Obesity and Income:
The impact of the Obesity Kuznets Curve on the Gender Gap

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Abstract

Simon Kuznets (1955) theorized that while countries develop, they have natural cycles that increase economic inequality, up to a certain point, which then cycles back downward, lowering economic inequalities. This pattern has been applied to environmental studies, and more recently health economics. Findings of an obesity Kuznets curve (Grecu and Rotthoff, 2015) indicate that as incomes rise, a subset of the population follows an Obesity Kuznets curve (in their case, white Females). Obesity levels in the United States are higher in women than in men (Cooper et al., 2021). Additionally, Kleinman et al. (2014) found that the costs of obesity to employers are higher for women than men, which leads to a plausible outcome where a portion of the gender wage gap is being driven by differences in the levels of obesity, which are estimated in this study.

JEL: I1, D1
Key Words: Obesity, Gender Gap, Kuznets Curve

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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. Particularly pointing out the fact that as economies develop, so too does the level of inequality, which then begins to decrease after reaching a threshold level of development. Furthermore, this idea has been applied in other areas, such as Environmental Economics and in Health Economics. 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).

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 there are costs to both employee obesity (in three tiers of obesity) on the employer and other costs of Type 2 diabetes and hypertension.

Given that wages can be impacted by gender, and also impacted 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 are able to 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 to the firms that employ them, with the Obesity Kuznets curve, allow us to analyze the impact of health on the gender wage gap between women and men across these different groups over different wage levels. Given the disproportional impact of these three impacts on white women, we find that obesity drives a greater difference in the gender wage gap over certain levels of income and obesity.

II. The impact of the Kuznets Curves, Wage Impacts, and Health Care Costs

Obesity Kuznets Curve

Simon Kuznets (1955) first theorized that as countries develop, they follow a natural cycle of an increase in inequality, followed by a decrease in inequality once incomes reach a certain unspecified threshold. This phenomenon (later proven to not hold for inequality), was named the Kuznets Curve. This inverted U-shaped relationship between growth and inequality was later developed to describe the behavior of pollutant concentrations, particularly sulfur dioxide and smoke, as countries develop (Grossman and Krueger, 1991). This U-shaped relationship, when it comes to environmental economics, has been named the Environmental Kuznets curve. Shafik (1994), also finds that the Kuznets curve holds for suspended particulate matter, ambient sulfur dioxide, annual deforestation, as well as total deforestation.

The application of the Kuznets curve has recently also been applied to describe population health outcomes. Rotthoff and Grecu (2015) find that an Obesity Kuznets curve exists for white females in the United States.

Wage Impacts

There is a plethora of factors that may impact wage levels. Differences in Education, job tenure, socioeconomic backgrounds, and gender have all been studied extensively as having correlative effects on wages. 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 does have a wage impact. However, the effect of health differences is not the same across all populations. For example, Cawley (2004) estimates overweight white women earn 4.5 and 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 have a 5 and 10.9 percent loss in hourly wages due to obesity. This is particularly insightful given that overweight males tend to command higher wages than their normal counterparts.

Health Care Costs

While obesity continues to rise, and differences in health between the work force change, health insurance plans are rarely adjusted for obesity and other health characteristics (Keenan et al., 2001). 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 health costs incurred by the firm. 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.

Table 1: Female and Male Employer Health Care Obesity Costs Pear Year (In USD)

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) (in USD)

	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 (in USD), (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 (in USD)

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

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 addition $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) estimate 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.

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

Since White Females follow an obesity Kuznets curve and males do not, 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.

This makes women even 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 fall 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

Driving women's wages up above the threshold that obesity rates fall (as found in Grecu and Rotthoff, 2015) will not only drive women's wages up, but it will also lower the wage penalty they face from 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.

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