Obesity-related wage differentials

Ana A Miranda
Pedro P Barros, Universidade Nova de Lisboa

Available at: https://works.bepress.com/pedro_pita_barros/13/
OBESITY-RELATED WAGE DIFFERENTIALS

EVIDENCE FROM PORTUGAL

Ana Aguiar de Miranda
Pedro Pita Barros
Universidade Nova de Lisboa

Abstract

This paper aims to assess whether obesity, as a chronic disease, can constitute an element of wage differentials in the labor market. The model used is a straightforward extension of the Jacob Mincer model, from 1974, and assumes that there are three main types of variables that can affect wages: demographic variables, occupational variables and health variables, which include the weight variables. The data comes from the Fourth National Health Survey (4thNHS) that was conducted, in Portugal, between February 2005 and January 2006. The results of this study show that currently there is no statistically significant effect of obesity on wages, both for males and females. Gender and schooling differences remain the main reason for wage differentials.

Key Words: obesity; wages; discrimination; labor market
1. Introduction

According to the World Health Organization, obesity is the second most important preventable cause of death in the world. Every year more than ten percent of the world’s population dies of diseases associated to obesity. Examples are type 2 diabetes, coronary heart diseases, hypertension, several types of cancer (endometrical, posmenopausal breast, kidney and colon), musculoskeletal disorders, sleep apnea and gallbladder disease. It is estimated that nowadays there are four hundred million obese people around the world, who are responsible for between two and eight percent of total health costs. Projections for 2025 indicate that, if no measures are taken to prevent the spreading of this disease, more than half of the world’s population will be obese and the health costs associated to obesity will be much higher. For that reason, obesity is not only an important public health problem but also a significant economic problem.

The number of individuals with excess of body weight increased dramatically over the last decades, especially from the eighties of the 20th century. According to Garcia and Quintana-Domeque (2006) in the last ten years only, obesity increased by ten to forty percent in the European countries.

The concern with obesity can be traced back in the economics literature to the work of Fogel (1994), who assessed the relative risks of mortality associated with weight and height. The increase of obesity throughout the times can be explained by several economic factors. The first one, and perhaps, the main one, is technological development. According to Lakdawalla and Philipson (2002) technological development can be accountable for the increase of weight in population because it encouraged the reduction of energy spent both in the workplace and at home. While in the workplace production becomes progressively more sedentary with the increasing use of technology in the production process, at home the extensive use of washing machines and dishwashers lies at the root of a lower spending of calories.

Moreover, technological development also led to the decrease in food prices through agriculture innovations. The innovations in agriculture, such as the introduction of more suitable techniques for cultivation and the use of fertilizers, increased agricultural productivity and consequently raised the amount of food available to supply. With more food available, its price decreases and people start to buy more food and to eat more. Thus, technological innovations can also explain the increase in energy intake.
However, it was not only the amount of energy intake that changed but also the kind of energies. By the late eighties people started to consume more carbohydrates as well as more beverages (rich in calories) and snacks.\(^1\)

Another economic factor that can be pointed out as a reason for the increase in the number of obese people is economic growth. Finkelstein, Ruhm and Kose (2005) argue that economic growth led to the increase in real wages and consequently to the rise of householders’ budgets. This makes people eat more and also eat more often away from home, which is often reflected in the intake of more caloric and less healthy foods.

Obesity has several important consequences. Cawley (2004) identifies three main channels of impact: earnings, disability and increased mortality and morbidity. We will focus here on the earnings costs of obesity, as measured by the differential wages paid to obese relative to non-obese workers.

The rise in obesity has extensive economic costs. The economic costs usually associated to obesity are divided in two types: direct and indirect costs. While the direct costs refer to the treatment, prevention and diagnostic of the disease, the indirect costs refer to the value of production lost due to illness, disability or premature death.

Currently direct costs represent the majority of the total costs with obesity. What happens in practice is that obese people consume more health care than non-obese people because they suffer from many chronic diseases associated to the excess of body weight. According to Lange (2007) the financial externalities associated to a higher consumption of health care are the main source of concern for economists. It so happens because the majority of the health costs associated to obesity are financed by governments and consequently by taxpayers. In addition, medicine developments allow obese people to live longer, which increases the total health costs associated to this disease. Of course, there are also gains from longevity.

The purpose of this work is to assess whether obesity carries other costs, besides a higher consumption of health care, for obese people. In particular, it aims to verify if obese workers, while sick workers, are discriminated against in the labor market, namely at wage level.

From the economic point of view it is particularly interesting to understand if obese workers are discriminated against at wage level since wages determine consumption and consequently define individuals’ welfare level. If obese workers receive fewer wages

---

\(^1\) On the causes of obesity, from an economic point of view, see Cutler (2003).
their total income will be less what may lead to less healthy diets. If it happens, obese people will continue to suffer from this disease and consequently the economic costs associated to obesity will not down. Thus, this is a cycle and it is important to ensure that obese workers do not earn lower wages to try to reduce the economic impact of this disease.

According to Baum and Ford (2004) there are many reasons that can explain wages discrimination of obese workers in their workplace. One of them is lower productivity. Obese people may be less productive that non-obese people due to their health constraints. Another reason is the cost associated with obese workers. Employers who provide health care may pay lower wages to obese workers because they expect obese workers to spend more in health care. The last reason is physical appearance. Obese workers may also suffer a wage penalty because they are not physically attractive, so they tend to be rejected in some kind of occupations – especially in those which involve a direct contact with public.

In order to assess if there is wage discrimination against obese workers we compared wage incomes between obese and non-obese workers. For that, we used a straightforward extension of the Jacob Mincer model, from 1974, which takes into account that, besides demographic and occupational variables, health variables can also determine workers’ wages. We concluded that there is no evidence to believe that obese workers receive lower wages than the non-obese ones and consequently that there is no health-related discrimination in the labor market.

This paper is structured as follows: in the next section there is a brief literature review regarding other papers, already done, about the relation between weight and wages. Then, in sections 3 and 4, the methodology and the data used are explained. In section 5 we show the results of our work and finally, in sections 6 e 7, we discuss the results and present the main conclusions.

2. Literature review

The effect of weight on wages has already been studied by several researchers. Although different results have been found, in broad terms there is no consensus about the existence of a clear and significant relationship between excessive weight and wages.
The studies referred below were done for the USA and most of them used data from the National Longitudinal Survey of Youth.

One of the most popular studies on this topic is by Register and Williams (1990). The aim of their work was “to determine whether there exists a wages penalty for obesity”. They concluded that obese females were discriminated against in the labor market - on average, they receive 12 percent less than comparable non-obese females (significant at p<0.01 level) – and no effect was found for males. However, they pointed out some potential problems that can bias their result. First, by they did not considered productivity differences among workers; second, by they only made a minimal control for occupation differences; third, by they did not considered that obese people can be obese because they earned lower wages, which led to less healthy diets. Finally, they failed to ensure that obese females suffered a wage penalty only because of their weight and not for other reasons, such as gender discrimination.

Following Register and Williams, Loh (1993) tried to “quantify the wage effects due to physical attributes, particularly height and weight”. He found that physical attributes are relevant both for males and females and that “obesity does not lower workers’ wages but slows their subsequent wage growth”. While for males, both height and weight have a positive effect on wages – although the positive effect of weight is not valid for obese workers – for females, height has a positive effect on wages but weight has no impact on them (this results are not statistically significant). Like in Register and Williams, Loh suggested that his results could be biased due to the omission of variables that can explain differences in wages but are not related to obesity. So, he decided to test some possibilities and found that also age, family background, academic performance and mental outlook explain differences in wages.

Later Hamermesh and Biddle (1994) tested the “impact of looks on earnings”. They concluded that beauty can be a factor of discrimination in the labor market and that more attractive people are usually better paid than less attractive people. Besides, they quantified the impact of height and weight on earnings, and found that obesity has a negative impact on females’ earnings – on average obese females earned 12% less than non-obese ones – and has no impact on males’ earnings; and that height has a positive impact on earnings, both for males and females. However, these results have no statistical significance. Hamermesh and Biddle also indicated two reasons that could bias their results and tested them. One is related to the definition of beauty. If each interviewer had a “different standard for beauty” the final results may not be clear about who gets
higher earnings. The other reason is the usually omitted-variable problem. They concluded that, independently of a universal beauty definition and a higher control of independent variables, the employers would discriminate against employees only by their looks. As Hamermesh and Biddle said, it suggested the existence of pure employer discrimination.

Cawley (2004) found a negative relationship between wages and weight for white females, though with a low economic effect (a 44% increase in weight, relative to the average, would be associated with a 9% wage reduction).

Mitra (2001) also analyzed the effects of height and weight on the wages of males and females. However, before doing so, she controlled several variables that could also affect wages but are not directly related to height and weight, such as background characteristics, education, cognitive skills, work experience and occupation. She concluded that weight has no impact on males’ wages but affected negatively females’ wages – on average, heavier females earned 0.2% less, per hour, than the remaining women (significant at p<0.01 level) – moreover, she founded that females’ with above average quantitative skills were not discriminated against based on their weight. Mitra’s work suggests that even controlling other variables – such as productivity and work experience – weight continues to have a slight negative impact on females’ wages.

Some years later Baum and Ford (2004) tried to “determine whether obesity causes lower wages”. They found that both obese males and obese females suffered a wage penalty – on average they suffered a penalty between 0.7% and 6.3% (significant at p<0.05 level) - and that the most penalized were females. Moreover, they tested “whether obese workers earn lower wages because they are limited by health constraints” and concluded that “obesity affects wages independently of health limitations”. For Baum and Ford, the omission of variables that control workers’ ability and motivation, can also introduce a bias to their results.

Finally, one of the most recent studies in this area is the Lange (2007) study. The aim of her work has to analyze the impact of obesity on wages. She found that, although obese females were not penalized in the labor market, obese males experience a slight penalization – they earn around 3% less than males with a normal weight. However, she did not find evidence to state that obesity has a negative impact on people’s wages, in general, since her results are not statistically significant.
3. The Empirical Model

The model used in this work is a straightforward extension of the 1974 Jacob Mincer model. The Mincer model has been used by several authors to investigate which factors determine differences on earnings. The most common version of the Mincer model is presented in Lemieux (2006) study and is given by the following equation:

$$\log Y = \log Y_0 + \alpha S + \beta X + \gamma X^2 + \varepsilon$$ (1)

where, $Y$ is earnings, $Y_0$ is the level of earnings of an individual with no education and no experience, $S$ is the number of years of schooling and $X$ is the number of years of labor market experience.

The model used here takes into account that other variables can affect earnings too. This approach was also used in other studies to measure the impact of weight on wages, for example on the Lange [4] study, and is defined in the following way:

$$\ln Wages_i = \beta_0 + \beta_1 X_i + \epsilon_i$$ (2)

where, the dependent variable ($\ln Wages$) is the logarithm of monthly wages, the independent variable ($X$) is a vector of characteristic control variables and $\epsilon_i$ is the error term for observation $i$. This model was estimated using ordinary least squares (OLS).

As for the dependent variable, it was constructed based on monthly wages since, wages were the best indicator we had to measure the existence of discrimination between workers with the same characteristics (like age, schooling and gender). Contrary to what might happen with other sources of income, wages usually depend intrinsically on the workers’ characteristics. Thus, we attempt to determinate whether, or, there is a systematic bias for obese workers to earn fewer wages than non-obese workers.

In turn, we defined a vector of control variables, divided into three categories: demographic, occupational and health variables.

---

2 The database used only gives information about total monthly incomes, which included earnings from wages, rents, subsidies, et al. Since it was not possible to isolate the weight of each component on the total income, it was assumed that most of the total monthly income comes from wages (what should happen in the majority of the householders). Moreover, as the incomes were divided by intervals, being the initial one for those who had monthly incomes until 150€ and the final one for those who had monthly incomes higher than 2000€, we considered the average point of each income bracket a good marker. Thus, we constructed the following average points: 75€, 200€, 300€, 425€, 600€, 800€, 1050€, 1340€, 1750€ and 3000€.
In the demographic variables group, we have age (in years), age squared\(^3\), schooling (years of education completed), gender (=1 if male) and a group of six dummies for the regions of residence (North, Center, Lisbon, Alentejo, Algarve, Madeira, being the omitted region Azores).

The occupational variables include eleven dummies for the economic activity (EA) of the firms where people worked at the time of the data collection (EA are listed in Table 1 in the appendix). It was only considered the EA of the firms who employed the majority of the individuals of the sample, the remaining (that amount to about 16% of the total) were put on the omitted dummy variable.

Finally, in the health variables group, we have two kinds of variables: weight variables and other health variables. For the weight variables the body mass index (BMI) was constructed for each individual and then dummies were generated. According to the World Health Organization the BMI is “a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults”. It is defined as weight in kilograms divided by square of height in meters. The BMI classification used in this work is the classification of the Portuguese National Health Service. The individuals with a BMI lower than 18 were considered Underweight, those with a BMI equal or higher than 18 but lower than 25 were considered Normal weight, those with a BMI equal or higher than 25 but lower than 30 were considered Overweight, and finally those with a BMI higher than 30 were considered Obese. In order to avoid perfect multicollinearity, the Normal weight variable was omitted. The following variables were included in the other health variables group: smoker (=1 if a smoker), diabetes (=1 if suffering or suffered from diabetes), hypertension (=1 if suffering or suffered from hypertension), vision impairment (=1 if only recognises a friend at a distance of one meter), hearing impairment (=1 if only hears a television or radio programme with high volume), stroke (=1 if suffered from a stroke), asthma (=1 if suffering or suffered from asthma) and emphysema (=1 if suffered from emphysema).

4. Data

This study uses data from the Fourth National Health Survey (4\(^{th}\)NHS). The 4\(^{th}\)NHS was conducted between February 2005 and January 2006, through a partnership between the

\(^3\) Age squared was introduced in the model in order to capture non-linear effects of age on wages since it is believed that the marginal effect of age is not constant over time. It means that one additional year at the beginning of a career is not the same as one additional year at the end of a career.
Instituto Nacional de Saúde Dr. Ricardo Jorge and the Instituto Nacional de Estatística. This survey covered individuals who resided in households from all regions of Portugal\textsuperscript{4} at the time of the survey. The population who resided in collective accommodation was excluded.

The sample for the 4\textsuperscript{th} NHS was selected from data of the Census of Population and Housing from 2001 (Census 2001). This Census is conducted in Portugal every ten years by the Instituto Nacional de Estatística, with the aim of gathering statistical, qualitative and quantitative knowledge of the Portuguese population and other residents in the national territory.

There are other databases on wages available for empirical work. However, this is the only one that allows to explicitly control for obesity and other health characteristics. Later on, we will discuss how the results obtained are consistent with previous econometric studies on the Portuguese labour market.

In total 41303 respondents were interviewed, 21301 of whom were females (52\% of the total) and 21194 were married (51\% of the total). The average age of respondents was 42 years old and the average number of schooling was 7 years.

However, this work only used a sub-sample, since two restrictions had to be imposed regarding the target group: one member families and individuals aged between 16 and 65, no retirees.

The first restriction arises because the database used only gives information about the total monthly income of the householders and as the aim of this work is to capture possible penalties suffered by obese workers it was necessary to guarantee that the monthly income of each individual only corresponded to income earned by him.

The second restriction came because our analysis only aims to focus on employees that receive wages so, as 16 years old is the legal age to start working in Portugal and 65 years old is the legal age for retirement, it was assumed that the individuals between the ages of 16 and 65 would be those who best represent this cohort. Thus, the retirees under 66 were also excluded from our analysis\textsuperscript{5}.

\textsuperscript{4} The 41303 respondents were distributed in an approximately homogeneous way among the seven regions: 14.8\% from the North, 14.41\% from the Center, 14.5\% from Lisbon, 14\% from Alentejo, 14.95\% from the Algarve, 14.43\% from Azores and 12.91\% from Madeira.

\textsuperscript{5} Our database only gives information about the main occupation of the individuals in the two last weeks before the realization of the survey. Analysing the answer to this question we find that retirees represents approximately 17\% of the total sub-sample, what represents a huge number. Thus, we decided to exclude them.
In this way, our final sample was formed by 816 observations, of which 51.8% corresponds to females, 35.2% to overweight individuals and 11.4% to obese individuals.

This reduction in sample size, however, does not imply a significant bias relative the overall sample of the population (as it can be verified in the Appendix). Variables in our reduced sample and in the survey have the mean less than one standard deviation from each other in most cases.

The descriptive statistics of standard variables is given in Table 1 (see the attached appendix). Figure 1 provides an overview of the distribution of our sample by BMI categories.

![Figure 1. Sample distribution by BMI category](image)

We also looked for the common positive relationship between obesity and hypertension and obesity and diabetes was valid for our sample. We found that, on average, obesity increases 11% the risk of having hypertension and 4% the risk of having diabetes. Gender differences in propensity to be obese or overweight are also present in the sample. Although females have a slightly higher propensity than males to be obese, around 2% more, males have a higher propensity to be overweight, around 6% more.

After that we compared the sample average monthly wages of workers, by BMI categories. First we did that for males and females together and then we did it separately by genders. The results are showed in Figures 2 and 3, respectively.

---

6 To test this we analyzed the likelihood of an individual be obese and simultaneously suffer from hypertension and the likelihood of an individual be non-obese and suffer from hypertension, separately. According to our results, on average, 30% of the obese people also are hypertense while only 19% of non-obese are hypertense. Thus, we concluded that obesity increases, on average, 11% the risk of suffering from hypertension. The same methodology was used for diabetes.
As we can see in Figure 2, the *obese* workers earn, on average, lower wages than the remaining workers. Furthermore, the individuals with *normal* weight are those who earn the highest wages. However, when we move to Figure 3 the results are a little bit different. Firstly, the *overweight* males are those who earn more and the *underweight* males who earn less (substantially less than the average). Secondly, between females, the *obese* ones earn less and, between males, the *obese* ones earn lower wages than the *overweight* and *normal* weight males but earn higher wages than the *underweight* males. However, it is necessary to bear in mind that this analysis was done without taking into account other factors, in addition to the weight, that may also affect wages. So these results must be considered as exploratory.

Finally, we examined if the impact of weight on wages was the same for workers with a *high level of education* and for those with a *low level of education*. In order to do that we define workers with a *high level of education* as those with more than 9 years of completed schooling and those with 9 years or less, as workers with a *low level of education*. Also here, we started by analysing what happened for males and females together and then we did an analysis separately by genders. The results are shown in Figures 4 and 5.
As shown in Figure 4, the individuals with a high level of education always earn more than those with a low level of education, independently of the BMI category where they are inserted; moreover, obese workers always earn lower wages. This result leads us to believe that the impact of the level of education on wages is stronger than the impact of weight on wages.

An identical conclusion can be drawn from Figure 5. Also by gender, the individuals with a high level of education always earn higher wages than those with low level of education and the obese workers are those who earn the lowest wages – with the exception of the underweight males that are those who earn the lowest wages.

However, we were interested in finding out not only how education affects wages by BMI category, but also to what extension the level of education could moderate the impact of weight on wages. In order to evaluate that we compared the differences between the wages of individuals with low and high levels of education. We concluded that education has a lower impact over obese workers’ wages and that the overweight males are those for whom additional years of education had a higher positive impact over wages. The results are shown in Table 2. As we can see, the wage differential between levels of education is smaller for obese workers’ (both for males and females).

\[\text{In our sample we have no observations for underweight males with a high level of education.}\]
These descriptive statistics suggest that obesity may be associated with differences in wages, but other characteristics, correlated with wages and obesity, cannot be ignored. The next section reports regression results, sorting out the several potential effects.

5. Results on the relationship between wages and obesity

To test the effects of obesity on wages we ran five different regressions. The first regression was run for males and females, together, in order to get the general impact of obesity on wages, *ceteris paribus*. Then, were ran two separate regressions, one just for males and the other one for females, in order to verify if the impact of obesity is different between genders. Finally, were ran two more regressions, one just for obese people and another one for non-obese people to see which variables affect wages when the weight is already controlled. Our aim was to assess if the variables that determine obese people wages were or not the same that determine non-obese people wages.

The full results of our first regression are given in Table 3 (see the attached appendix). Besides, in Table 4, is shown a summary of the most important results regarding our first’s three regressions.

According to it, obese workers suffer, on average, a wage monthly penalty of 1.8%. However, there is no statistical significance to state that this penalization happens in practice. Besides, we found that age, schooling and the activity sector where people work have a positive and significant impact on wages. While one year older in age increases wages, on average, by 5.5%, one additional year of education increases them by 7.7%. Furthermore, we found that being one year older at the beginning of the career is different from being so at the end of it. The impact of age on wages tends to decline at older ages.

Moreover, we also found that females receive, on average, less 15.3% than males; that the individuals who work in education are those who receive higher wages; that workers with normal weight are better paid that the remaining ones and that the wages of those
who have had a stroke decreases, on average, by 39.2%. However, these results are not statistically significant.\textsuperscript{8}

Table 4. Summary of Regressions Results (I)

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Regression for Males and Females</th>
<th>Regression for Males</th>
<th>Regression for Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in years)</td>
<td>0.055 (3.92)**</td>
<td>0.078 (3.64)**</td>
<td>0.017 (0.90)</td>
</tr>
<tr>
<td>Age Squared</td>
<td>-0.001 (-3.20)**</td>
<td>-0.001 (-2.96)*</td>
<td>-0.000 (-0.48)</td>
</tr>
<tr>
<td>Years of education (completed)</td>
<td>0.077 (11.39)**</td>
<td>0.071 (6.65)**</td>
<td>0.088 (9.31)**</td>
</tr>
<tr>
<td>Gender (=1 if male)</td>
<td>-0.153 (-2.73)</td>
<td>- -</td>
<td>- -</td>
</tr>
</tbody>
</table>

**Occupational Variables**

| Transportation/comm. industry | 0.458 (3.04)*                    | 0.153 (0.72)         | 0.72 (3.32)**          |
| Education industry            | 0.493 (4.80)**                   | 0.252 (1.16)         | 0.597 (5.17)**         |
| Health/social security industry | 0.349 (3.17)*                 | 0.300 (1.48)         | 0.438 (3.42)**         |

**Health Variables**

| Underweight (=1 if under)     | -0.031 (-0.20)                   | -0.167 (-0.32)       | 0.028 (0.18)           |
| Overweight (=1 if over)       | -0.023 (-0.42)                   | -0.031 (-0.38)       | 0.040 (0.52)           |
| Obese (=1 if obese)           | -0.018 (-0.21)                   | 0.007 (0.05)         | 0.014 (0.14)           |
| Vision Impairment (=1 if v.i.)| -0.157 (-0.63)                   | -0.712 (0.433)       | 0.107 (0.36)           |
| Stroke (=1 if had a stroke)   | -0.392 (-1.11)                   | -0.033 (-0.04)       | -0.396 (-1.02)         |
| Emphysema (=1 if had e.)      | -0.065 (-0.43)                   | 0.244 (0.96)         | -0.366 (-1.94)         |

Note: Log Wage is the dependent variable. The absolute values of the $t$ statistics are given in parentheses.

* Significant at the 0.05 level
** Significant at the 0.01 level

After that, we estimated equation (2) separately by gender. The complete results are shown in Tables 5 and 6, respectively (see the attached appendix). Once again the coefficients indicate that there is no statistically significant effect of obesity on wages. Nevertheless, now, the results suggest a positive relation between these two variables. Besides, they also indicate that the number of years of schooling still have a positive impact on wages, both for males and females; and that now age only has a positive and significant effect on males’ wages.

Analyzing each regression separately, we conclude that one year older in age increases, on average, by 7.8% males’ wages while one additional year of education increases them, on average, by 7.1%, being these results statistically significant. In addition, we found that, among males, those who work in the health sector are those who earn, on average, the highest wages; and that obese workers receive around 0.7% more than the remaining workers. However, these results are not statistically significant. Another interesting result, in relation to males’ equation, is that males with vision impairment receive, on average, less 71.2% than the remaining males.

As for females, one additional year of education increases their wages, on average, by 8.8%; and the females who work in the transportation/communication industry are those

\textsuperscript{8} For a more complete set of results see the Appendix.
who receive the highest wages, followed by those who work in education. These results are statistically significant. Furthermore, one year older in age increases females’ wages, on average, by 1.7% and obese females get a monthly bonus of 1.4%. Moreover, those females who have suffered from emphysema receive, on average, less 36.6% than the remaining females. Nevertheless, these results are not statistically significant.

Finally we ran two more regressions, one for obese workers and another for non-obese workers. The full results are shown in Table 7 (see the attached appendix) and Table 8 shows a summary of the most important results.

According to the results, the number of years of schooling is the only variable that affects positively and significantly obese workers’ wages. On average, one additional year of schooling increases wages by 10%. On the other hand, for non-obese workers, age and the activity sector where people work affect wages positively and significantly. Moreover, we can also see that obese females receive, on average, monthly wages 17% lower than obese males; that obese workers who work in the hotel industry are penalized about 24.6% and that the Body Mass Index was a negative effect on obese workers’ wages, around 3%. However, these results are not statistically significant.

<table>
<thead>
<tr>
<th></th>
<th>Regression for Obese</th>
<th>Regression for Non-Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (in years)</td>
<td>0.100 (1.87)</td>
<td>0.052 (3.48)**</td>
</tr>
<tr>
<td>Age Squared</td>
<td>-0.001 (-1.91)</td>
<td>-0.000 (-2.80)*</td>
</tr>
<tr>
<td>Years of education (completed)</td>
<td>0.092 (3.78)**</td>
<td>0.077 (10.74)**</td>
</tr>
<tr>
<td>Gender (=1 if male)</td>
<td>-0.170 (-0.88)</td>
<td>-0.146 (-2.44)</td>
</tr>
<tr>
<td>Occupational Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotel/restaurants industry</td>
<td>-0.246 (-0.83)</td>
<td>0.216 (1.92)</td>
</tr>
<tr>
<td>Transportation/comm. industry</td>
<td>0.748 (0.96)</td>
<td>0.435 (2.82)*</td>
</tr>
<tr>
<td>Education industry</td>
<td>0.447 (1.17)</td>
<td>0.493 (4.59)**</td>
</tr>
<tr>
<td>Health/social security industry</td>
<td>0.403 (1.09)</td>
<td>0.339 (2.92)*</td>
</tr>
<tr>
<td>Health Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>-0.030 (-1.01)</td>
<td>0.004 (0.45)</td>
</tr>
</tbody>
</table>

Note: Log Wage is the dependent variable. The absolute values of the $t$ statistics are given in parentheses.

* Significant at the 0.05 level
** Significant at the 0.01 level

As far as non-obese workers, one additional year old increases their wages, on average, by 5.2% and one additional year of schooling increases them 7.7% and again those who work in education are those who earn the highest wages. We also concluded that non-obese females receive around 14.6% less than non-obese males and that, the BMI has a positive effect on wages, despite these results not being statistically significant.
6. Discussion

Our main result states that there is no statistical reason to say that obese workers are subject to a wage differential in the Portuguese labor market. According to the results obtained, neither obesity nor the main diseases associated with it, diabetes and hypertension seem to be associated with lower wages.

On methodological grounds, there is an important caveat. The data do not respect the so-called classical linear model assumptions, since the normality assumption of the residuals fails to hold. It means that, our OLS estimators are the best linear unbiased estimators but not necessarily those with the smallest variance among unbiased estimators. Thus, only the Gauss-Markov assumptions are respected, which means that the interpretation of our statistical tests continues to be valid but is less strong that we would like.

Despite our results showing no evidence of a relationship between obesity and wages, they indicate a clear relationship between years of schooling and wages. According to them, years of schooling always affect workers wages positively. In practice, studying more than nine years, in Portugal, increases, at least, workers wages 7%, regardless of other features that could also affect wages. This result is in accordance with Cardoso’s (2007) study. She proved that workers with more years of schooling completed, namely, the graduates, are those who earn higher wages in the Portuguese labor market. Moreover, she showed that, from the eighties of the 20th century, the differences in wages of graduate and non-graduate workers increased sharply.

It allows us to conclude that years of schooling are more important to explain wage differences than health characteristics. It may happen because, since there is a lack of graduates in Portugal, employers have no room to discriminate against workers based on other characteristics beyond cognitive skills, here measured by years of schooling completed. In fact, only 15% of the Portuguese population is graduated, which makes Portugal one of the European countries with the lowest number of graduates. According to Portugal (2004), during the eighties, the supply of graduates was clearly lower than the demand, which contributed to the increase in the wage gap between graduate and non-graduate workers, which still exists in our society nowadays. Therefore we believe that the growth of the number of graduates may change the results of our study and lead to the appearance of cases of wage differentials based on health features in the future.
Given that, it is easy to understand why our results pointed that the workers in the Communication, Public Administration, Education and Health sectors are the ones who receive the highest wages. For the workers in these areas a university degree is required. So, once again those who have more years of schooling completed are the ones who earn the most.

Moreover, our study also indicates the existence of a positive relation between age and wages. It means that, on average, older workers receive higher wages than the younger ones, everything else remaining constant. According to Saraiva (2007) age is even one of the variables with higher weight on wages, explaining an important part of the wage gap. We think it may happen because older workers usually have more experience and experience tends to increase wages. Thus, age also seems to be more important to explain wage variation than health limitations.

Furthermore, we found that females are quite penalized in the Portuguese labor market. On average, they receive monthly wages 15% lower than counterpart males. The interesting point here comes when we compared our result with the results of Machado and Mata’s (1998) study and we found that there has been no progress, in terms of gender discrimination, in the last twenty years, in Portugal. The wage penalties suffered by females, twenty years ago, are about the same order of magnitude as today. So, females continue to be discriminated against just for being females.

The overall consistency of our results with previous studies of the Portuguese labor market reality suggests some confidence also exists about the absence of health-related wage differentials.

Nevertheless, our study failed to establish a significant relationship between regions and wages. It means that from the wage point of view the region of Portugal where you live is irrelevant. In this respect, it differs from Cardoso (2007) and Portugal (2004) results. According to them, workers who work in Lisbon earn, on average, higher wages that the remaining ones.

The absence of a significant relationship between health variables and wages does not mean that there is no wage differentials based on illness in the labor market. Our results just say that there are no reflections of this kind of difference on wages. So the possibility of sick workers suffering other kinds of discrimination in the labor market is not ruled out, like having a smaller probability of being employed. However, this falls outside the scope of this work.
To conclude this section, we would like to mention some potential problems that could bias our results. The first one was the omission of relevant variables. We considered the possibility of having excluded some relevant variables that may also explain differences on wages. Thus, we tested this possibility and we concluded that there are no omitted variables in our model, which means that we have no biases resulting from this 9.

The second potential problem is related to the measure of differences in productivity and abilities among workers. In principle, more productive workers should be compensated for it, as well as workers with more abilities. However, we have no information available in our data base to control this.

The last problem appears with the definition of the dependent variables. As it was referred at the beginning of this work, we had no information about the earnings that workers get only from their work, so we considered that the total income came exclusively from wages. The problem here rises if a significant percentage of the total income does not come from wages. Once against, there is no way to solve this issue in the data set used, where a trade-off between quality of wage date versus ability to include health-related controls variables was accepted.

7. Conclusion

In this work we assessed whether, or not, there is health-related wage differentials in the Portuguese labor market. To do that, we used obesity as a representative disease.

Obesity is nowadays one of the most important problems of public health. Every year a significant percentage of the world’s population dies of diseases associated to obesity, such as diabetes and hypertension. Besides being easily observable, obesity is also easy to measure, which facilitates the processing of data for analysis.

We concluded that obese workers do not face a wage differential in the Portuguese labor market. According to our results, there is no evidence to believe obese workers receive lower wages than the non-obese ones. Wage differentials due to schooling and to gender are far more significant, in quantitative terms, and should remain the main cause for wage differentials in Portugal. Nevertheless, it does not mean that obese workers are not subject to other kinds of discrimination, for example on the opportunity to obtain employment. 10 This issue is left for future research.

9 We used the Ramsey regression specification-error test for omitted variables. At a 95% level of significance we did not rejected the null hypothesis of the model had no omitted variables. So, our model has no omitted variables problem.

10 An issue addressed in Latif (2008), and certainly of importance.
References


Appendix

Table 1. Descriptive statistics of standard variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LogWage</td>
<td>816</td>
<td>6.209275</td>
<td>0.821476</td>
<td>4.317488</td>
<td>8.006368</td>
</tr>
<tr>
<td>Age (in years)</td>
<td>816</td>
<td>45.27328</td>
<td>13.02155</td>
<td>16</td>
<td>65</td>
</tr>
<tr>
<td>Age Squared</td>
<td>816</td>
<td>2219.023</td>
<td>1136.98</td>
<td>256</td>
<td>4225</td>
</tr>
<tr>
<td>Schooling (years of education completed)</td>
<td>816</td>
<td>8.566176</td>
<td>4.785257</td>
<td>0</td>
<td>26</td>
</tr>
<tr>
<td>Females</td>
<td>816</td>
<td>0.518382</td>
<td>0.499988</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>North</td>
<td>816</td>
<td>0.105392</td>
<td>0.307246</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Center</td>
<td>816</td>
<td>0.139706</td>
<td>0.346894</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Lisbon</td>
<td>816</td>
<td>0.188726</td>
<td>0.391530</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Alentejo</td>
<td>816</td>
<td>0.116422</td>
<td>0.320927</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Algarve</td>
<td>816</td>
<td>0.225490</td>
<td>0.418161</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Madeira</td>
<td>816</td>
<td>0.094363</td>
<td>0.292512</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Occupational Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture industry</td>
<td>816</td>
<td>0.056373</td>
<td>0.230781</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Textile industry</td>
<td>816</td>
<td>0.012255</td>
<td>0.110089</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Construction industry</td>
<td>816</td>
<td>0.096814</td>
<td>0.295885</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Trade/repair vehicles industry</td>
<td>816</td>
<td>0.145833</td>
<td>0.353155</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hotel/restaurants industry</td>
<td>816</td>
<td>0.074755</td>
<td>0.263157</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Transportation/communications industry</td>
<td>816</td>
<td>0.029412</td>
<td>0.169061</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Public administration industry</td>
<td>816</td>
<td>0.078431</td>
<td>0.269014</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Education industry</td>
<td>816</td>
<td>0.093137</td>
<td>0.290803</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Health/social security industry</td>
<td>816</td>
<td>0.062500</td>
<td>0.242210</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Collective/social/personal services industry</td>
<td>816</td>
<td>0.049020</td>
<td>0.216041</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Familiar activities industry</td>
<td>816</td>
<td>0.039216</td>
<td>0.194227</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Health Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>816</td>
<td>0.025735</td>
<td>0.158442</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Overweight</td>
<td>816</td>
<td>0.351716</td>
<td>0.477799</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Obese</td>
<td>816</td>
<td>0.113971</td>
<td>0.317970</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Smoker</td>
<td>816</td>
<td>0.343137</td>
<td>0.475048</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>816</td>
<td>0.045343</td>
<td>0.208183</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>816</td>
<td>0.208333</td>
<td>0.406366</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Vision Impairment</td>
<td>816</td>
<td>0.009804</td>
<td>0.098589</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hearing Impairment</td>
<td>816</td>
<td>0.012255</td>
<td>0.110089</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Stroke</td>
<td>816</td>
<td>0.004902</td>
<td>0.069886</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Asthma</td>
<td>816</td>
<td>0.063726</td>
<td>0.244413</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Emphysema</td>
<td>816</td>
<td>0.028186</td>
<td>0.165606</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Variable</td>
<td>Obs</td>
<td>Mean</td>
<td>Std. Dev</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------</td>
<td>---------</td>
<td>----------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td><strong>Demographic Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LogWage</td>
<td>40524</td>
<td>6.7603</td>
<td>0.7209</td>
<td>4.31748</td>
<td>8.006368</td>
</tr>
<tr>
<td>Age (in years)</td>
<td>41202</td>
<td>42.4918</td>
<td>23.053</td>
<td>0</td>
<td>102</td>
</tr>
<tr>
<td>Schooling</td>
<td>33166</td>
<td>7.3395</td>
<td>4.2169</td>
<td>0</td>
<td>26</td>
</tr>
<tr>
<td>Females</td>
<td>41303</td>
<td>0.5157</td>
<td>0.4997</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>North</td>
<td>41303</td>
<td>0.1477</td>
<td>0.3548</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Center</td>
<td>41303</td>
<td>0.1441</td>
<td>0.3511</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Lisbon</td>
<td>41303</td>
<td>0.1454</td>
<td>0.3526</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Alentejo</td>
<td>41303</td>
<td>0.1399</td>
<td>0.3469</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Algarve</td>
<td>41303</td>
<td>0.1495</td>
<td>0.3469</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Madeira</td>
<td>41303</td>
<td>0.1290</td>
<td>0.3353</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Occupational Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture industry</td>
<td>41303</td>
<td>0.1010</td>
<td>0.3013</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Textile industry</td>
<td>41303</td>
<td>0.0260</td>
<td>0.1592</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Construction industry</td>
<td>41303</td>
<td>0.0735</td>
<td>0.2610</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Trade/repair vehicles industry</td>
<td>41303</td>
<td>0.0275</td>
<td>0.1635</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hotel/restaurants industry</td>
<td>41303</td>
<td>0.0577</td>
<td>0.2332</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Transportation/communications</td>
<td>41303</td>
<td>0.0466</td>
<td>0.2108</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Public administration industry</td>
<td>41303</td>
<td>0.0577</td>
<td>0.2332</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Education industry</td>
<td>41303</td>
<td>0.0046</td>
<td>0.2108</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Health/social security industry</td>
<td>41303</td>
<td>0.0303</td>
<td>0.1714</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Collective/social/personal services</td>
<td>41303</td>
<td>0.0311</td>
<td>0.1736</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Familiar activities industry</td>
<td>41303</td>
<td>0.0291</td>
<td>0.1682</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Health Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>41303</td>
<td>0.0511</td>
<td>0.2202</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Overweight</td>
<td>41303</td>
<td>0.3064</td>
<td>0.4610</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Obese</td>
<td>41303</td>
<td>0.2025</td>
<td>0.4019</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Smoker</td>
<td>41303</td>
<td>0.1723</td>
<td>0.3777</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>41303</td>
<td>0.0722</td>
<td>0.2589</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>41303</td>
<td>0.2153</td>
<td>0.4111</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Vision Impairment</td>
<td>41303</td>
<td>0.0075</td>
<td>0.0862</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hearing Impairment</td>
<td>41303</td>
<td>0.0178</td>
<td>0.1321</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Stroke</td>
<td>41303</td>
<td>0.0186</td>
<td>0.1352</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Asthma</td>
<td>41303</td>
<td>0.0515</td>
<td>0.2211</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Emphysema</td>
<td>41303</td>
<td>0.0323</td>
<td>0.1768</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
### Table 3. Regression Results for Males and Females

Dependent variable: Log Wage  
N= 816

| Variable                      | Coefficient | Std.Error | t-value | P>|t| |
|-------------------------------|-------------|-----------|---------|-----|
| **Demographic Variables**     |             |           |         |     |
| Age (in years)                | 0.055033    | 0.014053  | 3.92    | 0.000 |
| Age Squared                   | -0.000518   | 0.000162  | -3.20   | 0.001 |
| Schooling (years of education completed) | 0.07733     | 0.006792  | 11.39   | 0.000 |
| Gender (=1 if male)           | -0.152516   | 0.055839  | -2.73   | 0.006 |
| North (=1 if North)           | -0.071586   | 0.102913  | -0.70   | 0.487 |
| Center (=1 if Center)         | -0.159455   | 0.094214  | -1.69   | 0.091 |
| Lisbon (=1 if Lisbon)         | -0.044655   | 0.089089  | -0.50   | 0.616 |
| Alentejo (=1 if Alentejo)     | -0.01378    | 0.097984  | -0.14   | 0.888 |
| Algarve (=1 if Algarve)       | -0.013258   | 0.086686  | -0.15   | 0.878 |
| Madeira (=1 if Madeira)       | -0.083842   | 0.104009  | -0.81   | 0.420 |
| **Occupational Variables**    |             |           |         |     |
| Agriculture industry          | -0.17217    | 0.115331  | -1.49   | 0.136 |
| Textile industry              | 0.074627    | 0.225382  | 0.33    | 0.741 |
| Construction industry         | 0.112176    | 0.099241  | 1.13    | 0.259 |
| Trade/repair vehicles industry | 0.086712    | 0.080977  | 1.07    | 0.285 |
| Hotel/restaurants industry    | 0.155425    | 0.102669  | 1.51    | 0.130 |
| Transportation/communications industry | 0.453711  | 0.149281  | 3.04    | 0.002 |
| Public administration industry | 0.3243     | 0.102582  | 3.16    | 0.002 |
| Education industry            | 0.492612    | 0.102723  | 4.80    | 0.000 |
| Health/social security industry | 0.348598  | 0.109942  | 3.17    | 0.002 |
| Collective/social/personal services industry | 0.107952  | 0.1195    | 0.90    | 0.367 |
| Familiar activities industry  | -0.160429   | 0.134833  | -1.19   | 0.234 |
| **Health Variables**          |             |           |         |     |
| Underweight (=1 if underweight) | -0.031423  | 0.155362  | -0.20   | 0.840 |
| Overweight (=1 if overweight) | -0.022996   | 0.054921  | -0.42   | 0.676 |
| Obese (=1 if obese)           | -0.017536   | 0.081692  | -0.21   | 0.830 |
| Smoker (=1 if smoker)         | -0.092593   | 0.055239  | -1.68   | 0.094 |
| Diabetes (=1 if diabetic)     | -0.150051   | 0.11824  | -1.27   | 0.205 |
| Hypertension (=1 if hypertensive) | -0.040503  | 0.063178  | -0.64   | 0.522 |
| Vision Impairment (=1 if have v.i) | -0.157366  | 0.24805  | -0.63   | 0.526 |
| Hearing Impairment (=1 if have h.i) | 0.081431  | 0.222325  | 0.37    | 0.714 |
| Stroke (=1 if had a stroke)   | -0.391918   | 0.352712  | -1.11   | 0.267 |
| Asthma (=1 if have asthma)    | -0.086683   | 0.101741  | -0.85   | 0.394 |
| Emphysema (=1 if had emphysema) | -0.06541   | 0.151151  | -0.43   | 0.665 |
| Constant=                     | 4.271402    | 0.300022  | 14.24   | 0.000 |

R-squared = 0.3389
F statistic = 12.54*

* Significant at the 0.01 level
## Table 5. Regression Results for Males

Dependent variable: Log Wage

N= 393

| Variable                                | Coefficient | Std.Error | t-value | P>|t| |
|-----------------------------------------|-------------|-----------|---------|-----|
| **Demographic Variables**               |             |           |         |     |
| Age (in years)                          | 0.078276    | 0.021521  | 3.64    | 0.000 |
| Age Squared                             | -0.000736   | 0.000249  | -2.96   | 0.003 |
| Schooling (years of education completed)| 0.070973    | 0.010671  | 6.65    | 0.000 |
| North (=1 if North)                     | -0.174169   | 0.164652  | -1.06   | 0.291 |
| Center (=1 if Center)                   | -0.135484   | 0.156716  | -0.86   | 0.388 |
| Lisbon (=1 if Lisbon)                   | -0.110641   | 0.13825   | -0.80   | 0.424 |
| Alentejo (=1 if Alentejo)               | -0.162817   | 0.14602   | -1.12   | 0.266 |
| Algarve (=1 if Algarve)                 | -0.072679   | 0.129436  | -0.56   | 0.575 |
| Madeira (=1 if Madeira)                 | 0.019863    | 0.170331  | 0.12    | 0.907 |
| **Occupational Variables**              |             |           |         |     |
| Agriculture industry                    | -0.390789   | 0.168732  | -2.32   | 0.021 |
| Textile industry                        | -0.907761   | 0.530705  | -1.71   | 0.088 |
| Construction industry                   | -0.059745   | 0.121833  | -0.49   | 0.624 |
| Trade/repair vehicles industry          | -0.0436     | 0.120962  | -0.36   | 0.719 |
| Hotel/restaurants industry              | -0.246719   | 0.170417  | -1.45   | 0.149 |
| Transportation/communications industry  | 0.153233    | 0.212876  | 0.72    | 0.472 |
| Public administration industry          | 0.095155    | 0.158662  | 0.60    | 0.549 |
| Education industry                      | 0.251779    | 0.217225  | 1.16    | 0.247 |
| Health/social security industry         | 0.300024    | 0.202879  | 1.48    | 0.140 |
| Collective/social/personal services industry | -0.200041   | 0.179777  | -1.11   | 0.267 |
| Familiar activities industry            | -0.293838   | 0.531318  | -0.55   | 0.581 |
| **Health Variables**                    |             |           |         |     |
| Underweight (=1 if underweight)         | -0.166554   | 0.525964  | -0.32   | 0.752 |
| Overweight (=1 if overweight)           | -0.030657   | 0.081145  | -0.38   | 0.706 |
| Obese (=1 if obese)                     | 0.00735     | 0.140556  | 0.05    | 0.958 |
| Smoker (=1 if smoker)                   | -0.06478    | 0.077492  | -0.84   | 0.404 |
| Diabetes (=1 if diabetic)               | -0.100821   | 0.21496   | -0.47   | 0.639 |
| Hypertension (=1 if hypertense)         | -0.176579   | 0.10691   | -1.65   | 0.009 |
| Vision Impairment (=1 if have v.i)      | -0.711862   | 0.432996  | -1.64   | 0.101 |
| Hearing Impairment (=1 if have h.i)    | 0.310599    | 0.424863  | 0.73    | 0.465 |
| Stroke (=1 if had a stroke)             | -0.033108   | 0.757701  | -0.04   | 0.965 |
| Asthma (=1 if have asthma)              | -0.116992   | 0.184781  | -0.63   | 0.527 |
| Emphysema (=1 if had emphysema)         | 0.243529    | 0.252837  | 0.96    | 0.336 |
| Constant                               | 3.78506     | 0.461358  | 8.62    | 0.000 |

R-squared = 0.3067  
F statistic = 5.15* 

* Significant at the 0.01 level
Table 6. Regression Results for Females

Dependent variable: Log Wage
N= 423

| Variable                        | Coefficient | Std.Error | t-value | P>|t| |
|--------------------------------|-------------|-----------|---------|----|
| **Demographic Variables**      |             |           |         |    |
| Age (in years)                 | 0.0173      | 0.019216  | 0.90    | 0.369 |
| Age Squared                    | -0.000107   | 0.000221  | -0.48   | 0.629 |
| Schooling (years of education completed) | 0.087655 | 0.009412  | 9.31    | 0.000 |
| North (=1 if North)            | 0.037587    | 0.132365  | 0.28    | 0.777 |
| Center (=1 if Center)          | -0.17328    | 0.116997  | -1.48   | 0.139 |
| Lisbon (=1 if Lisbon)          | -0.007067   | 0.117234  | -0.06   | 0.952 |
| Alentejo (=1 if Alentejo)      | 0.131638    | 0.135465  | 0.97    | 0.332 |
| Algarve (=1 if Algarve)        | 0.066205    | 0.120296  | 0.55    | 0.582 |
| Madeira (=1 if Madeira)        | -0.135266   | 0.131092  | -1.03   | 0.303 |
| **Occupational Variables**     |             |           |         |    |
| Agriculture industry           | -0.004024   | 0.161827  | -0.02   | 0.980 |
| Textile industry               | 0.368489    | 0.239967  | 1.54    | 0.125 |
| Construction industry          | 0.233882    | 0.383407  | 0.61    | 0.542 |
| Trade/repair vehicles industry  | 0.161155    | 0.110113  | 1.46    | 0.144 |
| Hotel/restaurants industry      | 0.43408     | 0.129187  | 3.36    | 0.001 |
| Transportation/communications industry | 0.719565 | 0.216702  | 3.32    | 0.001 |
| Public administration industry  | 0.518984    | 0.138804  | 3.74    | 0.000 |
| Education industry             | 0.596992    | 0.115455  | 5.17    | 0.000 |
| Health/social security industry | 0.43818     | 0.127972  | 3.42    | 0.001 |
| Collective/social/personal services industry | 0.402325 | 0.162095  | 2.48    | 0.013 |
| Familiar activities industry    | -0.081674   | 0.136315  | -0.60   | 0.549 |
| **Health Variables**           |             |           |         |    |
| Underweight (=1 if underweight) | 0.028034   | 0.155272  | 0.18    | 0.857 |
| Overweight (=1 if overweight)  | 0.040488    | 0.077941  | 0.52    | 0.604 |
| Obese                          | 0.014248    | 0.101079  | 0.14    | 0.888 |
| Smoker (=1 if smoker)          | -0.157376   | 0.084214  | -1.87   | 0.062 |
| Diabetes (=1 if diabetic)      | -0.124102   | 0.139907  | -0.89   | 0.376 |
| Hypertension (=1 if hypertensive) | 0.063981 | 0.077374  | 0.83    | 0.409 |
| Vision Impairment (=1 if have v.i) | 0.107037 | 0.295585  | 0.36    | 0.717 |
| Hearing Impairment (=1 if have h.i) | 0.06517    | 0.254945  | 0.26    | 0.798 |
| Stroke (=1 if had a stroke)    | -0.396081   | 0.386587  | -1.02   | 0.306 |
| Asthma (=1 if have asthma)     | 0.010081    | 0.119524  | 0.08    | 0.993 |
| Emphysema (=1 if had emphysema) | -0.366401   | 0.189265  | -1.94   | 0.054 |
| Constant=                      | 4.634194    | 0.408832  | 11.33   | 0.000 |

R-squared = 0.4411
F statistic = 9.96*  

* Significant at the 0.01 level
Table 7. Regression Results for Obese and Non-Obese Workers

Dependent variable: Log Wage

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obese N=92</th>
<th></th>
<th>Non-Obese N=723</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic Variables</strong></td>
<td>Coefficient</td>
<td>P-Value</td>
<td>Coefficient</td>
<td>P-Value</td>
</tr>
<tr>
<td>Age (in years)</td>
<td>0.100166</td>
<td>0.066</td>
<td>0.051714</td>
<td>0.001</td>
</tr>
<tr>
<td>Age Squared</td>
<td>-0.001137</td>
<td>0.061</td>
<td>-0.00048</td>
<td>0.005</td>
</tr>
<tr>
<td>Schooling (years of education completed)</td>
<td>0.091815</td>
<td>0.000</td>
<td>0.076665</td>
<td>0.000</td>
</tr>
<tr>
<td>Gender (=1 if Male)</td>
<td>-0.169888</td>
<td>0.380</td>
<td>-0.146432</td>
<td>0.015</td>
</tr>
<tr>
<td>North (=1 if North)</td>
<td>0.089606</td>
<td>0.743</td>
<td>-0.117594</td>
<td>0.298</td>
</tr>
<tr>
<td>Center (=1 if Center)</td>
<td>0.042116</td>
<td>0.860</td>
<td>-0.213595</td>
<td>0.039</td>
</tr>
<tr>
<td>Lisbon (=1 if Lisbon)</td>
<td>-0.117767</td>
<td>0.735</td>
<td>-0.068892</td>
<td>0.471</td>
</tr>
<tr>
<td>Alentejo (=1 if Alentejo)</td>
<td>-0.217074</td>
<td>0.448</td>
<td>-0.000258</td>
<td>0.998</td>
</tr>
<tr>
<td>Algarve (=1 if Algarve)</td>
<td>-0.191557</td>
<td>0.475</td>
<td>-0.020166</td>
<td>0.829</td>
</tr>
<tr>
<td>Madeira (=1 if Madeira)</td>
<td>-0.097723</td>
<td>0.756</td>
<td>-0.111871</td>
<td>0.320</td>
</tr>
<tr>
<td><strong>Occupational Variables</strong></td>
<td>Coefficient</td>
<td></td>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Agriculture industry</td>
<td>-0.075949</td>
<td>0.756</td>
<td>-0.196626</td>
<td>0.140</td>
</tr>
<tr>
<td>Textile industry</td>
<td>-0.901177</td>
<td>0.086</td>
<td>0.291111</td>
<td>0.251</td>
</tr>
<tr>
<td>Construction industry</td>
<td>0.413632</td>
<td>0.304</td>
<td>0.082949</td>
<td>0.426</td>
</tr>
<tr>
<td>Trade/repair vehicles industry</td>
<td>0.460777</td>
<td>0.058</td>
<td>0.03856</td>
<td>0.658</td>
</tr>
<tr>
<td>Hotel/restaurants industry</td>
<td>-0.246009</td>
<td>0.408</td>
<td>0.215865</td>
<td>0.055</td>
</tr>
<tr>
<td>Transportation/communications industry</td>
<td>0.747888</td>
<td>0.338</td>
<td>0.43488</td>
<td>0.005</td>
</tr>
<tr>
<td>Public administration industry</td>
<td>0.29028</td>
<td>0.438</td>
<td>0.32051</td>
<td>0.003</td>
</tr>
<tr>
<td>Education industry</td>
<td>0.446973</td>
<td>0.246</td>
<td>0.4932090</td>
<td>0.000</td>
</tr>
<tr>
<td>Health/social security industry</td>
<td>0.402504</td>
<td>0.280</td>
<td>0.338527</td>
<td>0.004</td>
</tr>
<tr>
<td>Collective/social/personal services industry</td>
<td>0.626237</td>
<td>0.092</td>
<td>0.049103</td>
<td>0.703</td>
</tr>
<tr>
<td>Familiar activities industry</td>
<td>-0.282403</td>
<td>0.416</td>
<td>-0.120012</td>
<td>0.417</td>
</tr>
<tr>
<td><strong>Health Variables</strong></td>
<td>Coefficient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>-0.029666</td>
<td>0.316</td>
<td>0.004125</td>
<td>0.656</td>
</tr>
<tr>
<td>Smoker (=1 if smoker)</td>
<td>-0.417696</td>
<td>0.062</td>
<td>-0.066633</td>
<td>0.252</td>
</tr>
<tr>
<td>Diabetes (=1 if diabetic)</td>
<td>0.014941</td>
<td>0.957</td>
<td>-0.194614</td>
<td>0.146</td>
</tr>
<tr>
<td>Hypertension (=1 if hypertension)</td>
<td>-0.04206</td>
<td>0.808</td>
<td>-0.035923</td>
<td>0.606</td>
</tr>
<tr>
<td>Vision Impairment (=1 if have v.i)</td>
<td>0.828851</td>
<td>0.236</td>
<td>-0.28481</td>
<td>0.287</td>
</tr>
<tr>
<td>Hearing Impairment (=1 if have h.i)</td>
<td>1.007777</td>
<td>0.168</td>
<td>-0.058324</td>
<td>0.806</td>
</tr>
<tr>
<td>Stroke (=1 if had a stroke)</td>
<td>NA</td>
<td>NA</td>
<td>-0.413198</td>
<td>0.247</td>
</tr>
<tr>
<td>Asthma (=1 if have asthma)</td>
<td>0.078097</td>
<td>0.809</td>
<td>-0.088346</td>
<td>0.421</td>
</tr>
<tr>
<td>Emphysema (=1 if had emphysema)</td>
<td>-0.27124</td>
<td>0.004</td>
<td>0.085895</td>
<td>0.629</td>
</tr>
<tr>
<td>Constant</td>
<td>4.676305</td>
<td>0.004</td>
<td>4.395224</td>
<td>0.000</td>
</tr>
</tbody>
</table>

R-squared 0.5808 0.3341

* F statistic 2.96 11.57

* Significant at the 0.01 level