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CHAPTER I

INTRODUCTION

The epidemic of obesity has prevailed worldwide, including advanced and developing countries, and it is currently regarded as a global pandemic disease. Obesity increases the risk of adverse health conditions, since it is associated with chronic medical conditions, reduced health-related quality of life, and increased health care and medication spending (Strum, 2002). Fontaine et al. (2003) and Finkelstein and Strobos (2010) among others also confirm that obesity decreases life expectancy.¹ According to NCD Risk Factor Collaboration (NCD-RisC), the prevalence of obesity increased from 3.2% to 10.8% among men and from 6.4% to 14.9% among women during the period from 1975 to 2014. Substantial differences in obesity rates exist across countries. OECD (2017) shows that the top two countries with the highest obesity rates are the United States (38.2%) and Mexico (32.4%), whereas the countries with the lowest rates are Japan (3.7%) and South Korea (5.3%). Many factors contribute to the variation in obesity across countries, including lifestyle, cultural and

¹ Puhl and Heuer (2010) highlight that overweight and obese individuals have stereotypes as unproductive, undisciplined, and unmotivated. These physiological effects of obesity might be unseen, but many obese individuals have body-shape dissatisfaction and suffer from depression. Mocan and Tekin (2009) also find that obesity and overweight could affect the self-confidence, and even wages, of young adults. In addition to the chronic health and physiological outcomes, obesity entails a financial burden for individuals and societies, so that the burden is not only on the individual's health care cost but the indirect cost in the society through the reduction in productivity and income tax (Lehnert et al., 2013; Tremmel et al., 2017).

socioeconomic factors, and genetic influences.² Among them, economic development can also be considered as one crucial determinant of the obesity epidemic (Finkelstein & Strombotne, 2010).

Following the concept of the Kuznets curve of the non-linear relationship between the income inequality and development (Kuznets, 1955), several studies have examined the health Kuznets curve of the non-linear relationship between the health inequality and development (Molini et al., 2010; Sahn & Younger, 2009; Costa-Front et al., 2017). Recently, Grecu and Rotthoff (2015) extend the application of the Kuznets curve to personal health, proxied by obesity, to the state level data in the United States. Under the obesity Kuznets curve, as incomes rise, weight gain occurs since individuals can afford excess food, so that caloric imbalance leads to an increase in obesity rates (Koplan & Dietz, 1999). Economic development with technological advancement creates cheap and delicious foods, which pushes lives with more sedentary lifestyles and less physical activity and thus causes the obesity epidemic (Lakdawala & Phillipson, 2009; Hruby & Hu, 2015; Finkelstein & Strombotne, 2010). However, given the argument that health is a normal good, continued increases in incomes enable people to shift consumption to healthier foods and to invest more in their overall personal health, which eventually reduces obesity rates.

² Some researches emphasize the role of globalization in relating to obesity (Goryakin et al., 2015; Costa-Font & Mas, 2016; Miljkovic et al., 2015; Miljkovic et al., 2018), and other works focus on the association of obesity with economic freedom (Ljungvall, 2013; Lawson et al., 2016). Dinsa et al. (2012) undertake a systematic review of studies assessing the association between socioeconomic status (SES) and measured obesity in low- and middle-income countries.

Several studies have examined the relationship between obesity and the income level. Jolliffe (2011) examines the body mass index (BMI) with the individual-level data of the United States and shows a negative income gradient in BMI at the obesity threshold and increases in income are correlated with healthier BMI values at the tails of the BMI distribution. Grecu and Rothhoff (2015) also study the case of the United States by using the state-level data and find a non-linear relationship between income levels and obesity rates particularly for white females. Concerning the works on the income-obesity relationship across countries, Goryakin and Suhrcke (2014) use the individual-level data of 56 countries during the period from 1991 to 2009 and reveal a positive and concave relationship between per capita income and obesity. In addition, Egger et al. (2012) apply spline regression analysis over 175 countries and present that GDP is positively related to BMI up to US\$3000 with less significant relationship beyond the level.

Our study extends the income-obesity analysis across countries with a focus on the obesity Kuznets curve contexts. We use the country-level five-year interval panel data of 130 countries during the period from 1975 to 2010. Differently from previous studies, we apply dynamic panel data analysis to estimate empirical models with obesity rates as a dependent variable and the income levels as an independent variable, allowing for a partial adjustment or persistence of obesity rates and unobserved panel level fixed effects. One methodological issue is that the models may suffer from endogeneity problems, so that the ordinary least squares (OLS) method derives biased estimators. To mitigate such problems, this study applies system GMM estimators,

initiated by Arellano and Bover (1995) and Blundell and Bond (1998), which include additional moment conditions under the assumptions that there is no autocorrelation in the idiosyncratic errors and the panel level effects are uncorrelated with the first-difference of the first observation of the dependent variable. Figure 1 show the visualisation of the association between obesity prevalence and income. The main results show a clear pattern of the obesity Kuznets curve, i.e., a non-linear relationship between health status and the income level, for both males and females. In addition, the critical value of the income level differentiating the sign of the relationship is larger for male than for female, implying that as incomes increase, females tend to pay more attention to health as a normal good. Policy implications from our analysis suggest that a strong initiative for health policy targeting obesity prevention is required for middle-income countries, many of which are currently experiencing high economic growth. The rest of this paper is organized as follows. Section 2 review the literature. Section 3 explains the methodology and data, and section 4 presents the estimated results with important implications related to the obesity Kuznets curve. The last section concludes.

CHAPTER II

LITERATURE REVIEW

2.1. Obesity

It is important first to present a few key issues related to obesity, such as the definition, causes of obesity and the risk of being obese. The definition of overweight and obesity are an accumulation of exorbitant fat that may endangered health (WHO, 2012). Body Mass Index (BMI) has been universally employed to assess a person's weight status and health with regards to obesity. People will consider obese if their BMI is more than 30 and they will classify as overweight if their BMI is more than 25. While to calculated BMI is by dividing the height and the squared of the weight (cm/kg^2). The more detailed of the BMI classification can be seen in Figure 2 of the Appendix.

Obesity occurred when the kalori that is used is less than the caloric intake so that will reduce excess to more weight. Finkelstein & Struburn (2010) explain such phenomenon with a simple mechanism. First is the increase in food consumption which is caused by the rising of real income and the decrease of the food price (Goldman et al., 2009; Lu & Goldman, 2010). Chou et al. 2004 found that the reduction of food price account for the increases of weight, in addition the the growth of restaurant to weight outcome. More over, fast-food advertisement in television significantly increase the weight. (Grossman et al., 2012). Powel (2009) test the fast food elasticiry for BMI with panel data and find similar result that the fast food price have negative association

with gain weight. Opposite result shown by Mazidi and Speakman (2017) study in United States said that the prevalence of obesity not related to the fast food restaurant because most of the restaurant are in the rich and educated area . Zagorsky (2017) explain that people from middle class eat less fast food than poor people. As it mentions before, obesity is the result of economic development (Finkelstein & Strombotne, 2010).

These changes alter the diet become more fat, meat, sugars and portion of foods that are consumed. The other thing is that the decrease in energy expenditure. The technology development has created more sedentary life and reduced physical activity. People will have less effort in their activity at work and home and on their mobilization (Lakdawalla and Philipson, 2009; Ng & Popkin, 2011). Chau et al. (2011) analysed Australian worker and found that sitting time and physical activity have strong relationship with obesity. Smith et al. 2014 also confirm that the increase of screen time and sedentary behaviour increase rapidly in the last decade.

There is overwhelming evidence that obesity increases the risk of many adverse health conditions. Obesity has a stronger association with the occurrence of chronic medical conditions, reduced health-related quality of life, and increased health care and medication spending than smoking or problem drinking have (Strum, 2002). The Global Burden of Disease (2017) said that more than two of three deaths related to obesity were due to cardiovascular disease (CVD), and followed by diabetes, chronic kidney disease, and cancer (GBD 2015 Obesity Collaborator, 2017). McGoldrick, K. E. (2004) and Finkelstein (2010) confirm that obesity decreases life expectancy as

Zahra et al. (2015) also showed that high blood pressure with CVD and diabetes have a strong positive association with mortality.

Despite the psychological burden causing by obesity, Puhl & Heuer (2010) highlighted that many studies mention that overweight and obese individuals have stereotypes as unproductive, undisciplined, and unmotivated and being blame for their weight. These physiological effects of obesity might be unseen, but those treatments make many obese individuals has body-shape dissatisfaction and leads to depression. Wit et al.(2009) found that BMI and depression have U shape relationship. Amenyah & Michels suggest that sexual attractiveness and health belief were the predictor for body ideal. Mocan & Tekin (2009) found that being obesity and overweight could effect the self-confidence of US young adults, and as implication will have an impact on their wages.

In addition to those chronic health outcome and physiological effect, obesity has a financial burden that affect individuals and society. Obese individuals have to suffer from the cost of illness such as hospitalization costs, physician visit costs, inpatient and outpatient cost, etc. (Tremmel et al., 2017). More over Lehnert et al. (2013) emphasized that financial burden of obesity is not only on the individual's health care cost but the indirect cost in the larger society through the reduces of the productivity, income tax and national healthcare expenditure public policies to reduce obesity. The reduction of one-unit BMI associated with the enhancement of health and save cost spending (Verhaeghe et al., 2016)

2.2. Obesity and Economic Level

Some scholar studies the increasing of obesity is as the result of globalization (Goryakin et al., 2015; Costa-Font & Mas, 2016; Miljkovic et al., 2015; Miljkovic et al., 2018). In their study, Miljkovic et al. (2015) hypothesized that obesity was the spill over of globalization and develop an economic model to explain the impact of globalization on obesity rates using data from 70 countries over period 1986-2008. Miljkovic et al. (2018) examined the relation of trade liberalization with increasing obesity rate in Brazil during 25 years since the 1990s, and the result is positive and significant. Using only OECD countries data from 1989-2005, Costa-Font & Mas (2016) found that the main factor of globalisation that fueled obesity rate is the social globalisation precisely are the ‘information flows’ and ‘social proximity.’ In the other hand, Goryakin et al. (2015) studied only in the 56 developing countries between 1991 and 2009, argue that overall globalisation responsible for the increasing of women obesity rate, but political and social globalisation dominate the effect of globalisation. In economic dimension, the relationship becomes concave, more economically globalized countries having a lower probability of being overweight.

Other studies focus more on the association between obesity and economic freedom (Ljungvall, 2013; Lawson et al., 2016; Egger et al., 2012). Studied only in high-income countries data between 1983-2008, Ljungval argue that economic freedom may affect individual behavior through for example the quality and quantity of food, access to social safety nets, and urban planning. Economic freedom has positive and significant association with level of BMI and the five-year change of BMI, while

the most contributor to the change of the freedom in regulation. Lawson et al. (2016) expand the observation into 135 countries and adding health care spending as the control variables and differentiate the result by the level of development and by gender. Their result suggests that as the impact of economic freedom, economic level is raised and followed by the increase of BMI (obesity). Using only year 2007 data with spline regression for 175 countries, Egger et al. (2012) found interesting result that economic level positively related to BMI for countries with income less than \$3000, while countries with income more than that there was no correlation, as some researcher predicts that the association between income level and BMI is non linear and this issue needs to be examined.

Using the samples of elderly people in Europe, Salmasi & Celidoni (2017) states that the probabilities to be obese is 10 to 20 percent higher for poor people than the rich. Measuring household income as the poverty, the probability to be obese is 0.146 more for poor men and women while 0.100 for men and 0.192 for women in considering wealth-based measure as poverty. Moreover, by investigating the country-level data of poverty and obese rates, Bennett et al. (2011) find that the residents of Rural Persistent Poverty counties are (34.5%) higher the proportion of obese residents than the other countries. Furthermore, Averett & Smith (2014) study about the relationship between financial adversity and body weight using the sample of teenagers in the United States. They found that there is a relationship between the two, the correlation between financial burden and body weight is suffering unobservable bias and the difficulties in paying bills make obesity for women.