"Body Size, Activity, Employment and Wages in Europe: A First Approach" *

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First Draft: August 2005. This Draft: October 2005.

Abstract

In this article we present the first empirical analysis on the associations between body size, activity, employment and wages for several European countries. The main advantage of the present work with respect to the previous literature is offered by the comparability of the data and its large geographical coverage. According to our results, for Spanish women, being obese is associated with both a 9% lower wage and probability of being employed, while for Swedish and Danish, obesity is associated with a 12% lower probability of being employed, and a 10% lower wage respectively. In Belgium, obesity is associated with a 19% lower probability of being employed for men. These robust estimates are strongly informative and may be used as a simple statistical rule of thumb to decide the countries in which lab and field experiments should be run.

JEL Classification: J3, I1.

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* This work is a revised version of the paper *"Obesidad y Mercado Laboral en la Unión Europea: una primera aproximación"*, included in the ISOS Project, June 2003 (European Union Contract Number: VS/2001/0497). We would like to thank Angus Deaton for his extraordinarily helpful comments. We also benefited from discussions with Marco González-Navarro and Maia Güell. John Cawley provided us with some valuable references. Financial support from BEC2002-04294 is gratefully acknowledged. Quintana-Domeque also acknowledges financial support from Banco de España, Fundación Rafael del Pino and the Princeton University Graduate School. Any remaining error is entirely due to our own responsibility.

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1. Introduction

That obesity constitutes one of the most important public health concerns those days is a well-known fact: firstly, it is a risk factor for numerous health problems and many chronic diseases (WHO, 2002), and secondly, its prevalence has increased by 10-40% in most European countries over the last decade (WHO, 2003). Moreover, obesity has become a phenomenon affecting not only adults but also teenagers and children, specially, in the south of Europe (IOTF, 2002, 2003). For all these reasons, it is a first order concern to assess both the determinants of obesity and its medical, economic and social consequences (Philipson, 2001). Here, the focus is not on the determinants of obesity (or BMI), but we aim at describing the association between body size, activity, employment and wages in Europe[1].

The literature on the effects of obesity on labor market outcomes for the US constitutes an important bulk of research[2]. One of the most robust findings of this line of research is that obese women tend to earn less than non-obese women (Cawley, 2005), but there are differences by ethnicity and/or race. However, the empirical evidence for Europe is more limited. On the one hand, there are some studies for England, Scotland, and Wales (Sargent and Blanchflower, 1994), Finland (Sarlio-Lahteenkorva and Lahelma, 1999) and Germany (Cawley, Grabka, and Lillard, 2005). On the other hand, there are

[1] For a recent article on the association between income and BMI across several European countries, see Quintana-Domeque (2005).

[2] See, for example, Register and Williams (1980), Hamermesh and Biddle (1994), Averett and Korenman (1996), Pagán and Dávila (1997), Cawley (2000, 2004), Behrman and Rosenzweig (2001), Saporta and Halpern (2002), Baum and Ford (2004), and Conley and Glauber (2005).

also preliminary estimates for Denmark (Greve, 2005). In England, Scotland, and Wales, hourly earnings of women at age 23 are found to be lower if they were obese at age 16, but no such difference exists for men (Sargent and Blanchflower, 1994). In Finland, obese female were found to have lower income levels than non-obese, but this was not the case for males. In Germany, obesity is negatively associa ted with wages, both for men and for women (Cawley, Grabka, and Lillard, 2005). Moreover, using genetics as a natural experiment, the authors arrive at the conclusion that is not possible to reject the hypothesis of no causal impact of weight on wages. There are also preliminary results for Denmark, where it seems that obesity is associated with no difference in wages for either men or women (Greve, 2005). Finally, it is worth mentioning a recent article that applies the propensity score technique in order to assess the causal effect of BMI on labor market outcomes in Europe as a whole (Sousa, 2005). Looking at all these studies, it is not difficult to realize that none of them provide a fully comparable country-by-country European analysis. Thus, the main scope of the present work is to provide the most reliable and comparable empirical estimates of the associations between BMI and labor market outcomes in a large number of European countries, exploiting the available information from the European Community Household Panel. The importance of this simple analysis relies on two main aspects: first, as emphasized by Cawley (2005) and Quintana-Domeque (2005), it is interesting to evaluate whether there is a universal pattern across countries or if it does vary with culture and labor market institutions. And secondly, and even more important, it is necessary to have the basic information reported here in order to allocate the experimental design effort in countries where we find statistical significant associations [3]. In this sense, the present estimates may serve researchers as an appealing rule of thumb to determine the geographic destine of a possible experimental study. It is important to highlight that we do not aim at providing causal estimates, and a discussion about this will be developed below.

The structure of the paper is the following. Section 2 describes the data set. In section 3 we start with a brief comment on correlation and causality, and then we show our empirical results. Section 4 presents some robustness checks for the reported associations. Finally, section 5 concludes with a discussion and suggests possible projects for further research.

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[3] For a quick survey on implicit discrimination and different lab and field experiments, see Bertrand et al. (2004).

2. Data Set

The data used in this paper are from the European Community Household Panel (ECHP), Eurostat, a survey based on a standardized questionnaire that involves annual interviewing (for the period 1994-2001) of a representative panel of households and individuals in each of the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the UK[4]. This panel covers a wide range of topics: income, health, education, housing, demographics and employment characteristics, etc. Although the total duration of the ECHP is 8 years, a key variable in this work (namely the BMI) is only available since 1998. Moreover, the BMI is not reported in 5 countries: England, France, Germany, Luxembourg, and The Netherlands. In Finland, BMI is only reported from 1999 onwards, and for the Swedish case, waves start in 1999.

The ECHP is a unique source of information for the main purpose of this paper, since its standardized methodology and procedures yield comparable information across countries.

We focus on three main labor outcomes: activity, employment, and wage. Hence, our three dependent variables are activity status (active versus inactive), employment status (employed versus unemployed), and the natural logarithm of hourly wage. The main explanatory variables are BMI (or the natural logarithm of BMI), weight (in kilos) controlled by height (in centimeters, or log of weight controlled for log of height), and an

[4] Information on the ECHP is available at the following web address:
http://forum.europa.eu.int/irc/dsis/echpanel/info/data/information.html

indicator variable of obesity (equals 1 for individuals with BMI $\geq$ 30 and 0 otherwise)[5]. All these variables are constructed using self-reported height and weight measures. The controls used in activity, employment, and wage equations are: age, squared age, two dummies indicating the highest completed education level, regional dummies, annual-time dummies, and the interactions between regional and annual-time dummies[6]. Moreover, activity and employment equations include a dummy indicating whether the individual is married and a dummy that informs about the presence of children below 12 in the household. In principle, marriage and children might be omitted. However, since these variables are excluded from the wage equation, these allow us to identify the coefficients of the wage equation after controlling for sample selection[7].

The sample is restricted to women and men between 18 and 64 with a BMI above 10 and below 60, either working with an employer in paid private sector employment, unemployed or inactive, who report not being hampered by any physical or mental problem that hampers their daily activities. Attached in the annex there are the basic descriptive statistics for each country.

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[5] Obesity (BMI = 30, WHO) is defined as an excessively high amount of body fat or adipose tissue in relation to lean body mass (National Research Council, 1989; Stunkard et al., 1993).

[6] Household income has not been added as a control because it is going to be quite strongly correlated with the hourly wage, i.e., earnings divided by hours. In fact, it may happen that (a) this sucks up a lot of what we are looking for, and (b) it is likely to distort a comparison we are interested in, since the relationship between hourly earnings and income is different for men and women. However, the reported results do not change too much when income is added. Month and year of interview dummies are also used.

[7] We need to assume, among other things, a specific distributional form for the error terms in the employment and wage equations.

3. Correlation, Causality and Estimated Associations

As we mentioned in the introduction three basic questions are addressed in this paper: What are the associations of body size, activity, employment and wages in European countries? Is there any pattern across countries? In which places should we run experiments? We also remarked that we do not pretend to infer the causal effect of BMI on labor market outcomes in the present work. Why? The problem is that this is always a quite complex task. The associations between body size and labor market outcomes can reflect three main effects (Cawley, 2005): the effect of obesity on labor market outcomes (discrimination and/or productivity), the effect of labor market outcomes on obesity (see Morland et al., 2002), and the effect of a third factor on both BMI and labor market outcomes (see, for example, the discount rate explanation in another context by Fuchs, 1982). In order to infer causality from BMI to labor market outcomes, several empirical strategies have been used: lagged measures of the BMI (see for example, Gortmaker et al., 1993), fixed-effects strategy (for example, individual differences like in Averett and Korenman, 1996, or using MZ twins, see Behrman & Rosenzweig, 2001), instrumental variables (for example, genetic variation, Cawley 2004), and, recently, propensity score (Sousa, 2005). However, all these strategies are very disappointing, since too strong requirements are needed. In the first case, the independence of the lagged BMI variable on the residual term is required, which is very unlikely to be the case. In the second one, we require our regressors to be strictly exogenous and that all the heterogeneity among individuals remains constant over time. But even in the case that these assumptions were satisfied, reverse causality could not be discarded. Furthermore, even when using MZ twins, and omitting this last caveat, it exists the possibility that fixed effects strategy leads to completely misleading estimates, at least taking into account that not only genetics matters but also epigenetic (Fraga et al., 2005)[8]. In strategy number three, the usual relevance and exogeneity conditions are required (Wooldridge, 2001). In Cawley (2000), the weight of a child is used as an instrument for the weight of the child's mother. Although at first glance one may think this is a valid instrument, a source of exogenous variation in weight due to genetics, if the genetic component of the child associated with BMI is also associated with other factors related with employment and wages of the mother, this kind of instrument does not satisfy the exogeneity condition. Recently, Cawley (2004) has used sibling weight adjusted for sex and age to instrument individual weight. The motivation is the same: genetics variation. Once again, the problem is that, as recognized by Cawley (2004, 2005), there exists the possibility that a substantial part of the genes responsible for obesity are also responsible for other factors that affect labor market outcomes, such as willingness to delay gratification (time discount rate) or some kind of ability. Since the current knowledge on which particular genes are responsible for obesity and other factors related with wages and employment is too scarce, we prefer to cast doubt on the validity of the instruments suggested by Cawley (2000, 2004), and in fact, any other worse attempt existing in the literature (like in Pagán and Dávila, 1997).

We were thinking hard to obtain a credible source of exogenous variation in weight, until we found that month of interview (or interview seasonal variation) could serve for our purposes, at least for workers with regular monthly wages and stable employment

[8] Although monozygotic twins are epigenetically indistinguishable during the early years of life, older monozygotic twins exhibited remarkable differences (Fraga et al., 2005).

contracts –those unaffected by seasonal variation– and assuming that seasonality has no other direct effect on employment and wages. However, notice that if the season affects weight, then the only bit of the effect on weight on wages would be the seasonal component of wages. But since we have ruled that out, by saying that wages are unaffected by seasonal variation, our instrument must yield an estimate of zero, because in the first stage we are regressing on seasonal something that, by definition, has no seasonal component. Beyond that, suppose the employer pays fat people less. That does not mean that they vary their wages over the year with seasonal variations in their weight.[9]

We also considered another candidate for being our body size valid instrument: the mode of interviewing (face-to-face versus other modes). The mode of interviewing puts some boundaries on what the individual is reporting about his/her observable characteristics, since in a face-to-face interview the interviewer can (in principle) adjust the reported data if there is a significant discrepancy. Assuming that there is no correlation between the mode of interviewing and the unobservable characteristics affecting the body size and the wage, the exogeneity condition is satisfied. Unfortunately, we found evidence of instrument weaknesses. Thus, the validity of this instrument was finally rejected.

It might be the case that for this reason, Sousa (2005) moves to a propensity score approach without the necessity of trying to find suitable instruments. However, this paper loses all its appealing power when pooling all of the countries, since this restricts each

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[9] We are in debt with Angus Deaton for clarifying all this argument.

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country to have the same coefficient structure (a very strong restriction). Moreover, if this assumed structure is false, the estimated relationship cannot be informative of the relations in each country. Furthermore, even if we are interested in an average estimate for Europe as a whole, we should proceed to properly weigh the individual coefficient estimates.

From our point of view, and given the dramatic difficulties to find a valid instrument or to incur in an aggregation problem like the one explained above, research in this field should move to an experimental evaluation project. However, before to start the experimental analysis, we need preliminary basic information derived from simple descriptive regression techniques: mere statistically significant associations may be used to choose the geographic destiny of an experimental study. Our suggested simple statistical rule of thumb consists in starting to run experiments in places where we find statistically significant associations, given the costs of running this kind of projects.

In Table – 1 we report the associations between different body size variables and the probability of being active. In general, there are negative and positive statistically significant associations between body size and the probability of being active for women (in Austria, Greece, Portugal, Spain, and Sweden) and men (Austria, Belgium, Denmark, Portugal, and Sweden) respectively.

Table – 2 shows statistically significant negative associations between body size variables and the probability of being employed for women in Austria, Belgium, Greece, Spain and Sweden. For male, we found statistically positive associations in Ireland, and Spain; although a negative one is registered in the case of Belgium.

In the next table, Table – 3, we estimate the association between body size variables and wages. We report negative associations for women in four countries: Belgium, Denmark, Portugal, and Spain. For men, our estimates show positive associations in four countries: Belgium, Greece, Ireland, and Italy.

Until this moment, we have reported our estimates on the associations between body size and labor market outcomes, and we have partially answered our first question. Moreover, looking at these estimates, it seems that no particular or universal pattern emerges across different cultures or labor market institutions, and this addresses the second question. Finally, we arrive at our third question: Where should we run experiments according to our empirical evidence? Before we give an appropriate answer to this question, there are some concerns regarding the robustness of our estimates that will be addressed in the next section.

Table – 1. Probit Marginal Effects Estimates.

Dependent Variable: Probability of being active.

(Robust standard errors)

[Sample size]

	Female			Male		
	Body Size Variable			*Body Size Variable*		
	BMI	Weight?	Obese	BMI	Weight?	Obese
Austria	-0.001	-0.001	-0.123**	0.005**	0.001*	-0.012
	(0.004)	(0.001)	(0.050)	(0.002)	(0.001)	(0.023)
	[5,518]			[5,044]		
Belgium	-0.000	0.000	0.008	0.009	0.003*	0.010*
	(0.004)	(0.001)	(0.058)	(0.006)	(0.002)	(0.053)
	[3,117]			[2,273]		
Denmark	0.005	0.002	0.062	0.005**	0.002**	0.008
	(0.005)	(0.002)	(0.060)	(0.003)	(0.001)	(0.027)
	[2,377]			[3,241]		
Finland	-0.003	-0.001	-0.055	0.004	0.001	-0.011
	(0.004)	(0.001)	(0.056)	(0.003)	(0.001)	(0.030)
	[2,995]			[3,448]		
Greece	-0.005*	-0.002**	-0.039	-0.001	-0.001	0.013
	(0.003)	(0.001)	(0.036)	(0.003)	(0.001)	(0.038)
	[8,267]			[5,154]		
Ireland	0.001	0.001	0.010	-0.001	-0.000	-0.014
	(0.004)	(0.001)	(0.051)	(0.002)	(0.001)	(0.033)
	[4,528]			[3,311]		
Italy	0.003	0.001	-0.001	-0.000	-0.000	-0.051
	(0.002)	(0.001)	(0.035)	(0.003)	(0.001)	(0.038)
	[14,624]			[10,855]		
Portugal	-0.009***	-0.004**	-0.125***	0.006***	0.002***	0.046**
	(0.003)	(0.001)	(0.048)	(0.002)	(0.001)	(0.015)
	[8,408]			[7,801]		
Spain	-0.006***	-0.002**	-0.040	0.002	0.001	0.022
	(0.002)	(0.001)	(0.026)	(0.002)	(0.001)	(0.019)
	[12,039]			[10,254]		
Sweden	-0.004	-0.002	-0.109***	0.005***	0.002***	0.028
	(0.003)	(0.001)	(0.045)	(0.002)	(0.001)	(0.016)
	[2,782]			[4,036]		

Note: Covariates: age, squared age, two educational dummies, a dummy that indicates whether individual is married or not, an indicator of children in the household, regional dummies, time dummies, interaction terms between regional and time dummies, year and month of interview dummies. Standard errors are robust to heteroskedasticity (clustered at the individual level) and observations have been weighted using the ECHP longitudinal weights.

? Weight controlling for height.

* Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level.

Table – 2. Probit Marginal Effects Estimates.

Dependent Variable: Probability of being employed.

(Robust standard errors)

[Sample size]

	Female			Male		
	Body Size Variable			*Body Size Variable*		
	BMI	Weight[?]	Obesity	BMI	Weight[?]	Obesity
Austria	-0.006***	-0.002**	-0.027	-0.001	-0.000	-0.022
	(0.002)	(0.001)	(0.033)	(0.001)	(0.001)	(0.020)
	[2,584]			[3,831]		
Belgium	-0.007*	-0.002	-0.089	-0.008**	-0.003**	-0.185***
	(0.004)	(0.002)	(0.058)	(0.004)	(0.001)	(0.062)
	[1,401]			[1,440]		
Denmark	0.002	0.001	0.031	-0.001	-0.000	-0.041
	(0.003)	(0.001)	(0.030)	(0.002)	(0.001)	(0.036)
	[1,601]			[2,711]		
Finland	-0.005	-0.002	-0.018	-0.000	-0.000	0.010
	(0.003)	(0.001)	(0.045)	(0.003)	(0.001)	(0.029)
	[1,846]			[2,604]		
Greece	-0.010***	-0.004***	-0.056	0.002	0.001	-0.029
	(0.004)	(0.001)	(0.065)	(0.003)	(0.001)	(0.039)
	[2,809]			[3,724]		
Ireland	-0.001	-0.000	-0.030	0.012***	0.004***	0.033
	(0.002)	(0.001)	(0.040)	(0.005)	(0.002)	(0.041)
	[1,955]			[2,710]		
Italy	-0.002	-0.001	-0.114	0.004	0.001	0.001
	(0.003)	(0.001)	(0.079)	(0.003)	(0.001)	(0.032)
	[4,553]			[6,850]		
Portugal	-0.000	-0.000	-0.016	-0.000	-0.000	0.007
	(0.003)	(0.001)	(0.043)	(0.002)	(0.001)	(0.022)
	[4,543]			[6,345]		
Spain	-0.005*	-0.002*	-0.087**	0.005***	0.002***	-0.005
	(0.003)	(0.001)	(0.040)	(0.002)	(0.001)	(0.023)
	[4,878]			[8,010]		
Sweden	-0.008***	-0.003***	-0.119***	0.002	0.001	-0.017
	(0.002)	(0.001)	(0.040)	(0.002)	(0.001)	(0.020)
	[1,938]			[3,405]		

Note: Covariates: age, squared age, two educational dummies, a dummy that indicates whether individual is married or not, an indicator of children in the household, regional dummies, time dummies, interaction terms between regional and time dummies, year and month of interview dummies. Standard errors are robust to heteroskedasticity (clustered at the individual level) and observations have been weighted using the ECHP longitudinal weights.

[?] Weight controlling for height.

* Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level.

Table – 3. OLS Estimates. Dependent variable: log(hourly wage).

(Robust standard errors)

[Sample size]

	Female			Male		
	Body Size Variable			*Body Size Variable*		
	log of BMI	log of Weight[?]	Obesity	log of BMI	log of Weight[?]	Obesity
Austria	-0.079	-0.080	0.004	0.078	0.082	0.027
	(0.089)	(0.089)	(0.043)	(0.087)	(0.084)	(0.033)
	[2,402]			[3,613]		
Belgium	-0.137*	-0.136*	-0.047	0.188**	0.187**	0.035
	(0.082)	(0.081)	(0.055)	(0.077)	(0.075)	(0.029)
	[914]			[1,219]		
Denmark	-0.197***	-0.202***	-0.098***	0.064	0.075	-0.015
	(0.069)	(0.070)	(0.037)	(0.068)	(0.071)	(0.031)
	[1,355]			[2,543]		
Finland	-0.089	-0.075	-0.043	0.048	0.046	0.013
	(0.067)	(0.067)	(0.034)	(0.083)	(0.082)	(0.031)
	[1,496]			[2,310]		
Greece	-0.037	-0.039	-0.008	0.228***	0.273***	-0.013
	(0.071)	(0.075)	(0.039)	(0.087)	(0.088)	(0.037)
	[1,951]			[3,103]		
Ireland	0.022	0.058	-0.016	0.341***	0.349***	0.061
	(0.068)	(0.069)	(0.032)	(0.103)	(0.104)	(0.051)
	[1,826]			[2,396]		
Italy	-0.031	-0.000	-0.073	0.095	0.128**	-0.030
	(0.055)	(0.057)	(0.050)	(0.061)	(0.060)	(0.028)
	[2,658]			[4,782]		
Portugal	-0.237***	-0.217**	-0.131***	0.138	0.167	-0.029
	(0.100)	(0.097)	(0.048)	(0.124)	(0.118)	(0.043)
	[3,976]			[5,984]		
Spain	-0.250***	-0.237***	-0.090*	0.047	0.072	-0.025
	(0.079)	(0.081)	(0.053)	(0.073)	(0.074)	(0.026)
	[3,528]			[6,705]		
Sweden	NA	NA	NA	NA	NA	NA

Note: Covariates: age, squared age, two educational dummies, time dummies, interaction terms between regional and time dummies, year and month of interview dummies. Standard errors are robust to heteroskedasticity (clustered at the individual level) and observations have been weighted using the ECHP longitudinal weights.

[?] Log of weight controlling for log of height.

* Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level.

NA: Wages are missing for Sweden.

4. Robustness Checks

To what extent are our estimated associations robust?[10] In this paper, we consider that the estimated associations between body size and labor market outcomes are robust if they satisfy the following requirements: (a) the body size – labor market outcomes relationships (activity, employment, and wages) are statistically significant for different measures of body size: BMI, weight controlling for height, and obesity (i.e., the associations are robust to different body size measures); (b) the body size – wage associations do not change after controlling for occupational dummies and sample selection (i.e., the associations are robust to unobserved differences associated with occupations or workers); and (c) the median (median regression) body mass-wage associations are also statistically significant (i.e., the associations are not driven by possible outliers).

Looking at Table – 1, it is easy to realize that robust statistically significant associations (in this case, those satisfying (a)) between activity and body size are found in Portugal both for women (negative) and for men (positive). Looking at other countries not satisfying (a), but with some statistical associations, suggests that no geographical pattern arises, at least in terms of activity status.

Table – 2 shows us that there are robust associations between body size and the probability of being employed in Belgium for men, and in Spain and Sweden for women. All of these associations are negative, suggesting that a higher body size is associated

[10] Sample robustness has also been checked: considering individuals below 18, without trimming the observations on BMI, and without controlling for year and month of interview dummies.

with a lower probability of being employed, both for women and men. For women, in Spain (Sweden), being obese is associated with an approximately 9% (12%) lower probability of being employed. In Belgium, for men, this is approximately 19%.

In Table – 3 we can see that condition (a) is satisfied for Denmark, Portugal, and Spain. However, condition (c) is not satisfied for Portugal, since after computing the marginal effect of the natural logarithm of BMI on the natural logarithm of hourly wage at the median, we get -0.028 with [-0.093, 0.037] as its normally approximated 95% confidence interval using bootstrapped standard errors with 100 replications. In fact, only wage-BMI associations for Denmark and Spain seem to be robust according to all previous requirements, from (a) to (c). For Spain, we obtain an estimate of -0.171 with [-0.313, -0.028] as its 95% confidence interval after controlling for occupational dummies, -0.151 with [-0.244, -0.057] as its normally approximated 95% confidence interval using median regression estimation (bootstrapped standard errors with 100 replications), and -0.256 with [-0.412, -0.100] as its 95% confidence interval after controlling for sample selection (Maximum Likelihood Estimation). In the case of Denmark, the estimate after controlling for occupational dummies is -0.162 with [-0.297, -0.028], -0.122 with [-0.192, -0.052] using median regression, and -0.195 with [-0.330,-0.060] after controlling for sample selection. In both cases, a higher body size is associated with a lower hourly wage for women. Specifically, looking at Table – 3 we see that a 10% increase in BMI is associated with a reduction of approximately 2.5% in hourly wage for Spanish women, and of 2% for Danish female. In other words, for women, being obese is associated with a lower wage, a 10% less in Denmark and a 9%

less in Spain. Notice that the result we find for Denmark is contrary to the preliminary result found in Greve (2005).

Before starting the discussion and the last part of this paper, we would like to mention some potential caveats regarding the previous tests and the main limitation of the present paper. First of all, the body size measures used in this analysis are self-reported, which means that are potentially measured with error. The standard result is that under measurement error in the explanatory variable its coefficient will be biased towards zero (assuming no other mismeasurement problem and classical measurement error). However, there is evidence showing that this measurement error is not random. In fact, the direction of the bias, and its extent, vary systematically with age and sex. If we had an alternative data set with an available BMI measure, we could try to correct for the measurement error in self-reported BMI, for example, using the technique described in Cawley (2000). Unfortunately, we have no other available data set. Nevertheless, Cawley (2000) reports that his findings do not change whether he corrects or not for the measurement error in self-reported BMI. Secondly, when controlling for occupational dummies we should realize that this is only a crude control for taking into account unobserved differences associated with jobs and wages. So it is necessary to keep in mind that we are incurring into a sample selection bias problem, provided that there exists non-random sorting into different occupations. Thirdly, the sample selection procedure to correct for biases due to employment self-selection is based on the Heckman procedure, the validity of which depends among other things on particular distributional assumptions about the error terms of the employment and wage equations (Heckman, 1979). Finally, and this is not properly a caveat, but a caution when interpreting the reported results: our estimates do not have a causal meaning, they only reflect mere associations. The important point, however, is that these estimated associations may help us to decide the geographical place to begin with an experimental project.

Running an experiment to try to evaluate the extent to which these results reflect causality instead of correlation or reverse causality may be straightforward (although time intensive) for the case of hiring decisions. For example, one could use a false-resume experiment *a la* Bertrand and Mullainathan (2004). A possible way to implement this may consist in randomly assigning photographs of obese and non-obese individuals or height-weight pair's combinations to false-resumes and submit them to firms[11]. The authors have started to work on the experimental design. Although this kind of experiment may be used to obtain information on people hired according to their weight (or at least called back for an interview), it is not trivial how this may work to assess the existence of wage discrimination. Hence, it is important to think about experiments designed to infer causality from body size to wages, far away from the instrumental variables approach.

[11] However, each of these strategies has a particular problem. One of the caveats with photos is that in order to be credible, these should be taken from different people (the ideal would be having different pair of resumes with the photo of the same individual varying the face size). But then we cannot capture whether what is being taken into account by the firm is body size or beauty. Even if the same photo was used and modified in different ways to obtain a thin and an obese individual, and these were sent to different firms, there would remain the problem associated with the potential low statistical power of the associated estimates. The main problem of the strategy based on randomly assigning height-weight pair's combinations to resumes is that it is very odd to include anthropometric data in a curriculum. Finally, there are ethic considerations that may difficult the implementation of such strategies.

5. Discussion

This work has estimated the associations between body size, activity, employment and wages for several European countries using the ECHP, and after running some robustness checks (body size definition, occupational dummies, sample selection, and median regression) the following three results arise: Firstly, there is a statistically significant and robust relationship between body size and the probability of being active for women (negative) and for men (positive) in Portugal; Secondly, in the case of the associations between body size and the probability of being employed, we observe robust and negative statistically significant associations for women in Spain and Sweden, and for men in Belgium; And, thirdly, the hourly-wage elasticities are robust and negatively statistically significant for women in Denmark and Spain. Notice, that there is no geographical pattern in these associations.

To sum up, we found negative associations between body size, employment and wages for women. This suggests that the existence of physical discrimination cannot be discarded: women may suffer a penalty from being obese in the job market, like the previous existing literature suggested. Unfortunately, none of these relations have a causal interpretation. What it is really important is that these results can lead us (and other researchers) to focus on some specific countries when running lab and field experiments, i.e., the countries where significant statistical and robust associations are found. In fact, the authors have started to work in the Spanish case.

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