Income, Obesity, and Gender:
Unraveling the Obesity Kuznets Curve

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Abstract

This study investigates the relationship between income, obesity, and gender, drawing from the concept of the Obesity Kuznets Curve (Grecu and Rotthoff, 2015). As nations experience economic growth, obesity levels initially rise with increasing income, peaking, and then subsequently decline. In the U.S., women exhibit higher obesity levels than men (Cooper et al., 2021), and the economic ramifications of obesity, particularly in terms of employer costs, disproportionately affect women (Kleinman et al., 2014). We demonstrate how disparity in obesity-related costs and outcomes contributes to the gender wage gap, using a salary negotiation ceiling.

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Key Words: Obesity's Wage Penalty, Gender Wage Gap, Obesity Kuznets Curve, Health Status

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I. Introduction

Hypothesized by Simon Kuznets (1955), the Kuznets curve describes the level of inequality in economies as they progress and develop. Suggesting that as economies develop, so does the level of inequality, which then begins to decrease after reaching a threshold level of development. Grecu and Rotthoff (2015) find that White Females in the United States show evidence of an Obesity Kuznets curve: as incomes rise, more resources are available to buy more food (increasing caloric intake and obesity), yet when incomes continue to rise, more value is placed on personal health causing people to decrease their obesity levels (though healthier, but more expensive, foods). Furthermore, this idea has been applied in other areas, such as Environmental Economics. These results are further supported in more recent literature where the results of Alola and Bekun (2021) "validat[ed] the obesity Kuznets curve hypothesis" And finding the existence of a global trend of an obesity Kuznets curve (Windarti et al., 2019).

In a separate strand of literature, a few studies have estimated the costs of employee obesity on the firm. Specifically, when employees are obese, healthcare costs (which are often paid for by the employer) increase. For example, Kleinman et al. (2014) indicate costs borne by the employer for hiring obese individuals (in three tiers of obesity) and other costs of Type 2 diabetes and hypertension.

Given that wages can be impacted by gender and by obesity levels (which can differ across genders), in this study we merge these two strands of literature: the cost of an employee being obese (Kleinman et al., 2014) with the impact of an Obesity Kuznets curve (Grecu and Rotthoff, 2015). When merging these two separate strands of literature, we can estimate the overall impact of obesity on wages. More specifically, estimate the potential impact of obesity on the gender wage gap. This happens as the obesity costs borne by the employer decrease the available wages that can be paid to the employee, and obesity impacts males and females differently.

A third strand of literature looks at the wage penalty of being an obese worker. Cawley (2004) estimates that obese white women who are two standard deviations above the mean (approximately 65

pounds) earn wages that are nine percent less than their non-obese counterparts. "[T]he equivalent wage effect of roughly one and a half years of education or three years of work experience." (page 451) Additionally, there is no statistical evidence for wage differences, as it relates to obesity levels, for other gender-ethnic groups.

The use of labor market outcomes for obese employees, their additional health care costs (borne by the employer), with the Obesity Kuznets curve, allow us to analyze the impact of health on the gender wage gap. Given the disproportional impact of these on white women, we find that obesity drives a greater difference in the gender wage gap over certain levels of income and obesity.

II. Kuznets Curves, Wage Impacts, and Health Care Costs

Obesity Kuznets Curve

Simon Kuznets (1955) theorized an inverted U-shaped curve for the relationship between growth and inequality. This was later named the Kuznets curve and has since been applied to pollution concentrations, particularly sulfur dioxide and smoke, as countries develop (Grossman and Krueger, 1991); nicknamed the Environmental Kuznets curve. Shafik (1994), also finds that the Kuznets curve holds for suspended particulate matter, ambient sulfur dioxide, annual deforestation, and total deforestation. Chen et al. (2019) also verified this environmental Kuznets curve for China. This theory has also been applied in health settings, first by Grecu and Rotthoff (2015), who find an Obesity Kuznets curve.

Wage Impacts

Recently, economics and health literature has begun to focus on the effect of health and health outcomes on the wages people can command, finding significant evidence that health impacts wages. However, the effect of health differences is not the same across all populations. For example, Cawley

(2004) estimates overweight white women earn 4.5 to 11.9 percent less than normal-weight women. A more recent study by Han et al. (2009) confirms these findings, overweight and obese white females face a 5 to 10.9 percent wage penalty. This is particularly insightful given that overweight males tend to command higher wages than their normal counterparts.

Health Care Costs

While obesity rates continue to rise, Keenan et al. (2001) find that differences in health between the workforce rarely lead to insurance plans price adjustments. The health literature also indicates that "average annual medical expenditures are $732 higher for obese than normal-weight individuals" (Bhattacharya and Bundorf, 2009). They also find that obese workers end up taking up the burden of their obesity through lower wages. However, more current research also indicates that employees incur losses, both in terms of payroll losses and lost productivity (Kleinman et al., 2014).

III. Merging the Literature

Tables 1-5 isolate employer obesity health costs and wage penalties, incurred by the firm (Kleinman et al., 2014 and Cawley, 2004). Table 1 demonstrates the differences between male and female costs at three different BMI levels. Table 2 lists the costs of Hypertension (HTN) and type-2 diabetes (T2DM) for both males and females. Tables 3 and 4, merge the costs of Obesity, with the costs of HTN and T2DM. Table 5, merges the literature on female wage penalties with obesity costs.

Tables 1-4

Grecu and Rotthoff (2015) find a curvilinear relationship between obesity and income, which peaks at $29,744 in total pre-tax income (or losses) from all sources for white females. With a BMI≥30. Kleinman et al. (2014) also find that average medical costs for employers for the same BMI group is $7,932 more than those females defined as not obese. Indicating that firms take on an additional $7,932 in

payroll costs a year for this BMI category. Cawley (2004) estimates white women earn 4.5 and 11.9 percent less than normal-weight women. A more recent study by Han et al. (2009) estimates this weight penalty at 4.5 and 11.9 percent. We can see that the salary of a BMI <27, $60,746 with an obesity cost of $5,302, totaling $66,048 in payroll costs. Subsequently, for BMI group 27≤BMI≤30, we can estimate their salary to be $58,012 with obesity costs of $5,946; thus, a total payroll cost of $63,959. We can construct a similar payroll cost for BMI>30, which includes hypertension. When adding the female payroll cost to the employer of $7,802, the total payroll costs are $69,252.

III. Outcomes

If we assume that an employer has $80,000 to spend on an employee, all in, then the amount of money that can go as a payment to the employee is what is left of that money after controlling for the obesity impact on their wages yields the following pay differentials across groups, listed in Table 5.

Tables 5 and 6

Due to the obesity Kuznets curve, in terms of payroll costs, women should become more attractive to an employer in terms of costs over time (as obesity falls). For HTN and T2DM, we can construct a similar weekly cost table. Males already command higher wages at BMI>30. Lee et al. (2019) indicate that Males have an increase in wages of 4.6% for every unit increase in BMI from the average.

Women become more competitive as they follow an obesity Kuznets curve. Comparing a male with a bachelor's degree and a BMI>30, with T2DM and HTM who would cost $2,044 as opposed to a female in the same category who costs $1,303. However, we know that females follow the Kuznets curves, so, as women continue to move down in the Kuznets curve, and men remain the same, the gap in payroll costs decreases, as well as the wages females can command. At BMI <27, females cost $1,267 in payroll costs and suffer no obesity wage penalties.

IV. Conclusion and Policy Implications

Driving women's wages above the threshold for obesity rates to fall (following the Obesity Kuznets curve) will not only drive women's wages up, but it will also lower the wage penalty they face for being obese. Thus, it will lower the costs to the firm for employing these women. As such, finding ways to increase health and lower obesity rates will also move towards closing the gender wage gap that we see today. Our findings underscore the need for targeted health campaigns, emphasizing the income outcome ramifications of obesity, across the entire population. However, it's clear that while women may be disproportionally affected by obesity in the workplace, all parties suffer from hidden costs.

We suggest that employers should be incentivized to introduce health programs, addressing the broader challenges of obesity – which would also allow them to address the gender wage gap potentially. Governments can amplify health awareness campaigns, leading to the benefits of growth and health and decreasing the gender wage gap. This study has limitations, and we encourage continued research on this topic.

Appendix (all in USD):

Table 1: Female and Male Employer Health Care Obesity Costs Pear Year

BMI	MALE	Female	Difference
BMI<27	3,648	5,302	-1,654
27≤BMI<30	4,248	5,946	-1,698
BMI≥30	5,471	7,932	-2,461

Table 2: Male and Female Health Care Costs Associated with Obesity (HTN & T2DM)

	Male	Female	Difference
HTN/DL	5,982	7,802	-1,820
T2DM	8,817	10,866	-2,049

Table 3: The difference in Male and Female Obesity Health Costs with HTN Per Year, (Assuming BMI <27 does not have HTN)

BMI	MALE	Female	Difference
BMI<27	3,648	5,302	-1,654
27≤BMI<30	10,230	13,748	-3,518
BMI≥30	11,453	15,734	-4,281

Table 4: The difference in Male and Female Obesity Health Costs with T2DM

BMI	MALE	Female	Difference
BMI<27	12,465	16,168	-3,703
27≤BMI<30	13,065	16,812	-3,747
BMI≥30	14,288	18,798	-4,510

Table 5: Merging the Literature on wages, wage impacts, and healthcare costs (in $, $, %, $, $, $)

BMI	Female Wage	Male Wage	Female Obesity Wage Penalty	Female Salary with Wage Penalty	Male Obesity Wage Cost	Female Obesity Costs
BMI < 27	60,746	78,840	0	60,746	3,648	5,302
27≤BMI<30	60,746	78,840	4.5	58,012	4,248	5,946
BMI≥30	60,746	78,840	11.9	53,517	5,471	7,932

Table 6: Male Obesity Costs in Relation to an Employers Salary Budget

BMI	Base Budget	Obesity Cost Male	Obesity Cost Female	Male Negotiating Ceiling	Female Negotiating Ceiling	Difference
BMI < 27	80,000	3,648	5,302	76,352	74,698	1,654
27≤BMI<30	80,000	4,248	5,946	75,752	74,054	1,698
BMI≥30	80,000	5,471	7,932	74,529	72,068	2,461
27≤BMI<30 + HTN	80,000	10,230	13,748	69,770	66,252	3,518
BMI≥30 + HTN	80,000	11,453	15,734	68,547	64,266	4,281
27≤BMI<30 + HTN + T2DM	80,000	19,047	24,614	60,953	55,386	5,567
BMI≥30 + HTN + T2DM	80,000	20,270	26,600	59,730	53,400	6,330

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