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# Productivity or discrimination?

## An economic analysis of excess-weight penalty in the Swedish labor market

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### Abstract

Using longitudinal data, this paper investigates the penalty for excess weight in the Swedish labor market, distinguishing between the productivity and the discrimination hypotheses. We analyze employment, income, and sickness absence, using the latter as a direct measure of productivity. We find that excess weight women, but not men, experience a significant employment penalty. Both genders experience a significant income penalty for obesity. We conclude that the penalties are associated with lower productivity, primarily in terms of health. We find no evidence of discrimination.

**JEL classification:** I10, I12, J23, J31

**Key words:** employment, income, sickness absence, obesity, overweight

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# 1. Introduction

Over the last 30 years the share of overweight and obese among men aged 16-84 in Sweden has increased from 30 percent to more than 50 percent. For women, the share has increased by 10 percentage points to 35 percent during the same period.<sup>1</sup> Research often finds that overweight and obese individuals are less likely to participate in employment and earn less. The literature discusses two main channels through which excess weight influences labor market outcomes; lower productivity and discrimination. However, to date, studies investigating the effects of excess weight in the Swedish labor market are few (Lundborg et al. 2010; Rooth 2009; Lundborg et al. 2007). The determinants of the weight penalties are equally unexplored.

This paper investigates the excess weight penalty for men and women in the Swedish labor market, distinguishing between the productivity and the discrimination channels. The paper analyzes two labor market outcomes, employment and income, using longitudinal data. We study the employment and income penalties for excess weight, including the effect of health, thereafter investigating whether the penalties depend on a health-related productivity loss or on discrimination. Thus, we consider a penalty for excess weight after controlling for health as a potential indication of discrimination (see e.g. Baum and Ford 2004; Morris 2006 and 2007; Lundborg et al. 2010).

By analyzing both employment participation and income, we get a more complete picture of how excess weight individuals fare in the labor market than previous research, which tends to analyze the outcomes separately. Lundborg et al. (2007) a cross-sectional study on European +50 individuals and Greve, (2008), a longitudinal study on Danes, are two exceptions. Furthermore, by analyzing two labor market outcomes and both genders, this paper contributes to the research on Swedish labor market conditions. Lundborg et al. (2010) analyze the obesity effect on earnings for men, while Rooth (2009) studies the differential treatment of obese men

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<sup>1</sup> Statistics Sweden, Survey of Living Conditions.

and women in the hiring process. Lundborg et al. (2007) study labor market outcomes for both men and women belonging to the “Nordic group” of Sweden and Denmark.

In addition, this paper contributes to the literature on weight and labor market outcomes by further exploring sickness absence as a direct measure of productivity. Specifically, and in contrast to earlier studies (Atella et al. 2008; Sanz-de-Galdeano 2007), we use register data enabling the analysis of actual absence behavior. Furthermore, the analysis separates between short-term and long-term absence spells.

We perform separate analyses for men and women, using a pooled regression model and lags of individual BMI to control for reversed causality. Because of our sample size, we cannot control for reversed causality and individual fixed effects simultaneously. However, we find that fixed effects generate a smaller bias, thus motivating the use of a pooled regression model.

The rest of the paper proceeds as follows. Section 2 reviews the related literature. Section 3 presents the data and the descriptive statistics. Section 4 analyzes the relationship first between excess weight and employment, thereafter between excess weight and income and third between excess weight and sickness absence. Section 5 discusses the results and Section 6 concludes the paper.

## **2. Literature review**

Research on excess weight and labor market outcomes often observes employment and income penalties, particularly for women. However, the picture is still inconclusive, partly owing to the different methods used to deal with endogeneity. Cawley (2004) investigates the relationship between BMI and wage using OLS, OLS with BMI lags, individual fixed effects and IV (using sibling BMI as instrument) on US longitudinal data (the National Longitudinal Survey of Youth, NLSY). The only consistent result across approaches pertains to white obese females who appear

to earn less than their non-obese peers, a result that may suggest discrimination. Studies observing that physical appearance matters in the labor market support the hypothesis of discrimination. Using the same source of data as Cawley (2004), Han et al. (2009) find an extra wage penalty for obese individuals having jobs with customer contact in the US when controlling for individual fixed effects. Applying OLS with weight lags on longitudinal data, Harper (2000) attributes the observed wage differential for obesity (for women) and unattractiveness (for both genders) in the British labor market to employer discrimination. Rooth (2009) finds a similar pattern, using data from a Swedish field experiment: Individuals with “unfavorable looks” (obesity for women and unattractiveness for men) are less likely to receive a callback for a job interview. However, these studies do not control for health, which may be a crucial factor considering the serious health risks associated with obesity.

Studies that do control for health come to different conclusions. Regressing current earnings on lags of individual BMI and physical (cardiovascular) fitness at 18, retrieved from military enlistment tests, Lundborg et al. (2010) observe a large impact of physical fitness on the wage penalty for excess weight among Swedish men. By contrast, other studies find a minor effect or no effect of health on the wage penalty. Baum and Ford (2004) investigate the wage differential for obese individuals in the US using longitudinal data (NLSY). After applying OLS, individual fixed effects, sibling-specific but time-variant effects and a combination of the two latter approaches, the analysis concludes that health does not affect the obesity penalty. OLS results from analyzing repeated cross-sectional survey data also imply a weak effect of health on the wage penalty experienced by English men and women (Morris 2006). Applying IV models (using the prevalence of obesity in the respondent’s living area as an instrument) on the same data Morris (2007) finds employment penalties for both genders, penalties that variations in health cannot fully explain.

Health limitations may lead to absence from work, making absence behavior a potential proxy for productivity. Cawley (2000) finds a positive correlation between obesity and

disability among American women, using longitudinal survey data (NLSY). However, the results from IV estimations (using child's BMI as instrument) do not determine the direction of causality. Using pooled data for nine countries in the European Community Household Panel (ECHP), Atella et al. (2008) observe in OLS quantile regressions that the wage penalty for obesity remains unchanged when controlling for the number of reported days of absence during the last four weeks. However, pooling data for countries with different legislative structures regarding income insurances and employment protection may disguise effects at the country level. Sanz-de-Galdeano (2007) uses the same data but regresses days of absence on obesity country by country. Using individual weight lags and controlling for random effects, the study shows that obesity increases absence frequency for women in four out of nine countries but not for men in any country. However, research from other disciplines finds a positive relationship between excess weight and sickness absence for men and women (e.g. Jans et al. 2007; Ferrie et al., 2007; Laaksonen et al. 2007; Cawley et al. 2007).

### **3. Data and descriptive statistics**

Our empirical analysis uses data from the Swedish Survey of Living Conditions (the ULF survey) from Statistics Sweden integrated with register data from the Longitudinal Integration Database for Health Insurance and Labor Market Studies (LISA). The ULF survey is an annual systematic survey of living conditions, conducted by Statistics Sweden since 1975. The data is collected in the form of one-hour personal interviews with randomly selected individuals aged 16 to 84 years. This study uses data from 1988/89, 1996/97 and 2004/05, three two-year waves focusing on health-related issues. The first wave, 1988/89, is used to control for weight lags. The material from LISA includes individual-specific information from the Social Insurance Agency, such as sickness absence and sickness benefits.

At the outset, the working sample for the employment regressions consists of  $n=35,179$  observations. The sample is restricted to working age individuals, i.e. those between 20 and 64 years of age ( $n=24,897$ ). We are only interested in individuals who appear at least twice ( $n=6,864$ ).<sup>2</sup> In addition, we require information on BMI and that BMI is lower than 70 ( $n=6,778$ ). Those who are or have been underweight are excluded ( $n=6,554$ ), making normal weight the reference group to the two excess weight categories, overweight and obese. We eliminate missing observations on education ( $n=6,541$ ) and on health measures ( $n=6,537$ ). The remaining observations are distributed almost equally between men ( $n=3,335$ ) and women ( $n=3,202$ ).

By applying further restrictions on the employment sample, we construct the sample for the income and absence regressions. First, only individuals with positive labor market income enter the sample ( $n=6,139$ ). Second, we focus on employed individuals, leaving out the self-employed, the unemployed and other groups who are also eligible for sickness benefits ( $n=4,853$ ). Third, missing observations on sickness absence are excluded ( $n=4,849$ ). Fourth, we require information on work-related factors, such as occupation ( $n=4,729$ ), leaving us with almost as many observations for women ( $n=2332$ ) as for men ( $n=2397$ ).

### *A. Dependent variables*

This paper studies the effect of obesity on the likelihood of employment, the level of labor market income and the probability of sickness absence.

1. The employment variable takes the value one if the individual is full-time or part-time employed, and zero otherwise.
2. Earnings are measured as the logarithm of yearly labor market income, which includes wages and transfers, such as child allowances.

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<sup>2</sup> Because a fraction of the included individuals appears in the first and the third waves, the lag length in the sample

3. We use two measures of sickness absence, one measure of long-term absence, based on register data, and one measure of short-term absence, based on survey data. The Swedish sickness insurance is a mandatory social insurance remunerating income lost due to health-related absence from work. After seven days of self-certification, a medical certificate issued by a physician is required for continued remuneration. Since 1992 the employer is financially responsible for the initial absence period, called the sick-pay period. After that period, the Social Insurance Agency registers the sickness absence and pays out the benefits. The length of the sick-pay period has varied over the years. Because of the variation, our variable of long-term absence describes whether or not the individual has been registered as absent because of sickness more than 28 days consecutively during a year. Our variable of short-term absence is based on information from the ULF survey and measures whether or not the individual has been sickness absent during the last 14 days. To exclude the possibility that the short-term variable picks up long-term sickness absence, we require that individual has no registration of long-term absence.<sup>3</sup> Therefore, the sample size decreases (n=4258) when we regress short-term absence on body mass.

## *B. Independent variables*

### *1. Excess weight measures*

We measure normal weight, overweight and obesity using the Body Mass Index, based on self-reported height and weight. This paper relies on the WHO classification for the bounds of the different weight categories: normal weight  $18.5 \leq \text{BMI} < 25$ , overweight  $25 \leq \text{BMI} < 30$  and obesity  $\text{BMI} \geq 30$ .

### *2. Additional background variables*

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varies.

<sup>3</sup> By doing so, we also avoid labeling as healthy those individuals with registered long-term absence but with no short-term absence. However, it is of course possible to have both long and short absence spells during a year.



We control for individual age and age squared, marital status and cohabitation, first and second generation immigrant status. For women, we also include the number of children under the age of six, to control for pregnancy-related weight gain. The analysis also considers the educational level attained. There are four levels; primary school, two years of secondary school, more than two years of secondary school and higher education. In addition, we control for panel wave and region of residence.

In addition to sickness absence, we use a set of variables to control for health: self-assessed health, the degree of pain or discomfort because of a disease or diseases, a measure of mobility, daily smoking and financial stress. Self-assessed health is measured on a five-point scale in the 96/97 wave (the respondent is asked to assess his or her general health state according to the categorization “very good”, “good”, “in between good and bad”, “bad”, “very bad”) and on a three-point scale in the 04/05 wave (“good”, “in between good and bad”, “bad”). We construct a measure of self-assessed health using the latter three-point scale, incorporating assessments of “very good” and “very bad” health into the categories of “good” and “bad” health, respectively. In the ULF survey, the respondent is asked to state up to six diagnoses from which he or she suffers and to assess the pain or discomfort experienced because of each diagnosis. We use a measure that ranks the pain or discomfort across diagnoses according to a three-point scale, high, medium and low, based on the reported frequency and intensity of the pain or discomfort. The mobility variable describes whether or not the individual can run a short distance. The variable of financial stress describes whether or not the respondent has worried about his or her income for the following year.

We consider several aspects of work, aspects that studies on absenteeism identify as potentially driving factors (Johansson and Palme 2002; Barmby 2002; Ichino and Riphahn 2004). These aspects typically pertain to the work environment or tasks of the individual or to employment protection and other economic incentives for absence. We control for occupation (five socioeconomic classes; unskilled or skilled blue-collar worker, low-skilled, medium-skilled or

high-skilled white-collar worker), sector (public or private), industry (ten different industries according to the SNI 92 classification), the number of years working for the current employer and the national unemployment rate.

### *Descriptive statistics*

Tables A1 to A4 in the Appendix present the sample shares for men and women across BMI categories (using lags of body mass), labor market outcomes and absence. In the employment sample less than ten percent are obese. The share of employed among the obese is smaller compared to the group with normal weight and the share among obese women is smaller than that of obese men.

Looking next on the income sample, where only employed individuals are included, we observe, quite naturally, a smaller share of obese individuals. On average, obese men and women earn less than their normal weight peers, whereas overweight men earn more. Obesity is associated with more long-term absence, particularly for women. Obese women are also more short-term absent but not obese men.

## **4. Results**

### **4.1 Employment**

Throughout the analysis, we consider statistical significance at  $p < 0.05$ . Table 1 presents the effects of excess weight on the probability of employment participation for men. We observe a sizeable employment penalty related to poor health for obese men. However, the difference in employment probability between obese and normal weight men is insignificant. The raw estimate in model 1, controlling for age and BMI category, suggests that obese men are 6 percent less likely to be employed than normal weight men. Controlling for family characteristics, immigrant

status and region of residence (model 2) reduces the penalty to 5 percent.<sup>4</sup> Educational controls in model 3 decrease the employment penalty to 4 percent. When we add health measures to the specification (model 4), the estimated penalty virtually disappears.<sup>5</sup>

Compared to obese men, the employment penalty for overweight men is smaller and does not seem to be so closely related to health but, again, all estimates are insignificant. However, the raw employment penalty of 3.4 percent in model 1 is close to statistical significance. When we control for variations in educational attainment (model 3) the penalty decreases to 3 percent, while health controls (model 4) reduce it to 2 percent. Overall, we do not find any significant difference in employment probability between excess weight men and normal weight men. Specifically, our results do not imply discrimination of obese and overweight men.

**Table 1 about here**

Table 2 presents the regression results for excess weight women. We find that obese women experience an employment penalty that is primarily explained by variations in health. The raw estimate suggests that obese women are 10.5 percent less likely to be employed, compared to women with normal weight. The significant employment penalty decreases to approximately 10 percent when we control for family characteristics and immigrant status in model 2. When accounting for education (model 3), the employment penalty for obesity decreases to roughly 8 percent and is close to the limit of significance. Controlling for the health effect in model 4 produces an insignificant estimate of almost 2 percent.

In a (panel) fixed effect model obese women experience a penalty of 8.3 percent, near significance at the 5 percent level, after controlling for health. The result suggests, although

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<sup>4</sup> Controlling for the socioeconomic class of the parents does not make any marked difference to our results, neither for men nor for women.

<sup>5</sup> Students, conscripts, unemployed, self-employed and employed are entitled to benefits in the Swedish sickness insurance, homemakers and pensioners are not. Nevertheless, we have run controls for long-term and short-term sickness absence together with the other measures of health, finding that the results hardly change at all.

weakly, that obese women are discriminated against in the employment process. Due to a small sample size we are, however, not able to use lagged weight indicators in this model. Therefore, the seemingly large discrimination coefficient in the fixed effect model is probably caused by reversed causality. Thus, since reversed causality seems to give rise to a much larger bias than omitted variables do (after all, we explain the entire baseline obesity effect), and since data do not allow us to estimate a fixed effect model with lagged weight indicators, the paper do not pursue with the fixed effect model.

Overweight women experience a significant employment penalty amounting to 4.5 percent in the baseline model (see Table 2). After controlling for educational attainment (model 3), however, we observe an insignificant penalty of approximately 3 percent. Health controls in model 4 reduce the estimate to almost 2 percent. Thus, the association between excess weight and smaller employment probability among Swedish female employees appears to be related to lower productivity. Health is in focus when explaining the employment penalty for obese women while the penalty is insignificant for overweight women after accounting for education but before accounting for health. However, when running regressions controlling for health and education separately (i.e. adding health controls and education controls to model 2, respectively), we find that variations in health explains more of the penalty for both obese and overweight women. There is no evidence of discrimination against excess weight women.

**Table 2 about here**

## **4.2 Income**

Starting with the male results on income in Table 3, we find that obese men experience a significant income penalty, associated with other factors than discrimination. According to the baseline estimate, obesity is associated with a 16.5 percent lower income on average. Controlling

for family characteristics, immigrant status and region of residence in model 2 produces a significant income penalty for obesity amounting to nearly 14 percent. After controlling for educational attainment (model 3) we observe an income differential of 10.4 percent between obese and normal weight men. Model 4 adds controls for health limitations and sickness absence, including both long-term and short-term absence to model 3.<sup>6</sup> Health, in a wide sense, explains a large part of the penalty for obesity; we observe an insignificant penalty of 5.4 percent. Work aspects prove to be quite important too. Adding controls for employment characteristics to model 3, model 5 generates an insignificant income penalty of 4.5 percent. When we control health, including absence, and work in model 6, we observe that obese men earn on average 1.8 percent less annually than normal weight men, but the difference is statistically insignificant. Our results imply that obese men experience a considerable income penalty, which stems from a health-related productivity loss. We also observe a large impact of employment characteristics on the penalty, implying a sorting of obese men into jobs with lower annual income. However, given the type of employment, we do not find any indications of income discrimination against obese men.

For overweight men the significant baseline estimate suggests that they earn on average almost 4.5 percent less annually compared to normal weight men. However, additional controls eliminate the statistical significance. Furthermore, after considering the variation in education in model 3, the penalty disappears. An interesting result emerges whenever employment characteristics are included in the model specification: there is an income reward of nearly 3 percent for overweight men, near significance at the 5 percent level (see model 5 and model 6). To conclude, we find no indications of income discrimination against overweight men.

**Table 3 about here**

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<sup>6</sup> In this context, we momentarily relax the restriction of no long-term absence for the measure of short-term absence

Table 4 presents the regression results for excess weight women. We find that obese women earn on average significantly less than normal weight women and that the penalty is associated with lower productivity, primarily health. According to the baseline estimate, obese women experience a significant income penalty amounting to 9 percent. The penalty increases to over 10 percent in model 2. However, when controlling for education (model 3), we find an insignificant income penalty of nearly 6 percent. The estimate remains insignificant in subsequent models. Accounting for health (model 4) reduces the estimate to 1 percent, while controls for work characteristics (model 5) decrease the penalty to 3.6 percent. When applying the full specification (model 6), the penalty for obesity disappears. In addition, studying the separate effects of health and education on the income penalty we observe that health matters more than education for obese women, just as in the case of employment participation.

The income penalty for overweight women is insignificant across all models. The raw estimate implies that overweight women earn on average almost 3 percent less annually than normal weight women, an income differential that educational controls (model 3) erase. Adding health or work controls (models 4 and 5) do not change the result. Model 6 produces an insignificant estimate of almost 2 percent. Thus, there is no significant association between overweight and lower annual income for Swedish female employees. In other words, our analysis does not find any evidence of income discrimination, neither against obese nor against overweight female employees.

**Table 4 about here**

### **4.3 Sickness absence**

In contrast to other studies using absence from work (Atella et al. 2008; Sanz-de-Galdeano, 2007), we use both register data, offering an opportunity to study actual behavior, and self-

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to keep the sample size intact.

reported data on absence due to sickness. In addition, we separate between short and long absence spells, illustrating not only the severity of weight-related ailments and thereby the size of the productivity loss but potentially also the time preferences of excess weight employees.

### *Long-term absence*

We assume that our variable of long-term absence primarily reflects a health-related productivity loss rather than individual preferences for work or exertion. First, there is an association between long-term absence and marginalization (Bryngelson 2009), making long-term absence a relatively unattractive alternative to work. Second, control mechanisms in the insurance system, in particular the requirement of a physician's certificate asserting the medical grounds for absence, reduce the individual's influence on his or her labor market status.

A significant obesity effect after controlling for health may signal discrimination. However, if discrimination at work affects individual health negatively, e.g. causes a depression, sickness absence may be medically motivated. In that case we may mistake a discrimination effect for a productivity effect when controlling for health. We are not able to control for the diagnosis or diagnoses that motivate sickness absence but we have information on the respondent's chronic or long-term diseases, including psychiatric diagnoses such as depression. After inspecting our sample, we do not find any indication of obese or overweight individuals having more problems with their mental health than normal weight individuals. Instead, excess weight is primarily associated with diabetes, asthma and back pain.

Table 5 presents the results from regressing long-term absence on excess weight for men. We find that obesity increases the probability of absence on account of health limitations. The raw obesity estimate is positive significant, suggesting that obese men are over 9 percent more likely to be long-term absent than normal weight men. Controls for family characteristics, immigrant status and region of residence (model 2) explain only a fraction of the increased absence risk. After controlling for educational attainment (model 3), the estimate falls to 8

percent. Model 4 adds controls for health, generating an insignificant obesity effect to almost 3 percent. The increased propensity for long-term absence of obese male employees does not appear to primarily originate from circumstances related to their work life: In model 5, obesity is associated with a significant absence probability of just over 7 percent. Taking account both of individual health and of employment characteristics we observe an insignificant effect of 2.6 percent. To sum up, obese men are more likely to be long-term absent from work due to poor health. We find no indications of discrimination increasing the absence probability. This observation supports our earlier conclusion that the income differential observed between obese and normal weight men is related to variations in health.

Our results also indicate that overweight men are more likely to be long-term absent from work due to poor health. The positive and strongly significant baseline estimate implies an increased absence risk of 3.4 percent. Model 2 reduces the overweight effect to approximately 3 percent. Accounting for differences in education (model 3), produces an increased absence probability of overweight men amounting to 2.5 percent. Controlling for health (model 4) generates an insignificant overweight effect of 1.7 percent. We also observe that employment characteristics have a minor impact on the absence probability of overweight men; the effect is almost identical to the estimate generated in model 3. Adding health and work controls in the full specification (model 6) produces an insignificant overweight effect under 2 percent.

**Table 5 about here**

Table 6 shows the female results. Although the difference is insignificant, obesity is associated with a higher probability of long-term absence compared to normal weight women, originating from limitations in health. In all models where health controls are not included (models 1 to 3 and model 5), obese women in employment experience a 7-8 percent greater



likelihood of absence than their normal weight peers. However, controlling for individual health (model 4 and model 6) completely erases the difference. The estimates of overweight women are considerably smaller in size and insignificant across all model specifications. Intuitively, we expect both male and female excess weight, and obesity in particular, to be associated with increased health risks but we only observe significant effects in the male case. Quite possibly, the small sample size explains the large but insignificant estimates observed for obese women.

**Table 6 about here**

### *Short-term absence*

We consider short-term absence as an indication of minor health problems that motivate shorter absence spells (e.g. one or two days off at a time) but do not warrant longer absence spells (here, more than 28 consecutive days). Short-term absence could also serve as an indication of a high individual time discount rate, particularly when considering that the first seven days of sickness absence is a self-certification period. However, we cannot distinguish between the alternative interpretations.

According to the regression results for men in Table 7, there is no significant difference in the probability of short-term absence between excess weight and normal weight men. We observe very small estimates for obese men, while overweight is associated with a 1 percent increase in the absence probability across all models.

**Table 7 about here**

Similarly, we find that excess weight does not significantly increase the probability of short-term absence for women (see Table 8). However, the estimates are quite large, suggesting

that obese women are 4-5 percent and overweight women are 2 percent more likely to be absent.<sup>7</sup> Although statistically insignificant, we observe that the excess weight effects for women and men prove quite resilient to controls. The stability probably indicates that there is more to short-term absence and excess weight than our sample is capable of showing.

**Table 8 about here**

## 5 Discussion

According to our baseline estimate, obese men are 6 percent less likely to participate in employment but the difference is not significant. However, once employed there is a large significant income penalty for being obese. The baseline suggests that obese men earn on average 16.5 percent less annually than normal weight men, an income differential explained by differences in health. A higher male morbidity among obese employees may follow from the absence of an employment barrier. Our findings correspond well with those of Lundborg et al. (2010), who study BMI and income for Swedish men aged 28-38. The income penalty amounts to 18.3 percent at the baseline and disappears when they control for health as measured by physical fitness. However, we find that not only health but also employment characteristics matter. There is a sorting of obese men into low income jobs, a sorting that could indicate either lower productivity, due to bad health or some other productivity-related factor, or discrimination, or maybe both. This result contrasts with US findings that obese men select into jobs where they can offset the penalty for obesity (Págan & Dávila 1992). Overweight, on the other hand, does not seem to disadvantage men in the labor market. Only the raw income penalty of 4.5 percent is significant. Moreover, the penalty disappears when controlling for education. In conclusion, we

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<sup>7</sup> If we let the measure of short-term absence include observations of having registered long-term absence, thereby including the observations with both long-term and short-term absence, the male results remain more or less the same, while we get much larger estimates for women, both in size and in significance levels.

find no evidence of income discrimination against obese or overweight men in the Swedish labor market.

Obese women are 10.5 percent and overweight women 4.5 percent less likely to participate in employment, according to our baseline estimate. In addition, obesity, but not overweight, affects the income for female employees negatively. The baseline estimate implies that obese women earn on average 9 percent less annually. Interestingly, the income penalty is larger for men than for women, a result that differs from the general pattern found in the literature. Both employment and income penalties for women are associated with lower productivity, contrasting with a Danish study that attributes the penalties to discrimination (Greve 2008). We find that primarily health but also education matter for the obesity penalty both in the employment and in the income context. Our findings suggest that excess weight, particularly obesity, influences women's opportunities in the labor market quite early in life. A lower level of human capital investment may be the result of poor health. However, the direction of causality may be the reverse; lower education is generally associated with lower investment in health, possibly leading to obesity. The educational level of excess weight women could also signal a higher time discount rate. Observing an indirect wage penalty through education in the US, particularly for women, Han et al. (2009b) propose an alternative interpretation relating to the psychosocial situation and the self-esteem of the individual (see also Cawley 2004; Sargent and Blanchflower 1994).

The results on long-term sickness absence suggest that obese men experience a considerable production loss due to poor health, supporting our findings of a health-related income penalty for obesity. Considering the serious health risks associated with obesity, the positive relationship between excess weight and long-term absence is expected. However, we find that female excess weight has no significant effect on either long-term or short-term absence. On the other hand, the small sample size may be the cause to the large but insignificant estimates we observe for women. Nevertheless, when studying short-term absence an interesting pattern

emerges. Excess weight increases the probability of short-term absence for women, by 4-5 percent for obese women, while the effect for men is very small. Our results imply that there are behavioral differences between men and women in terms of sickness absence (see Broström et al. 2004), signaling gender-specific time preferences or maybe gender-specific psycho-social conditions at work (there may be less tolerance against variations in women's appearance). The results could also be a manifestation of gender-specific health investment. Research finds that women tend to invest more in their health and take more preventive action than men, potentially leading to more frequent sickness absence (Paringer 1983; Galdas et al. 2005).

## 6. Conclusions

In this paper we explore the penalty for excess weight, i.e. overweight and obesity, in the Swedish labor market, distinguishing between the productivity and discrimination hypotheses. The analysis shows that excess weight is associated with a significant employment penalty for women but not for men. Among employees, obesity is associated with a lower annual income for both genders. The penalties for excess weight are related to productivity; the primary source is poor health. The analysis of sickness absence confirms our findings on excess weight and labor market outcomes. Obese men are more likely to be long-term absent due to poor health, signaling lower productivity. We find quite large but insignificant obesity effects on long-term sickness absence for women. Additionally, there is no significant association between excess weight and short-term absence. In conclusion, we find no evidence of discrimination against men and women with excess weight in the Swedish labor market.

Compared to other studies on weight and labor market outcomes, we find the reverse gender pattern when analyzing income levels. Our findings on sickness absence also indicate that excess weight burdens men more than women, a relationship that differs from previous research on absenteeism. We identify a need for further studies on weight and gender in the Swedish labor market.

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## Appendix

**Table A1. Sample share and employment share across BMI categories**

BMI category (lag)	Men (n=3335)		Women (n=3202)	
	% sample	% employed	% sample	% employed
Normal weight	46	75	62	77
Overweight	45	73	30	76
Obese	9	70	8	65

**Table A2. Sample share and mean income across BMI categories**

BMI category (lag)	Men (n=2397)		Women (n=2332)	
	% sample	mean income (SEK)	% sample	mean income (SEK)
Normal weight	64	299500	77	217900
Overweight	31	308000	20	217000
Obese	5	275600	3	205600

**Table A3. Sample share and long-term absence share across BMI categories**

BMI category (lag)	Men (n=2397)		Women (n=2332)	
	% sample	% long term absence	% sample	% long term absence
Normal weight	64	5	77	12
Overweight	31	10	20	15
Obese	5	16	3	21

**Table A4. Sample share and short-term absence share across BMI categories**

BMI category (lag)	Men (n=2226)		Women (n=2032)	
	% sample	% short term absence	% sample	% short term absence
Normal weight	63	3	71	4
Overweight	34	4	23	5
Obese	3	2	6	8

## Tables

**Table 1. Employment and excess weight**

<b>Men (n=3335)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
obese	-0.0592 (0.0414)	-0.0508 (0.0406)	-0.0422 (0.0406)	0.00419 (0.0413)
overweight	-0.0342 (0.0185)	-0.0339 (0.0185)	-0.0271 (0.0186)	-0.0220 (0.0180)
R-squared	0.033	0.044	0.048	0.089

Notes: Linear probability models. Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05. The dependent variable measures whether or not the individual is (part time or full time) employed. Model 1 controls for lags of obesity and overweight (using lags of normal weight as reference), age, age squared and panel waves. Model 2 adds controls for marital status, cohabitation, for being first and second generation immigrant and for region of residence. Model 3 adds controls for educational attainment. Model 4 adds controls for self-assessed health, degree of pain or discomfort due to disease(s), mobility, smoking and financial stress.

**Table 2. Employment and excess weight**

<b>Women (n=3,202)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
obese	-0.105** (0.0449)	-0.0987** (0.0445)	-0.0789 (0.0426)	-0.0186 (0.0413)
overweight	-0.0451** (0.0201)	-0.0406** (0.0201)	-0.0330 (0.0200)	-0.0167 (0.0190)
R-squared	0.051	0.055	0.069	0.130

Notes: Linear probability models. Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05. The covariates are the same as in Table 1, except model 2 which also includes the number of children under the age of six.



**Table 3. Income and excess weight**

<b>Men (n=2397)</b>	1	2	3	4	5	6
obese	-0.165*** (0.0492)	-0.139*** (0.0489)	-0.104** (0.0476)	-0.0525 (0.0453)	-0.0450 (0.0371)	-0.0177 (0.0357)
overweight	-0.0446** (0.0210)	-0.0311 (0.0204)	0.00379 (0.0203)	0.00827 (0.0200)	0.0287 (0.0165)	0.0297 (0.0165)
R-squared	0.115	0.172	0.234	0.268	0.439	0.452

Notes: Linear regression models. Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05. The dependent variable measures the annual log labor market earnings (wages and transfers) of the employed individual. The baseline model controls for excess weight categories (using normal weight as reference) age, age squared and panel wave. Model 2 adds controls for marital status, cohabitation, first and second generation immigrant and region of residence. Model 3 adds controls for educational attainment. Model 4 adds controls for various health measures; self-assessed health, degree of pain or discomfort because of diagnosed disease(s), mobility, smoking, financial stress and sickness absence to model 3. Model 5 adds controls for occupation, sector, industry, part-time work, the number of years at current employer and for the yearly national unemployment rate. Model 6 adds controls for work-related factors, health and sickness absence to model 3.

**Table 4. Income and excess weight**

<b>Women (n=2332)</b>	1	2	3	4	5	6
obese	-0.0905** (0.0446)	-0.102** (0.0410)	-0.0596 (0.0381)	-0.0104 (0.0401)	-0.0360 (0.0340)	-0.00601 (0.0347)
overweight	-0.0278 (0.0204)	-0.0303 (0.0197)	-0.00749 (0.0176)	0.00767 (0.0176)	0.00880 (0.0150)	0.0178 (0.0151)
R-squared	0.121	0.181	0.273	0.281	0.487	0.485

Notes: Linear regression models. Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05. The covariates are the same as in Table 3, except model 2 which also includes the number of children under the age of six.

**Table 5. Long-term absence and excess weight**

<b>Men (n=2397)</b>	1	2	3	4	5	6
obese	0.0919** (0.0366)	0.0891** (0.0368)	0.0815** (0.0366)	0.0296 (0.0349)	0.0741** (0.0359)	0.0260 (0.0345)
overweight	0.0339*** (0.0123)	0.0314** (0.0123)	0.0251** (0.0124)	0.0173 (0.0116)	0.0246** (0.0123)	0.0182 (0.0115)
R-squared	0.020	0.027	0.033	0.143	0.047	0.150

Notes: Linear probability models. Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05. The dependent variable measures whether or not the employed individual was registered as absent due to illness during 28 consecutive days during a year. The baseline model controls for excess weight categories (using normal weight as reference), age, age squared and panel waves. Model 2 adds controls for marital status, cohabitation, for being first and second generation immigrant and for region of residence. Model 3 adds controls for educational attainment. Model 4 adds controls for various health measures; self-assessed health, the degree of pain or discomfort because of diagnosed disease(s), mobility, smoking and financial stress to model 3. Model 5 adds controls for occupation, sector, industry, part-time work, the number of years at current employer and for the yearly unemployment rate at the national level. Model 6 adds controls for both health and work-related factors to model 3.

**Table 6. Long-term absence and excess weight**

<b>Women (n=2332)</b>	1	2	3	4	5	6
obese	0.0797 (0.0469)	0.0807 (0.0468)	0.0730 (0.0471)	-0.00836 (0.0422)	0.0731 (0.0474)	-0.00702 (0.0425)
overweight	0.0172 (0.0188)	0.0153 (0.0188)	0.00983 (0.0189)	-0.00997 (0.0176)	0.00689 (0.0188)	-0.0114 (0.0177)
R-squared	0.008	0.012	0.018	0.162	0.028	0.168

Notes: Linear probability models. Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05. The covariates are the same as in Table 5, except model 2 which also includes the number of children under the age of six.

**Table 7. Short-term absence and excess weight**

<b>Men (n=2226)</b>	1	2	3	4	5	6
obese	-0.00408 (0.0163)	-0.00474 (0.0165)	-0.00618 (0.0165)	-0.0144 (0.0173)	-0.00593 (0.0167)	-0.0137 (0.0173)
overweight	0.0125 (0.00904)	0.0127 (0.00906)	0.0122 (0.00900)	0.0115 (0.00915)	0.0115 (0.00921)	0.0109 (0.00938)
R-squared	0.005	0.006	0.008	0.018	0.014	0.023

Note: Linear probability models. Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05. The dependent variable measures whether or not the employed individual was absent due to sickness during last 14 days. The baseline model controls for excess weight categories (using normal weight as reference), age, age squared and panel waves. Model 2 adds controls for marital status, cohabitation, for being first and second generation immigrant and region of residence. Model 3 adds controls for educational attainment. Model 4 adds controls for various health measures; self-assessed health, degree of pain or discomfort because of diagnosed disease(s), mobility, smoking and financial stress to model 3. Model 5 adds controls for occupation, sector, industry, part-time work, the number of years at current employer and for the yearly unemployment rate at the national level. Model 6 adds controls for both health and work-related factors to model 3.

**Table 8. Short-term absence and excess weight**

<b>Women (n=2032)</b>	1	2	3	4	5	6
obese	0.0468 (0.0325)	0.0479 (0.0329)	0.0488 (0.0329)	0.0396 (0.0337)	0.0525 (0.0331)	0.0434 (0.0337)
overweight	0.0210 (0.0127)	0.0221 (0.0129)	0.0223 (0.0129)	0.0204 (0.0128)	0.0231 (0.0126)	0.0214 (0.0126)
R-squared	0.009	0.012	0.013	0.026	0.024	0.036

Note: Linear probability models. Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05. The covariates are the same as in Table 7, except model 2 which also includes the number of children under the age of six.