI.
We use a question on self-declared current job situation to determine whether an individual is retired or not. According to this definition, anyone who declares herself as retired, whether she has been or not in a paid job during the month preceeding the interview -even for a few hours- is considered as retired. Conversely, anyone who declares herself to be employed or self-employed is considered as currently working. The self-declared retirement status seems to be a reliable information in SHARE : it is strongly associated with the eligibility for either public or private pensions in the dataset[7]. Table 2 provides summary statistics for the full sample in 2004. It also presents characteristics in 2004 for the individuals either employed/retired in both waves or retiring between the two waves. According to Table 2, 43 percent of the full sample sample was employed or self-employed in 2004, the rest being retired. Six hundred and twenty-nine individuals (15 percent of the individuals working in 2004) retired between the two waves. We also use an alternative and more restrictive definition of retirement as a robustness check. According to this definition, an individual is considered as retired if (i) his self-declared job situation is "retired" and (ii) he did not do any paid work during the preceeding month. Conversely, an individual is considered as employed if his self-declared job situation is "employed or self employed". According to this definition, only 260 individuals (7 percent of the individuals working in 2004) retired between the

[5]We restrict our analysis to the individuals aged 50-69 because labour force participation in European countries declines after the age of 50 and very few people are still working after age 69. The proportion of people aged 65-69 still working in our sample is smaller than one in five in most countries.

[6]Most authors using longitudinal data and exploring the impact of retirement on health/weight choose to keep only those individuals who were employed in the first wave. They then analyse their transitions to retirement across waves. We propose to keep individuals who were employed as well as individuals who were retired in the first wave. This will not affect the estimated effect of retirement in FE and FEIV models, given that only individuals retiring between the two waves contribute to the estimation of this effect. Keeping retired individuals in the first wave allows us to keep a large sample and some effects -such as ageing for instance- will thus be more precisely estimated.

[7]Among the 3124 individuals retired in both waves in our sample, 73% declared that they had received an income from either a public or occupational old age pension during the year preceeding the interview.

two waves.
The BMI is calculated in each wave as the self-declared weight in kilograms divided by the square of the self-declared height in meters (kg/m^2). Related weight measures are also derived from the BMI : clinical weight categories (underweight (BMI under 18.5 kg/m^2), normal (BMI from 18.5 to 24.9 kg/m^2), overweight (BMI from 25 to 29.9 kg/m^2) and obese (BMI 30 kg/m^2 and above)) as well as a dummy variable indicating whether weight changes (gains or losses) exceeded 10 percent between the two waves. In 2004, the average BMI of the full sample was 26.5 kg/m^2, slightly above the overweight threshold. Seventeen percent of the sample was obese, 44 percent overweight, 38 percent normal and less than 1 percent underweight. Figure 1 suggests a significant impact of retirement on weight changes -either gains or losses- : the proportion of individuals experiencing a weight change of at least 10 percent between 2004 and 2006 is higher among the individuals retiring between the two waves (13 percent) than among those employed or retired across both waves (10 percent)[8].

As far as covariates are concerned, different sets are used, depending on the specification (POLS, FE or FEIV model).
Age is introduced as a continuous variable in each specification, as well as marital status (lives with a spouse-partner/does not live with a spouse-partner) and a time dummy (equal to 1 in 2006, 0 else). The average age of the full sample in 2004 was 59 years-old. The average age in 2004 among the individuals retiring between the two waves was 60 years-old. Eighty-one percent of our sample lived with a spouse or partner.
Gender, educational level[9] (primary education/lower secondary/upper secondary/postsecondary), occupation[10] (blue collars/white collars/technicians/managers and professionals) and country dummies are only included in the POLS specification, as FE and FEIV models do not permit to identify the effects of time-invariant variables. Summary statistics for gender, educational level, occupation and country can be found in Table 2. In 2004, 56 percent of the individuals in the full sample were men, 21 percent had achieved primary education, 18 percent lower secondary education, 31 percent upper secondary education and 30 percent post secondary education. Thirty-one percent of the sample were in blue-collar occupations, 21 percent in white-collar occupations, 17 percent were technicians and 31 percent managers or professionals. Belgium, Sweden, Greece and France were the most represented countries.
Health variables are not introduced in our baseline specifications, as they are not predetermined variables. They are indeed determined at the same time as the retirement status, and including them would thus generate potential endogeneity in the model. However, we include them in some specifications as robustness checks. Whenever introduced in our regressions, the health covariates are : dichotomised self-assessed health status (measured on a five-point scale and dichotomised as excellent/very good/good versus fair/poor), the presence of at least one chronic disease and the

[8]The two proportions are significantly different according to the chi-square test. A similar result is obtained with weight categories : 25 percent of the individuals retiring between the two waves experienced a change in their weight category as opposed to 18 percent among those employed or retired in both waves.
[9]Based on the 1997 International Standard Classification of Education (ISCED 97)
[10]Based on the 1988 International Standard Classification of Occupations (ISCO 88). Occupation is not time-varying in our data, which is plausible given that we consider elderly workers.

Euro-D depression index (measured on a twelve-point scale, where twelve is highly depressed).

Finally, we supplement our dataset by the Earliest Retirement Age (ERA) in force in 2005 in each country (see Table 1). We build a dummy variable for each individual indicating whether his age is above or below the ERA in his country.

4 Results

4.1 First stage results : determinants of retirement

First stage results are reported in Table 3 and indicate that the ERA is an important and significant predictor of retirement. Reaching the ERA between 2004 and 2006 increases the probability of retiring during that same period by almost 0.11 points. This result shows that reaching the ERA provides an exogeneous shock on retirement. Age itself is not statistically important for retirement behaviour once controlling for the country-specific age breaks and the time dummy. The coefficient on the time dummy (dummy variable equal to 1 in year 2006, 0 else) is significant and positive, indicating that the respondants are ageing between the two waves and more likely to retire in 2006. Finally, living with a spouse-partner is not statistically important for retirement behaviour.

4.2 Baseline results : impact of retirement on weight related measures

In Table 4 we report the results obtained when estimating the model presented in equation (2). Panel (a) reports results of POLS estimates for the BMI and the probability of being overweight or obese in columns (1) and (2) respectively. All specifications include age, a time dummy, marital status and time-invariant variables such as gender, educational level, occupation and country dummies. Standard errors are clustered at the individual level. Most of the control variables are statistically significant and of the expected sign. Higher education is associated with a lower BMI and a lower probability of being overweight or obese. Similarly, compared with a blue-collar occupation, being in a managerial or professional occupation is negatively correlated with BMI and the probability of being overweight or obese. Conversely, being a man and living with a spouse or a partner are both associated with a higher BMI and a higher risk of overweight or obesity. Surprisingly, age has a small and insignificant impact on all weight related measures. Many of the country dummies are significant. The POLS results reveal a positive an significant relationship between retirement and BMI as well as between retirement and the probability of being overweight or obese.

However, these correlations are hard to interpret, because they potentially reflect the effects of unobserved characteristics that may affect both weight and retirement behaviour. The importance of confounding factors is apparent when we look at the coefficient on retirement in the regressions modelling the probability of being overweight or obese. In the naïve specification reported in Panel (a) column (2), the coeffiecient on retirement is positive and significant. The sign of the coefficient changes -and remains significant- in the FE model (Panel (b) column (2)) once taken into account the potential endogeneity arising from the correlation between retirement and time-invariant unobserved characteristics. Not controlling for time-invariant factors -such as time preference for

instance which has a positive effect both on the probability to retire and on weight changes- may indeed generate an upward bias and account for the positive effect of retirement on weight in POLS models.
However the negative sign in the FE model (Panel (b) column (2)) cannot be interpreted as causal : a number of time-varying unobservable factors can easily account for it : health or psychological deterioriations -for instance- may trigger both retirement and weight loss. Hence, we need to take into account the remaining endogeneity in the model by instrumenting retirement with ERAs (Panel (c) column (2)). So, under the hypothesis that reaching ERA is a valid instrument, our preferred IV estimates in Panel (c) show that while retirement induced by social security rules does not significantly affect BMI, it causes a 0.20 point increase in the probability of being overweight or obese. It suggests a non-linear effect of retirement on BMI.
All in all, this result is in line with the hypothesis that retirement might trigger behavioural changes that lead to weight gain. Social isolation and depression, the loss of a structured time and the development of sedentary habits might be potential mechanisms through which retirement causes weight gain.

4.3 Robustness checks

In the previous section, we show that while retirement induced by social security rules does not significantly affect BMI, it causes a 0.20 point increase in the probability of being overweight or obese.
Baseline specifications showed in Table 4 do not include health variables. A potential concern when introducing health variables is that the estimated effect of retirement on weight would be biased in the presence of variables determined at the same time as retirement. However, in order to compare our results with Chung et al. (2009)[11] -whose specifications include health variables-, we include them in an alternative specification. Our results are robust to the introduction of dichotomized self-assessed health status, the presence of at least one chronic disease and the Euro-D depression index. The estimated coefficient of retirement on BMI is still insignificant in the FE-IV regression (coefficient : 0.45, standard error : 0.75) and is still equal to 0.20 (significant at a 10% level, standard error : 0.12) when modelling the probability of being overweight or obese.
Our results are also robust to the exclusion of underweight individuals. As underweight status is associated with an increased risk of morbidity and mortality for the elderly (Corrada et al. (2006)), it might be the case that underweight individuals lose weight through retirement, thus leading to an insignificant impact of retirement on BMI in the whole sample. It is not the case however, as the estimated coefficient of retirement is still insignificant in the BMI FE-IV regression when excluding underweight individuals (coeff : 0.28, s.e : 0.73) but is equal to 0.19 and remains significant when modelling the probability of being overweight or obese (coeff : 0.19, s.e : 0.12).
Finally, as a robustness check, we use a more restrictive definition of retirement : according to this definition, an individual is considered as retired if (i) his self-declared job situation is "retired" and

[11] As underlined in the introductory section, Chung et al. (2009) is the only study that takes into account the endogeneity of retirement behaviour and estimates the causal effect of retirement on BMI using US data from the HRS.

(ii) he did not do any paid work during the month preceeding the interview -not even for a few hours. Being in a paid job after retirement may help individuals preserve a social network and a structured use of time. The impact of retirement on weight is then expected to be larger among the individuals not in any paid work after retirement. The estimated coefficient of retirement on BMI among this subpopulation is still insignificant (coeff : 0.51, s.e : 1.66) but the estimated coefficient of retirement on the probability of being overweight or obese is larger and equal to 0.47 (coefficient : 0.47, significant at a 10% level, standard error : 0.27). This result shoud be interpreted with care however, if overweight and obese individuals are less likely to self-select into paid jobs after retirement.

5 Conclusion

This paper studies the effect of retirement on weight using the 2004 and 2006 waves of SHARE. It exploits the European variation in retirement schemes to produce an exogeneous shock in retirement behaviour and finally estimates the causal impact of retirement on weight. Our results show that retirement induced by social security rules causes a 0.20 point increase in the probability of being overweight or obese among the 50-69 years old. The results are robust to various alternative specifications. Our findings for Europe are quite consistent with the results previously obtained for the USA when using IV-methods (Chung et al. (2009))[12], suggesting that retirement leads to behavioural changes in food intake and physical activity that subsequently trigger weight gain.

A limitation to this study is that BMI does not take into account body composition : it does not distinguish fat from lean mass (Prentice and Jebb (2001); Burkhauser and Cawley (2008)). The 2004 and 2006 waves of SHARE lack more accurate measures of fatness and we were limited to using BMI for this study. However, SHARE will be adding a measure of waist circumference in the 2010 wave. Further exploration of these new data will allow a better estimation of the impact of retirement on weight and body composition.

Moreover, our results for retirement do not necessarily generalize to other transitions out of employment. The impact of other transitions out of employment -unemployment, invalidity or inactivity- on weight among older workers should be further invastigated.

Finally, further research is needed to explore the underlying mechanisms through which retirement triggers weight gain. Given the increasing number of people approaching retirement age, the higher risk of overweight and obesity induced by retirement will have considerable impacts on health outcomes and health care systems. Understanding the causal channels through which retirement operates on weight may help designing efficient public policies.

[12] Although Chung et al. (2009) do not examine the effect of retirement on the probability of being overweight or obese, they do find a positive and significant albeit modest (0.24 BMI on average) causal impact of retirement on BMI. Their estimated causal effect of retirement on BMI is quite close to our -insignificant- estimate in the FE-IV model (coeff : 0.383, s.e : 0.723) in Panel (c) column (2).

Bibliography

Anderson, L. and J. Mellor (2008): "Predicting health behaviors with an experimental measure of risk preference," *Journal of Health Economics*, 27, 1260–1274.

Andreyeva, T., P. Michaud, and A. Van Soest (2007): "Obesity and health in Europeans aged 50 years and older," *Public Health*, 121, 497–509.

Behncke, S. (2011): "Does retirement trigger ill health?" *Health Economics*, 21, 282–300.

Böckerman, P., E. Johansson, P. Jousilahti, and A. Uutela (2008): "The physical strenuousness of work is slightly associated with an upward trend in the BMI," *Social Science & Medicine*, 66, 1346–1355.

Bradford, L. (1979): "Can You Survive Your Retirement?" *Harvard Business Review*, 57, 103–109.

Brunello, G. and B. d'Hombres (2007): "Does body weight affect wages? Evidence from Europe," *Economics & Human Biology*, 5, 1–19.

Burkhauser, R. and J. Cawley (2008): "Beyond BMI: The value of more accurate measures of fatness and obesity in social science research," *Journal of Health Economics*, 27, 519–529.

Cawley, J. (2004): "The impact of obesity on wages," *Journal of Human Resources*, 39, 451–474.

Cawley, J., J. Moran, and K. Simon (2010): "The impact of income on the weight of elderly Americans," *Health Economics*, 19, 979–993.

Charles, K. (2002): "Is retirement depressing?: Labor force inactivity and psychological well-being in later life," Tech. rep., National Bureau of Economic Research.

Chung, S., M. Domino, and S. Stearns (2009): "The effect of retirement on weight," *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 64, 656–665.

Coe, N. and M. Lindeboom (2008): "Does retirement kill you? Evidence from early retirement windows," *CentER Discussion Paper Series No. 2008-93*.

Coe, N. and G. Zamarro (2011): "Retirement effects on health in Europe," *Journal of Health Economics*, 30, 77–86.

Colchero, M., B. Caballero, and D. Bishai (2008): "The effect of income and occupation on body mass index among women in the Cebu Longitudinal Health and Nutrition Surveys (1983-2002)," *Social Science & Medicine*, 66, 1967–1978.

Corrada, M., C. Kawas, F. Mozaffar, and A. Paganini-Hill (2006): "Association of body mass index and weight change with all-cause mortality in the elderly," *American Journal of Epidemiology*, 163, 938–949.

Emery, C., J. Dinet, A. Lafuma, C. Sermet, B. Khoshnood, and F. Fagnani (2007): "Évaluation du coût associé à l'obésité en France," *La Presse Médicale*, 36, 832–840.

Finkelstein, E., I. Fiebelkorn, and G. Wang (2003): “National medical spending attributable to overweight and obesity: how much, and who’s paying?” *Health Affairs*, 22, 3–219.

Forman-Hoffman, V., K. Richardson, J. Yankey, S. Hillis, R. Wallace, and F. Wolinsky (2008): “Retirement and weight changes among men and women in the Health and Retirement Study,” *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 63, 146–153.

Friedmann, E. and R. Havighurst (1954): *The meaning of work and retirement*, Arno Press.

Garrouste, C. et al. (2012): “Collateral effects of a pension reform in France,” Tech. rep., HEDG, c/o Department of Economics, University of York.

Grossman, M. (1972): “On the concept of health capital and the demand for health,” *The Journal of Political Economy*, 80, 223–255.

Gruber, J. and D. Wise (1999): *Social Security and Retirement around the World.*, University of Chicago Press.

Gueorguieva, R., J. Sindelar, R. Wu, and W. Gallo (2010): “Differential changes in body mass index after retirement by occupation: hierarchical models,” *International journal of public health*, 56, 111–116.

Guo, S., C. Zeller, W. Chumlea, and R. Siervogel (1999): “Aging, body composition, and lifestyle: the Fels Longitudinal Study,” *The American journal of clinical nutrition*, 70, 405–411.

IASO/IOTF (2002): “Obesity in Europe. The Case for Action.” Available at `http://www.iaso.org/site_media/uploads/Sep_2002_Obesity_in_Europe_Case_for_Action_2002.pdf`.

——— (2010): “Obesity and overweight,” Available at `http://www.iaso.org/iotf/obesity/obesitytheglobalepidemic/`.

Ikeda, S., M. Kang, and F. Ohtake (2010): “Hyperbolic discounting, the sign effect, and the body mass index,” *Journal of health economics*, 29, 268–284.

Keese, M. (2006): *Live longer, work longer*, OECD.

Kyrou, I. and C. Tsigos (2009): “Obesity in the Elderly Diabetic Patient Is weight loss beneficial? No,” *Diabetes care*, 32, S403–S409.

Lallukka, T., E. Lahelma, O. Rahkonen, E. Roos, E. Laaksonen, P. Martikainen, J. Head, E. Brunner, A. Mosdol, M. Marmot, et al. (2008a): “Associations of job strain and working overtime with adverse health behaviors and obesity: evidence from the Whitehall II Study, Helsinki Health Study, and the Japanese Civil Servants Study,” *Social Science & Medicine*, 66, 1681–1698.

Lallukka, T., S. Sarlio-Lähteenkorva, L. Kaila-Kangas, J. Pitkäniemi, R. Luukkonen, and P. Leino-Arjas (2008b): “Working conditions and weight gain: a 28-year follow-up study of industrial employees,” *European journal of epidemiology*, 23, 303–310.

Marcus, J. (2012): "Does job loss make you smoke and gain weight?" *Available at SSRN 2020174*.

Morris, S. (2006): "Body mass index and occupational attainment," *Journal of Health Economics*, 25, 347–364.

Muenster, E., H. Rueger, E. Ochsmann, S. Letzel, and A. Toschke (2011): "Association between overweight, obesity and self-perceived job insecurity in German employees," *BMC public health*, 11, 162.

Must, A., J. Spadano, E. Coakley, A. Field, G. Colditz, and W. Dietz (1999): "The disease burden associated with overweight and obesity," *JAMA: the journal of the American Medical Association*, 282, 1523–1529.

Neuman, K. (2008): "Quit your job and get healthier? The effect of retirement on health," *Journal of Labor Research*, 29, 177–201.

Nooyens, A., T. Visscher, A. Schuit, C. Van Rossum, W. Verschuren, W. Van Mechelen, and J. Seidell (2005): "Effects of retirement on lifestyle in relation to changes in weight and waist circumference in Dutch men: a prospective study," *Public health nutrition*, 8, 1266–1274.

Nooyens, A., T. Visscher, W. Verschuren, A. Schuit, H. Boshuizen, W. van Mechelen, and J. Seidell (2009): "Age, period and cohort effects on body weight and body mass index in adults: The Doetinchem Cohort Study," *Public health nutrition*, 12, 862–870.

OECD (2010): "Health data," Available at `http://ec.europa.eu/health/reports/docs/health_glance_en.pdf`.

Peytremann-Bridevaux, I. and B. Santos-Eggimann (2008): "Health correlates of overweight and obesity in adults aged 50 years and over: results from the Survey of Health, Ageing and Retirement in Europe (SHARE)," *Swiss medical weekly*, 138, 261–266.

Prentice, A. and S. Jebb (2001): "Beyond body mass index," *Obesity Reviews*, 2, 141–147.

Ribet, C., M. Zins, A. Gueguen, A. Bingham, M. Goldberg, P. Ducimetiere, and T. Lang (2003): "Occupational mobility and risk factors in working men: selection, causality or both? Results from the GAZEL study," *Journal of epidemiology and community health*, 57, 901.

Rohwedder, S., R. Willis, et al. (2010): "Mental retirement," *Journal of Economic Perspectives*, 24, 119–38.

Sanz-de Galdeano, A. (2005): *The obesity epidemic in Europe*, IZA.

Schmeiser, M. (2009): "Expanding wallets and waistlines: the impact of family income on the BMI of women and men eligible for the earned income tax credit," *Health economics*, 18, 1277–1294.

Schmid, A., H. Schneider, A. Golay, and U. Keller (2005): "Economic burden of obesity and its comorbidities in Switzerland," *Sozial-und Präventivmedizin/Social and Preventive Medicine*, 50, 87–94.

Schulte, P., G. Wagner, A. Ostry, L. Blanciforti, R. Cutlip, K. Krajnak, M. Luster, A. Munson, J. O'Callaghan, C. Parks, et al. (2007): "Work, obesity, and occupational safety and health," *American journal of public health*, 97, 428–436.

Smith, P., B. Bogin, and D. Bishai (2005): "Are time preference and body mass index associated?: Evidence from the National Longitudinal Survey of Youth," *Economics & Human Biology*, 3, 259–270.

WHO (2012): "Obesity and overweight," Available at `http://www.who.int/mediacentre/factsheets/fs311/en/`.

A Appendix

Figure 1: Proportion of individuals experiencing a weight change (gain or loss) of at least 10% among (i) employed and retired at both waves (ii) retiring between 2004 and 2006 (SHARE, 2004-2006).

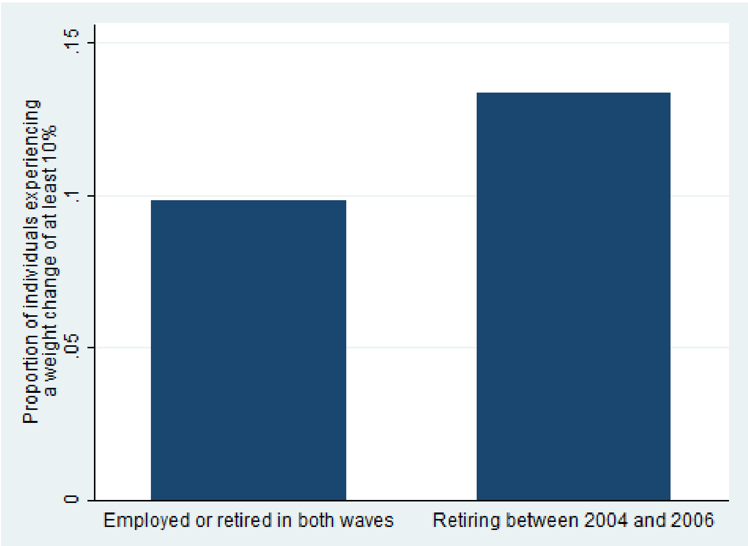

Table 1: Official, Earliest retirement ages (ERA), Effective retirement ages in 2004, Proportion of retired individuals below and above ERA and Proportion of individuals retiring when reaching ERA (SHARE 2004-2006).

Country	Earliest retirement age (ERA)[a]		Official retirement age[a]		Effective retirement age in 2004[b]	% of retired before ERA	% of retired after ERA	% of individuals retiring when reaching ERA
	Men	Women	Men	Women				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	62	57	65	60	57	31	95	52
Belgium	60	60	65	63	58	18	91	54
France	60	60	65	65	58	15	93	55
Germany	63	60	65	65	61	13	87	51
Greece	55	55	65	65	59	11	51	5
Italy	56	56	65	60	59	15	81	24
Netherlands	60	60	65	65	59	5	77	34
Spain	60	60	65	65	61	9	72	13
Sweden	61	61	65	65	62	9	66	15
Switzerland	63	62	65	65	62	5	74	24

[a] Official and earliest retirement ages are provided by Keese (2006) OECD report. They concern workers retiring in 2005 under the main mandatory pension schemes and exclude special arrangements for public-sector workers and other workers such as the long-term unemployed or disabled.
[b] The effective retirement age in 2004 refers to the average age in 2004 of individuals retiring between the two waves.

Table 2: Summary statistics in 2004 (SHARE, 2004).

Characteristics		**Whole Sample** (N=7225) Average	**Employed or retired in both waves** (N=6596) Average	**Retiring between the two waves** (N=629) Average
Demographics				
Age		59	59	60
Gender	Men	0.56	0.56	0.59
	Women	0.44	0.44	0.41
Marital status	Lives with spouse/partner	0.81	0.80	0.85
	Doesn't live with a spouse/partner	0.19	0.20	0.15
Education level	Primary education	0.21	0.21	0.22
	Lower secondary	0.18	0.18	0.21
	Upper secondary	0.31	0.31	0.28
	Post-secondary	0.30	0.30	0.29
Occupation	Blue collars	0.31	0.31	0.32
	White collars	0.21	0.21	0.19
	Technicians	0.17	0.17	0.18
	Managers and professionals	0.31	0.31	0.31
Employment				
Retirement status	Retired	0.57	0.47	0.0
	Employed or self-employed	0.43	0.53	1
Health related measures				
Weight category	Underweight	0.1	0.1	0.0
	Normal	0.38	0.39	0.38
	Overweight	0.44	0.44	0.47
	Obese	0.17	0.17	0.15
Body Mass Index		26.5	26.5	26.5
Weight change $\geq 10\%$	Yes	0.1	0.1	0.13
	No	0.9	0.9	0.87
Self-assessed health	Excellent/Very good/Good	0.83	0.83	0.85
	Fair/Poor	0.17	0.17	0.15
Euro-D	Euro-D depression index (1 to 12)	1.9	1.9	1.8
Chronic diseases	At least one	0.66	0.66	0.68
	None	0.34	0.34	0.32
Country	Austria	0.08	0.34	0.32
	Belgium	0.15	0.16	0.12
	France	0.12	0.12	0.11
	Germany	0.10	0.10	0.13
	Greece	0.12	0.13	0.06
	Italy	0.10	0.10	0.11
	Netherlands	0.09	0.08	0.11
	Spain	0.05	0.04	0.06
	Sweden	0.15	0.15	0.18
	Switzerland	0.04	0.04	0.04

Table 3: First stage results. Impact of being over the Earliest Retirement Age (ERA) on retirement status (SHARE, 2004-2006).

	Retired
Over the ERA	0.105***
	(0.010)
Age	0.012
	(0.008)
Time dummy	0.044**
	(0.019)
Lives with spouse-partner	-0.018
	(0.020)
R-squared	0.47
Observations	14445

Notes : (1) *** : significant at the 1% level, ** : significant at the 5% level, * : significant at the 10% level. (2) Standard errors in parentheses. (3) Estimation by a Fixed-Effect linear probability model.

Table 4: Impact of retirement on weight related measures (SHARE, 2004-2006).

	BMI	Overweight or Obese (BMI≥25)
Panel (a) : POLS	(1)	(2)
Retirement	0.662***	0.132**
	(0.139)	(0.065)
Age	-0.023	0.010
	(0.014)	(0.006)
Time dummy	-0.109***	-0.026
	(0.037)	(0.022)
Lives with spouse-partner	0.102	0.130**
	(0.135)	(0.061)
Men	0.793***	0.625***
	(0.107)	(0.051)
Post secondary education	-1.433***	-0.595***
	(0.175)	(0.086)
Upper secondary education	-0.726***	-0.320***
	(0.162)	(0.079))
Lower secondary education	-0.378**	0.141***
	(0.172)	(0.084)
Managers and professionals	-0.299**	-0.207***
	(0.145)	(0.073)
Technicians	0.040	0.023
	(0.163)	(0.079)
White collars	-0.219	-0.089
	(0.153)	(0.072)
R-squared/Pseudo R2	0.05	0.05
Observations	13750	13750
Panel (b) : FE regressions	(1)	(2)
Retirement	-0.084	-0.375*
	(0.090)	(0.211)
Age	-0.018	-0.165
	(0.061)	(0.182)
Time dummy	0.170	0.680
	(0.145)	(0.437)
Lives with spouse-partner	0.469***	0.938*
	(0.158)	(0.490)
R-squared/Pseudo R2	0.0001	0.02
Observations	14550	1666
Panel (c) : FE-IV regressions	(1)	(2)
Retirement	0.383	0.20*
	(0.723)	(0.115)
Age	-0.028	-0.009
	(0.063)	(0.010)
Time dummy	0.151	0.018
	(0.148)	(0.024)
Lives with spouse-partner	0.476***	0.054***
	(0.159)	(0.025)
First Stage F-stat	205.43	205.43
R-squared	0.004	0.004
Observations	14445	14445

Notes : (1) *** : significant at the 1% level, ** : significant at the 5% level, * : significant at the 10% level. (2) Standard errors in parentheses. (3) POLS regressions in Panel (a) also include country dummies. (4) Standard errors are clustered at the individual level in POLS models (Panel (a)). (5) POLS model in column (2) in Panel (a) is estimated by a logit model. (6) FE model in column (2) in Panel (b) is estimated by a conditional fixed-effect logistic model, which only consider individual within-variability in the outcome variable, thus dropping individuals not changing weight categories.