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DOES BODY WEIGHT AFFECT WAGES? EVIDENCE FROM EUROPE

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Does Body Weight affect Wages? Evidence from Europe*

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Abstract

We use data from the European Community Household Panel to investigate the impact of body weight on wages in 9 European countries. When we pool the available data across countries and years, we find that a 10% increase in the average body mass index reduces the real earnings of males and females by 3.27% and 1.86% respectively. Since European culture, society and labour market are heterogeneous, we estimate separate regressions for Northern and Southern Europe and find that the negative impact of the body mass index on earnings is larger - and statistically significant - in the latter area.

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1 Introduction

A growing literature documents the relationship between physical appearance and labour market outcomes in developed countries (Heineck, 2005 Cawley, 2004, Cawley and Danziger, 2000, Hamermesh and Biddle, 1994, Averett and Korenman, 1996, Register and Williams, 1990). One key indicator of physical appearance is body weight in kilograms related to (squared) height in meters, or the body mass index (henceforth BMI). The available empirical evidence suggests that this index is negatively correlated with wages. While most of evidence is based on US data, there are also a few recent studies which focus on Europe (Fahr, 2004, Sousa, 2005, Paraponaris et al, 2005, Garcia and Quintana-Domeque, 2006[1]).

Excessive body weight, or obesity (defined as $BMI > 30$), has been shown to be an handicap to social advancement, especially for women. The consequences of obesity are numerous, both in terms of an increase in health problems (diabetes, cardiovascular diseases, hypertension) and in terms of the adverse impact on the quality of life. On the one hand, obesity may hamper productivity. On the other hand, when labour markets are imperfect and there is asymmetric information about individual productivity, obese individuals may be statistically discriminated if employers believe that they are less productive and less healthy than the rest of the population (Aigner and Cain, 1977). Taste discrimination by employers and /or customers, and cultural factors may also result in differentiated treatment based on physical attributes (Becker, 1957). Finally, individual self esteem - and the reservation wage - might depend on physical attributes[2].

In this paper, we explore the impact of BMI on wages in nine European countries, using information from the European Community Household Panel, a dataset explicitly designed to favour international comparisons[3]. Any such exploration must confront the fact that a correlation between BMI and wages need not imply a causal relationship running from the former to the latter. The uncovered correlation could in fact reflect both that body weight affects wages and/or that wages affect body weight. We follow Cawley, 2000, 2004 and Cawley et al, 2005, and use information on the BMI of parents, siblings, and children to construct an estimate of the relationship between BMI and wages based on instrumental variables.

We find that BMI negatively affects wages in Europe, and that the size of this effect is larger for males than for females. The uncovered relationship is much stronger on average in the countries of the "olive belt" of Europe - Spain, Greece, Italy and Portugal - than in the countries of the "beer belt" (Austria, Ireland, Denmark, Belgium and Finland), and statistically significant only in the former group of countries. This result is consistent with the higher concern about weight expressed by Southern Europeans in a recent Eurobarometer survey. Part of this concern could be due to the larger negative labour market effects of an increase in body weight.

It is an open question whether the larger negative impact of BMI on pay in the "olive belt" of Europe is due to the larger negative productivity effects associated to an increase in weight, or to the stronger discrimination against the overweight or obese. While we leave this question to further investigation in a separate paper, in this paper we focus instead on the role of the local environment and find that living in a region with higher than national average BMI has a moderate but statistically significant effect on the relationship between BMI and pay, both in the "olive" and in the "beer" belt. Moreover, the direction of this effect varies with gender. We explain this difference with the interaction of two factors at play in local labor markets, the stigma effect and the relative labour supply effect. On the one hand, the social stigma associated to relatively high body weight is less relevant in areas where a higher share of the population is overweight. This contributes to reduce the negative effect of higher weight on earnings. On the other hand, overweight individuals in areas with a higher density of overweight population may face less favorable labour market conditions, because the relative supply of individuals with similar weight is more plentiful. Therefore, the labour supply effect increases the negative impact of higher weight on earnings. According to our findings, the former effect prevails for males, and the latter effect matters more for females.

2 The Empirical Relationship between BMI and Wages

We model individual (log) hourly wages w as follows:

$$w_{it} = \beta_0 + X_{it}\beta_1 + BMI_{it}\gamma_1 + \eta_{it}, \ i = 1, ..., N, \quad t = 1, ..., T \qquad (1)$$

where the subscript i is for the individual, t is for time, X_{it} is a vector of explanatory variables, BMI_{it} is the body mass index, and η_{it} is the disturbance term. Standard OLS estimates yield unbiased results if BMI and the disturbance η are uncorrelated. As reviewed in detail by Cawley, 2004, there are at least three reasons why this condition fails.

First, there is potential reverse causality, because BMI is higher among those with low income, who have a higher intake of cheap food rich in fat and sugar. Low status individuals may also exercise less. Second, unobservable individual effects - such as ability - included in the disturbance η and associated to genetic and non-genetic factors are correlated both with earnings and with the respondents's weight. Finally, BMI can be measured with error - as we rely on self-reported measures of weight and height.

Gortmarker et al, 1993, Sargent and Blanchflower, 1994, and Averett and Korenman, 1996, address reverse causality by replacing the contemporaneous BMI with its seven-year lagged value. Since our data cover a relatively short span of time, we cannot use this strategy. Averett and Korenman, 1996, Behrman and Rosenzweig, 2001, Conley and Glauber, 2005, use information on siblings and twins to remove the common household effect - due to both genetic and non - genetic factors. Baum and Ford, 2004, and Cawley, 2004 rely on fixed effect estimators to control for unobservable individuals effects.

Pagan and Davila, 1997, Cawley, 2000, 2004 and Cawley et al, 2005 use instrumental variables[4]. Pagan and Davila use indicators of health problems, such as self-esteem and family poverty, as instruments. However, as argued by Cawley, 2004, these instruments may not be valid as they are likely to be correlated with earnings. Behrman and Rosenzweig, 2001, use a twin estimator and select as instrument the lagged weight of BMI to simultaneously correct for reverse causality and endogeneity. Cawley, 2000, 2004 instrument individual BMI with the BMI of a biological family member[5]. Finally, Cawley et al, 2005, study the relationship between obesity and earnings in the US and Germany, and use the weight of a child or of a parent as instruments[6].

Does the BMI of a biological family member satisfies the two necessary conditions for instrument validity? As reviewed by Cawley, 2004, members of a biological family share part of their genes, which ensures a strong correlation between the endogenous variable and its instrument. In other words, the selected instrument is unlikely to be weak. The second condition requires that the BMI of a biological family member should be uncorrelated with the error term in the wage regression. This could fail to happen if there are unobserved effects which affect both the BMI of parents, siblings and children, and the wage residual in (1). Cawley, 2004, argues extensively that this is unlikely, quoting evidence from adoption studies, which suggest that the correlation of weight within families is due to genetic factors rather than to family environment.

In support of Cawley's view, Vogler et al, 1995, and Grilo and Pogue-Geile, 1991, report no evidence that the common family environment influences the BMI. On the other hand, there are also numerous studies which find that overweight and obesity are strongly linked to socioeconomic status, both in the US and in Europe (Chou et al, 2004, Robert and Reither 2004, Zhang and Wang, 2004, Cavelaars et al, 2000, Wardle et al, 2002).

Even if we subscribe to the view that the BMI of the biological family member is affected by family environment, Cawley's instrument remains valid if unobserved factors influence wages only via the variables in the vector X. In this paper, we use the BMI of a biological family member as instrument for individual BMI. Our identifying assumption is that - conditional on individual BMI - the inclusion of observable measures of educational attainment, health, occupation, and sector of activity, is sufficient to capture individual differences in ability and family background. We find this assumption plausible, because of the well known correlation of individual ability and family background with educational outcomes, health and occupational choice. Needless to say, our empirical conclusions are subject to this assumption being correct.

3 Data and Descriptive Statistics

Our data are drawn from the European Community Household Panel (ECHP), a dataset designed and coordinated by Eurostat, the European Statistical Office. The ECHP is an harmonized cross-national longitudinal survey covering all countries in the European Union from 1994 to 2001, with a focus on household income and living conditions, and with information on individual health, education and employment status[7].

We only consider countries where information on weight and height is available - Denmark, Belgium, Ireland, Italy, Greece, Spain, Portugal, Austria and Finland - and focus on employees working at least 15 hours per week and aged between 18 and 65 years over the period $1998-2001$[8]. Our key indicator is the BMI, which is highly correlated with direct measures of body fat and is widely used in epidemiology and medicine[9]. We eliminate potential outliers by restricting our sample further to include only individuals with a BMI above 15 and lower than 35[10].

Table 1 provides summary statistics, separately for men and women. An individual is considered as underweight, overweight and obese if her BMI is below 18.5, between 25 and 30 and equal or higher than 30 respectively. Males are more likely to be overweight and obese than females: 41% and 7% of males are overweight and obese respectively, compared to 22% and 4% for females. The importance of obesity varies in a substantial way across countries. The highest percentage of obese males is found in Finland (10%), and the lowest in Ireland (5%). Denmark has the highest percentage of obese females (9%), and Italy the lowest (3%).

INSERT TABLE 1

4 Results

In the empirical estimates, we convert nominal into real wages using the time varying Purchasing Power Parity (PPP) conversion index provided by ECHP and drawn from Eurostat data. Beside individual BMI, the regressors in the baseline specification include individual age and age squared, time and country dummies, and dummies for part-time labor and marital status. Educational attainment is captured by two dummies, one for secondary and one for tertiary education; household composition is measured by a dummy for the presence of children younger than 12 in the household; and individual health is proxied by three variables: a dummy equal to 1 if the individual is in poor or bad health, a dummy equal to 1 if the individual is hampered in her daily activity by illness, and the number of cigarettes smoked. Studies have shown that the prevalence of health problems is higher for the obese than for the rest of the population (Michaud and Van Soest, 2005) and that obesity may limit labour supply. Smoking habits can affect current productivity - for instance because of the breaks from work required by the act of smoking- and are negatively correlated with weight (Molarius et al, 1997)[11]. In a less parsimonious specification, we also include industry and occupation dummies.

We instrument individual BMI with the BMI of a biological family member, defined as a parent, child or sibling[12]. For individuals with several available family members, we average out all available $BMIs$. For example, when an individual has two parents and three siblings, we take the unweighted average of the average BMI of the parents and the average BMI of the siblings[13]. Since the European Community Household Panel does not explicitly report parental and sibling information for each interviewed individual, we need to find this information by linking records of individuals belonging to the same household. This exercise is not possible, for instance, for one person households, or for couples with no children and no living parents, or for households without parents or siblings currently alive. Therefore, our instrument can only be computed for a sub-sample of individuals (restricted sample)[14].

Table 2 compares the restricted with the full sample, separately for males and females: while the average BMI in the two samples is similar, individuals in the restricted sample are younger, less educated, have lower average pay, and belong to more numerous households. Since household size is larger in Southern Europe, individuals belonging to the countries in this area have a higher probability of being included in the restricted sample than individuals from Northern Europe, which also explains the lower average education and earnings registered in the restricted sample. In fact, average educational attainment and wages are typically lower in Southern Europe.

INSERT TABLE 2

Since selection into the restricted sample of individuals with information on the BMI of a biological family member is non random, we can correct for endogenous selectivity using the two-step approach suggested by

Wooldridge, 2002: in the first step we estimate separate probit equations for each year in the sample; in the second step we augment the wage equation with the computed inverse Mills ratio and its interactions with time dummies[15]. Since this correction does not alter in a meaningful way the estimated coefficient of BMI, we prefer to report in the text the IV estimates for the restricted sample, and to relegate the estimates with correction for selectivity in the Appendix.

The IV estimates - weighted with the longitudinal ECHP weights - are reported in Table 3, both for the baseline and the less parsimonious specification, and separately for males and females[16]. Table $A1$ in the Appendix reports the results of the same regressions, augmented with the inverse Mills ratio and its interactions with time dummies. Furthermore, Table $A2$ reports the OLS estimates and Table A3 shows IV results when the selected specification does not include the three health-related variables.

INSERT TABLE 3

It turns out that the estimated effect of BMI on log wages is always negative and statistically significant at the conventional level of confidence of 5%[17]. The inclusion of occupational and industry dummies reduces the absolute size of the effect, we believe because physical activity is inversely associated with BMI, in particular for men (Martinez-Gonzales et al, 1999, Stam-Moraga, 1999), and occupations that are demanding in terms of physical strength are less remunerated in the labor market. Without controlling for occupation and industry, our estimates suggest that a 10% increase in mean BMI reduces wages by 3.49% for females and 5.29% for males. With controls for occupation and industry, the reduction of wages is about half as big, at 1.86% and 3.27% respectively. When we do not control for health, the negative effect of BMI on wages is slightly larger, which suggests that the effect of BMI on earnings works through channels other than health.

Controlling for endogenous selection into the restrictive sample does not affect the estimated coefficient associated with BMI[18]. Moreover, IV and OLS estimates of the impact of BMI on wages are different, especially for males, and smaller in absolute value in the case of OLS. One reason is that OLS estimates suffer of the attenuation bias associated to measurement error in the BMI. Another reason is that OLS estimates may be biased upwards by the positive correlation between unobservables - such as motivation or perseverance - and the BMI: heavier individuals compensate their weight with characteristics - unobserved by the econometrician - that are rewarded in the labor market.

As discussed in Section 2, our IV estimates are valid under the maintained assumption that unobserved ability and family background affect individual earnings only via the variables included in the vector of controls X. In principle, such assumption could be tested. In practice, we have only one instrument for one endogenous variable, and we cannot compute the standard Sargan test for instrument validity, which requires at least one additional instrument.

Our results are in line with Cawley, 2004, who finds evidence of a negative and statistically significant relationship between earnings and BMI only for the sub-sample of white American females. In contrast with Cawley, however, we find evidence of a negative and statistically significant relationship also for males, and the size of this effect is bigger than for females.

The specification (1) implicitly assumes that the relationship between the

BMI and log wages is linear. Given the paucity of available instruments, it is difficult to estimate a more flexible specification, for instance by replacing BMI with dummies for under-weight, over-weight and obesity (see Cawley, 2004), and we resort instead to estimating the same relationship over two different sub-samples of individuals, those with a BMI above the country and gender specific median BMI, and the others. As shown in Table 4, the estimated relationship is negative, stronger and statistically significant for females with a BMI below the median and for males with a BMI above the median. More in detail, the less parsimonious specification in columns 2 and 4 show that the coefficient attached to BMI is equal to zero for females with a BMI above the country median and to -0.069 for the other females. Turning to males, this coefficient is equal to -0.054 for those with a BMI above the country median and to -0.020 for the remaining males. For females, this result suggests that an increase in the BMI has a substantially higher impact on earnings when they start from underweight or regular weight than when they start from overweight or obesity. The opposite holds for males.

INSERT TABLE 4

4.1 Heterogeneous responses

In summary, our results point out that heavier European workers experience a wage penalty in the labor market. Is the negative impact of BMI on earnings common across Europe, or does it vary along well defined patterns? European culture and society is far from homogeneous, and it is natural to expect that cultural differences in the perception of the ideal weight and physical attributes can explain different levels of tolerance and discrimination against heavier individuals. For the purposes of this study, an interesting economic classification separates the countries of the southern "olive belt" - Greece, Italy, Portugal and Spain - and the countries of the "beer belt" in Central and Northern Europe - Austria, Belgium, Denmark, Finland and Ireland. Table 5 reports the impact of BMI on log wages in the two groups of countries, separately for males and females. We find that, independently of gender, in the less parsomonious specification the impact of BMI on wages is negative (equal to -0.015 and -0.022 for females and males respectively) and statistically significant in the countries of the "olive belt", and not statistically different from zero in the countries of the "beer belt"[19]. The combination of the results in Tables 4 and 5, and the fact that Southern European countries have a large share of the available observations, suggest that the negative relationship between the body mass index and log pay uncovered by our data is mainly a feature of the Mediterranean countries.

INSERT TABLE 5

We hasten to add to this result three qualifications. First, the focus on the wages earned by workers implies that we ignore both the self-employed and unemployed individuals, who may not be employed because of overweight or obesity. Therefore, the differential impact of the BMI on wages is likely to assess only part of the deleterious effects of weight on employability. For instance, body weight may have a negative impact on the probability of employment in the countries of the beer belt of Europe, and a deleterious effect on the earnings of countries of the olive belt (Paraponaris et al, 2005). By focusing only on the wage effects, we downplay the negative effects of weight in one of the two groups of countries.

Second, the data on BMI are based on self-reported sources, and there is no comparison with real data on body weight in the countries covered by this study[20]. Third, the classification of countries into the "olive" and "beer" belt should not be over-emphasized, as the response of earnings to BMI varies also within each group of countries, as shown by the country specific estimates reported in Table 6. We acknowledge that the relatively small number of observations for some of the countries in the sample - Belgium, Denmark and Finland - may be responsible for the rather imprecise estimates. At the same time, we notice the absence of a statistically significant relationship between log pay and BMI in Greece, a typical "olive belt" member, and the presence of such relationship among Austrian men, who belong to the "beer belt" in our classification.

INSERT TABLE 6

While we are aware that a more satisfactory comparison of the two belts of Europe must await better and more balanced data, which include for instance the largest Central and Northern European countries, we find that our results are broadly in line with the recent findings of the Eurobarometer survey of Europeans carried out by Eurostat on risk issues (Eurostat, 2006). When asked whether they are worried about putting on weight, the Italians, the Greeks and the Spaniards are at the top of the league (after Malta and Cyprus) in giving an affirmative answer, and the Austrians and Irish are close to the bottom[21]. This paper suggests that the higher average concern with weight in Southern Europe could depend, among other things, on the larger negative labor market effects associated to an increase in the BMI.

So far, we have assumed that the key difference in the relationship between BMI and wages is the group of countries an individual belongs to. One may argue, however, that important heterogeneity exists also within national borders. A natural and rather striking example is the industrialized North and the agricultural South of Italy. This line of argument suggests that the local culture contributes - together with the national culture - to the shaping of labor market attitudes towards weight. We try to capture the contribution of the local environment as follows: first, we compute for each country and by gender both the national and the regional (average) BMI, using the information on the region of residence of the individual[22]. Second, we define a dummy REG, equal to 1 if the individual lives in a region with a higher than national average BMI, and to 0 otherwise, and add to the wage regressions the interaction of this dummy with individual BMI.

The effect of this interaction on log wages is a priori ambiguous. On the one hand, living in areas with a higher than average share of overweight individuals could reduce the social stigma associated to relatively high body weight (the "stigma" effect). In this case, the negative sensitivity of wages to increases in BMI should decline with respect to areas with few overweight people. On the other hand, suppose that regular weight and overweight workers are allocated to different jobs. If relative labor demand is evenly distributed across areas, the regions with a larger share of overweight workers are likely to pay less for the jobs these workers are typically allocated to, because of a "labour supply" effect. If this is the case, an individual who becomes overweight in a region with higher than average BMI is likely to experience a more sizeable wage loss with respect to regular weight individuals, because she is shifting to a group in larger supply.

Table 7 presents the results of the IV estimates only for the less parsimonious specification and separately by gender and group of country[23]. It turns out that the interaction term is statistically significant, negative for females and positive for males, which suggests that the "labour supply" effect prevails for the former and the "stigma" effect prevails for the latter. In the case of females, our results suggest that living in an area with higher than average BMI leads to a moderate 7% increase in the coefficient associated to BMI in the earnings regression. In the case of males, living in an area with higher than average BMI reduces the same coefficient by 4%.

INSERT TABLE 7

5 Conclusion

The purpose of the paper is to investigate the relationship between body weight and wages in Europe. This issue has attracted considerable attention by applied economists, because of the recent diffusion of obesity, with its negative economic and social consequences. Most of the existing evidence, however, is for the US and the UK. We have used data from the European Community Household Panel - a comparative dataset - to investigate the impact of body weight on wages in 9 European countries, covering both Northern and Southern Europe. When we pool the available data across countries and years (1998-2001), we find that a 10% increase in the average

BMI reduces the real earnings of males and females by 1.86% and 3.27% respectively. Since the European culture, society and labour market are heterogeneous, we allow the relationship between the BMI and earnings to vary between Northern and Southern Europe, and find that the negative impact of the former on the latter is larger - and statistically significant - in Southern Europe.

These results have two important caveats. First, our IV estimates, which rely on the BMI of biological family members as instrument for individual BMI, are valid under the maintained identifying assumption that unobserved ability and family background influence wages only via observable controls, which include education, occupation, and health. This assumption is plausible but should be subject to testing.

Second, our data exclude countries such as Germany, France and the UK. Therefore, we are aware that a more satisfactory comparison of the two belts of Europe must await better and more balanced data. At the same time, however, we find our results in line with the recent findings of the Eurobarometer survey of Europeans, showing that Southern European place a higher concern on putting on weight. This paper suggests that such concern could depend, among other things, on the larger negative labor market effects associated to an increase in the body mass index.

The natural question to ask is why do Southern European labour markets respond to an increase in BMI with a larger decrease in pay compared to the labour markets of the "beer belt". One possibility is that the decline in relative productivity and health associated with being overweight or obese is larger in Southern Europe. An alternative possibility is that discrimination against the overweight and obese is higher in the labour markers of the "olive belt". A satisfactory answer to this question, which disentangles productivity effects from the potential presence of discrimination, is difficult and goes well beyond our exploratory investigation. We confirm, however, that the local economic and social environment do matter, by presenting evidence that the size of the effect of BMI on pay depends on whether the individual lives in an area with higher or lower than average BMI.

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6 Endnotes

[1]These studies use the European Community Household Panel. Fahr, 2004, and Garcia and Quintana-Domeque, 2006, do not address the potential endogeneity of BMI in wage regressions. Sousa, 2005, use matching techniques and focuses on the impact of the BMI on labor force participation. Cawley et al, 2005, investigate the relationship between obesity and earnings in the US and Germany.

[2]See Andolfatto *et al,* 2004 for a theoretical analysis of the impact of self esteem on labour market choices.

[3] In spite of monetary unification, Europe differs broadly in culture, values and social customs. Suppose that, ceteris paribus, body weight attracts a negative premium in Madrid and a positive premium in Dublin. In a perfectly mobile labor market, we would expect mobility flows from Madrid to Dublin to arbitrage away these differences. If mobility costs are substantial, however, either because of language or because of social networks, these differences will persist over time.

[4]Recently, Sousa, 2005 studies the impact of weight on employment and labour maket participation in Europe, using a matching estimator.

[5]Biological members include parents, siblings and children.

[6]Note also that Cawley, 2000, 2004, correct the self-reported measures of weight and height using the methodology outlined by Lee and Sepanski, 1995, and Bound et al*,* 2002.

[7]See the Appendix for further details on the data.

[8]We have no information about weight for the previous years of the panel.

[9]Several other measures have been used in the literature, such as the

weight and height, or the percentage of obese individuals. Authors often use the three indicators - underweight, overweight and obese - for clinical weight specification. In addition, Harper, 2000 uses indicators of the location of the respondent in the gender distribution of BMI.

[10]The very obese ($BMI > 35$) and the very thin ($BMI < 15$) are only 1.3% of the total sample, and are in a category which faces very different problems regarding employment and health. Both groups are much more likely to be inactive and in bad health.

[11]Smoking also controls for unobservable heterogeneity in the individual discount rate. See Komlos et al, 2004, Borghans and Golsteyn, 2005 and Smith *et al,* 2005 for a discussion on the relationship between obesity and time preferences.

[12]The ECHP allows us to separate biological children and parents from step - children and parents. We only consider the former in the construction of the instrumental variable.

[13]Alternatively, we have selected randomly the BMI of a biological member. Our empirical results, however, remain qualitatively unchanged. The results are available from the authors upon request.

[14]Members of the same household are matched by using the relationship file in the ECHP dataset. In this file there is a record for each pair of individuals belonging to the same household, which contains information about the type of relationship they have (ie, partner, child, parents, siblings, grandchild, grandparent). See Locatelli et al, 2001, for further details.

[13]The additional variable in the probit equation omitted from the vector X is the number of adult members in the household. Standard errors of the wage regressions are bootstrapped to take into account the presence of

generated regressors.

[14]These weights are necessary for our results to apply to the European population rather than to a sample of observations drawn from the same population.

[15]We check instrument weakness by regressing BMI on the full set of explanatory variables plus the selected instrument and test whether the inclusion of the latter can be rejected by an F test. It turns out that the value of the F statistic is well above the threshold value of 10, indicated by Stock and Staiger, 1997, as the rule of thumb criterion to establish instrument weakness.

[16]A test of the joint significance of the inverse Mills ratio and its interactions with time dummies cannot reject the null hypothesis that the associated coefficients are zero in the case of females.

[17]In the table we also report the F tests for the equality of coefficient across the two groups of countries. It turns out that the null hypothesis (equality of coefficients) is always rejected by our data.

[18]If we suppose that the beer belt and the olive belt generate, for cultural reasons, different biases in the declaration, the heterogeneous effects uncovered in the paper could be partly linked to heterogeneous ways of responding to the survey.

[19]The percentages of affirmative answers are 63% in Italy, 53% in Greece, 51% in Spain, 50% in Belgium, 49% in Finland, 48% in Denmark, 45% in Portugal, 42% in Ireland and 39% in Austria.

[20]In the ECHP, the region of residence is usually coded at the aggregate NUTS 1 level.

[21]We instrument the interaction term with the interaction of the BMI

of the biological family member with the dummy REG.

7 Appendix

The European Community Household Panel (ECHP) is centrally designed and coordinated by the Statistical Office of the European Communities (www.ec.europa.eu/eurostat). The ECHP is a survey - running from 1994 to 2001− based on annual interviewees of a representative panel of households and adult individuals – aged 16 years and over - in each country. Fifteen European countries are included: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom. Austria joined in 1995 and Finland in 1996. The survey is representative both in cross-sections and longitudinally and contains comparable information across member countries on income, work and employment, poverty and social exclusion, housing, health, and other social indicators about living conditions. The information is stored in the "Production data base", which consists of 6 files : household file, personal file, register file, longitudinal link file, country file, and relationship file.

8 Tables

Table 1: Summary statistics, ECHP, 1998-2001

	Females			Males		
	BMI	overw	obese	BMI	overw	obese
Full sample	*23.30*	*0.22*	*0.04*	*25.20*	*0.41*	*0.07*
Denmark	24.05	0.23	0.09	25.48	0.44	0.09
Belgium	22.93	0.15	0.05	24.94	0.38	0.07
Ireland	23.42	0.22	0.05	25.08	0.44	0.05
Italy	22.73	0.19	0.03	25.00	0.38	0.06
Greece	23.30	0.22	0.04	25.51	0.47	0.06
Spain	22.94	0.18	0.04	25.47	0.42	0.09
Portugal	23.79	0.26	0.05	25.07	0.39	0.06
Austria	23.36	0.23	0.04	25.11	0.40	0.07
Finland	24.23	0.31	0.06	25.30	0.40	0.10
Observations		17,767			34,679	

Note: Overw: BMI between 25 and 30. Obese: BMI equal or higher than 30.
Source : ECHP, 1998-2001.

Table 2: Summary statistics, ECHP, 1998-2001

	Full sample		Restricted sample	
	Males	Females	Males	Females
Net hourly real wage in Euro at PPP	8.6	7.7	7.7	6.8
Age	39.19	38.20	38.10	37.38
Secondary level of education %	37.97	40.12	36.08	38.74
Tertiary level of education %	19.57	27.44	15.86	22.40
BMI	25.41	23.38	25.20	23.30
Number of adults in the household	2.82	2.68	3.56	3.40
Married %	64.27	60.11	51.16	47.95
Poor or bad Health %	2.22	2.73	2.61	2.80
Hampered in daily activity %	6.54	7.73	6.20	6.69
Part-time labor%	2.04	13.50	2.20	12.33
Children under 12%	33.83	33.58	16.69	17.18
Number of cigarettes smoked	7.77	3.72	7.81	3.52
Number of observations	46,568	34,679	25,101	17,767
Greece	4,841	3,222	2,852	1,820
Italy	8,877	5,959	5,355	3,526
Portugal	8,070	6,320	5,132	3,947
Spain	8,438	5,092	5,106	3,199
Austria	5,062	3,744	2,819	1,890
Belgium	2,148	1,860	692	618
Denmark	3,076	2,902	508	485
Finland	2,766	3,022	729	791
Ireland	3,290	2,558	1,908	1,491

Table 3: IV estimates. Dependent variable: log real wages in PPP units

	Females		Males	
	1	2	3	4
BMI	-0.015^{***} 3.31	-0.008^{**} 1.98	-0.021^{***} 4.22	-0.013^{***} 2.76
Age	0.041^{***} 14.05	0.035^{***} 13.72	0.038^{***} 14.37	0.033^{***} 13.78
Age squared ∗100	-0.033^{***} 8.61	-0.029^{***} 8.84	-0.029^{***} 9.52	-0.027^{***} 9.29
Part time	0.063^{***} 4.33	0.020 1.53	0.042 1.48	0.014 0.52
Married	-0.017 1.53	-0.024^{**} 2.40	-0.128^{***} 11.71	-0.106^{***} 10.51
Secondary level education	0.292^{***} 30.24	0.142^{***} 14.61	0.190^{***} 21.08	0.122^{***} 13.98
Third level education	0.692^{***} 48.18	0.323^{***} 20.30	0.537^{***} 40.02	0.297^{***} 21.33
Bad Health	-0.027 0.95	-0.011 0.40	-0.114^{***} 4.99	-0.091^{***} 4.35
Hampered in daily activity	-0.068^{***} 3.83	-0.048^{***} 2.89	-0.108^{***} 8.00	-0.091^{***} 7.23
Current smoker	0.003^{***} 5.63	0.003^{***} 5.70	-0.001^{***} 4.60	-0.000^{***} 3.09
Children under 12	-0.032^{***} 2.82	-0.024^{**} 2.30	-0.003 3.36	-0.019^{**} 2.31
Year dummies	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes
Occupational dummies	no	yes	no	yes
Sectoral dummies	no	yes	no	yes
R^2	0.544	0.616	0.538	0.598
Obs.	17,767		25,101	

Note : White heteroskedasticity-consistent standard errors. Absolute values of the t-statistic below coefficients. * Significant at 10% level of confidence. ** Significant at 5% level of confidence. *** Significant at 1% level of confidence.

Table 4: IV estimates in two sub-samples, by gender. Dependent variable: log real wages in PPP units

	Females		Males	
	Sample of individuals with a BMI above the country median BMI			
	1	2	3	4
BMI	-0.003	0.000	-0.075^{***}	-0.054^{***}
	0.32	0.10	5.36	4.20
R^2	0.568	0.645	0.475	0.566
Obs.	8,981		12,789	
	Sample of individuals with a BMI below or equal the country median BMI			
	1	2	3	4
BMI	-0.113^{***}	-0.069^{**}	-0.029	-0.020
	3.19	2.145	1.20	0.88
R^2	0.450	0.562	0.538	0.596
Obs.	8,786		12,312	
Year dummies	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes
Additional covariates	yes	yes	yes	yes
Occupational dummies	no	yes	no	yes
Sectoral dummies	no	yes	no	yes

Note : White heteroskedasticity-consistent standard errors. Absolute values of the t-statistic below coefficients. All estimates include age, age squared, country and time dummies. Additional covariates include education dummies (secondary and tertiary), indicators for marital status, part-time, health situation, current smoking habits and the presence of children under 12. * Significant at 10% level of confidence. ** Significant at 5% level of confidence. *** Significant at 1% level of confidence.

Table 5: IV estimates, by gender and group of countries. Dependent variable: log real wages in PPP units

	Females - IV -		Males - IV -	
Olive belt	1	2	3	4
BMI	-0.021^{***} 3.33	-0.015^{***} 2.54	-0.005 0.72	-0.022^{***} 3.50
R^2	0.547	0.626	0.499	0.570
Observations	12,492		18,445	
beer belt				
BMI	-0.004 0.86	-0.000 0.15	-0.004 0.69	-0.004 0.71
R^2	0.378	0.444	0.415	0.468
Observations	5,275		6,656	
Year dummies	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes
Additional covariates	yes	yes	yes	yes
Occupational dummies	no	yes	no	yes
Sectoral dummies	no	yes	no	yes
$F-test$ $p-value$	73.87 0.00	138.77 0.00	85.65 0.00	163.33 0.00

Note : White heteroskedasticity-consistent standard errors. Absolute value of the t-statistic below coefficients. All estimates include age, age squared, country dummies and time dummies. Additional covariates include education dummies (secondary and tertiary), indicators for marital status, part-time, health situation, current smoking habits and the presence of children under 12. * Significant at 10% level of confidence. ** Significant at 5% level of confidence. *** Significant at 1% level of confidence.

Table 6. IV estimates, by country. Dependent variable: log real wages in PPP units

	FEMALES - IV -	MALES - IV -
	1	2
GREECE	-0.007	-0.015
	0.58	0.98
Obs.	1,820	2,852
ITALY	-0.014^{*}	-0.039^{***}
	1.67	4.44
Obs.	3,526	5,355
PORTUGAL	-0.035^{***}	0.001
	3.08	0.13
Obs.	3,947	5,132
SPAIN	-0.004	-0.040^{***}
	0.46	3.84
Obs.	3,199	5,106
AUSTRIA	0.003	-0.050^{***}
	0.33	4.07
Obs.	1,890	2,819
DENMARK	0.002	-0.007
	0.41	0.59
Obs.	485	508
BELGIUM	0.010	0.028
	0.57	1.25
Obs.	618	692
IRELAND	-0.004	-0.028^{**}
	0.52	1.99
Obs.	1,491	1,908
FINLAND	-0.036^{*}	-0.012
	1.69	0.64
Obs.	791	729
Year dummies	yes	yes
Country dummies	yes	yes
Additional covariates	yes	yes
Occupational dummies	yes	yes
Sectoral dummies	yes	yes

Note : White heteroskedasticity-consistent standard errors. Absolute value of the t-statistic below coefficients. All estimates include age, age squared, country dummies and time dummies. Additional covariates include education dummies (secondary and tertiary), indicators for marital status, part-time, health situation, current smoking habits and the presence of children under 12. * Significant at 10% level of confidence. ** Significant at 5% level of confidence. *** Significant at 1% level of confidence.

Table 7: IV estimates with interaction of individual BMI with the dummy REG, by gender. Dependent variable: log real wages in PPP units

	Females - IV -		Males - IV -	
	Olive Belt	Beer Belt	Olive Belt	Beer Belt
	1	2	3	4
BMI	-0.014^{**}	-0.048	-0.025^{***}	-0.002
	2.41	0.87	3.87	0.39
BMI*REG	-0.0009^{**}	-0.002^{***}	0.001^{***}	0.001^{***}
	2.38	4.26	4.14	2.70
R^2	0.626	0.447	0.569	0.471
Obs.	12,492	5,275	18,445	6,656
Year dummies	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes
Additional covariates	yes	yes	yes	yes
Occupational dummies	yes	yes	yes	yes
Sectoral dummies	yes	yes	yes	yes

Note : REG: dummy equal to 1 if the individual lives in an area with higher than (country) average BMI. White heteroskedasticity-consistent standard errors. Absolute values of the t-statistic below coefficients. All estimates include age, age squared, country and time dummies. Additional covariates include education dummies (secondary and tertiary), indicators for marital status, part-time, health situation, current smoking habits and the presence of children under 12. * Significant at 10% level of confidence. ** Significant at 5% level of confidence. *** Significant at 1% level of confidence.

Table A1. IV estimates corrected for selectivity. Dependent variable: log real wages in PPP units.

	Females		Males	
	1	2	3	4
BMI	-0.015^{***}	-0.008^{**}	-0.022^{***}	-0.013^{***}
	3.50	2.11	4.45	3.81
Age	0.040^{***}	0.035^{***}	0.036^{***}	0.033^{***}
	14.16	14.11	12.53	13.01
Age squared $*100$	-0.032^{***}	-0.029^{***}	-0.028^{***}	-0.025^{***}
	8.81	9.26	8.23	8.35
Part time	0.073^{***}	0.029^{***}	0.042	0.013
	6.06	2.40	1.55	0.48
Married	-0.009	-0.021^{**}	-0.117^{***}	-0.098^{***}
	0.88	1.96	8.28	9.87
Secondary level education	0.288^{***}	0.140^{***}	0.189^{***}	0.122^{***}
	31.64	15.70	19.58	15.22
Third level education	0.683^{***}	0.319^{***}	0.535^{***}	0.296^{***}
	42.34	19.26	43.10	19.22
Bad Health	-0.029	-0.011	-0.114^{***}	-0.091^{***}
	1.13	0.42	4.38	4.47
Hampered in daily activity	-0.076^{***}	-0.054^{***}	-0.108^{***}	-0.092^{***}
	3.83	2.88	6.88	7.49
Current smoker	0.003^{***}	0.002^{***}	-0.001^{***}	-0.000^{***}
	5.35	6.19	3.91	3.97
Children under 12	-0.034^{***}	-0.024^{***}	-0.003^{***}	-0.026^{***}
	3.16	2.08	3.65	3.48
Mill ratio	-0.017	-0.005	-0.023	-0.017
	1.28	0.39	1.53	1.25
Mill ratio* year 1999	-0.001	-0.003	0.005	0.013
	0.07	0.20	0.25	0.66
Mill ratio* year 2000	-0.010	-0.010	-0.034^{*}	-0.028
	0.45	0.48	1.66	0.45
Mill ratio* year 2001	-0.005	-0.007	-0.017	-0.015
	0.30	0.43	0.74	0.82
Joint signif.of time dummies inter. with Mills ratios. $\underset{(p-value)}{\chi_2}$	7.03	1.53	17.94	16.02
	0.134	0.820	0.001	0.003
Year dummies	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes
Occupational dummies	no	yes	no	yes
Sectoral dummies	no	yes	no	yes
R^2	0.544	0.616	0.538	0.597
Obs.	17,767		25,101	

Note : White heteroskedasticity-consistent standard errors. Absolute values of the t-statistic below coefficients. * Significant at 10% level of confidence. ** Significant at 5% level of confidence. *** Significant at 1% level of confidence.

Table A2. OLS estimates. Dependent variable: log real wages in PPP units.

	Females		Males	
	1	2	3	4
BMI	-0.006^{***}	-0.003^{***}	0.004^{***}	0.004^{***}
	5.34	3.27	3.68	4.00
Age	0.039^{***}	0.034^{***}	0.031^{***}	0.029^{***}
	14.07	14.04	13.69	13.63
Age squared $*100$	-0.032^{***}	-0.029^{***}	-0.023^{***}	-0.022^{***}
	8.43	8.77	8.27	8.48
Part time	0.062^{***}	0.019	0.033	0.008
	4.30	1.48	1.20	0.32
Married	-0.015	-0.023^{**}	0.119^{***}	0.100^{***}
	1.32	2.29	11.32	10.19
Secondary level education	0.300^{***}	0.145^{***}	0.195^{***}	0.125^{***}
	32.40	15.09	21.95	14.45
Third level education	0.702^{***}	0.326^{***}	0.549^{***}	0.303^{***}
	51.36	20.76	42.80	22.63
Bad Health	-0.026	-0.010	-0.110^{***}	-0.088^{***}
	0.91	0.37	4.83	4.20
Hampered in daily activity	-0.075^{***}	-0.052^{***}	-0.108^{***}	-0.092^{***}
	4.28	3.15	8.15	7..31
Current smoker	0.003^{***}	0.003^{***}	-0.001^{***}	-0.000^{***}
	5.76	5.78	4.00	2.64
Children under 12	-0.035^{***}	-0.025^{**}	0.034^{***}	-0.022^{***}
	3.07	2.43	3.91	2.68
Year dummies	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes
Occupational dummies	no	yes	no	yes
Sectoral dummies	no	yes	no	yes
R^2	0.547	0.617	0.554	0.594
Obs.	17,767		25,101	

Note : White heteroskedasticity-consistent standard errors. Absolute values of the t-statistic below coefficients. * Significant at 10% level of confidence. ** Significant at 5% level of confidence. *** Significant at 1% level of confidence.

Table A3. IV estimates. Dependent variable: log real wages in PPP units. Health related variables excluded.

	Females		Males	
	1	2	3	4
BMI	-0.016^{***}	-0.009^{**}	-0.024^{***}	-0.015^{***}
	3.52	2.12	4.65	3.14
Age	0.041^{***}	0.036^{***}	0.038^{***}	0.034^{***}
	14.28	13.91	14.38	13.80
Age squared $*100$	-0.030^{***}	-0.030^{***}	-0.003^{***}	-0.020^{***}
	8.90	9.08	9.77	9.52
Part time	0.064^{***}	0.021	0.050^{**}	0.020
	4.40	1.57	1.71	0.73
Married	-0.019^{*}	-0.025^{**}	-0.134^{***}	-0.111^{***}
	1.63	2.49	12.19	10.96
Secondary level education	0.292^{***}	0.141^{***}	0.194^{***}	0.125^{***}
	30.24	14.54	21.35	14.16
Third level education	0.693^{***}	0.322^{***}	0.545^{***}	0.300^{***}
	48.13	5.56	40.07	21.31
Current smoker	0.003^{***}	0.003^{***}	-0.001^{***}	-0.000^{***}
	5.44	5.56	4.58	3.06
Children under 12	-0.031^{***}	-0.023^{**}	$-0.003 * **$	-0.021^{***}
	2.71	2.21	3.63	2.53
Year dummies	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes
Occupational dummies	no	yes	no	yes
Sectoral dummies	no	yes	no	yes
R^2	0.543	0.615	0.531	0.593
Obs.	17,767		25,101	

Note : White heteroskedasticity-consistent standard errors. Absolute values of the t-statistic below coefficients. * Significant at 10% level of confidence. ** Significant at 5% level of confidence. *** Significant at 1% level of confidence.