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The Impact of Obesity and Income on Happiness: Evidence from EU Countries

Summary: The World Happiness Report 2018 ranks 156 countries by their happiness levels, and revealed a link between happiness and obesity. Despite the importance of this link, few studies have analyzed this relationship. Moreover, it may be the case that the relationship between happiness and obesity is nonlinear. The relationship between happiness and income, however, has been studied by several researchers, particularly after the publication of Easterlin (1974). In his famous paradox, Easterlin found that after reaching a certain level, the further increase of material wealth no longer promotes happiness. Here, we investigate whether there is a quadratic relationship between happiness & obesity and happiness & income, for a panel of EU countries for the period 2005-2016, using the system GMM method. The empirical results suggest an inverse U-shaped relationship between happiness & obesity and happiness & income, implying that as obesity (income), represented by body mass index, increases, happiness first increases then stabilizes and finally decreases. Hence, the existence of an inverted U-shaped relationship between happiness and income supports the validity of the Kuznets curve hypothesis. Some control variables were also included in the regressions in order to solve omitted variable bias problems. The results indicate that income inequality and unemployment have a significantly negative impact on happiness.

Keywords: Happiness, Obesity, Income, Kuznets curve, EU countries.

JEL: D60, I31, J35.

Happiness, one of life's fundamental goals, has been the subject of much psychological, sociological and medical research. An increasing interest in the concept of happiness has been observed recently in the economic literature, mainly due to policymakers' growing interest in measures of economic development that go beyond the traditional welfare measures such as GDP. Some major determinants of happiness highlighted in the empirical research are income, employment, age, gender, education, marital status, ethnicity, inflation and environment (see, among the others, Rafaeli Di Tella, Robert J. MacCulloch, and Andrew J. Oswald 2001; Alois Stutzer and Bruno S. Frey 2006; Simon Luechinger 2009; Carola Grün, Wolfgang Hauser, and Thomas Rhein 2010; Daniel Kahneman and Angus Deaton 2010; Richard Layard, Guy Mayraz, and Stephen J. Nickell 2010; Philip Oreopoulos and Kjell G. Salvanes 2011; Deaton and Arthur A. Stone 2016; Terence C. Cheng, Nattavudh Powdthavee, and Andrew J. Oswald 2017). However, there has been a lack of study on a key question about the determinants of happiness: What role does obesity play in predicting happiness?

Addressing this question is important, given the rising prevalence of obesity in both developed and developing countries. Obesity, defined as excess body weight in the form of fat, may influence the quality of life through its affects on self-confidence, self-esteem, social relationship and likelihood for depression.

There are two main aims of this paper, one is to examine the possible quadratic relationship between happiness and obesity, using data from EU countries for the period 2005-2016. To our best knowledge, no study has investigated the non-linear relationship between happiness and obesity. It is plausible that, as body mass index increases, happiness initially increases, then stabilizes, and finally, decreases. The other aim is to extend the income-happiness analysis across EU countries, with an emphasis on happiness Kuznets curve contexts. Hence, the present paper contributes to the limited evidence currently available in the literature.

The rest of the paper is organized as follows. Section 1 discusses the related literature. The econometric methodology is discussed in Section 2. Section 3 discusses the data and empirical results. Our concluding remarks appear in Section 4.

1. A Brief Literature Review

This study has two main objectives, first, to examine the impact of obesity on happiness using data from EU countries, and second, to investigate the relationship between happiness and income. Hence, in this section, we briefly review studies on the relationship between happiness and obesity, and between happiness and income.

People are generally classified as overweight, obese and morbidly obese if their body mass index (BMI) is more than 25, 30 and 40, respectively. Obesity leads to a number of chronic diseases, such as hypertension, diabetes, cardiovascular disease and cancer, and obesity is expected to have a negative impact on happiness. Consumption of food in excess of the daily caloric needs leads to excessive weight gain, impacting happiness by affecting self-confidence, and personal and social relationships. Many empirical studies have established a negative relationship between happiness and obesity. For instance, a study by Stutzer (2007), using cross-sectional data from the Swiss Health Survey 2002, revealed that obesity decreases the subjective well-being of individuals who reported limited self-control. Using panel data from Germany, UK and Australia, Marina Selini Katsaiti (2012) found that in all three countries, obesity has a negative effect on individual happiness. Using cross sectional data from the US, Renata Forste and Erin Moore (2012) found a negative relationship between happiness and BMI. Zia Ul-Haq et al.'s (2013) cross-sectional study using logistic regression on UK data revealed adverse effects of obesity on happiness, and that compared with obese men, obese women are less likely to experience poor health, but more likely to feel unhappy. Ehsan Latif (2014) examined the impact of obesity on happiness using longitudinal Canadian data for the period of 1994-2006. The results indicate that obesity significantly reduces happiness for females, but not for males. Masanori Kuroki (2016) examined the relationship between obesity and life satisfaction utilizing self-report life satisfaction data, finding lower life satisfaction for the overweight and obese. More recently, Nazim Habibov and Elvin Afandi (2018), using a diverse sample of 27 post-communist transitional countries, found that an increase BMI reduces happiness.

Petri Böckerman et al. (2014), on the other hand, using data from Finland found that obesity has no effect on happiness. Similarly, Wang-Sheng Lee and Zhong Zhao (2017), analyzing differences in BMI and mental health in different parts of China found that obesity has no significant effect on mental health. In contrast to all of the above findings, Kitae Sohn (2017) indicates a positive relationship between obesity and happiness in Indonesia, where obesity is considered as a symbol of affluence. Moreover, Kazuma Sato (2020), using panel data from China and the United States, found that in China, overweight or obese men and overweight women are happier than those of normal weight, and also presents evidence that obesity is unrelated to happiness in the United States. Olivier Bargain and Jinan Zeidan (2019), using panel data from Mexico, reported that the relationship between obesity and happiness varies according to the individual's earning capacity.

In summary, most previous studies present a negative relationship between the two variables, with only limited evidence of a positive association. As mentioned before, no previous studies investigated the quadratic relationship between happiness and obesity, and it is possible that there is a non-linear relationship. That is, happiness first increases with an increase in body mass index, then stabilizes and decreases after reaching the threshold body mass index. Hence, in light of previous findings, the possibility of a non-linear relationship is worth investigating.

The relationship between happiness and income has been studied by several researchers, particularly after the publication of Richard A. Easterlin (1974). In his famous paradox, Easterlin found that after reaching a certain level, further increase of material wealth no longer promotes happiness. Hence, more wealth does not automatically promote happiness (Easterlin 1974; Ed Diener et al. 1985). Although there is a general agreement among researchers on this association, empirical studies have produced conflicting results. For instance, Paul Frijters, John P. Haisken-Denew, and Michael A. Shields (2004) and Eleftherios Giovanis (2014) found a significant positive association between happiness and income, while Andrew E. Clark (2003) found a negative relationship and Shields and Allan Wailoo (2002) found insignificant relationships. Some researchers, however, found that income is a crucial determinant of happiness to a certain point, after which, there is a weaker correlation (Carol Graham 2005; Layard 2005).

The non-linear relationship between happiness and income, however, has not been investigated until recently; few studies have focused on the relationship in the framework of the Kuznets Curve to depict an inverted U-shaped relationship. Adam Sulkowski and D. Steven White (2016) investigated the Kuznets-type relationship between happiness and income, using model-based cluster analysis to group sixty-one countries based on statistical similarities with respect to happiness, development, income and carbon emissions. Their findings indicate a possible Kuznets curve for happiness. The clusters of countries at the extremes of the lowest and highest average levels of development and income have the highest self-reported levels of happiness. Their findings further indicate that clusters of countries in the middle of the development and income spectrum have the comparatively lowest average levels of happiness. Rati Ram (2017), however, investigated a Kuznets-type relation between average happiness and happiness-inequality for a group of countries. His findings indicate an evidence of an inverted-U relation in which happiness-inequality first increases with mean happiness, reaches a peak, and then declines. Finally, Andrew T. Jebb et al. (2018) investigated the non-linear relationship between happiness and income using data from the Gallup World Poll, a representative sample of over 1.7 million individuals worldwide. Controlling for demographic factors, they use spline regression models to statistically identify points of "income satiation". They found that satiation occurs at $95,000 for life evaluation and $60,000 to $70,000 for emotional well-being. Their findings, however, show that there is substantial variation across world regions, with satiation occurring later in wealthier regions. Their findings also indicate that in certain parts of the world, incomes beyond satiation are associated with lower life evaluations.

In this paper, we consider obesity and income as the key variables in explaining the variation in the happiness index. However, considering some socioeconomic factors that affect happiness, we also investigate the impact of income (or social) inequality computed as the ratio between the richest and poorest Quintiles (RP20) of average income, household debt as a percentage of GDP, annual inflation rate, the share of urban population and unemployment rate on happiness and obesity. This is the first study to include these control variables in the analysis of the relationship between happiness-obesity and happiness-income, thus addressing omitted variable bias problems.

Several papers found a negative relationship between income inequality and happiness (see, for instance, Shigehiro Oishi, Selin Kesebir, and Diener 2011; Oishi and Kesebir 2015; Dennis Wesselbaum 2019). A few papers have investigated how happiness is impacted by household debt which is expected to be almost as important as income in predicting worry and life satisfaction. Antje Jantsch and Ruut Veenhoven (2018) investigated the relationship between private wealth and happiness and found a negative relationship between debt and happiness.

In most countries, some cities are growing faster than the national average, which put some pressure on urban resources and the environment. In developing countries particularly, workers are migrating to urban areas for better jobs, life, education and treatment. There is little evidence in the literature for a positive relationship between urbanization and happiness; in fact, urbanization is expected to have negative effects due to problems such as high crime rate and poverty. Recently, Adam Okulicz-Kozaryn and Joan Mazelis (2018), investigating the relationship between urbanization and happiness, tested Louis Wirth (1938)'s theory of urban life, which focuses on the various negative consequences of urbanization, and found that the core characteristics of urban life (in particular, size and density) contribute to unhappiness. In addition, urbanization could also be considered as an important source of an obesogenic environment. Urban areas are characterized by higher-calorie foods, transportation networks, fewer open areas, more mass media, and less work-related physical activity. Hence, the urban food environment along with inadequate social and building environments, and technological advancements lead to poorer diets, less active lifestyles and greater unhappiness.

Several papers have included in the regression to analyze whether changes in general prices are associated with changes in happiness. It is expected that higher inflation reduces happiness since individuals hold money for the transaction or speculation purposes. Hence, high inflation rates would negatively affect this as they act as a tax. Furthermore, high inflation rates can cause higher uncertainty, affecting happiness adversely. Di Tella, MacCulloch, and Oswald (2001) and David G. Blanchflower (2007) investigated the impact of a set of microeconomic and macroeconomic variables on happiness. Their results show that increase in inflation rates negatively affects happiness. However, Wesselbaum (2019) found that a higher inflation rate in fact increases happiness.

Finally, a small number of papers have investigated the impact of the unemployment rate on happiness. Two effects should be considered: a positive one, as more leisure might increase utility, and a negative one, as lower incomes reduce consumption and hence, utility and happiness. However, the income effect is expected to be stronger, i.e., higher unemployment rates reduce happiness. Furthermore, the uncertainty generated by unemployment is expected to have an additional negative impact on happiness (see Wesselbaum 2019). Blanchflower (2007) using data from 23 OECD countries from 1973 to 2006 found that an increase in unemployment negatively affects happiness and Wesselbaum (2019) found similar results.

2. The Model and Econometric Methodology

We first test whether there exists a quadratic relationship between happiness-obesity and happiness-income, using the system GMM methodology, which avoids possible endogeneity problems in the model. It might also be plausible to introduce the lagged value of *HPI* to the regression since a country with a high level of the index in the past is likely to have a higher index in the next period. The general regression model for this purpose is specified as follows:

Model 1:

$$HPI_{i,t} = \alpha + \varphi HPI_{i,t-1} + \beta_1 BMI_{i,t} + \beta_2 BMI_{i,t}^2 + \gamma_1 GDP_{i,t} + \gamma_2 GDP_{i,t}^2 + \varepsilon_{i,t}, \tag{1}$$

where subscripts i =1, …, N and t = 1, …, T denote country and year, respectively. HPI_{it} denotes happiness index. *BMI*, *BMI*^{2}, *GDP* and *GDP*^{2} represent the body mass index, square of body mass index, *per capita* real *GDP* and square of *per capita* real *GDP,* respectively. α is the intercept term; β_1, β_2, γ_1, and γ_2 are the corresponding coefficients. The main reason for including the lagged value of the dependent variable is to gauge the possible persistence in happiness. Hence, φ represents the rate at which the *HPI* converges toward a long-run level. $\varepsilon_{it} = v_i + u_{i,t}$, is assumed to consist of an unobservable country-specific component (v_i) and a random disturbance ($u_{i,t}$). The country-specific component is assumed to be stochastic and not correlated with the random component.

From the above specification, it is possible to test whether there is a non-linear relationship between BMI and the dependent variable (*HPI*). An inverted *U*-shaped relationship is identified if $\beta_1 > 0$ and $\beta_2 < 0$. Other possible outcomes include a flat pattern where no relationship exists ($\beta_1 = \beta_2 = 0$) and a monotonic relationship ($\beta_1 > 0$ and $\beta_2 = 0$). The marginal impact of body mass index on $HPI_{it}$is given by $\frac{\partial HPI_{it}}{\partial BMI_{it}} = \beta_1 + 2\beta_2 BMI_{it}$. Hence, $\beta_1 > 0$ captures the initial increase in HPI_{it}as BMI increases while $\beta_2 < 0$ shows the inverted *U*-shape pattern at which point an increase in *BMI* leads to lower HPI_{it}. The turning point or critical threshold level can be obtained when $\frac{\partial HPI_{it}}{\partial BMI_{it}} = 0$. Hence, the corresponding threshold can be expressed as $BMI^*_{it} = \frac{-\beta_1}{2\beta_2}$, which is expected to be positive.

As explained before, obesity and income are the two key variables explaining variation in the happiness index. However, the omitted variable bias problems could be solved by including some control variables (i.e., income inequality computed as the ratio between the richest and poorest Quintiles (*RP20*) of average income, household debt as a percentage of GDP, annual inflation rate, the share of urban population and the unemployment rate). Hence, the extended model is specified as follows:

Model 2:

$$\begin{aligned} HPI_{i,t} = \alpha + \varphi HPI_{i,t-1} + \beta_1 BMI_{i,t} + \beta_2 BMI^2_{i,t} + \gamma_1 GDP_{i,t} \\ + \gamma_2 GDP^2_{i,t} + \delta_1 INEQ_{i,t} + \delta_2 DEBT_{i,t} + \delta_3 INF_{i,t} \\ + \delta_4 UR_{i,t} + \delta_5 UNEMP_{i,t} + \varepsilon_{i,t}, \end{aligned} \quad (2)$$

where *INEQ*, *DEBT*, *INF*, *UR*, and *UNEMP* represent income inequality, household debt, inflation, urban population and unemployment, respectively.

It should be noted that using a lagged value of the happiness index as a right-side variable in Equations (1) and (2) could create complications in the estimations due to the correlation between the lagged dependent variable and the disturbance term. As discussed in Erik Biørn and Jayalakshmi Krishnakumar (2008), there are two potential sources of endogeneity in a panel data model: (1) correlation between explanatory variables and specific effects; and (2) correlation between explanatory variables and the idiosyncratic error term. Biørn and Krishnakumar (2008) called them as the single endogeneity and double endogeneity, respectively. The two main causes of the double endogeneity are observed in practical situations. One is the presence of measurement errors in the explanatory variables, and the other is the simultaneity problem that arises when the regression equation is one of several structural equations of a simultaneous model and thus contains current endogenous explanatory variables. In the present study, both the single and double endogeneity problems are possible since we include a lagged happiness index as an explanatory variable, which might be correlated with the country-specific effects, and there might be simultaneity between the happiness index and explanatory variables. Hence, it is important to take endogeneity into account in the examination of the relationship between happiness and obesity.

To resolve this problem, we can take the first differences of the original model specified in Equations (1) and (2). The first difference transformation eliminates both the constant term and the country-specific effects (v_i). In this new specification, there is still a correlation between the difference lagged happiness index and the new error term. With the elimination of the country-specific effects, a straightforward instrumental variables' estimator is available. It is possible to construct instruments for the lagged happiness index, in the form of either differences or lagged levels. If the ($u_{i,t}$) follows i.i.d. process, the lags of happiness index will be correlated with the lagged happiness index, but uncorrelated with the composite error, as suggested by T. W. Anderson and Cheng Hsiao (1981). However, Manuel Arellano and Stephen R. Bond (1991) propose a more efficient, generalized method of moments (GMM) procedure.

They provide additional instruments that could be obtained in a dynamic panel model if one utilizes the orthogonality conditions that exist between the lagged value of the happiness index and the differenced errors. Hence, they propose a two-step GMM estimator by using these moment conditions. In the first step, the error terms are assumed to be both independent and homoscedastic across countries and over time. In the second, the residuals obtained in the first step are used to build a consistent estimate of the variance-covariance matrix. Assumptions of independence and homoscedasticity are then relaxed, making the two-step estimator asymptotically more efficient. Hence, this estimator is referred to as the difference GMM estimator.

Arellano and Olympia Bover (1995) and Richard Blundell and Bond (1998) demonstrate that the instruments used in the difference GMM estimator could be less informative in some cases, and suggest differencing the instruments instead of the regressors to make them uncorrelated with the country-specific effect (v_i). This leads from the difference GMM to the system GMM estimator, which is a joint estimation of the equations in levels and first differences. The system GMM estimator avoids the weak instrument problem that the Arellano and Bond (1991) estimator would face and provides a more flexible variance-covariance structure for the moment conditions (David Roodman 2009). Hence, our preferred estimator is the two-step system GMM.

The consistency of the GMM estimator depends on the validity of the moment conditions. Hence, the Hansen test is used to test for the over-identification restrictions. The null of Hansen test is that the instruments are valid, not correlated with the error term and that the excluded instruments were correctly excluded from the equation. In addition to the Hansen test, we use two more diagnostics. The first-order and second-order serial correlation in the disturbances are tested to verify whether there are lags that are invalid instruments. The Arellano-Bond test results require significant first-order serial correlation and lack of second-order serial correlation.

3. Data and Empirical Results

3.1 Data

Our sample includes two key variables (*BMI* and *GDP*) and five control variables to explain the variation in happiness index (*HPI*). The control variables are the ratio between the richest and poorest Quintiles (*RP20*) of average income, household debt as a percentage of *GDP*, annual inflation rate, the share of urban population, and annual unemployment rate. The sample covers the period between 2005 and 2016 and includes all EU countries except for Poland. These are Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom. Poland is dropped from the sample due to the data availability.

Data for the happiness index were obtained from the World Database of Happiness (2020)[1]. This database is based on a survey asking "Suppose the top of the ladder

[1] **Veenhoven.** 2020. World Database of Happiness. https://worlddatabaseofhappiness.eur.nl/ (accessed February 12, 2020).

represents the best possible life for you and the bottom of the ladder the worst possible life. Where on this ladder do you feel you personally stand at the present time?" The possible scores range from 10 to 0. Data for body mass index were obtained from the NCD Risk Factor Collaboration[2] (NCD-RisC), which is a network of health scientists around the world that provides rigorous and timely data on risk factors for non-communicable diseases (NCDs) for 200 countries and territories. The data collection considers about 2,545 population-based surveys from 193 countries with nearly 129 million adult participants whose risk factor levels have been measured. Data for GDP, inflation, unemployment, and urban population were obtained from the World Bank (2020)[3]. The GDP data were in US dollars and deflated to 2010 prices. CPI was used as the proxy for annual inflation. Data for household debt as a percentage of GDP were obtained from the IMF (International Monetary Fund 2020)[4]. The World Bank provides income share held by the lowest and the highest 20% for each county in the sample. Income inequality, defined as RP20, is the ratio between the income share held by the highest 20% and the lowest 20%. It is possible to use the GINI index as a proxy for income inequality, but continuous data were not available during the sample period.

The summary statistics of all variables of interest in the panel reported in Table 1.

Table 1 Summary Statistics

Variable	Mean	St. dev	Min	Max
HPI	6.298	0.914	3.844	8.019
BMI	26.195	0.601	25.000	27.500
GDP	33216.970	21009.860	5561.160	111968.400
INEQ	5.238	1.172	3.333	9.000
DEBT	57.198	30.525	8.600	139.430
INF	2.129	2.272	-4.480	15.400
URBAN	72.827	12.555	51.530	97.920
UNEMP	9.043	4.379	3.477	27.466

Notes: HPI, BMI, GDP, INEQ, DEBT, INF, UR, UNEMP and St. dev stand for happiness index, body mass index, per capita real GDP, the ratio between the richest and poorest Quintiles (RP20) of average income, household debt as a percentage of GDP, annual inflation rate, the share urban population, annual unemployment rate, and standard deviation, respectively.

Source: Authors' calculation.

The summary statistics of all variables of interest by country are also reported. As seen in Table 2, the happiness score ranges from 7.7 in Denmark to 4.2 in Bulgaria. The mean *BMI*, however, ranges from 25.0 in France to 27.1 in Ireland. As for the *per capita* real *GDP*, Luxembourg has the highest mean *per capita GDP*, while Bulgaria is the poorest country in the panel.

[2] **NCD Risk Factor Collaboration.** 2020. https://ncdrisc.org/data-downloads.html (accessed February 14, 2020).

[3] **World Bank.** 2020. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators (accessed February 20, 2020).

[4] **International Monetary Fund.** 2020. Household Debt. https://www.imf.org/external/datamapper/HH_ALL@GDD/CAN/GBR/USA/2020 (accessed February 28, 2020).

Table 2 Summary Statistics by Country

Country	Statistics	*HPI*	*BMI*	*GDP*	*INEQ*	*DEBT*	*INF*	*UR*	*UNEMP*
Austria	Mean	7.2	25.4	47264.9	4.8	51.8	1.9	57.8	5.2
	St. dev	0.2	0.1	1134.1	0.2	1.3	0.9	0.5	0.5
	Min	6.9	25.2	44637.9	4.3	50.2	0.5	57.1	4.1
	Max	7.5	26.6	48172.2	5.1	54.4	3.4	58.8	6.0
Belgium	Mean	7.0	25.9	44412.9	4.3	52.8	2.0	97.7	8.0
	St. dev	0.2	0.13	695.4	0.1	5.6	1.3	0.1	0.6
	Min	6.9	25.7	42994.4	4.2	43.1	-0.1	97.4	7.0
	Max	7.3	26.1	45457.9	4.4	59.5	4.5	97.9	8.5
Bulgaria	Mean	4.2	26.0	6884.7	6.8	22.4	3.7	72.5	9.4
	St. dev	0.4	0.3	657.5	0.6	3.4	4.1	1.2	2.4
	Min	3.8	25.6	5561.16	5.9	15.0	-1.4	70.6	5.6
	Max	4.9	26.4	7967.71	7.5	26.8	12.4	74.3	12.9
Croatia	Mean	5.6	26.7	13912.4	5.6	38.4	2.1	55.3	13.0
	St. dev	0.3	0.4	493.2	0.2	3.3	2.0	0.7	3.1
	Min	5.2	26.1	13119.8	5.3	30.8	-1.1	54.3	8.5
	Max	6.0	27.4	14777.4	5.7	41.9	6.1	56.4	17.3
Cyprus	Mean	6.1	26.7	29849.1	5.0	113.7	1.3	67.5	9.0
	St. dev	0.5	0.1	1959.9	0.5	15.1	2.2	0.5	4.9
	Min	5.4	26.6	27045.8	4.4	89.5	-2.1	66.9	3.7
	Max	6.8	26.8	32651.9	5.9	130.1	4.7	68.3	16.1
Czech Rep.	Mean	6.5	26.9	20050.3	3.8	27.3	2.0	73.4	6.2
	St. dev	0.2	0.2	995.4	0.1	5.1	1.7	0.1	1.3
	Min	6.2	26.6	180114	3.7	16.6	0.3	73.2	3.9
	Max	6.7	27.1	21894.1	3.9	31.7	6.4	73.6	7.9
Denmark	Mean	7.7	25.3	59380.2	3.9	125.9	1.6	86.9	5.9
	St. dev	0.2	0.1	1255.7	0.2	8.2	0.1	0.6	1.5
	Min	7.5	25.1	57229.1	3.6	111.8	0.3	85.9	3.5
	Max	8.0	25.3	61174.6	4.2	139.4	3.4	87.6	7.6
Estonia	Mean	5.4	26.1	16397.4	5.5	44.2	3.3	68.3	8.8
	St. dev	0.2	0.2	1299.3	0.4	6.9	3.2	0.3	3.7
	Min	5.1	25.8	14282.6	4.9	32.0	-0.5	68.0	4.6
	Max	5.6	26.4	18094.6	6.2	57.0	10.4	68.7	16.7
Finland	Mean	7.5	25.9	46481.2	4.0	59.1	1.6	84.1	8.0
	St. dev	0.1	0.1	1483.6	0.1	7.2	1.4	1.0	0.8
	Min	7.3	25.9	45065.8	3.9	46.4	-0.2	82.9	6.4
	Max	7.7	26	49363.7	4.1	67.1	4.1	85.3	9.4
France	Mean	6.7	25.0	41132.2	5.1	51.8	1.3	78.5	9.3
	St. dev	0.3	0.0	575.4	0.3	5.3	0.9	0.9	1.0
	Min	6.3	25	40052.3	4.5	41.6	0.0	77.1	7.3
	Max	7.1	25.1	41969.0	5.4	57.2	2.8	79.9	10.4
Germany	Mean	6.7	26.3	42882.7	4.8	58.6	1.4	76.8	6.8
	St. dev	0.2	0.2	2284.8	0.2	4.6	0.8	0.5	2.2
	Min	6.4	26.1	38969.3	4.6	53.1	0.2	76.0	4.2
	Max	7.0	26.6	45923.0	5.1	67.6	2.6	77.2	11.0
Greece	Mean	5.5	27.1	25809.7	6.5	57.5	1.7	76.5	16.9
	St. dev	0.6	0.1	3184.1	0.6	8.2	2.3	1.3	8.0
	Min	4.7	26.9	22251.3	5.8	39.7	-1.7	74.5	7.8
	Max	6.6	27.1	30054.9	7.3	65.1	4.7	78.4	27.5
Hungary	Mean	5.0	26.8	13685.9	4.7	29.7	3.5	68.9	8.6
	St. dev	0.3	0.3	632.3	0.6	6.7	2.6	1.5	2.0
	Min	4.7	26.3	12974.1	4.0	20.3	-0.2	66.4	5.1
	Max	5.4	27.3	14997.2	5.9	39.5	8.0	70.8	11.2
Ireland	Mean	7.1	27.1	53939.2	5.2	91.3	1.2	61.6	10.3
	St. dev	0.2	0.2	7115.5	0.3	20.5	2.6	0.7	4.2
	Min	6.8	26.8	48071.7	4.8	52.3	-4.5	60.5	4.6
	Max	7.6	27.5	69892.3	5.7	117.2	4.9	62.7	15.5
Italy	Mean	6.2	25.7	35734.7	6.3	40.8	1.6	68.6	9.2
	St. dev	0.4	0.1	1664.8	0.4	3.5	1.17	0.7	2.4
	Min	5.8	25.6	33616.0	5.6	33.0	-0.1	67.7	6.1
	Max	6.9	25.7	38236.8	7.0	44.0	3.4	69.9	12.6
Latvia	Mean	5.2	26.3	12855.3	6.7	36.1	4.1	67.9	11.8
	St. dev	0.5	0.2	1208.6	0.5	9.6	4.9	0.1	4.3
	Min	4.7	25.9	10873.4	5.8	23.7	-1.1	67.8	6.0
	Max	5.9	26.7	14733.8	7.7	50.4	15.4	68.0	19.5

Lithuania	Mean	5.7	26.3	13262.4	6.6	24.1	3.1	66.9	10.3
	St. dev	0.3	0.1	1680.23	0.6	4.9	3.2	0.2	4.2
	Min	5.1	26.2	10537.9	5.6	13.8	-0.9	66.6	4.3
	Max	6.1	26.4	15945.5	7.6	32.6	10.9	67.4	17.8
Luxembourg	Mean	7.0	26.1	105714.0	5.1	55.9	1.9	88.7	5.6
	St. dev	0.1	0.14	3173.2	0.3	6.2	1.2	1.3	1.1
	Min	6.7	25.9	101380.8	4.7	45.4	0.3	86.6	4.1
	Max	7.1	26.3	111968.4	5.7	65.3	3.4	90.5	7.1
Malta	Mean	6.3	27.1	21925.0	4.5	55.0	2.0	94.1	5.7
	St. dev	0.3	0.0	2077.1	0.1	5.1	1.1	0.3	1.0
	Min	5.8	27.1	19585.1	4.3	44.5	0.3	93.6	4.0
	Max	6.6	27.1	26064.2	4.7	60.4	4.3	94.5	6.9
Netherlands	Mean	7.5	25.5	50577.1	4.2	113.1	1.6	87.2	5.5
	St. dev	0.1	0.08	1155.0	0.2	4.3	0.8	2.7	1.2
	Min	7.3	25.3	48107.6	4.1	108.0	0.3	82.6	3.7
	Max	7.6	25.6	52267.7	4.5	118.7	2.5	90.6	7.4
Portugal	Mean	5.3	25.8	22113.4	6.5	85.0	1.5	60.8	11.1
	St. dev	0.2	0.1	527.2	0.3	6.3	1.5	2.2	3.1
	Min	5.0	25.6	21228.1	5.9	72.4	-0.8	57.5	7.6
	Max	5.7	25.8	22829.9	6.9	92.1	3.7	64.1	16.2
Romania	Mean	5.4	26.1	8568.9	7.8	15.9	4.3	53.7	6.8
	St. dev	0.4	0.5	906.0	0.6	3.2	3.3	0.3	0.5
	Min	4.9	25.4	6838.3	6.9	8.6	-1.5	53.2	5.8
	Max	6.0	26.9	10162.1	9.0	19.3	9.0	54.0	7.3
Slovakia	Mean	5.9	26.1	16701.2	4.1	25.3	2.1	54.6	12.7
	St. dev	0.3	0.2	1724.8	0.2	8.0	1.9	0.6	2.0
	Min	5.3	25.7	13210.3	3.6	12.3	-0.5	53.8	9.6
	Max	6.2	26.4	19275.1	4.4	38.0	4.6	55.6	16.2
Slovenia	Mean	5.9	26.1	23536.4	3.6	26.9	1.9	52.8	7.4
	St. dev	0.2	0.3	943.1	0.2	3.7	1.7	0.8	1.9
	Min	5.7	25.7	22029.4	3.3	18.8	-0.5	51.5	4.4
	Max	6.1	26.6	25447.4	3.9	30.9	5.7	54.0	10.1
Spain	Mean	6.5	26.1	30802.4	6.6	76.8	1.8	78.6	17.8
	St. dev	0.4	0.1	1123.4	0.6	6.6	1.7	0.8	6.7
	Min	6.2	25.9	29008.0	5.7	64.1	-0.5	77.3	8.2
	Max	7.3	26.2	32459.9	7.4	84.0	4.1	79.8	26.1
Sweden	Mean	7.3	25.8	52795.0	4.3	75.4	1.1	85.4	7.5
	St. dev	0.1	0.2	1926.8	0.2	8.5	1.3	0.9	0.8
	Min	7.2	25.5	49554.3	3.9	61.1	-0.5	84.3	6.1
	Max	7.6	26	56473.0	4.6	85.1	3.4	86.9	8.6
U. K.	Mean	6.9	27.0	40189.4	5.7	89.7	2.3	81.4	6.4
	St. dev	0.1	0.1	1083.3	0.3	3.8	1.2	1.0	1.3
	Min	6.5	26.7	38545.9	5.2	85.3	0.1	79.9	4.8
	Max	7.0	27.1	42039.7	6.1	96.4	4.5	82.9	8.1

Notes: HPI, BMI, GDP, INEQ, DEBT, INF, UR, UNEMP and St. dev stand for happiness index, body mass index, per capita real GDP, the ratio between the richest and poorest Quintiles (RP20) of average income, household debt as a percentage of GDP, annual inflation rate, the share of urban population, annual unemployment rate and standard deviation, respectively.

Source: Authors' calculation.

3.2 Empirical Results

Table 3 reports the system GMM regression results for the models specified in Equations (1) and (2). The consistency of the GMM estimators depends both on the assumption that the error term does not have a serial correlation problem, and on the validity of the instrument. The specification test results for the GMM estimations are reported at the bottom of the table. The Hansen test results suggest that the instruments are uncorrelated with the error term. As for the serial correlation in the residuals in differences, the AR(1) test rejects the null hypothesis of no existence of first-order serial correlation, and the AR(2) test shows a lack of second-order serial correlation. Hence, the results show that all *GMM* equations are properly specified.

In two regressions reported in Table 3, the lagged endogenous variable is significantly positive with a parameter value around 0.40, confirming the persistence in the happiness index. The regression results of Model 1 presented in the second column of Table 3 indicate a significant positive relationship between *HPI* and *BMI*, suggesting that higher *BMI* leads to higher *HPI*. This result does not support the findings of Stutzer (2007), Forste and Moore (2012), Katsaiti (2012), Ul-Haq et al. (2013), Latif (2014), Kuroki (2016) and Habibov and Afandi (2018). However, this result supports the findings of Sohn (2017), Bargain and Zeidan (2019) and Sato (2020) that found a positive relationship between happiness and obesity. The results further indicate that the coefficient of squared *BMI* is significantly negative, suggesting that there exists a non-linear relationship between *HPI* and *BMI*. Hence, these results verify an inverse *U*-shaped relationship between these variables. The non-linear relationship between these variables suggests that *HPI* initially rises with an increase in *BMI*, then, as a threshold is reached, stabilizes and decreases. The panel results further indicate that the marginal impact of *BMI* on *HPI* is (5.0554-0.1910*BMI*). Hence, a one-unit increase in *BMI* causes the *HPI* to increase by 4.8644 units on average. Hence, the threshold *BMI* is around 26.5 for the whole panel, implying that *HPI* increases with *BMI* until 26.5, and then it starts to decrease with *BMI*. It should be noted that the threshold *BMI* is slightly greater than the panel average of 26.2 reported in Table 1. As can also be clearly seen in Table 2, most EU countries' *BMI* levels are around the threshold level.

As for the *per capita* real income, the quadratic term of income is included in the regressions to capture a possible non-linear relationship between *HPI* and real income. To verify the Kuznets Curve hypothesis for the sampled countries, it is necessary to confirm an inverse *U*-shaped relationship between these two variables. The regression results of Model 1 indicate a significant positive relationship between *HPI* and *per capita* real income, suggesting that higher income leads to increase in the *HPI*. This result supports the findings of Frijters, Haisken-Denew, and Shields (2004), Katsaiti (2012) and Giovanis (2014). The results further indicate that the coefficient of squared *per capita* real income is significantly negative, suggesting a non-linear relationship between *per capita* real income and *HPI*. Hence, this result verifies an inverse *U*-shaped relationship, supporting the Kuznets Curve hypothesis in EU countries. The non-linear relationship between these variables suggests that *HPI* first increases with an increase in *per capita* real income, until it reaches the threshold level, then stabilizes and decreases. This result supports the findings of Ram (2017), which uses happiness inequality instead of real GDP *per capita*.

The panel results further indicate that the marginal impact of *per capita* real income on *HPI* is (0.0544-0.0008*GDP*). Hence, a one-unit increase in *per capita* real *GDP* causes the *HPI* to increase by 0.054 units on average. Hence, the threshold income level is around $68,000 for the whole panel, implying that *HPI* increases with *per capita* real income until $68,000 and then it starts to decrease with income. The impact of the global economic crisis of 2007 on the HPI is also controlled in the regressions, including a dummy variable that takes a value of one for the years 2007-2008 and zero otherwise. Although the crisis occurred in the second half of 2007 the sampled countries felt the impact of the crisis deeply in 2008. The coefficient of the crisis is statistically insignificant, implying that the crisis has no effect on the *HPI*.

Moreover, since the threshold income level is far above the panel average, all variables were winsorized at the 1st and 99th percentiles for a robustness test. The regression results again produced a threshold income level of around $68,000. The results are not reported but are available from the authors upon request.

As discussed before, Model 2 includes the two key variables and five control variables. The empirical results of this model are reported in the third column of Table 3. The results indicate that both BMI (and *GDP*) and its squared (and GDP^2) are significantly related to *HPI*, suggesting again the existence of a non-linear relationship between *BMI* (and *GDP*) and *HPI*. Hence, these results verify our previous findings.

Table 3 Estimation Results

	Model 1	***Model 2***
Intercept	-64.3996** (30.1029)	-89.2128** (35.5968)
HPI_{t-1}	0.4088* (0.1064)	0.3366* (0.133)
BMI	5.0554** (2.2967)	7.0265* (2.7231)
BMI^2	-0.0955** (0.04367)	-0.1333* (0.0518)
GDP($1,000)	0.0544* (0.0105)	0.0594* (0.0116)
GDP^2	-0.0004* (0.0001)	-0.0004* (0.0001)
INEQ		-0.0552** (0.0237)
DEBT		-0.0007 (0.0008)
INF		-0.0037 (0.0084)
UR		-0.0001 (0.0018)
UNEMP		-0.0219* (0.0056)
AR1(p-value)	0.000	0.002
AR2 (p-value)	0.755	0.773
Hansen (p-value)	0.290	0.379
NOG	27	27
NOI	16	12

Notes: HPI, BMI GDP, GDP^2 INEQ, DEBT, INF, UR and UNEMP stand for happiness index, body mass index, per capita real GDP, square of per capita real GDP, the ratio between the richest and poorest Quintiles (RP20) of average income, household debt as a percentage of GDP, annual inflation rate, the share urban population, and annual unemployment rate, respectively. * and ** denote statistical significance at the 1% and 5% levels. Figures in the parentheses are the robust standard errors. AR denotes autocorrelation. NOG and NOI denote number of groups and number of instruments, respectively.

Source: Authors' calculation.

As for the control variables, the results show that income or social inequality represented by the ratio between the richest and poorest Quintiles (RP20) of average income has a negative significant impact on *HPI*, suggesting that higher-income inequality reduces happiness in the sampled countries. It is known that higher inequality slows economic growth, causes social conflicts, increases crime, and reduces health.

Hence, our empirical result supports this observation and findings of Oishi, Kesebir, and Diener (2011), Oishi and Kesebir (2015) and Wesselbaum (2019). The results also indicate a significant negative link between unemployment rates and *HPI*, suggesting that increases in unemployment lead to a decrease in the *HPI*, i.e., lower incomes, lead to reduced consumption and therefore, utility and happiness. Moreover, the uncertainty generated by unemployment will have an additional negative impact on happiness. This result supports the findings of Blanchflower (2007) and Wesselbaum (2019). Furthermore, the coefficients of annual inflation rates, household debt and urbanization have the expected signs, but are statistically insignificant, suggesting that no relationships exist between these variables and the happiness in the context of EU countries. Some additional determinants of happiness discussed in the literature are age, gender, education, marital status, ethnicity, environment, household size and disability. Due to the data unavailability, these variables were not controlled in the regression, but future research may shed light on the possible nonlinear relationship between happiness and obesity using large micro level data.

4. Concluding Remarks

The one of the main objectives of this paper was to investigate quadratic relationships between happiness and obesity, represented by body mass index, in a panel of EU countries. The other objective of this paper was to examine whether there is a quadratic relationship between happiness and real income. Our findings indicate evidence of an inverted-U shaped relationship between the variables. An increase in body mass index seems to increase happiness until a threshold level of body mass index (26.5), after which it starts to decline. As stated before, people are generally classified as overweight if their body mass index (*BMI*) is more than 25. Hence, the average European is overweight since the panel mean BMI is 26.2. Although most sampled countries' mean body mass indices are around the threshold level, they are above the threshold level for the recent years of our sample.

Hence, the findings suggest that the obesity problem should not only be considered as a serious health problem involving chronic diseases such as hypertension, diabetes, cardiovascular disease, and cancer, but also may lead to reduced wellbeing. The finding indicates that EU countries have reached and passed the threshold level of *BMI*, suggesting that policymakers should design effective anti-obesity policies that may improve health, life satisfaction, and happiness of EU citizens. In light of our empirical findings, the related literature identified policies that might be applied to help people maintain a healthy *BMI*.

The findings also indicate the existence of an inverted U-shaped curve between the happiness index and *per capita* real income, supporting the validity of the Kuznets curve hypothesis (Simon Kuznets 1955). Hence, for the sampled countries, as real income increases, happiness increases to a real income threshold level $68,000, then stabilizes and finally decreases. It should be noted that the threshold income level is far above the mean income level of the sample. As discussed before, all variables were winsorized at the 1st and 99th percentiles to decrease the impact of outliers on the regression. However, the regression results are very similar. Hence, our results are robust.

This paper also examined the impact of income (or social) inequality, household debt, urbanization, inflation and unemployment on happiness in order to resolve omitted variable bias problems. The results show that household debt, inflation and urbanization have no significant impact on happiness. Income inequality and unemployment, however, have a significant negative impact on happiness, suggesting that countries have higher income inequality and unemployment rates have a lower happiness index. Hence, income or social inequality and unemployment rates contribute to unhappiness. Policymakers should produce some policies that take income inequality and unemployment under control in order to increase the well-being of the people.

References

Anderson, T. W., and Cheng Hsiao. 1981. “Estimation of Dynamic Models with Error Components.” *Journal of the American Statistical Association*, 76(375): 598-606. http://dx.doi.org/10.1080/01621459.1981.10477691

Arellano, Manuel, and Stephen R. Bond. 1991. “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.” *The Review of Economic Studies*, 58(2): 277-297. http://dx.doi.org/10.2307/2297968

Arellano, Manuel, and Olympia Bover. 1995. “Another Look at the Instrumental Variables Estimation of Error Components Models.” *Journal of Econometrics*, 68(1): 29-51. http://dx.doi.org/10.1016/0304-4076(94)01642-D

Bargain, Olivier, and Jinan Zeidan. 2019. “Heterogeneous Effects of Obesity on Mental Health: Evidence from Mexico.” *Health Economics*, 28(4): 447-460. http://dx.doi.org/10.1002/hec.3852

Biørn, Erik, and Jayalakshmi Krishnakumar. 2008. “Measurement Errors and Simultaneity.” In *The Econometrics of Panel Data: Fundamentals and Recent Developments in Theory and Practice*, ed. László Mátyás and Patrick Sevestre, 323-367. Berlin: Springer. http://dx.doi.org/10.1007/978-3-540-75892-1_10

Blanchflower, David G. 2007. “Is Unemployment more Costly than Inflation?” National Bureau of Economic Research Working Paper W13505.

Blundell, Richard, and Stephen R. Bond. 1998. “Initial Conditions and Moment Restrictions in Dynamic Panel Data Models.” *Journal of Econometrics*, 87(1): 115-143. http://dx.doi.org/10.1016/S0304-4076(98)00009-8

Böckerman, Petri, Edvard Johansson, Samuli I. Saarni, and Suoma E. Saarni. 2014. “The Negative Association of Obesity with Subjective Well-Being: Is It All about Health?” *Journal of Happiness Studies*, 15(4): 857-867. http://dx.doi.org/10.1007/s10902-013-9453-8

Cheng, Terence C., Nattavudh Powdthavee, and Andrew J. Oswald. 2017. “Longitudinal Evidence for a Midlife Nadir in Human Well-Being: Results from Four Data Sets.” *Economic Journal*, 127(599): 126-142. http://dx.doi.org/10.1111/ecoj.12256

Clark, Andrew E. 2003. “Inequality-Aversion and Income Mobility: A Direct Test.” Département et Laboratoire d’Économie Théorique Appliquée Working Paper 11.

Deaton, Angus, and Arthur A. Stone. 2016. “Understanding Context Effects for a Measure of Life Evaluation: How Responses Matter.” *Oxford Economic Papers*, 68(4): 861-870. http://dx.doi.org/10.1093/oep/gpw022

Di Tella, Rafaeli, Robert J. MacCulloch, and Andrew J. Oswald. 2001. “Preferences over Inflation and Unemployment: Evidence from Surveys of Happiness.” *American Economic Review*, 91(1): 335-341. http://dx.doi.org/10.1257/aer.91.1.335

Diener, Ed, Robert A. Emmons, Randy J. Larsen, and Sharon Griffin. 1985. “The Satisfaction with Life Scale.” *Journal of Personality Assessment*, 49(1): 71-75. http://dx.doi.org/10.1207/s15327752jpa4901_13

Easterlin, Richard A. 1974. “Does Economic Growth Improve the Human Lot? Some Empirical Evidence.” In *Nations and Households in Economic Growth: Essays in Honour of Moses Abramovitz*, ed. Paul A. David and Melvin W. Reder, 89-125. New York: Academic Press. http://dx.doi.org/10.1016/B978-0-12-205050-3.50008-7

Forste, Renata, and Erin Moore. 2012. “Adolescent Obesity and Life Satisfaction: Perceptions of Self, Peers, Family, and School.” *Economics and Human Biology*, 10(4): 385-394. http://dx.doi.org/10.1016/j.ehb.2012.04.008

Frijters, Paul, John P. Haisken-Denew, and Michael A. Shields. 2004. "Money Does Matter! Evidence from Increasing Real Incomes and Life Satisfaction in East Germany Following Reunification." *American Economic Review*, 94(3): 730-740. http://dx.doi.org/10.1257/0002828041464551

Giovanis, Eleftherios. 2014. "Relationship between Well-Being and Recycling Rates: Evidence from Life Satisfaction Approach in Britain." *Journal of Environmental Economics and Policy*, 3(3): 201-214. http://dx.doi.org/10.1080/21606544.2014.883941

Graham, Carol. 2005. "The Economics of Happiness." *World Economics*, 6(3): 41-55.

Grün, Carola, Wolfgang Hauser, and Thomas Rhein. 2010. "Is any Job Better than No Job? Life Satisfaction and Re-employment." *Journal of Labor Research*, 31(3): 285-306. http://dx.doi.org/10.1007/s12122-010-9093-2

Habibov, Nazim, and Elvin Afandi. 2018. "Does Life Satisfaction Determine Subjective Health?" *Applied Research in Quality of Life*, 11(2): 413-428. http://dx.doi.org/10.1007/s11482-014-9371-x

Jantsch, Antje, and Ruut Veenhoven. 2018. "Private Wealth and Happiness: A Research Synthesis Using an On-Line Findings Archive." Erasmus Happiness Economics Research Organization Working Paper 2018-3. http://dx.doi.org/10.1007/978-3-030-05535-6_2

Jebb, Andrew T., Louis Tay, Ed Diener, and Shigehiro Oishi. 2018. "Happiness, Income Satiation and Turning Points around the World." *Nature Human Behaviour*, 2(1): 33-38. http://dx.doi.org/10.1038/s41562-017-0277-0

Kahneman, Daniel, and Angus Deaton. 2010. "High Income Improves Evaluation of Life, but Not Emotional Well-Being." *Proceedings of the National Academy of Sciences*, 107(38): 16489-16493. http://dx.doi.org/10.1073/pnas.1011492107

Katsaiti, Marina Selini. 2012. "Obesity and Happiness." *Applied Economics*, 44(31): 4101-4114. http://dx.doi.org/10.1080/00036846.2011.587779

Kuroki, Masanori. 2016. "Life Satisfaction, Overweightness and Obesity." *International Journal of Wellbeing*, 6(2): 93-110. http://dx.doi.org/10.5502/ijw.v6i2.519

Kuznets, Simon. 1955. "Economic Growth and Income Inequality." *American Economic Review*, 49(1): 1-28.

Latif, Ehsan. 2014. "Obesity and Happiness: Does Gender Matter?" *Economics and Business Letters*, 3(1): 59-67. http://dx.doi.org/10.17811/ebl.3.1.2014.59-67

Layard, Richard. 2005. *Happiness: Lessons from a New Science*. New York: Penguin Group.

Layard, Richard, Guy Mayraz, and Stephen J. Nickell. 2010. "Does Relative Income Matter? Are the Critics Right?" In *International Differences in Well-Being*, ed. Ed Diener, John F. Helliwell, and Daniel Kahneman. New York: Oxford University Press. http://dx.doi.org/10.1093/acprof:oso/9780199732739.001.0001

Lee, Wang-Sheng, and Zhong Zhao. 2017. "Height, Weight and Well-Being for Rural, Urban and Migrant Workers in China." *Social Indicator Research*, 132(1): 117-136. http://dx.doi.org/10.1007/s11205-015-1143-y

Luechinger, Simon. 2009. "Valuing Air Quality Using the Life Satisfaction Approach." *The Economic Journal*, 119(3): 482-515. http://dx.doi.org/10.1111/j.1468-0297.2008.02241.x

Oishi, Shigehiro, Selin Kesebir, and Ed Diener. 2011. “Income Inequality and Happiness.” *Psychological Science*, 22(9): 1095-1100. http://dx.doi.org/10.1177/0956797611417262

Oishi, Shigehiro, and Selin Kesebir. 2015. “Income Inequality Explains why Economic Growth Does Not always Translate to an Increase in Happiness.” *Psychological Science*, 26(10): 1630-1638. http://dx.doi.org/10.1177/0956797615596713

Okulicz-Kozaryn, Adam, and Joan Maya Mazelis. 2018. “Urbanism and Happiness: A Test of Wirth’s Theory of Urban Life.” *Urban Studies*, 55(2): 349-364. http://dx.doi.org/10.1177/0042098016645470

Oreopoulos, Philip, and Kjell G. Salvanes. 2011. “Priceless: The Nonpecuniary Benefits of Schooling.” *Journal of Economic Perspectives*, 25(1): 159-184. http://dx.doi.org/10.1257/jep.25.1.159

Ram, Rati. 2017. “Kuznets Curve in Happiness: A Cross-Country Exploration.” *Economic Modelling*, 66(2): 272-278. http://dx.doi.org/10.1016/j.econmod.2017.06.006

Roodman, David. 2009. “A Note on the Theme of too many Instruments.” *Oxford Bulletin of Economics and Statistics*, 71(1): 135-158. http://dx.doi.org/10.1111/j.1468-0084.2008.00542.x

Sato, Kazuma. 2020. “Unhappy and Happy Obesity: A Comparative Study on the United States and China.” *Journal of Happiness Studies*, 22(3): 1259-1285. http://dx.doi.org/10.1007/s10902-020-00272-2

Shields, Michael A., and Allan Wailoo. 2002. “Exploring the Determinants of Unhappiness for Ethnic Minority Men in Britain.” *Scottish Journal of Political Economy*, 49(5): 445-466. http://dx.doi.org/10.1111/1467-9485.00241

Sohn, Kitae. 2017. “The Fatter Are Happier in Indonesia.” *Quality of Life Research*, 6(2): 393-402. http://dx.doi.org/10.1007/s11136-016-1403-6

Stutzer, Alois, and Bruno S. Frey. 2006. “Does Marriage Make People Happy, or Do Happy People Get Married?” *Journal of Socio-Economics*, 35(2): 326-347. http://dx.doi.org/10.1016/j.socec.2005.11.043

Stutzer, Alois. 2007. “Limited Self-Control, Obesity and the Loss of Happiness.” Institute for the Study of Labor Discussion Paper 2925.

Sulkowski, Adam, and D. Steven White. 2016. “A Happiness Kuznets Curve? Using Model-Based Cluster Analysis to Group Countries based on Happiness, Development, Income, and Carbon Emissions.” *Environment, Development and Sustainability*, 18(4): 1095-1111. http://dx.doi.org/10.1007/s10668-015-9689-z

Ul-Haq, Zia, Daniel F. Mackay, Daniel Martin, Daniel J. Smith, Jason M. R. Gill, Barbara I. Nicholl, Breda Cullen, Jonathan Evans, Beverly Roberts, Ian J. Deary, John Gallacher, Matthew Hotopf, Nick Craddock, and Jill P. Pell. 2013. “Heaviness, Health and Happiness: A Cross-Sectional Study of 163 066 UK Biobank Participants.” *Journal of Epidemiology and Community Health*, 68(2): 330-348. http://dx.doi.org/10.1136/jech-2013-203077

Wesselbaum, Dennis. 2019. “Happiness over the Financial Crisis.” *Oxford Development Studies*, 47(1): 113-133. http://dx.doi.org/10.1080/13600818.2018.1524862

Wirth, Louis. 1938. “Urbanism as a Way of Life.” *American Journal of Sociology*, 44(1): 1-24. http://dx.doi.org/10.1086/217913

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