WAGE AND OBESITY: A NEW LOOK INTO THE GENERATION Y

Guanlin Gao, Chaminade University of Honolulu Bo Liu, Southern New Hampshire University Yiwen Yu, Indiana University South Bend

ABSTRACT

This research study employs the most current data from NLSY97 to examine the correlation between weight and wage for females of Generation Y. A fixed-effect model is used to analyze how weight and other factors are associated with the hourly compensation of young female workers. Results of this study show that being heavier in weight does not reduce an individual's wage. Factors such as having more years of education and work experience, holding a union job, as well as marriage and motherhood are positively related to the wage of females of Generation Y. **JEL Classification:** J31, J71

INTRODUCTION

According to reports from the Centers for Disease Control and Prevention (CDC), by the year of 2014, 70.7% of the United States adult population is overweight, with 32.8% of them being obese or extremely obese. On the aggregated level, the estimated expenditure on obesity-related health care is 109.2 billion US dollars (Cawley & Meyerhoefer, 2012). On the individual level, being overweight or obese not only leads to serious health problems and higher medical costs but also associates to other negative consequences in life such as potential social stigma and discrimination in the labor market.

Previous research studies have found that overweight and obese individuals suffer a wage penalty. This phenomenon was discovered in the US labor market (for example, Register & Williams, 1990; Baum & Ford, 2004; Cawley, 2004; Fikkan and Rothblum, 2012) as well as in Canada (Larose et al, 2016), the United Kingdom (Kinge, 2016), Germany (Kropfhäußer & Sunder, 2015; Caliendo & Gehrsitz, 2016), and other European countries (Brunello & D'Hombres, 2007). Furthermore, researchers have found that overweight and obese women are more likely to experience a higher wage penalty compared to their male counterparts. For example, using data from the National Longitudinal Survey of Youth 1979 (NLSY79), Baum and Ford (2004) have found that obese workers suffer a wage penalty for a long time in their careers in the US labor market. Moreover, obese females receive a higher wage penalty compared to males, ceteris paribus. Cawley (2004) has found a consistent significant

negative weight-wage effect for overweight and obese white females while using all the weight-height measurements including BMI, weight and height ratio, and clinical weight classifications. Sabia and Rees (2012) draw the same conclusion that the wage penalty only exists for heavier white females using an alternative dataset from the National Longitudinal Study of Adolescent Health. Furthermore, researchers have attempted to identify the source of this inverse weight-wage relationship. For example, DeBeaumont (2009) includes occupation categories in the regression model to explain the weight-wage effect and has found that overweight women in sales and service occupations receive lower wage payment as a result of customer discriminations. Judge & Cable (2011) find that there is a positive linear relationship between thin and wages for women, and lean women suffer from a wage decrease the most when they gain weight and move from the underweight to the normal weight category. They claim that media cultivation could explain this weight-wage stigma. Han et al. (2009) have also found that the wage penalty is larger for heavier workers whose job requires social interactions. Besides, they claim that the weight-wage relationship is racespecific and the wage penalty does not apply to African Americans.

We believe this weight-wage issue worth a revisit because all the previous studies draw their conclusions based on NLSY79 or other datasets focusing on the same age cohort. In the recent decades, the social expectations of women have changed and so are the directions of media cultivation. As people from the NLSY79 cohort, who were born between the years of 1957-1964 gradually phase out of the labor force, a new generation is entering the labor market, the Generation Y. Dataset tracking this new cohort who were born between the years of 1980-1984 from their teens to thirties is available in the National Longitudinal Survey of Youth 1997 (NLSY97). This research study uses the most current data from NLSY97 to study the correlation between weight and wage for females of Generation Y. A fixed-effect model is employed to examine the weight-wage relationship as well as how other factors determine the hourly compensation of female workers. Results of this study show that being overweight, obese or extremely obese does not reduce an individual's wage, regardless of her job type. Factors such as having more years of education and work experience, holding a union job, being married or have been married, having and raising children are positively related to one's wage.

This paper contributes to the current literature by providing a fresh look at the weight-wage relationship among females of Generation Y in the US labor market. In contrast to previous research studies, there is no evidence found for the weight-wage penalty among females of Generation Y. To the best of our knowledge, Majumder (2013) is the only existing research examining the same issue using data from NLSY97. This research study further extends Majumder (2013) to include more rounds of observations and additional explanatory variables including employer-based health plans, job types, and the interaction terms between one's weight and job type to identify the possible sources of weight-wage discrimination. Results of this study provide further evidence that working females of Generation Y seem to no longer face the weight-wage penalty.

The rest of this paper proceeds as follows. The next section describes the data. Section 3 introduces the empirical model, and Section 4 presents the regression results. Section 5 offers concluding remarks.

DATA

The dataset employed in this research is obtained from the National Longitudinal Survey of Youth 1997 (NLSY97) from the United States Bureau of Labor Statistics. This dataset consists a representative sample of the population in the United States born between the years of 1980-1984. The interviews were first conducted in 1997 and continued annually until 2011 and then biannually afterward. All 17 rounds of data starting from the year of 1997 to the year 2015 are included in this study.

Only the observations of female respondents who were employed at the time of the interview are utilized to match the scope of this research study. Since the data in NLSY97 is solicited via self-reported surveys, it contains missing values due to noninterview, valid or invalid skip of a question, and other reasons. To obtain a balanced panel data, the missing values are cleaned and imputed in the following way except for the weight and height variables: the missing value of a variable in a specific year is interpolated as the average of the sum of that variable in the previous year and the following year, if the values of both of these years exist and are the same. For example, if a person lives in the same core-based statistical area (CBSA) in year t-1 and year t+1 while that value in year t is missing, then it is assumed that in year t the person also lives the same core-based statistical area. An observation is treated as missing if it is impossible to interpolate its value according to this rule stated above. For example, if a person lives in a CBSA in year t-2 and year t+1 while those observations in year t-l and year t are missing, then the observations in year t-l and t are treated as missing values. Regarding the weight variable, all the observations of an individual are excluded if any of the values of her weight variable in the year 1997 or 2015 is missing because it is impossible to interpret the initial value or the ending value of a person's weight. If any of the values of the weight variable of an individual is missing in between the years of 1997 and 2015, the missing value is imputed by linear interpolation, i.e., replacing the missing value with the average value of the year before and after. Furthermore, subject observations with a weight lighter than 50 pounds and heavier than 998 pounds are excluded, which in total count as 1% of the sample. For the height variable, observations with a missing initial value in the year 1997 are dropped while the observations with missing values in other years are interpolated and replaced by the average of the values of the year before and after if the individual was younger than 25 years old at the time of the interview. For adult respondents who were 25 years old or above at the time of the interview, their missing height values are replaced with their latest reported height. Observations with a height smaller than 40 inches are excluded, which in total count as 1% of the sample. Also, females who were pregnant or had a newborn within six months of the interview date are excluded because pregnancy and childbearing usually affect women's body weight as well as their labor supply decisions at the same time. Females who were enrolled in schools as full-time students or serving the military during the time of the interview are also excluded from the data. Variables such as subject's self-reported mental health condition, the type of work and the amount of work the subject is limited to do due to health reasons, the usage of illegal sustenance such as marijuana and cocaine, or any sick leave the subject took in the past month are excluded from the dataset because these variables contain numerous missing values. Also, the age variable is not included in the regression model because there is a small variance in this variable among the cohort.

The dataset contains a total of 25,825 observations with a sample size of 4,098 females. Table 1 provides the descriptive statistics of all the variables. Among our sample, 49.18% are White, 27.22% are African American, and the rest of the 23.60% are Hispanic or other races. The *Hourly compensation* variable is the hourly monetary compensation a respondent receives from her primary job. This variable is truncated between 1 dollar and 1,000 dollars. The Employer health plan is a binary variable equal to one if the respondent purchases her primary health plan policy from her current or previous employer and zero otherwise. *Union* is a binary variable which equals to one if the respondent's primary job is covered by a contract that is negotiated by a union or employee association and zero otherwise. Self-employed is a binary variable equal to one if the individual is self-employed and zero otherwise. White collar is a binary variable equal to one if the respondent holds a white-collar type of job which requires interpersonal relationship and social interactions, including jobs in retail trade, management, entertainment, etc. This variable equals to zero if the respondent holds a blue-collar type of job which does not require frequent social interactions, such as jobs in agriculture, mining, manufacturing, etc. This White collar variable is computed based on the 2002 Census Industrial and Occupational Classification Codes. The Work experience variable describes an individual's related work experience measured in years. Several variables are included as indicators of an individual's health condition, such as the Body Mass Index (BMI), clinical weight classifications (Underweight, Healthy weight, Overweight, Obese, and Extremely obese), the number of days an individual smoked a cigarette (Smoke days) and the number of days she consumed more than five drinks (*Drink days*) in the past 30 days of the interview date.

The BMI variable is computed from individual's height and weight using the formula BMI = (Weight in kilograms) / (Height in meters)². This variable is truncated to exclude outliners smaller than 10 and larger than 50. Underweight, Healthy weight, Overweight, Obese, and Extremely obese are binary variables describing a person's body type based on the clinical weight classifications. An adult is considered as underweight with a BMI less than 18.5 and overweight with a BMI equal or larger than 25. A person is considered as obese if her BMI is equal or larger than 30 and extremely obsess if her BMI is equal or larger than 40. In our sample, the percentages of females being overweight, obese, or extremely obese are 24.40%, 20.27%, and 5.23%, respectively. The number of females who belong to the healthy weight category (18.5 \leq BMI \leq 25) counts as 45.90% of the sample, and that number of the underweight category counts as 3.05%. No high school, High school, College/ Associate degree, and Graduate/Professional degree are binary variables describing an individual's highest degree obtained at the time of the interview. The regression model also includes personal characteristics, such as marital status (Never married), parental status (# of Bio children in hh), and residential status (Region and CBSA). The binary variable Never married equals to one if the individual has never married and zero otherwise. # of Bio children in hh shows the number of biological children living in the household. The variable Region describes in which census region the individual lives, including Northeast, North Central, South, and West. The binary variable CBSA equals to one if a person lives in a core-based statistical area, which is defined as an urban city with more than 10,000 people and the adjacent socioeconomically-tied counties and zero otherwise.

EMPIRICAL MODEL

The following empirical model is estimated to examine the correlation between weight and wage for women of Generation Y in the US labor market:

$$ln(Y) = \beta_0 + B_1 Weight + B_2 X + B_3 U + B_4 V + B_5 Z + \varepsilon_{ii}$$
(1)

The dependent variable ln(Y) is the logarithm of hourly compensation an individual receives from her primary job. This variable includes base pay, bonuses, commissions, and overtime, etc. A person's primary job is defined as a full-time job which requires no less than 30 hours work per week. If an individual holds more than one job at the same time, the primary job is defined as the job at which the individual works the most hours; and if the hours worked are the same, the primary job is the one with the earliest start date.

The independent variables include factors measuring an individual's weight, general health condition, occupation, education, and personal characteristics. Two separate measurements, BMI and clinical weight classifications are used measure the Weight variable. While B₁, the coefficient of BMI measures the linear correlation between weight and wage in the former model specification where BMI is used as a measurement of weight, in the latter model specification where the clinical weight classifications is used as a measurement of weight, B₁ is a group of coefficients that measure the wage gap between different weight groups. X is a vector of variables measuring individual's general health condition except for weight or body type. These variables include an individual's cigarette and alcohol consumptions in the past 30 days of the interview date. Variables such as the use of illegal drugs or other variables depicting one's physical and mental health conditions are not included because these variables contain numerous missing values which cannot be interpolated. U is a vector of variables measuring an individual's occupation status, including one's work experience, the squared term of work experience, self-employment status, and variables describing if the individual's job is covered by a contract that was negotiated by a union or employee association, if the individual holds employer-based health insurance plan, and if the individual holds a white-collar job. If there is employerbased weight discrimination due to the concern that heavier weight is associated with poor health condition and lower work productivity, the coefficient of the Employer health plan variable should be negative and significant for those who purchase their health insurance plans through their employers. If there is customer-based weight discrimination due to appearance, the coefficient of the job type variable White collar should be negative and significant for females whose job requires social interactions with customers. V is a vector of variables measuring personal characteristics including marital status, the number of biological children in the household, education level, and residential status. Model (1) also includes a group of interaction terms between weight category and job types, which is captured by the vector of variables Z. ε_{ii} is the error term, where i denotes the individual and t denotes the year of the interview. This fixedeffect model controls for the time-invariant unobserved individual heterogeneity. Results of the regression analysis are presented in the next section.

RESULTS

Regression results of various model specifications of Model (1) are shown in Table 2 and Table 3. Table 2 presents the results where the weight variable is measured by the clinical weight classifications using healthy weight as the default group. Results show that across different model specifications, underweight women either make the same wage, as shown in Table 2 Column (1) and (2), or they make 23.7% to 23.9% less compared to their normal weight counterparts, as shown in Table 2 Column (3) and (4). These results are significant at the 5% level. Being overweight, obese, or extremely obese seems to either have a null effect or positively relate to wage. Furthermore, only one of the interaction terms of weight category and job type, Underweight* White collar in Column (4) is positive and significant at the 10% level, which implies that there is a wage-penalty for underweight females who hold white-collar jobs. In other words, these results show that there is little evidence for customer-based work discrimination for heavier women. Besides, it is found that the coefficients of the Employer health plan variable across all model specifications are either insignificant or have positive signs. This finding implies that if an individual purchased her primary health plan policy via her current or previous employer, either it has a null effect or it is positively related to her wage. Therefore, there is evidence found for employer-based wage discrimination. These results are consistent with Majumder (2013).

Results of this study also show that having more years of education significantly increases the hourly compensation received by an individual, holding all other things equal. Although there is no statistically significant difference in wage between those high-school dropouts and those who finished high school, the wage gap between high-school dropouts and those who have a college or associate degree ranges from 11.8% to 12.8%, holding everything else equal. This wage difference is even larger for those females with a graduate or professional degree, which is 28.0% to 30.8% higher compared to high-school dropouts. All these results are significant at the 1% level. Work experience also plays a positive role in increasing one's wage. Holding everything else constant, having one more year of related work experience increases the hourly compensation by 3.23% to 5.47%, and these results are significant at the 1% level. Holding a union job increases one's hourly compensation by 3.04% to 4.16% across different model specifications, and all these results are significant at the 1% level as well. There is no significant difference in the hourly compensation for individuals living in different regions of the country or being a resident of a core-based statistical area (CBSA). An interesting note is that being self-employed, never married, and not having or raising children are negatively associated with the wage of females of Generation Y. Moreover, holding a white-collar job seems to be inversely related to one's wage. However, this result may be due to the limited number of females holding blue-collar jobs in our sample (about 7.7% of the sample size). Furthermore, the results show that the coefficients of the number of days an individual smoked or drank in the past 30 days of the interview date are either insignificant or positively related to wage with small magnitude. Nevertheless, there is no causal interference of these coefficients.

Table 3 shows the regression results when the weight variable is measured by BMI. The coefficient of the *BMI* variable captures the relationship between wage and a marginal change in one's BMI. Results of this model specification confirm our findings in Table 2 that there is a positive relationship between wage and weight.

Besides, same results are found that having more years of education and related work experience positively impact one's wage, as well as holding a union job. The signs of these coefficients do not change when robustness check is performed with both unclustered and clustered errors at the individual level and for different race groups. Regression analysis using data from the year 2004-2015 are also conducted in which all respondents are over the age of 20. The regression results show that using abbreviated years only changes the magnitude of the coefficients but not the signs. These results are available upon request.

CONCLUSION

This research study uses a fixed-effect model to analyze the relationship between weight and wage for females of General Y. We did not find any wage penalty, and neither did we find any evidence for employer-based discrimination or customer-based discrimination on heavier females. Results of this study show that there are positive returns to education and related work experience. Besides, holding a union job is associated with a higher wage, holding everything else equal. Being married and raising children seem to not have an adverse impact on wage for females of General Y.

It is noteworthy that our findings reflect the relationship between weight and wage without any causal inference. One possible extension for future research is using family member's BMI as an instrumental variable to identify the causal relationship between one's weight and wage (for example, Sabia & Rees, 2012). Also, results of this study are based on a sample of females who were employed at the time of interview. It does not apply to those females who were searching for a job or not in the labor force. Neither does our results imply or predict how weight influences employer's hiring decisions. These topics are worth studying in future research as well.

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TABLE 1: DESCRIPTIVE STATISTICS

VARIABLE	Obs	Mean	Std. Dev.	Min	Max
Demographic					
White	28,825	0.49183	0.4999419	0	1
Black	28,825	0.2721596	0.4450793	0	1
Others	28,825	0.2360104	0.424636	0	1
Employment					
Hourly compensation	28,825	18.15365	29.03993	1	1000
Employer health plan	14,488	0.5896604	0.4919123	0	1
Union	28,825	0.1101308	0.2422717	0	1
Self-employed	19,421	.0322331	.1766233	0	1
White collar	18,706	0.923447	0.2658879	0	1
Work experience	28,825	2.204082	2.170352	0	21.73077
Health Condition					
BMI	28,492	26.75572	6.540991	11.14656	49.99601
Underweight (BMI < 18.5)	28,825	0.0304597	0.1718514	0	1
Healthy weight $(18.5 \le BMI \le 25)$	28,825	0.4589766	0.4983229	0	1
Overweight $(25 \le BMI < 30)$	28,825	0.2440243	0.4295146	0	1
Obese $(30 \le BMI \le 40)$	28,825	0.2026713	0.4019966	0	1
Extremely obese $(BMI \ge 40)$	28,825	0.0523157	0.2226668	0	1
Smoke days	28,825	18.54179	7.22364	0	30
Drink days	28,825	5.477352	4.82008	0	30
Education and Work					
Experience					
No high school	27,865	0.2002512	0.4001955	0	1
High school	28,825	0.5430009	0.4981561	0	1
College/Associate degree	28,825	0.1938942	0.3953538	0	1
Graduate/Professional degree	28,825	0.0362186	0.1868368	0	1
<u>Personal</u>					
Characteristics					
Never married	28,825	0.6402428	0.4799374	0	1

# of Bio children in hh	28,825	1.584657	0.6956983	0	8
Region	25,268	2.710385	0.9847171	1	4
CBSA	25,254	0.9386632	0.2399519	0	1

TABLE 2: REGRESSION RESULTS USING CLINICAL WEIGHT CLASSIFICATIONS AS A MEASUREMENT OF WEIGHT

VARIABLES	(1)	(2)	(3)	(4)
Underweight	-0.0337	-0.0342	-0.237**	-0.239**
	(0.0338)	(0.0338)	(0.115)	(0.115)
Overweight	0.0218*	0.0215*	0.0822*	0.0812*
	(0.0127)	(0.0127)	(0.0468)	(0.0468)
Obese	0.0601***	0.0588***	-0.0225	-0.0246
	(0.0174)	(0.0174)	(0.0570)	(0.0570)
Extremely obese	0.0543**	0.0540**	0.0448	0.0435
	(0.0195)	(0.0195)	(0.0644)	(0.0644)
Union	0.0411**	0.0416**	0.0304*	0.0308*
	(0.0174)	(0.0174)	(0.0181)	(0.0181)
Work experience	0.0547***	0.0546***	0.0323***	0.0323***
	(0.00391)	(0.00391)	(0.00414)	(0.00413)
Work experience ²	-0.00185***	-0.00186***	-0.000159	-0.000170
	(0.000341)	(0.000341)	(0.000362)	(0.000362)
Self-employed	-0.180***	-0.181***	-0.0323	-0.0336
	(0.0335)	(0.0335)	(0.0382)	(0.0382)
High school	0.0459	0.0443	0.0457	0.0439
	(0.0368)	(0.0368)	(0.0440)	(0.0440)
College/Associate	0.121***	0.118***	0.128***	0.125***
degree	(0.0404)	(0.0404)	(0.0472)	(0.0471)
Graduate/ Professional	0.284***	0.280***	0.308***	0.303***
degree	(0.0459)	(0.0459)	(0.0524)	(0.0524)
White collar			-0.112***	-0.112***
			(0.0350)	(0.0350)
Underweight* White	e collar		0.0919	0.228*
Č			(0.120)	(0.120)
			()	()

Overweight* White collar			0.0228	-0.0537
			(0.0475)	(0.0475)
Obese* White collar			0.0803	0.0814
			(0.0571)	(0.0570)
Extremely obese* V	Vhite collar		-0.000233	-0.00961
•			(0.0822)	(0.0822)
Never married	-0.107***	-0.107***	-0.126***	-0.125***
	(0.0145)	(0.0145)	(0.0158)	(0.0158)
# of Bio children in hh	0.0499***	0.0496***	0.0431***	0.0432***
	(0.00867)	(0.00867)	(0.0116)	(0.0116)
CBSA	-0.0548	-0.0544	-0.0223	-0.0213
	(0.0376)	(0.0376)	(0.0439)	(0.0439)
Region	-0.00118	-0.00157	-0.00704	-0.00759
	(0.0131)	(0.0131)	(0.0146)	(0.0146)
Smoke days		0.000886		0.00136*
		(0.000659)		(0.000747)
Drink days		0.00215**		0.00227**
		(0.000875)		(0.000969)
Employer health plan	0.000754	0.000337	0.0683***	0.0678***
-	(0.0116)	(0.0116)	(0.0126)	(0.0126)
Constant	2.618***	2.594***	2.658***	2.624***
	(0.0633)	(0.0645)	(0.0829)	(0.0840)
Observations	14,377	14,377	11,612	11,612
R-squared	0.081	0.081	0.081	0.082
Number of pubid	3,627	3,627	3,246	3,246

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

TABLE 3: REGRESSION RESULTS USING BMI AS A MEASUREMENT OF WEIGHT

VARIABLE	(1)	(2)	(3)	(4)
BMI	0.00721***	0.00716***	0.00654***	0.00651***
	(0.00145)	(0.00145)	(0.00247)	(0.00247)
Union	0.0389**	0.0394**	0.0293	0.0296
	(0.0175)	(0.0175)	(0.0182)	(0.0182)
Work experience	0.0536***	0.0536***	0.0308***	0.0308***
	(0.00394)	(0.00394)	(0.00418)	(0.00418)
Work experience ²	-0.00184***	-0.00185***	-0.000134	-0.000150
	(0.000345)	(0.000345)	(0.000367)	(0.000367)
Self-employed	-0.167***	-0.168***	-0.0536	-0.0552
	(0.0341)	(0.0341)	(0.0385)	(0.0384)
High school	0.0466	0.0450	0.0461	0.0444
	(0.0368)	(0.0368)	(0.0440)	(0.0440)
College/Associate	0.120***	0.117***	0.127***	0.124***
degree	(0.0405)	(0.0405)	(0.0472)	(0.0472)
Graduate/Professional	0.283***	0.279***	0.307***	0.302***
degree	(0.0460)	(0.0460)	(0.0525)	(0.0525)
White collar			-0.117***	-0.117***
			(0.0280)	(0.0280)
Underweight* White co	ollar		0.0113	0.0113
			(0.0426)	(0.0426)
Overweight* White col	llar		0.0163	0.0163
			(0.0162)	(0.0162)
Obese* White collar			0.0294	0.0289
			(0.0269)	(0.0269)
Extremely obese* Whi	te collar		-0.0132	-0.0132
-			(0.0449)	(0.0449)
Never married	-0.104***	-0.104***	-0.123***	-0.123***
	(0.0146)	(0.0146)	(0.0159)	(0.0159)
# of Bio children in	0.0504***	0.0501***	0.0434***	0.0434***
hh				
	(0.00883)	(0.00883)	(0.0118)	(0.0118)
CBSA	-0.0568	-0.0569	-0.0281	-0.0274

	(0.0382)	(0.0382)	(0.0444)	(0.0444)		
Region	-0.00471	-0.00511	-0.00844	-0.00896		
	(0.00985)	(0.00985)	(0.0113)	(0.0113)		
Smoke days		0.000956		0.00148**		
		(0.000665)		(0.000756)		
Drink days		0.00214**		0.00228**		
		(0.000880)		(0.000977)		
Employer health plan	0.00501	0.00459	0.0722***	0.0716***		
	(0.0117)	(0.0117)	(0.0127)	(0.0127)		
Constant	2.452***	2.428***	2.508***	2.472***		
	(0.0740)	(0.0751)	(0.103)	(0.104)		
Observations	14,185	14,185	11,478	11,478		
R-squared	0.081	0.082	0.081	0.082		
Number of pubid	3,609	3,609	3,228	3,228		
Standard arrays in paranthagas						

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1