Happiness and Overweight:
Panel data analysis on the differences between Male and Female

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Globalization of slimming norm tends to spread the perception that being fat is a source of unhappy especially for the case of female. This paper examines the association between overweight and happiness using global parallel panel data and compares the differences between male and female. Using generalized least squares to estimate the fixed effect panel data models, the empirical results show that happiness increases with percentage of overweight. Happiness tends to make people grow plump for both male and female. Increase in GDP per capita increases the percentage of overweight in a country and the effect is higher for male than female. Social support increases the percentage of overweight in low/middle income countries but reduces the percentage of overweight in high income countries for the case of female. Life expectancy increases the proportion of overweight but it is significant only for the case of male. Overweight and positive affect are negatively related and the impact is higher for male than female. Negative affect are positively associated with overweight. The association between happiness and overweight for female in high income countries tends to exhibit a different pattern in comparing with low or middle income countries.

1. Introduction

Advertisements for slimming products/service account for a huge market. The marketing focus on advertising the concept that slimming equals to beautiful and health. This slimming norm particularly affects the norm of female who are always caution about their appearance. Swami et al. (2015) reported a research in U.S. from 9667 women and found that BMI was negatively associated with body appreciation. Marketing perception of slimming had driven the slimming norm caused people to think that fat was unhappy thus reduced happiness of the society (Offer 2001). Of course, everyone loves to be beautiful as this is an important element of building up one's self-identity especially for female. Yet healthy is also important, there is no point being beautiful but having a poor health. Overweight is normally related to poor health because of the strong relationship between overweight and diabetes, heart disease, and cancers. This global slimming norm tends to spread the idea that being fat is a source of unhappy because being hurt your health and appearance. It is being observed that in tweets, people's happiness reduced as the obesity rate increased (Gore et al. (2015).

However, body weight depends on a lot of factors, for example, genetic code, eating culture and working life. There are a lot of things that people cannot control, thus making the process of getting slim may be difficult to some people. Slimming can make people feel unhappy because dieting can bring up anxiety and people needs to struggle with their eating habit. This can bring up negative emotion and make people obsessed with their body image (Dobson and Anderson, 2005).

Literature found that the association between happiness and body mass were indeed inconclusive and needed to account for the cultural effect. In some countries fat means happy. For example in Indonesia, happiness is positive associated with body mass (Sohn, 2017). Although, obese people are less happy than the non-obese in U.S., obesity and happiness are positively correlated in Russia. Happiness depends on a lot of factors such as income, social support and health. One of the reason for the positive relationship between body mass and happiness is that fat represents wealth and health, thus fat means people are enjoying a happy life. Wells et al. (2012) analyzed associations between obesity prevalence and income and found that there existed a positive association in the sense that rich people were getting fat. Simeon et al. (2003) found that in Trinidadian obesity was associated with wealth, and to a lesser extent with happiness. Social relationship inherently affects our eating habit. If our family and friends are following healthy eating habit, it is most likely that we are eating healthy and it is much more easily to manage our weight. If our family and friend do not care about healthy eating habit and do not engaged into physical exercise, it is likely that we get fat. Studies have found that social support such as neighborhood, family, friends and living environments affected people's body mass (Wang et al. (2014).

This paper intends to investigate the association between happiness and body mass by estimating models using fixed effect panel data model from 88 countries and compares the differences between male and female for the case of high income and low or middle income countries. The model will also include emotional factors, social support, GDP and healthy life expectancy as the dependent variables.

2. Methodology

2.1 Data

This paper estimated the panel annual data from 88 countries between the periods 2010 to 2014 with 51 high income countries and 37 low or middle income countries. The high income countries are classified following World Bank's definition where high-income countries are those with a GDP per capita of $12,736 or more. Countries with GDP per capita less $12,736 than are classified as low or middle income countries. The BMI data comes from Global Health Observatory data repository which traces for adult (+18 years) body-mass index in 200 countries from 1975 to 2014 with 19.2 million participants. The happiness and related socioeconomics comes from World Happiness Report 2015 (Helliwell et al. 2015). Matching out the data sets come up with 88 countries with data of both BMI and happiness between the periods 2010 to 2014.

Table 1 Body Mass index (BMI)

	All countries		Low or middle income		High income	
Countries	88		37		51	
Sample size	440		185		255	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
MBMI	25.5025	2.0681	23.939	2.034	26.6365	1.1516
FBMI	25.7352	1.9677	24.917	2.276	26.3290	1.4480
(%)MBMI25	49.1596	19.3430	33.342	17.724	60.6349	10.2309
(%)FBMI25	48.7409	13.6705	41.326	15.057	54.1200	9.4696
(%)MBMI30	15.6009	8.3886	8.484	6.322	20.7639	5.3873
(%)FBMI30	20.9061	9.1732	15.795	9.052	24.6145	7.2965

Where: MBMI represents the male mean body mass index, age-standardized (kg/m²), MBMI25 represents the male overweight (body mass index ≥ 25), age-standardized (%), MBMI30 represents the male obesity (body mass index ≥ 30), age-standardized (%), FBMI represents the female mean body mass index, age-standardized (kg/m²), FBMI25 represents the female overweight (body mass index ≥ 25), age-standardized (%), FBMI30 represents the female obesity (body mass index ≥ 30), age-standardized (%).

Table 1 shows that the mean BMI between male and female are similar. However in low or middle income countries, the percentage of the overweight for female is larger than that of male. The opposite situation happens in high income countries, in which, the percentage of overweight for male is larger than that of female. For the case of obesity, in all countries, the percentage of obesity for female is higher than that of male. In general, the percentage of overweight and obesity are higher in high income countries than in low/middle income countries.

2.2 Models

$$BMI_{it} = \beta_1 HAPP_{it} + \beta_2 Positive_{it} + \beta_3 Neagtive_{it} + \beta_4 GDPPC_{it} + \beta_5 Social_{it} + \beta_6 Lifeexp_{it} + \delta_t + \alpha_i + \varepsilon_{it}$$

where t = 1, . . . T time periods and i = 1 . . ., N countries. α_i are the unobserved cultural heterogeneity which is assumed to be constant overtime for each country. The observed independent variables including HAPP: happiness, Positive: positive emotions, Negative: negative emotions, GDPPC: GDP per capita, Social: social support and Lifeexp: healthy life expectancy. BMIit is dependent variable, the BMI indexes described in table 1. δ_t is the period effect which is a binary dummy used to capture the unobserved time variation effect. ε_{it} is the error term with $Var(\varepsilon_{it}) = \sigma_t^2$ and all covariance between error terms are zero.

3. Empirical Results

3.1 BMI, Happiness and Socioeconomics variables

Table 2 shows that the adjusted R^2 of the BMI models are ranged from 0.7426 to 0.2168. The adjusted R^2 are generally larger in the case of male than female. Moreover, adjusted R^2 are also higher in case of low- or middle-income countries than in high income countries. It seems that the model generally fits better for the case of low or middle income countries and for the case of male.

Table 2: BMI, Happiness and Socioeconomics variables

	All countries		Low or middle income countries		High income countries	
	MBMI	FBMI	MBMI	FBMI	MBMI	FBMI
HAPP	0.3395** (0.0937)	0.3114** (0.1482)	0.6009** (0.1563)	0.6556** (0.2344)	0.3660** (0.1140)	0.8025** (0.1554)
Positive	-5.9768** (0.6305)	-3.2276** (0.9977)	-8.1209** (0.8851)	-6.1744** (1.3307)	-3.5147** (0.8492)	-1.5016 (1.1578)
Negative	1.1636 (0.7749)	3.0028** (1.2236)	-0.3193 (1.1745)	0.1736 (1.7599)	2.0497** (0.9772)	3.8643** (1.3252)
GDPPC	0.6441** (0.0970)	0.7152** (0.1537)	0.6291** (0.2082)	0.9278** (0.3124)	0.6711** (0.1615)	0.4499** (0.2201)

Socials	2.6409** (0.6961)	1.1595 (1.0996)	4.5419** (0.8693)	4.8233** (1.3054)	-3.1906** (1.2352)	-8.6073** (1.6773)
Lifeexp	0.1095** (0.0129)	-0.0109 (0.0204)	0.1422** (0.0221)	0.0817** (0.0332)	0.0784** (0.0151)	-0.1231** (0.0206)
Adjusted R^2	0.7426	0.2652	0.7126	0.4844	0.3974	0.2168
** Significant at 5% significance level.						

The associations between happiness and BMI are positive in all cases. BMI tends to increase with the level of happiness, the effect is higher for the case of low or middle income countries than in high income countries. Moreover, the coefficients are larger for the cases of female than that for male in both high and low or middle income countries.

The associations between BMI and positive emotions are negative in all cases. High level of positive emotions tends to associate with low BMI, the effect is larger in the case of male as well as in low income countries. In the case of high-income countries, the association is insignificant for the case of female. The associations between BMI and negative emotions are positive but only significance for the case of high income countries. It seems that higher level of negative emotions tends to associate with higher BMI but the association only being effective in high income countries and that effect is larger for the case of female than male. The associations between BMI and GDP per capita are positive. In the low-income countries case, the association for female is larger than that of male, but the reverse result appears in the high-income countries. The increase in GDP per capita tends to exhibit higher influence on the BMI of female in low income countries than in high income countries. The associations of BMI and social support show opposite sign in case of both low- and high-income countries. BMI tends to increase with social support in low income countries but decreases in high income countries. The negative association between social support and BMI is the largest in case of female in high income countries.

The associations of BMI and health life expectance are positive in most cases, except for the female in both high-income countries and all countries cases. In general BMI increases with health life expectance. However, for the case of female in high income countries, BMI reduces with health life expectance.

3.2 Overweight, Happiness and Socioeconomics variables

Table 3 shows that the adjusted R^2 of the overweight models are ranged from 0.8244 to 0.2647. The adjusted R^2 are generally larger in the overweight model than BMI models. It seems that the overweight model generally fits better than the BMI model. Like the BMI models, the adjusted R^2 for male overweight model is larger than that of female. The model tends to fit better for the case of male than female. In addition, the model also works better for the case of low income countries than high income countries.

Table 3: Overweight, Happiness and Socioeconomics variables

	All countries		Low or middle income		High income	
	MBMI25	FBMI25	MBMI25	FBMI25	MBMI25	FBMI25
HAPP	3.5809 ** (0.7269)	2.7830** (0.9270)	5.4743** (1.1759)	4.5779** (1.5116)	3.6561** (0.9289)	5.6461** (0.9738)
Positive	-58.8615** (4.8805)	-30.6787** (6.2300)	-75.2299** (6.6064)	-46.9461** (8.5434)	-38.6396** (6.9129)	-16.1691** (7.2661)
Negative	14.1206**	28.5155**	-2.9947	-4.2850	30.4674**	48.7414**

	(6.0050)	(7.6518)	(8.8221)	(11.3396)	(7.9514)	(8.3416)
GDPPC	7.1518** (0.7514)	5.3503** (0.9601)	6.3158** (1.5687)	7.3060** (2.0158)	7.5176** (1.3106)	4.3028** (1.3809)
Socials	32.0745** (5.3909)	22.2328** (6.8706)	41.6024** (6.4915)	41.6899** (8.3878)	2.1391 (10.0717)	-39.7012** (10.5665)
Lifeexp	0.8645** (0.0999)	-0.1364 (0.1276)	1.2374** (0.1654)	0.3254 (0.2134)	0.5277** (0.1230)	-0.7747** (0.1292)
Adjusted R^2	0.8244	0.4062	0.7884	0.5133	0.4878	0.2647
** Significant at 5% significance level.						

The associations between happiness and overweight are positive and significant. In general the empirical result shows that percentage of overweight increases with the increasing level of happiness. Good life normally accomplished with overweight. The association for male is larger than that of female in low or middle income countries but the reverse result happens in high income countries. The associations between positive emotion and overweight are negative and significant. The increase in positive emotion reduces the percentage of overweight. Moreover, the effect tends to be larger for the cases of male than female and also for the cases of low or middle income countries than high income countries. The associations between negative emotion and overweight are significant in high income countries but insignificant in low- or middle-income countries. Moreover, the association is larger in the case of female than male. The associations between GDP per capita and overweight are positive and significant. Similar to the empirical results of the BMI models in table 1, table 2 shows that in the low or middle income countries case, the association for female is larger than that of male, but the reverse result appears in the high income countries case. The associations between social support and overweight are positive and significant in the case of low or middle income countries. However, for high income countries, the association is negative and significant only for the female. The associations between health life expectancy and overweight are positive and significant for male in low or middle income countries. For high income countries, the associations are significant but with opposite signs for male (positive) and female (negative).

3.3 Obesity and selected key factors of happiness

Table 4 shows that the adjusted R^2 of the overweight models are ranged from 0.8244 to 0.2647. The adjusted R^2 are generally larger in the case Obesity models than BMI models but less than the overweight cases. Similar to other models, the obesity models tend to fit better for the case of male than female and have higher explanation power for low income rather than high income countries.

Table 4: Obesity, Happiness and Socioeconomics variables

	All countries		Low or middle income		High income	
	MBMI30	FBMI30	MBMI30	FBMI30	MBMI30	FBMI30
HAPP	1.7473** (0.3360)	1.7775** (0.6154)	1.5350** (0.4320)	2.3325** (0.9543)	2.1115** (0.5190)	3.6957** (0.7463)
Positive	-21.6588** (2.2610)	-18.0850** (4.1415)	-27.8080** (2.4157)	-29.3610** (5.3801)	-13.8173** (3.8620)	-7.4022 (5.5612)
Negative	6.7982** (2.7780)	20.2923** (5.0815)	0.5504 (3.2519)	0.1035 (7.1709)	16.7854** (4.4399)	35.9825** (6.3696)
GDPPC	4.2033** (0.3478)	4.9551** (0.6377)	3.0161** (0.5761)	5.5005** (1.2726)	5.2786** (0.7330)	4.4377** (1.0563)
Socials	9.8157** (2.4947)	8.8576* (4.5660)	14.9940** (2.3780)	21.5031** (5.2871)	-4.4885 (5.6210)	-28.4023** (8.0724)
Lifeexp	0.1634**	-0.2996**	0.3493**	0.0396**	0.0285	-0.7167**

	(0.0462)	(0.0847)	(0.0603)	(0.1342)	(0.0687)	(0.0990)
Adjusted R^2	0.7926	0.4006	0.7747	0.4642	0.3896	0.2672
** Significant at 5% significance level. * Significant at 10% significance level.						

The associations between obesity and happiness are positive and significant. Generally, the associations for female are larger than male. Good life associated with an increase in the percentage of obesity and the effect is larger for female than male. The associations between obesity and positive emotions are negative and significant. However, for the case of female high-income countries, the association are insignificant. Positive emotions normally come with vitality that consume more energy to reduce the percentage of obesity, but this does not seem to work for female in high income countries. The association between obesity and negative emotions are positive and significant in case of high income countries. The effect on female is larger than that on male. The association between GDP per capita and obesity are positive but the coefficients are smaller than that in the case of overweight. Similar to the case of overweight, in the obesity cases the coefficient for female is higher than male in the low-income countries. However, the coefficient for male is higher than female in the high-income countries. The association between social support and obesity are positive in the low or middle income countries but negative in high income countries. Moreover, the coefficients are larger in the case of female than that of male.

The association between life expectance and obesity are positive in the case of low or middle income countries but negative for the case of female in high income countries.

4. Conclusion

In general, weight increases with life happiness evaluation. Eating better and working less can help people to feel happier in their life evaluation but there is a risk of getting fat. The coefficient for male is higher than that of female in low/middle income countries but the reverse is true for high income countries. A good life for female in high income countries generally associated with a higher calories surplus through engaging less physical activities perhaps consuming less calories in housework. Female tends to enjoy the pleasure from cooking as well as eating.

Positive emotion normally reduces weight but negative emotion increases weight in high income countries. On the one hand, many significant events utilize eating as a meaningful aspect of celebrations (positive emotion), which creates an intake of more. On the other hand, positive emotion associates with value activities such as sport on which people enjoy and willing to devote energy thus consume more calories. For the case of male positive emotion reduces weight by motivating male to participate in higher calories consumption activities than eating. Negative emotion leads to consumption of excess food and low physical activity, thus producing overweight in high income countries. Overeating can serve as a means to temporary repair negative mood but it seems that only high-income countries can afford the financial cost of overeating to comfort negative mood. The stress for female to control their weight, may ultimately play a major role in their overeating behavior. In high income countries, the slimming norm has put too much stress on female and create overweight.

Increase in GDP per capita increases body mass. However, the impact on male and female are different when comparing high and low/middle income countries. The high level of overweight among low/middle income women has widely been attributed to the habit of avoiding food wastage because of the experiences from food scarcity. As income increases,

people in low/middle income countries tend to reserve more food by eating to avoid food scarcity thus overweight increases with income. However, in high income countries, the slimming norm and the financial ability allows females to be able to pay for health food and control their weight.

Social support increases body mass in low/middle income countries but reduces body mass in high income countries. Social support can help women to manage overweight/obesity through eating behavioral change and maintaining physical activity. Low/middle income countries have a different body size norm. Fat can be a status symbol of rich because fat people have enough money to eat.

Life expectancy increases body mass in low/middle income countries but reduces body mass in high income countries. Although there is a gain in life expectancy, overweight individuals generally experience a higher proportion of poor health in life time. Female, especially those in high income countries, tends to follow a healthier lifestyle such as more physical activities and eating less so as to avoid the adverse effect of overweight/obesity.

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