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Measuring Socio-economic Factors and Sensitivity of Happiness

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Abstract

There is significant variation in average subjective well-being across countries. What makes people in some countries happier or more miserable than others? We know that a wide range of socio-economic circumstances affects individuals' subjective well-being. Many studies focus on select aspects of the lives of individuals in each country and can explain only a part of the difference in subjective well-being across countries. Thus, they have not been able to fully explain cross-country variation in average well-being. Covering a comprehensive set of socio-economic variables, we provide a fuller account of external factors that generate differences in average well-being across countries. However, these factors still cannot completely explain the cross-country variation. While an individual's subjective well-being is affected by socio-economic status, every individual does not necessarily draw the same level of subjective well-being from a given condition of life. There are evidently differences in the sensitivity of individuals' happiness to socio-economic conditions and this partly explains cross-country variation in average subjective well-being. In this study, we decompose the difference in average subjective well-being across countries into a comprehensive set of socio-economic factors along with cross-country difference in sensitivity of happiness. We adopt Data Envelopment Analysis (DEA) to estimate a happiness function and specify the sensitivity score for each country in a sample. We draw on a comprehensive set of well-being indicators released by the Better Life Initiative of the Organisation for Economic Cooperation and Development, along with measures of income inequality. These indicators, which assess the population's average life circumstances in multiple socioeconomic factors, comprise the 10 representative factors of well-being. We find that the *health* factor and sensitivity term play the largest role in generating variation in subjective well-being. Even within countries, the average level of subjective well-being varies between different population groups. Drawing on a set of indicators that assess the life circumstances of different groups within each country, our decomposition formulation allows for a full explanation of the differences in average life satisfaction between the groups. Women's higher subjective well-being is attributed mainly to a *work–life balance* factor, while its impact is largely offset by a *jobs* factor. In addition, women's greater sensitivity of happiness helps to raise their subjective well-being relative to men. On the other hand, high income earners have higher subjective well-being than low income earners in most countries. Life circumstances of high income earners are better in most socio-economic aspects. However, high income earners have lower sensitivity of happiness than low income earners. High income earners are happier than low income earners but are not as happy as would be expected from their better life circumstances.

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1. Introduction

Economists have asked the question of what makes some countries rich and others poor for a long time. Gross domestic product (GDP) per capita has long been used as a proxy measure for how well off people are, or in other words, peoples' well-being. Thus, much effort has been devoted to explaining cross-country differences in GDP per capita or per worker.[1] However, there are clearly factors which affect people's well-being other than just income.[2] Happiness research shows that self-reported life satisfaction is a more reasonable measure of individual well-being than personal income.[3] This study focuses on a country's average subjective well-being (or happiness) and explores why it differs across countries in order to answer the question of what makes some countries rich and others poor.[4]

There are a large number of determinants of happiness. Numerous studies address what factors influence people's subjective well-being and to what extent. These studies are concerned not only with the influence of economic factors, such as income and jobs, on people's subjective well-being. The studies also show that non-material aspects of people's lives, such as social relations with family and friends, are important for determining their subjective well-being. Frey (2008) surveys the effect of a variety of factors on subjective well-being.

However, there are two shortcomings with the early studies on identifying the determinants of subjective well-being and quantifying their influences. First, they often focus on select aspects of people's lives and estimate their impact on happiness by holding other factors constant. By missing many determinants of subjective well-being, they fail to explain completely cross-country variations.[5] Second, they often assume a happiness function that is too simplistic in structure, such as a linear functional form or a limited number of cross-terms among explanatory variables. An assumption of a simple functional form a priori restricts the interaction among explanatory variables. Thus, the studies fail to measure accurately the influences of each determinant on subjective well-being.

This study has two key features to overcome these shortcomings. First, we deal with a comprehensive set of socio-economic determinants which capture people's life circumstances. Second, we adopt a Data Envelopment Analysis (DEA) technique to estimate a happiness function. We begin by explaining why we choose this estimation approach. Among the reasons why earlier studies do not consider a comprehensive set of indicators in the happiness function is that these studies rely on a regression

[1] See Caselli (2005).

[2] An alternative approach is to aggregate income and other factors, such as life expectancy, leisure, and inequality, to enrich a measure of overall well-being. See Fleurbaey and Gaulier (2009) and Jones and Klenow (2010).

[3] There are multiple measures of happiness. This study adopts the 0–10 point scale of the Cantril Ladder of life satisfaction.

[4] The terms 'happiness', 'subjective well-being', and 'life satisfaction' are used interchangeably, as is common in the literature.

[5] Helliwell and Wang (2012, 2013) also investigate the socio-economic the cross-country variation of subjective well-being and explain it from different life circumstances using individual survey data. Helliwell and Wang (2013) explain three quarters of the international differences in subjective well-being by a much smaller number of variables (six) to characterize people's life circumstances. By comparing people's lives using more than double this number of variables, we can attribute a higher proportion of the differences in subjective well-being to the differences in life conditions.

approach. Highly correlated explanatory variables do not allow us to derive statistically meaningful results because of multi-collinearity. On the other hand, DEA is a deterministic approach based on linear programming to construct a non-parametric piece-wise frontier over the data. Therefore, first of all, since it is a deterministic approach, it is immune from problems of multi-collinearity even when highly correlated explanatory variables exist. Second, since it does not a priori assume any functional form, it allows us to capture a variety of types of interaction between underlying variables which contribute to people's well-being.

DEA was originally proposed by Charnes et al. (1978) for constructing production frontiers and measuring the productive efficiency of firms. Just as every firm does not produce the same amount of output from a given input, every individual does not enjoy the same amount of subjective well-being from given socio-economic situations. In addition, just as efficient firms produce more from a given input than less efficient firms, sensitive people have higher subjective well-being from a given socio-economic condition than less sensitive people. Thus, the application of DEA to our field of study allows us to derive sensitivity of happiness for each country in addition to specification of the happiness function.

Application of DEA to national average subjective well-being specifies sensitivity of people in each country. This suggests that countries' socio-economic conditions of their people's lives influence the national average subjective well-being, but do not fully determine average subjective well-being because of differences in sensitivity. As Frey and Stutzer (2002), Frey (2008), and Oishi (2010) advocate, more personal factors, such as personality, demography, and culture, also influence people's subjective well-being. Thus, people in some countries appear intrinsically happier than others, even when faced with the same socio-economic situations. Countries' sensitivity terms reflects such factors uncovered by socio-economic variables.

Recently, the DEA technique has been applied widely to the measurement of quality of life and overall well-being. However, it has been restricted mostly to aggregating separate well-being indicators or variables into a single measure; this is surveyed by Cherchye et al. (2007). For happiness research, Guardiola and Picazo-Tadeo (2013) utilize DEA to address the problem of how to relate people's satisfaction with different domains of their lives to overall life satisfaction. While the researchers focus on overall life satisfaction, which equals our subjective well-being, they address a different question.

Although we understand that there are many underlying socio-economic determinants of subjective well-being, the manner of selecting variables or indicators which influence people's well-being is difficult practically. Drawing upon the 2009 recommendations of France's commission on economic and social measurement (Stiglitz et al., 2009), which went beyond GDP to measure wealth and progress, the Organization for Economic Cooperation and Development (OECD) identified 11 well-being dimensions as being essential to people's well-being and released 24 underlying indicators (OECD, 2011). The dimensions cover material living conditions, such as income and wealth, as well as quality of life, such as community, environment, and work–life balance. Drawing on these OECD data, we estimate a happiness function based on the DEA technique and decompose the cross-country variation in subjective well-being into a set of factors covering every aspect of people's lives.

The OECD has made available a set of indicators differentiated by population groups, such as males and females, and high and low income earners in each country. Average

subjective well-being of females is higher than that of males while that of high income earners is higher than that of low income earners. Setting one population group as the reference group, our decomposition formula allows us to fully decompose the difference in average subjective well-being between different population groups into socio-economic factors and sensitivity of happiness. We investigate the reason why females and high income earners are happier than the other population groups.

The paper is presented as follows. Section 2 explains the procedure of estimation and decomposition. Section 3 explains data of the OECD well-being indicators. Section 4 provides the empirical results. Section 5 concludes.

2. Method: Model and Estimation Strategy

National average subjective well-being differs largely across countries. Our ultimate goal is to explain where this difference in subjective well-being comes from. It is well known that people's subjective well-being depends on their life circumstances in a wide range of socio-economic aspects.[6] Thus, we relate the average level of subjective well-being of people in a country to the socio-economic status of the country.[7] In Equation (1) below, SWB^c indicates national average subjective well-being of country c. Socio-economic vector $\boldsymbol{x}^c = (x_1^c, \dots, x_N^c)$ consists of N socio-economic variables and characterizes life circumstances of people in country c in terms of N socio-economic aspects.[8] The relationship between SWB^c and $\boldsymbol{x}^c$ is summarized by a happiness function H as follows.

$$SWB^c = \theta^c H(\boldsymbol{x}^c) \tag{1}$$

By assuming a cross-national happiness function H that is common to all the countries, we can attribute the differences in subjective well-being across countries by the differences in $\boldsymbol{x}$. However, individuals who share the same life circumstances do not necessarily have the same level of subjective well-being. This is because socio-economic vector $\boldsymbol{x}$ does not cover more personal aspects of people's subjective well-being, such as personality, demography, and culture.[9] Thus, some individuals are intrinsically happier than others, even though their life conditions are the same.

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[6] See Frey (2008).

[7] For simplicity, the average level of subjective well-being of people in a country is called 'national average subjective well-being' or 'subjective well-being of a country' in this paper

[8] For example, the n-th component x_n^c corresponds to the n-th socio-economic condition of country c, such as income, jobs, and environment. However, each socio-economic condition is often characterized by a vector consisting of multiple indicators; for example, the environmental quality of country c might be captured by qualities of air and water as well as green spaces. Thus, it is appropriate to adopt a socio-economic vector consisting of N sub-vectors, such as $\boldsymbol{x}^c = (\boldsymbol{x}_1^c, \dots, \boldsymbol{x}_N^c)$. While our empirical application adopts this framework, it complicates our description of the model and estimation strategy. Thus, for simplicity, we consider the case in which each socio-economic condition is characterized by one indicator, such as $\boldsymbol{x}^c = (x_1^c, \dots, x_N^c)$.

[9] De Neve et al. (2012) investigate the role of personality types in explaining people's subjective well-being. Oishi (2010) discusses the role of cultural differences in explaining cross-country differences in people's subjective well-being.

Rather than identifying such uncovered factors in further detail and measuring their respective contributions, we introduce an overarching concept of *sensitivity of happiness* θ to capture these influences on national average subjective well-being.[10] It is constructed so that $0 \leq \theta \leq 1$.[11] The maximum value of 1 indicates that a country is sensitive to its socio-economic conditions. A smaller value of θ indicates a less sensitive or more insensitive country. For example, given any socio-economic vector $\boldsymbol{x}$, a larger share of individuals who are intrinsically unhappy in a country raises its national average subjective well-being beyond the level expected from its socio-economic status $H(\boldsymbol{x})$, leading to a smaller θ.

Before we discuss how to estimate the happiness function H and the sensitivity term θ, we explain how to decompose the cross-country differences in subjective well-being into multiple factors. Multilateral comparison requires a reference country. We investigate the likely reasons why the subjective well-being of each country is higher or lower than a hypothetical reference country. Suppose K countries constitute our sample. We construct a hypothetical reference country characterized by the sensitivity term and the socio-economic vectors that are averaged over K countries so that $\bar{\theta} = (1/K)\Sigma_{k=1}^{K}\theta^k$ and $\bar{\boldsymbol{x}} = (1/K)\Sigma_{k=1}^{K}\boldsymbol{x}^k = \left(\bar{x}_1^k, \ldots, \bar{x}_N^k\right)$. The subjective well-being of people in the reference country is expressed by $\bar{\theta}H(\bar{\boldsymbol{x}})$. This is the level of happiness which we expect people to experience when they face the average life circumstances across countries in every socio-economic aspect and when they are characterized by average sensitivity of happiness. We can attribute the difference between SWB^c and $H(\bar{\boldsymbol{x}})$ to the difference in the sensitivity term and N socio-economic factors between country c and the reference country by the following Equations (2) and (3).

$$\begin{aligned}\frac{SWB^c}{\bar{\theta}H(\bar{\boldsymbol{x}})} &= \frac{\theta^c H(\boldsymbol{x}^c)}{\bar{\theta}H(\bar{\boldsymbol{x}})} \\ &= \underbrace{\frac{\theta^c}{\bar{\theta}}}_{sensitivity} \times \underbrace{\frac{H(\boldsymbol{x}^c)}{H(\bar{x}_1, x_2^c, \ldots, x_N^c)}}_{1^{st}\ factor} \\ &\times \cdots \times \underbrace{\frac{H(\bar{x}_1, \ldots, \bar{x}_{n-1}, x_n^c, x_n^c, \ldots, x_N^c)}{H(\bar{x}_1, \ldots, \bar{x}_{n-1}, \bar{x}_n, x_n^c, \ldots, x_N^c)}}_{n-th\ factor} \times \cdots \\ &\times \underbrace{\frac{H(\bar{x}_1, \ldots, \bar{x}_{N-1}, x_N^c)}{H(\bar{\boldsymbol{x}})}}_{N-th\ factor}\end{aligned} \tag{2}$$

[10] We find that introducing the concept of sensitivity of happiness is a practical solution to controlling for the uncovered factors because these factors involve subjects which are difficult to measure.

[11] Sensitivity corresponds to efficiency, which is a measure of productive performance and requires the fewest inputs to produce the most outputs. Just as a firm producing more output from the same input is considered to be more efficient, in this study, a country with greater subjective well-being from the same socio-economic vector is considered to be more sensitive. θ_c is within the range between 0 and 1 because θ_c is the counterpart to the Farell measure, which is normalized within the same range.

$$\frac{SWB^c}{\bar{\theta}H(\bar{\boldsymbol{x}})} = \frac{\theta^c H(\boldsymbol{x}^c)}{\bar{\theta}H(\bar{\boldsymbol{x}})} = \underbrace{\frac{\theta^c}{\bar{\theta}}}_{sensitivity} \times \underbrace{\frac{H(x_1^c, \bar{x}_2, \dots, \bar{x}_N)}{H(\bar{\boldsymbol{x}})}}_{1^{st}\ factor} \times \cdots \times \underbrace{\frac{H(x_1^c, \dots, x_{n-1}^c, x_n^c, \bar{x}_{n+1}, \dots, \bar{x}_N)}{H(x_1^c, \dots, x_{n-1}^c, \bar{x}_n, \bar{x}_{n+1}, \dots, \bar{x}_N)}}_{n-th\ factor} \times \cdots \times \underbrace{\frac{H(\boldsymbol{x}^c)}{H(x_1^c, \dots, x_{N-1}^c, \bar{x}_N)}}_{N-th\ factor} \tag{3}$$

Both equations construct the contribution of each socio-economic factor in the same manner. This is captured by the increase in subjective well-being associated with the difference of a corresponding socio-economic variable between country c and the reference country, holding all other socio-economic variables fixed. While Equation (2) starts from $H(\boldsymbol{x})$ and approaches $H(\bar{\boldsymbol{x}})$ by changing from each socio-economic variable of country c, x_n^c to the cross-country average $\bar{x}_n$ in the order from 1st socio-economic factor to N-th socio-economic factor one by one, Equation (3) starts from $H(\bar{\boldsymbol{x}})$ and approaches $H(\boldsymbol{x})$ by changing from the cross-country average of each socio-economic variable $\bar{x}_n$ to that of country c.

The contribution of the sensitivity term is determined uniquely in both Equations (2) and (3). However, the formulation for each socio-economic factor varies according to these two equations. Equations (2) and (3) display equally reasonable decomposition of the difference of subjective well-being between SWB^c and $H(\bar{\boldsymbol{x}})$. Thus, we adopt the geometric mean of Equations (2) and (3) as our preferred decomposition formula following the convention originated by Fisher (1922) and Malmquist (1953). It is represented as follows.

$$\frac{SWB^c}{\bar{\theta}H(\bar{\boldsymbol{x}})} = \underbrace{\frac{\theta^c}{\bar{\theta}}}_{sensitivity} \times \underbrace{\left(\frac{H(\boldsymbol{x}^c)}{H(\bar{x}_1, x_2^c, \dots, x_N^c)} \cdot \frac{H(x_1^c, \bar{x}_2, \dots, \bar{x}_N)}{H(\bar{\boldsymbol{x}})}\right)^{1/2}}_{1^{st}\ factor} \times$$
$$\cdots \times \underbrace{\left(\frac{H(\bar{x}_1, \dots, \bar{x}_{n-1}, x_n^c, x_n^c, \dots, x_N^c)}{H(\bar{x}_1, \dots, \bar{x}_{n-1}, \bar{x}_n, x_n^c, \dots, x_N^c)} \cdot \frac{H(x_1^c, \dots, x_{n-1}^c, x_n^c, \bar{x}_{n+1}, \dots, \bar{x}_N)}{H(x_1^c, \dots, x_{n-1}^c, \bar{x}_n, \bar{x}_{n+1}, \dots, \bar{x}_N)}\right)^{1/2}}_{n-th\ factor} \times \tag{4}$$
$$\cdots \times \underbrace{\left(\frac{H(\bar{x}_1, \dots, \bar{x}_{N-1}, x_N^c)}{H(\bar{\boldsymbol{x}})} \cdot \frac{H(\boldsymbol{x}^c)}{H(x_1^c, \dots, x_{N-1}^c, \bar{x}_N)}\right)^{1/2}}_{N-th\ factor}$$

Equation (4), a decomposition formula, defines the contribution of each socio-economic factor by the geometric mean of corresponding ones in Equations (2) and (3).

Taking the natural logarithm on both sides of Equation (4), we can additively decompose the differences in subjective well-being into a percentage scale between country c and the reference country. We can go one step further by multiplying both sides of the natural logarithm of (4) by the subjective well-being of the reference country $\bar{\theta}H(\bar{\boldsymbol{x}})$. This allows us to additively decompose the differences of subjective

well-being between country c and the reference country in the original 10 point scale into the sensitivity term and N socio-economic factors.[12]

Now, we turn our attention to the problem of estimating $H(\boldsymbol{x})$ and θ^c. We adopt the DEA approach introduced by Charnes et al. (1978). DEA was originally invented as a tool for measuring productive efficiency of firms. It uses linear programming to construct a non-parametric piece-wise production frontier over observed input–output data and to measure the efficiency of each unit relative to the frontier. The production frontier specifies the maximum amount of output attainable from given inputs. The difference between a firm's actual amount of output and its maximum amount indicated by the production frontier captures the firm's efficiency.

Considering socio-economic vector $\boldsymbol{x}$ as input and subjective well-being SWB as output attainable from $\boldsymbol{x}$, DEA estimates a happiness function in the same way it estimates a production frontier. The estimated happiness function indicates the maximum level of subjective well-being expected from a given socio-economic vector. This is the level that sensitive countries have given their socio-economic situations. Under this setting, the concept of productive efficiency corresponds to sensitivity of happiness. The application of DEA computes the sensitivity of happiness for a country characterized by SWB and $\boldsymbol{x}$ as follows.[13]

$$\frac{SWB}{H(\boldsymbol{x})} = \underset{\lambda^1,\dots,\lambda^K}{max}\{\varphi: \Sigma_{k=1}^{K} x_n^k \lambda^k \le x_n \text{ for } n = 1,\dots,N; \Sigma_{k=1}^{K} SWB^k \lambda^k \le \varphi SWB; \lambda^k \ge 0 \text{ for } k = 1,\dots,K\} \quad (5)$$

Equation (5) constructs a piece-wise linear happiness function that tightly envelopes observed data SWB^k and $\boldsymbol{x}^k$ for $k = 1,\dots,K$ under assumptions of convexity and constant returns to scale. Thus, just as all the firms on the production frontier are

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[12] For example, in a simple case of $N = 2$, the decomposition formula (4) is as follows.

$$\frac{SWB^c}{\bar{\theta}H(\bar{\boldsymbol{x}})} = \underbrace{\frac{\theta^c}{\bar{\theta}}}_{sensitivity} \times \underbrace{\left(\frac{H(x_1^c,x_2^c)}{H(\bar{x}_1,x_2^c)} \cdot \frac{H(x_1^c,\bar{x}_2)}{H(\bar{x}_1,\bar{x}_2)}\right)^{1/2}}_{1^{st}\ factor} \times \underbrace{\left(\frac{H(\bar{x}_1,x_2^c)}{H(\bar{x}_1,\bar{x}_2)} \cdot \frac{H(x_1^c,x_2^c)}{H(x_1^c,\bar{x}_2)}\right)^{1/2}}_{2^{nd}\ factor}.$$

In this case, the percentage differences in subjective well-being between country c and the reference country are decomposed as follows.

$$\left(\frac{SWB^c - \bar{\theta}H(\bar{\boldsymbol{x}})}{\bar{\theta}H(\bar{\boldsymbol{x}})}\right) \times 100 \approx \ln\left(\frac{SWB^c}{\bar{\theta}H(\bar{\boldsymbol{x}})}\right) \times 100 = \underbrace{\ln\frac{\theta^c}{\bar{\theta}} \times 100}_{sensitivity\ (\%)} + \underbrace{\left(\frac{1}{2}\right)\ln\left(\frac{H(x_1^c,x_2^c)}{H(\bar{x}_1,x_2^c)} \cdot \frac{H(x_1^c,\bar{x}_2)}{H(\bar{x}_1,\bar{x}_2)}\right) \times 100}_{1^{st}\ factor\ (\%)} +$$

$$\underbrace{\left(\frac{1}{2}\right)\ln\left(\frac{H(\bar{x}_1,x_2^c)}{H(\bar{x}_1,\bar{x}_2)} \cdot \frac{H(x_1^c,x_2^c)}{H(x_1^c,\bar{x}_2)}\right) \times 100}_{2^{nd}\ factor\ (\%)}.$$

Furthermore, the differences in subjective well-being between country c and the reference country are additively decomposed as follows.

$$SWB^c - \bar{\theta}H(\bar{\boldsymbol{x}}) \approx \underbrace{\ln\frac{SWB^c}{\bar{\theta}H(\bar{\boldsymbol{x}})} \times \bar{\theta}H(\bar{\boldsymbol{x}})}_{difference\ (0-10\ scale)} = \underbrace{\ln\frac{\theta^c}{\bar{\theta}} \times \bar{\theta}H(\bar{\boldsymbol{x}})}_{sensitivity\ (0-10\ scale)} +$$

$$\underbrace{\left(\frac{1}{2}\right)\ln\left(\frac{H(x_1^c,x_2^c)}{H(\bar{x}_1,x_2^c)} \cdot \frac{H(x_1^c,\bar{x}_2)}{H(\bar{x}_1,\bar{x}_2)}\right) \times \bar{\theta}H(\bar{\boldsymbol{x}})}_{1^{st}\ factor\ (0-10\ scale)} + \underbrace{\left(\frac{1}{2}\right)\ln\left(\frac{H(\bar{x}_1,x_2^c)}{H(\bar{x}_1,\bar{x}_2)} \cdot \frac{H(x_1^c,x_2^c)}{H(x_1^c,\bar{x}_2)}\right) \times \bar{\theta}H(\bar{\boldsymbol{x}})}_{2^{nd}\ factor\ (0-10\ scale)}.$$

[13] Just as efficiency of a firm is captured by the ratio between its actual output and its maximum output, sensitivity of happiness for a country is captured by the ratio between its actual subjective well-being and maximum subjective well-being $SWB/H(\boldsymbol{x})$.

considered to be efficient, all countries on the constructed happiness function are considered to be sensitive to socio-economic vector $\boldsymbol{x}$. Their subjective well-being is calculated by $H(\boldsymbol{x})$ from its socio-economic vector $\boldsymbol{x}$. On the other hand, just as technically inefficient firms operate below the production frontier, the average subjective well-being of less sensitive countries SWB is below $H(\boldsymbol{x})$. The ratio $SWB/H(\boldsymbol{x})$, which ranges between 0 and 1, shows how far each country characterized by SWB and $\boldsymbol{x}$ is located from the happiness function, which defines the sensitivity of subjective well-being. The sensitivity term θ^c of country c is directly calculated by $\theta^c = H(\boldsymbol{x}^c)/SWB^c$ from Equation (5). Note that we can compute $SWB/H(\boldsymbol{x})$ for any combination of SWB and $\boldsymbol{x}$. Thus, we can compute $H(\overline{\boldsymbol{x}})/H(\widehat{\boldsymbol{x}})$ for any arbitrary $\overline{\boldsymbol{x}}$ and $\widehat{\boldsymbol{x}}$. Given any SWB, Equation (5) derives $H(\overline{\boldsymbol{x}})/SWB$ and $H(\widehat{\boldsymbol{x}})/SWB$, which leads to $(H(\overline{\boldsymbol{x}})/SWB)/(H(\widehat{\boldsymbol{x}})/SWB) = H(\overline{\boldsymbol{x}})/H(\widehat{\boldsymbol{x}})$. The Appendix intuitively explains how to estimate a happiness function based on DEA and implement the decomposition of the difference in subjective well-being in a simple case of two countries with one socio-economic variable.

3. Data: OECD Better Life Index

Income per capita has long been used for comparing people's well-being across countries. However, it is now widely recognized that income provides only a partial perspective on people's lives. The search for alternative measures of well-being has received growing attention. The Commission on the Measurement of Economic Performance and Social Progress, appointed by former French president Nicholas Sarkozy in 2008 (Stiglitz et al., 2009), discusses previous studies and unresolved issues on measuring well-being.

Drawing upon the recommendations of the commission (Stiglitz et al., 2009), the OECD's Better Life Initiative in 2011 released multiple indicators evaluating people's lives in each member country based on 11 socio-economic dimensions identified as being essential to well-being.[14] We call these indicators the OECD Better Life Index (BLI). The data was updated in 2012 and 2013 to include the latest data with additional indicators. The present study adopts the latest version of data released in 2013, which covers 36 countries, including Brazil and Russia.[15]

The BLI consists of two types of indicators: 11 well-being indicators and 24 headline indicators. The 24 headline indicators evaluate the socio-economic status of people in each country and include air quality, water quality, and students' test scores. They are classified under 11 more general socio-economic dimensions, such as environment and education. Thus, each dimension of well-being might be characterized by multiple headline indicators. Headline indicators are selected under a number of quality criteria, such as conceptual and policy relevance and comparability of concepts and survey questions. Each well-being indicator is calculated from its underlying headline indicators and is scaled over the range 0–1.[16] On the other hand, a variety of data

[14] The OECD launched the Better Life Initiative on its 50th anniversary, held under the theme 'Better Policies for Better Lives'. It aims to better understand what drives the well-being of people and what countries need to do to achieve greater progress for all (OECD, 2011).

[15] There were 34 countries covered in 2011. The revised dataset released in 2012 includes 36 countries, incorporating Brazil and Russia.

[16] See OECD (2011) for a detailed description of the selection of headline indicators and the construction of well-being indicators.

constitutes 24 headline indicators and they are measured in different scales, such as years, people, or dollars.

One of the 24 headline indicators is national average of reported life satisfaction, based on the Cantril Ladder question by the Gallup World Poll on a 0–10 point scale and categorized under a dimension of 'subjective well-being'. The remaining 23 headline indicators are categorized under 10 dimensions of well-being. The reliability of reported life satisfaction as a measure of subjective well-being is widely accepted and the fact that it is affected by a variety of factors associated with people's lives is widely reported (Frey and Stutzer, 2002; Frey, 2008). With regard to national averages of reported life satisfaction as national averages of subjective well-being, and the other 23 headline indicators as socio-economic variables, we explain the differences in subjective well-being across countries by the differences in socio-economic conditions. Recently, there has been an accumulation of empirical evidence that individuals dislike income equality.[17] Thus, we add the Gini index as an additional component of the socio-economic vector and categorize it under the *income* dimension.

Section 2 considers each component of the socio-economic vector $\boldsymbol{x} = (x_1, \dots, x_N)$ capturing a distinct aspect of the socio-economic status of people's lives. In this section, we adopt a more realistic framework in which multiple indicators characterize a distinct socio-economic status, as explained in Footnote 8. Thus, the socio-economic vector we deal with in this section consists of 10 sub-vectors, such that $\boldsymbol{x} = (\boldsymbol{x}_1, \dots, \boldsymbol{x}_{10})$, and each sub-vector corresponds to a distinct aspect of the socio-economic status. The socio-economic vector comprises 23 headline indicators and the Gini index, which are classified under 10 socio-economic dimensions, following the classification of the BLI.[18] Thus, while we adopt BLI headline indicators as well as the Gini index, we explain the difference in subjective well-being by the difference in the 10 essential socio-economic factors of well-being, rather than the detailed 23 underling indicators.

[Place Table 1 appropriately here]

Table 1 summarizes the 23 headline indicators of the BLI along with the Gini index. In addition, Table 1 provides correspondence between them and the 10 dimensions of well-being. Among the 10 dimensions, the first three are categorized as material living conditions and the remaining seven as quality of life. Dimensions of the material living standard show larger variation across countries and larger correlation with subjective well-being than those of quality of life. However, larger correlation is observed only for indicators with higher variation. It is not true for dimensions of the quality of life. Although headline indicators in the *community* and *health* dimensions vary a little across countries, significant correlation relative to subjective well-being is documented. On the other hand, headline indicators in the *safety* dimension differ significantly among countries and are only slightly correlated with subjective well-being.

In addition to a national average of indicators, the OECD Better Life Initiative releases headline indicators for different population groups within each country. Life conditions for males and females are similar in many dimensions. Life conditions for

[17] See Diener et al. (1995), Veenhoven and Ehrhardt (1995), and Ferrer-i-Carbonell and Ramos (2013).
[18] We classify the Gini index under an *income* dimension.

females have a slightly higher subjective well-being than that for males on average by around 0.1 in a 0–10 point scale. On the other hand, high income earners enjoy better lives than low income earners in all dimensions except for the *environment* dimension, which is characterized by water quality.[19] High income earners report significantly higher subjective well-being than low income earners by around 1 in a 0–10 point scale. Applying Equation (4), we can attribute the differences in subjective well-being between different population groups in each country to the differences in life circumstances surrounding these groups and sensitivity of happiness. For example, if we are concerned with why females in Ireland have around a 50% higher subjective well-being than males in the same country, we can set Ireland's females as country c and Ireland's males as the reference country. We can then decompose the ratio of female subjective well-being to male subjective well-being to the sensitivity term and 10 socio-economic factors from Equation (4). However, we need to be aware of the fact that the coverage of indicators for different population groups is severely limited. This limited coverage of indicators might produce bias in our results. We investigate how serious the bias is by applying the decomposition formula to different selections of indicators.

All the headline indicators of the BLI cannot be used without any transformation in our computation. Each component in the socio-economic vector needs to impact positively on subjective well-being in the framework of DEA. Thus, we adopt a linear monotone transformation for some headline indicators.[20]

4. Results and Discussion

Variation in subjective well-being across countries

Applying Equation (4) to the 24 indicators for total population, we can fully decompose the differences in subjective well-being between each country in a sample and the reference country into 10 socio-economic factors and a sensitivity term.

[Place Figure 1 appropriately here]

Figure 1 presents the full empirical results of the decomposition of the differences in subjective well-being between each country and the reference country.[21] It shows to

[19] The BLI measure of water quality is the ratio of people who responded they are satisfied with water quality in the Gallup World Poll. Since this indicates individual perceptions of water quality, a smaller value of water quality for high income earners does not necessarily mean worse conditions of the water in their environment. Most likely, high income earners set a higher standard for the water quality than low income earners.

[20] Linear monotone decreasing transformation is applied to seven indicators. The transformed indicators $\tilde{x}_{1.1}, \tilde{x}_{1.2}, \tilde{x}_{2.3}, \tilde{x}_{3.2}, \tilde{x}_{3.3}, \tilde{x}_{6.1}, \tilde{x}_{9.1}, \tilde{x}_{9.2}$, and $\tilde{x}_{10.1}$ are used as components of socio-economic vector $\boldsymbol{x}$. They are defined as follows.
a) $\tilde{x}_{1.1} = 100 - x_{1.1}$; b) $\tilde{x}_{1.2} = 100 - x_{1.2}$; c) $\tilde{x}_{2.3} = 1 - x_{2.3}$; d) $\tilde{x}_{3.2} = 100 - x_{3.2}$; e) $\tilde{x}_{3.3} = 100 - x_{3.3}$; f) $\tilde{x}_{6.1} = \frac{\text{World highest score of Sudan (=156.2)} - x_{6.1}}{\text{World highest score of Sudan (=156.2)} - \text{World lowest score of Gabon (=6.7)}}$; g) $\tilde{x}_{9.1} = 100 - x_{9.1}$; h) $\tilde{x}_{9.2} = 100 - x_{9.2}$; and i) $\tilde{x}_{10.1} = 100 - x_{10.1}$. While Stevenson and Wolfers (2008; 2013) use the natural logarithm of individual income for explaining subjective well-being, we use monetary measures of income and wealth without any transformation. Our non-parametric estimation of the happiness function based on DEA allows us to capture the decreasing marginal utility of income and wealth on subjective well-being.

[21] We note that countries' subjective well-being is lower than the reference country by 6.47% on average, reflecting the relatively high level of subjective well-being of the reference country $H(\bar{\boldsymbol{x}})$.

what extent each country's well-being is larger than the reference country and where the difference comes from by quantifying the contribution of each factor in the 0–10 point scale.[22] Each country has a different reason for exceeding or falling below the level of the reference country. While the highest subjective well-being, that of Switzerland, is attributed mainly to *income* and *health* factors, the second highest subjective well-being, that of Norway, is attributed mainly to *housing* and *work–life balance* factors. The *civic engagement* factor plays the largest role for enhancing subjective well-being in Mexico.

Positive impacts of some factors are often cancelled out by negative impacts of other factors. While Korea, Japan, and Russia are countries with low subjective well-being, life conditions of their people are better in some aspects of socio-economic status. However, significant effects of some other factors on subjective well-being, such as *health*, *environment*, and *civic engagement* factors, cancel out these positive influences.

A significant sensitivity term evidently explains differences in subjective well-being in many countries. Insensitivity of happiness is found mostly in countries with low subjective well-being. For example, the largest sensitivity terms are found in Greece and Hungary, which are characterized by the lowest and the third lowest values of subjective well-being. This means that their subjective well-being is lower than expected from their socio-economic status. While their life circumstances are poor, the circumstances are not as bad as their subjective well-being indicates. Australia is an exceptional country that has high subjective well-being and high socio-economic status but shows lower sensitivity of happiness. It means that while their life circumstance is good, their subjective well-being is not as high as expected.

[Place Table 2 appropriately here]

The decomposition results of each country in Figure 1 enable us to detect the main drivers of the differences in subjective well-being among countries. The results answer the question of why the people of some countries are happier or more miserable than those of others. Table 2 summarizes country results. We note that countries' subjective well-being is lower than the reference country by 0.393 on average, reflecting the relatively high level of subjective well-being of the reference country $H(\bar{x})$. The average difference in subjective well-being and the average contribution of each factor depend on the selection of the reference country. Thus, it is more appropriate to compare the standard deviations of each contributing factor rather than their means in order to understand the relative contribution of factors in generating the distribution of subjective well-being.

Eight socio-economic factors certainly contribute to the variation in average subjective well-being across countries. In particular, the *health* factor considerably influences the differences in subjective well-being across countries with the largest standard deviation of 0.374; the second largest socio-economic factor is civic engagement at 0.272. On the other hand, *safety* and *community* factors have little impact on the variation in subjective well-being across countries. Clearly, the sensitivity term also plays an important role in generating the differences in subjective

[22] Figure A2 decomposes the differences in subjective well-being relative to the reference country on a percentage scale. Countries are ordered according to the value of their subjective well-being.

well-being with standard deviation of 0.362, which is comparable to the largest *health* factor.

In addition to investigating the separate role of each factor, we consider the overall impact of material living standards as well as the quality of life. In summing up the standard deviation of factors in each domain, material living standards add up to 0.395 and quality of life adds up to 1.067. Even allowing for the sensitivity term, the factors categorized under quality of life explain more than half of the total variation in subjective well-being across countries.

Differences in subjective well-being between different population groups within each country

Although coverage of indicators is limited, indicators for different population groups are available. By applying Equation (4) to them, we can investigate the reason why subjective well-being of a group is higher than that of other groups in each country. While females' subjective well-being is on average higher than that of males, high income earners' subjective well-being is on average higher than low income earners' subjective well-being. We explain the reasons for such gaps between different population groups below.

[Place Figure 2 appropriately here]

By setting males in each country as the reference country, Equation (4) allows us to decompose the ratio of females' subjective well-being to males' subjective well-being in each country.[23] Figure 2 presents the full empirical results of the decomposition of the differences in subjective well-being between females and males for each country. It shows to what extent females' well-being is larger than that of males and where this difference comes from by quantifying the contribution of each factor in the 0–10 point scale.[24] The reasons why females are happier than males are similar across countries. While *work–life balance* and *safety factors* raise females' subjective well-being, *jobs* and *health* factors lower it in most countries. Finland and the US are exceptional in that the *health* factor boosts females' subjective well-being.

Clearly, the sensitivity term plays a significant role in expanding the differences in subjective well-being in many countries. Significant sensitivity terms are found especially among countries with larger gender gaps in subjective well-being. Differences in subjective well-being between males and females are attributed largely to differences in sensitivity of happiness in such countries. Poland is an extreme example. Although females are surrounded by worse life circumstances in every aspect in Poland, females are much happier than males by 5.129%. It is simply attributed to the fact that females' happiness are much more sensitive than males'.

[Place Table 3 appropriately here]

[23] In the previous analysis on the distribution of national average subjective well-being, the same reference country is used for every country. However, in the decomposition of the differences in subjective well-being between females and males, a different reference is used for each country. In addition, we note that the happiness function is constructed from 72 data points, which comprise males and females in 36 countries.

[24] Figure A3 decomposes the differences in subjective well-being of females relative to males on a percentage scale. Countries are ordered according to the differences in subjective well-being between females and males.

The decomposition results of each country in Figure 2 enable us to detect the main drivers of the differences in subjective well-being between females and males. This answers the question of why females are happier than males on average. Table 3 summarizes country results. We note that females' subjective well-being is lower than males' by 0.085 on average. It is more appropriate to compare the mean of each contributing factor rather than the standard deviation in order to understand the relative contribution of factors in generating the differences of subjective well-being between females and males.

Among eight socio-economic factors, half boost females' subjective well-being and the remaining half lower it. In particular, *work–life balance* and *safety* factors considerably raise females' subjective well-being and display higher averages of 0.098 and 0.037, respectively. On the other hand, the *jobs* factor significantly lowers females' subjective well-being with an average of –0.098. Clearly, the sensitivity term also plays a key role in raising females' subjective well-being with an average of 0.077, which is comparable to the largest *work–life balance* factor.

[Place Figure 3 appropriately here]

In a similar manner, setting low income earners in each country as the reference country, Equation (4) allows us to decompose the ratio of high income earners' subjective well-being to low income earners' subjective well-being in each country.[25] Figure 3 presents the full empirical results of the decomposition of the differences in subjective well-being between high and low income earners for each country. It shows to what extent high income earners' well-being is larger than low income earners' and where this difference comes from by quantifying the contribution of each factor in the 0–10 point scale.[26] Almost all socio-economic factors boost high income earners' subjective well-being, except for the *environment* factor. Especially, high income earners' subjective well-being in Russia is sharply lowered by the *environment* factor. On the other hand, the sensitivity term is found to be negative in many countries. However, it becomes largely negative in some countries such as Portugal, Greece and Belgium.

[Place Table 4 appropriately here]

The decomposition results of each country in Figure 3 enable us to detect the main drivers of the differences in subjective well-being between high and low income earners. The results answer the question of why high income earners are happier than low income earners on average. Table 4 summarizes country results. We note that high income earners' subjective well-being is higher than low income earners' by 0.84 on average. We compare the mean of each contributing factor rather than the standard deviation in order to understand the relative contribution of factors in generating the differences of subjective well-being between high and low income earners.

[25] In the previous analysis on the distribution of national average subjective well-being, the same reference country is used for every country. However, in the decomposition of the differences in subjective well-being between high and low income earners, a different reference is used for each country. In addition, we note that the happiness function is constructed from 72 data points, which comprise high and low income earners in 36 countries.

[26] Figure A4 decomposes the differences in subjective well-being of high income earners relative to low income earners on a percentage scale. Countries are ordered according to the differences in subjective well-being between high and low income earners.

Most socio-economic factors raise high income earners' subjective well-being, except for the *environment* factor. The environment factor lowers subjective well-being with an average of – 0.07. Since the reported satisfaction of water quality only constitutes the *environment* factor for high and low income earners, a negative *environment* factor does not mean that high income earners live in worse environmental condition but rather that high income earners are more dissatisfied with the same water quality than low income earners. However, the sensitivity term also plays a key role for lowering high income earners' subjective well-being with an average of –0.112. This negative sensitivity term means that high income earners are supposed to be happier based on their life circumstances. However, their subjective well-being is not as high as expected given their socio-economic status. This leads to their lower sensitivity of happiness compared to low income earners.

Discussion: Selection of countries and variables

We perform the following four kinds of sensitivity analysis to check to what extent our results are driven by the coverage of countries and the selection of variables. All analyses are conducted for national average data only. By applying Equation (4) in different cases, we decompose the differences of subjective well-being between each country and the reference country.

- Case A: Greece is excluded
- Case B: Inequality is excluded
- Case C: Variables for explaining differences between females and males
- Case D: Variables for explaining differences between high and low income earners

The first two analyses investigate the validity of the results on the decomposition of the variation in average subjective well-being across countries. The last two analyses investigate the validity of the results of the decomposition of the differences of average subjective well-being between female and male groups, and between high income and low income groups.

[Place Table 5 appropriately here]

Table 5 reports average and standard deviation of contributing factors in the 0–10 point scale. Figure 1 shows that Greece's sensitivity term of happiness is considerably large at –20.78% relative to the reference country's subjective well-being. This is nearly double Hungary's value of –13.69%, which is the second largest in absolute value. Thus, our first analysis (Case A) implements Equation (4) and excludes Greece. Comparing the standard deviation of contributing factors between Case A and the reference case, we see that the role of the sensitivity term is underestimated when Greece is excluded. However, this hardly affects the evaluations of the other contributing factors. Even though Greece can be considered as an outlier, the relative importance of contributing factors is unaffected, other than the sensitivity term.

The Gini index is the only indicator measuring the distribution of socio-economic status within countries, unlike other variables, which measure countries' average socio-economic status. The second analysis (Case B) implements Equation (4) and excludes the Gini index to see the extent to which dealing only with countries' average values of socio-economic status would bias our decomposition results. By comparing the standard deviation of contributing factors between Case B and the reference case, we see that the exclusion of the Gini index hardly changes measurement of contributing factors including the *income* factor. It might partly

justify the manner that we only focus on national average of socio-economic status omitting its distribution in all contributing factors other than *income* factor.

As explained in the previous section, the coverage of indicators for different population groups is severely limited compared to that for total population. Thus, the third and fourth analyses implement Equation (4) using the data of countries' average subjective well-being for total population, but adopt the same set of indicators as those for male and female groups (Case C) and high and low income earners (Case D). Bias in estimation is rather small, except for the following factors. *Education* and *civic engagement* are overestimated, while *environment* and *health* are underestimated in both cases. In addition, in Case D, the *income* factor, which captures only disposable income, is certainly overestimated. Thus, it is likely that the largest role, that of the *work–life balance* factor for driving the differences in subjective well-being between females and males and that of the income factor for driving the differences in subjective well-being between high and low income earners, is rather discounted if we use the full set of indicators. However, since the overall influence of contributing factors are well differentiated, the limited set of indicators would not make much difference on the relative contributions of socio-economic factors and sensitivity term.

5. Conclusion

People's well-being is a multi-dimensional concept associated with a variety of socio-economic conditions affecting their lives. The OECD recently specified 11 well-being dimensions as being essential to people's well-being and released 24 underlying indicators. Utilizing these underlying indicators with the Gini index, we explored the relationship between subjective well-being and socio-economic status related to people's overall well-being. Previous studies have estimated a happiness function by regression analysis using a select number of variables. However, in cases in which a comprehensive set of indicators such as BLI appear, multi-collinearity observed among explanatory variables makes it difficult to derive statistically significant results. Another problem is that they have often imposed restricted inter-relation among explanatory variables. On the other hand, our study adopted DEA for estimating the happiness function, which is a deterministic method requiring no specification of functional form for the happiness function. The application of DEA to happiness research allowed us to incorporate highly correlated indicators into explanatory variables of the happiness function and to deal with any interaction between factors that contribute to people's subjective well-being. In addition, using DEA, we were also able to specify sensitivity of happiness for each country, which reflects all factors uncovered by the socio-economic variables.

Based on the estimated happiness function, we decomposed the variation of countries' average subjective well-being into 10 socio-economic factors and a sensitivity term. The *health* factor and sensitivity term made the largest contributions. The overall contribution of factors classified under quality of life was much larger than the overall contribution of factors classified under material living standard and explain more than half of the total variation in subjective well-being across countries. In addition, we decomposed the differences of subjective well-being between different population groups in each country. On average, females' subjective well-being was slightly higher than males'. However, this reflected the positive influence of *work–life balance* and *safety* factors and the negative influence of the *jobs* factor. Females

showed greater sensitivity of happiness. On the other hand, subjective well-being of high income earners was considerably higher than that of low income earners. The life circumstances of high income earners were better in many aspects of socio-economic status, which raised their subjective well-being. However, sensitivity of happiness in high income earners was smaller than in low income earners. While females were happier than expected given their socio-economic situation, high income earners were happier than low income earners but not as happy as would be expected from their better socio-economic situations.

This study found that the sensitivity term plays a significant role in generating differences in average subjective well-being across countries as well as differences in average subjective well-being between different population groups; it is an overarching concept which reflects all factors, not only socio-economic aspects. A shortcoming of our study is that it cannot explain the reason why sensitivity of happiness differs across countries. By identifying and quantifying uncovered factors behind the differences in sensitivity of happiness, we could enrich the happiness function with more explanatory variables. This revealed the determinants of sensitivity of happiness and enabled us to provide more detailed decomposition of the differences of subjective well-being. We leave this for future research.

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Appendix: Estimation Procedure of the Happiness Function and Implementation of Decomposition

We graphically illustrate how to implement the decomposition of the differences in subjective well-being based on Equations (4) and (5) using a simple case of a single socio-economic variable x and two observations: countries A and B. Points A and B in Figure 4 correspond to the observation of each country. x^A and x^B indicate a socio-economic variable for each country, respectively; SWB^A and SWB^B indicate subjective well-being for each country, respectively.

[Place Figure 4 appropriately here]

Since the slope of $0B$ is higher than that of $0A$, country B is considered as being more sensitive to its socio-economic variable than country A. Thus, Equation (5) constructs a happiness function $H(x)$ by the ray from the origin through point B. $H(x)$ depicts the hypothetical value of subjective well-being that sensitive country B would draw from any given socio-economic variable x. Thus, the ratio of the actual subjective well-being of each country to $H(x)$ indicates each country's sensitivity of happiness θ. The sensitivity of country B is evaluated at 1, such that $\theta^B = H(x^B)/SWB^B = 1$. On the other hand, $H(x^A)$ is smaller than SWB^A and, thus, point A is below the happiness function. Therefore, country A 's sensitivity is below 1, such that $\theta^A = SWB^A/H(x^A) < 1$.

Point C indicates the hypothetical reference country for implementing Equation (4). Both the socio-economic variable and the sensitivity term for country C are the averages of the values of the two countries, such that $\bar{x} = (x^A + x^B)/2$ and $\bar{\theta} = (\theta^A + \theta^B)/2$. Thus, subjective well-being of country C is calculated by $SWB^C = \bar{\theta}H(\bar{x})$.

We apply Equation (4) to the data of three countries to investigate the reasons why country A is less happy than the reference county C and country B is happier than reference country C in the ratio form as follows.

$$\frac{SWB^A}{SWB^C} = \underbrace{\frac{\theta^A}{\underbrace{\theta^C}}}_{sensitivity(ratio)} \times \underbrace{\frac{H(x^A)}{\underbrace{H(x^C)}}}_{socio-economic\ factor(ratio)}, \tag{A1}$$

$$\frac{SWB^B}{SWB^C} = \underbrace{\frac{\theta^B}{\underbrace{\theta^C}}}_{sensitivity(ratio)} \times \underbrace{\frac{H(x^B)}{\underbrace{H(x^C)}}}_{socio-economic\ factor(ratio)}. \tag{A2}$$

Taking the natural logarithm of Equations (A1) and (A2) at both sides, we can additively decompose the differences in subjective well-being on a percentage scale into sensitivity term and socio-economic factor as follows.

$$\left(\frac{SWB^A - SWB^C}{SWB^C}\right) \times 100 \approx \ln\left(\frac{SWB^A}{SWB^C}\right) \times 100 = \underbrace{\ln\left(\frac{\theta^A}{\theta^C}\right) \times 100}_{sensitivity(\%)} + \underbrace{\ln\left(\frac{H(x^A)}{H(x^C)}\right) \times 100}_{socio-economic\ factor(\%)}, \tag{A3}$$

$$\left(\frac{SWB^B - SWB^C}{SWB^C}\right) \times 100 \approx \ln\left(\frac{SWB^B}{SWB^C}\right) \times 100 = \underbrace{\ln\left(\frac{\theta^B}{\theta^C}\right) \times 100}_{sensitivity(\%)} + \tag{A4}$$

$$\underbrace{\ln\left(\frac{H(x^B)}{H(x^C)}\right)\times 100}_{socio-economic\ factor(\%)} \quad .$$

Moreover, by multiplying Equations (A3) and (A4) by SWB^C, we can additively decompose the differences in subjective well-being in the original 0–10 point scale into differences in sensitivity term and socio-economic factor as follows:

$$SWB^A - SWB^C \approx \ln\left(\frac{SWB^A}{SWB^C}\right)\times SWB^C = \underbrace{\ln\left(\frac{\theta^A}{\theta^C}\right)\times SWB^C}_{sensitivity(0-10\ scale)} + \underbrace{\ln\left(\frac{H(x^A)}{H(x^C)}\right)\times SWB^C}_{socio-economic\ factor(0-10\ scale)} , \tag{A5}$$

$$SWB^B - SWB^C \approx \ln\left(\frac{SWB^B}{SWB^C}\right)\times SWB^C = \underbrace{\ln\left(\frac{\theta^B}{\theta^C}\right)\times SWB^C}_{sensitivity(0-10\ scale)} + \underbrace{\ln\left(\frac{H(x^B)}{H(x^C)}\right)\times SWB^C}_{socio-economic\ factor(0-10\ scale)} . \tag{A6}$$

As explained in Section 4, we can also apply Equation (4) to explain the differences in subjective well-being between different population groups. Suppose that country A is the male group and country B is the female group in the same country. If we set country B as the reference rather than country C, Equation (4) allows us to decompose the differences in subjective well-being between the male and female groups into multiple factors as follows.

$$\frac{SWB^A}{SWB^B} = \underbrace{\frac{\theta^A}{\theta^B}}_{sensitivity(ratio)} \times \underbrace{\frac{H(x^A)}{H(x^B)}}_{socio-economic\ factor(ratio)} , \tag{A7}$$

$$\left(\frac{SWB^A - SWB^B}{SWB^B}\right)\times 100 \approx \ln\left(\frac{SWB^A}{SWB^B}\right)\times 100 = \underbrace{\ln\left(\frac{\theta^A}{\theta^B}\right)\times 100}_{sensitivity(\%)} + \underbrace{\ln\left(\frac{H(x^A)}{H(x^B)}\right)\times 100}_{socio-economic\ factor(\%)} , \tag{A8}$$

$$SWB^A - SWB^B \approx \ln\left(\frac{SWB^A}{SWB^B}\right)\times SWB^B = \underbrace{\ln\left(\frac{\theta^A}{\theta^B}\right)\times SWB^B}_{sensitivity(0-10\ scale)} + \underbrace{\ln\left(\frac{H(x^A)}{H(x^B)}\right)\times SWB^B}_{socio-economic\ factor(0-10\ scale)} . \tag{A9}$$

Equations (A7), (A8) and (A9) help us to investigate the reasons why females' subjective well-being is higher than males' subjective well-being. Similarly, we can also explain the reasons why subjective well-being of high income earners is higher than that of low income earners.

Table 1: Summary Statistics of Variables and their Correlation with Subjective Well-being

Variables		Unit	Mean					Std. Dev.	Coeff. Vari.[a]	Correlation[b]
			Total	Male	Female	High	Low	Total	Total	Total
SWB	**Subjective well-being**									
	Cantril ladder of life satisfaction	[0, 10]	6.6	6.5	6.6	7.1	6.2	0.9	0.13	1.00
x_1	**Housing**									
$x_{1.1}$	Dwellings without basic facilities	percent	2.3					3.2	1.39	−0.47
$x_{1.2}$	Housing expenditure	percent	20.8					3.0	0.14	0.10
$x_{1.3}$	Rooms per person	persons	1.6					0.4	0.27	0.60
x_2	**Income**									
$x_{2.1}$	Household net adjusted disposable income	current PPP US$	22383			43877	8778	6943	0.31	0.56
$x_{2.2}$	Household net financial wealth	current PPP US$	36710					27426	0.75	0.42
$x_{2.3}$	Gini coefficient for disposable income[c]	[0,1]	0.3					0.1	0.22	0.34
x_3	**Jobs**									
$x_{3.1}$	Employment rate	percent	66.1	72.5	59.8	81.6	45.4	7.2	0.11	0.71
$x_{3.2}$	Job security	percent	10.6	10.6	10.5			4.8	0.45	0.04
$x_{3.3}$	Long-term unemployment rate	percent	3.1	3.2	3.1	1.8	5.5	2.6	0.82	−0.58
$x_{3.4}$	Personal earnings	current US$	33402	36192	29527	43137	20140	12371	0.37	0.58
x_4	**Community**									
$x_{4.1}$	Quality of support network	percent	89.6	89.0	90.2	92.9	84.5	5.7	0.06	0.54
x_5	**Education**									
$x_{5.1}$	Educational attainment	percent	74.0	74.8	73.3			17.0	0.23	0.19
$x_{5.2}$	Student skills	standarized score	493.3	488.7	497.9	544.4	446.2	30.3	0.06	0.15
$x_{5.3}$	Years in education	years	17.4	17.1	17.8			1.2	0.07	0.12
x_6	**Environment**									
$x_{6.1}$	Air pollution	micrograms per m^2	20.8					9.3	0.45	−0.19
$x_{6.2}$	Water quality	percent	83.0	84.1	82.3	83.7	84.8	10.9	0.13	0.65
x_7	**Civic engagement**									
$x_{7.1}$	Consultation on rule-making	standarized score	7.1					2.7	0.38	0.24
$x_{7.2}$	Voter turnout	percent	71.9	72.3	71.6	78.3	67.8	11.9	0.17	0.36
x_8	**Health**									
$x_{8.1}$	Life expectancy	years	79.6	76.7	82.4			3.1	0.04	0.43
$x_{8.2}$	Self-reported health	percent	67.7	70.5	65.4	78.4	59.6	14.5	0.21	0.63
x_9	**Safety**									
$x_{9.1}$	Assault rate	percent	4.1	4.5	3.7			2.3	0.57	0.01
$x_{9.2}$	Homicide rate	cases per 100000	3.0	4.9	1.2			5.1	1.72	0.01
x_{10}	**Work-Life Balance**									
$x_{10.1}$	Employees working very long hours	percent	9.9	13.3	5.7			9.9	0.99	−0.16
$x_{10.2}$	Time devoted to leisure and personal care	hours	14.6	14.8	14.4			0.8	0.06	0.23

a) The coefficient of variation is standard deviation divided by average. It ranges from 0 to 1.
b) The correlation between each indicator and subjective well-being; both refer to national average of total populations.
c) The Gini coefficient of disposable income is a part of the OECD Income Distribution database. All other variables are underlying data for the OECD Better Life Index.

Table 2: Decomposition of Differences in Subjective Well-Being Relative to Reference Country (0–10 point scale)

	Subjective well-being	Sensitivity	Housing	Income	Jobs	Community	Education	Environment	Civic engagement	Health	Safety	Work-Life Balance
Mean	−0.393	−0.010	−0.021	−0.026	−0.037	0.000	−0.025	−0.023	−0.130	−0.102	0.002	−0.020
Std. Dev.	0.866	0.362	0.103	0.165	0.126	0.002	0.124	0.102	0.272	0.374	0.021	0.172
Max	0.733	0.226	0.220	0.517	0.115	0.000	0.071	0.046	0.450	0.285	0.065	0.166
Min	−2.489	−1.295	−0.356	−0.360	−0.411	−0.015	−0.723	−0.536	−0.984	−1.477	−0.063	−0.954
Zero contributions[a]		0	5	7	3	34	19	11	0	2	28	19

a) Number of counties in which each factor has no influence on subjective well-being.

Table 3: Decomposition of Differences in Subjective Well-being between Females and Males (0–10 point scale)

	Subjective well-being	Sensitivity	Jobs	Community	Education	Environment	Civic engagement	Health	Safety	Work-Life Balance
Mean	0.085	0.077	−0.098	0.015	0.019	−0.003	−0.001	−0.058	0.037	0.098
Std. Dev.	0.202	0.181	0.225	0.037	0.061	0.012	0.073	0.137	0.125	0.179
Max	0.482	0.776	0.331	0.156	0.235	0.024	0.310	0.116	0.562	0.666
Min	−0.308	−0.122	−1.049	0.000	−0.182	−0.047	−0.239	−0.606	−0.006	−0.026
Zero contributions[a]		12	5	24	16	23	23	7	28	16

a) Number of counties in which each factor has no influence on subjective well-being.

Table 4: Decomposition of Differences in Subjective Well-being between High and Low Income Earners (0–10 point scale)

	Subjective well-being	Sensitivity	Income	Jobs	Community	Education	Environment	Civic engagement	Health
Mean	0.840	−0.112	0.353	0.165	0.069	0.086	−0.070	0.077	0.272
Std. Dev.	0.499	0.476	0.273	0.255	0.222	0.117	0.269	0.119	0.235
Max	1.889	0.798	1.287	1.261	1.301	0.424	0.131	0.456	0.807
Min	−0.203	−1.407	0.041	0.000	−0.078	0.000	−1.526	0.000	0.000
Zero contributions[a]		5	0	1	13	10	4	16	3

a) Number of counties in which each factor has no influence on subjective well-being.

Table 5: Comparison of Contribution Factors under Difference Cases

	A: Greece excluded	B: Inequality excluded	C: Male and female	D: High and low income	Reference	
	Std. Dev.	Std. Dev.	Average	Average	Average	Std. Dev.
Sensitivity	0.2947	0.3620	−0.0138	−0.0156	−0.0097	0.3619
Housing	0.1005	0.1033			−0.0214	0.1033
Income	0.1668	0.1649		−0.0189	−0.0258	0.1652
Jobs	0.1255	0.1274	−0.0286	−0.0397	−0.0374	0.1262
Community	0.0036	0.0025	−0.0022	−0.0082	−0.0005	0.0025
Education	0.1276	0.1242	−0.0140	−0.0011	−0.0249	0.1242
Environment	0.1026	0.1021	−0.0437	−0.0531	−0.0234	0.1021
Civic engagement	0.2787	0.2723	−0.0412	−0.0430	−0.1298	0.2721
Health	0.3837	0.3737	−0.1308	−0.1116	−0.1019	0.3738
Safety	0.0211	0.0206	0.0021		0.0019	0.0206
Work-Life Balance	0.1804	0.1715	−0.0266		−0.0201	0.1715

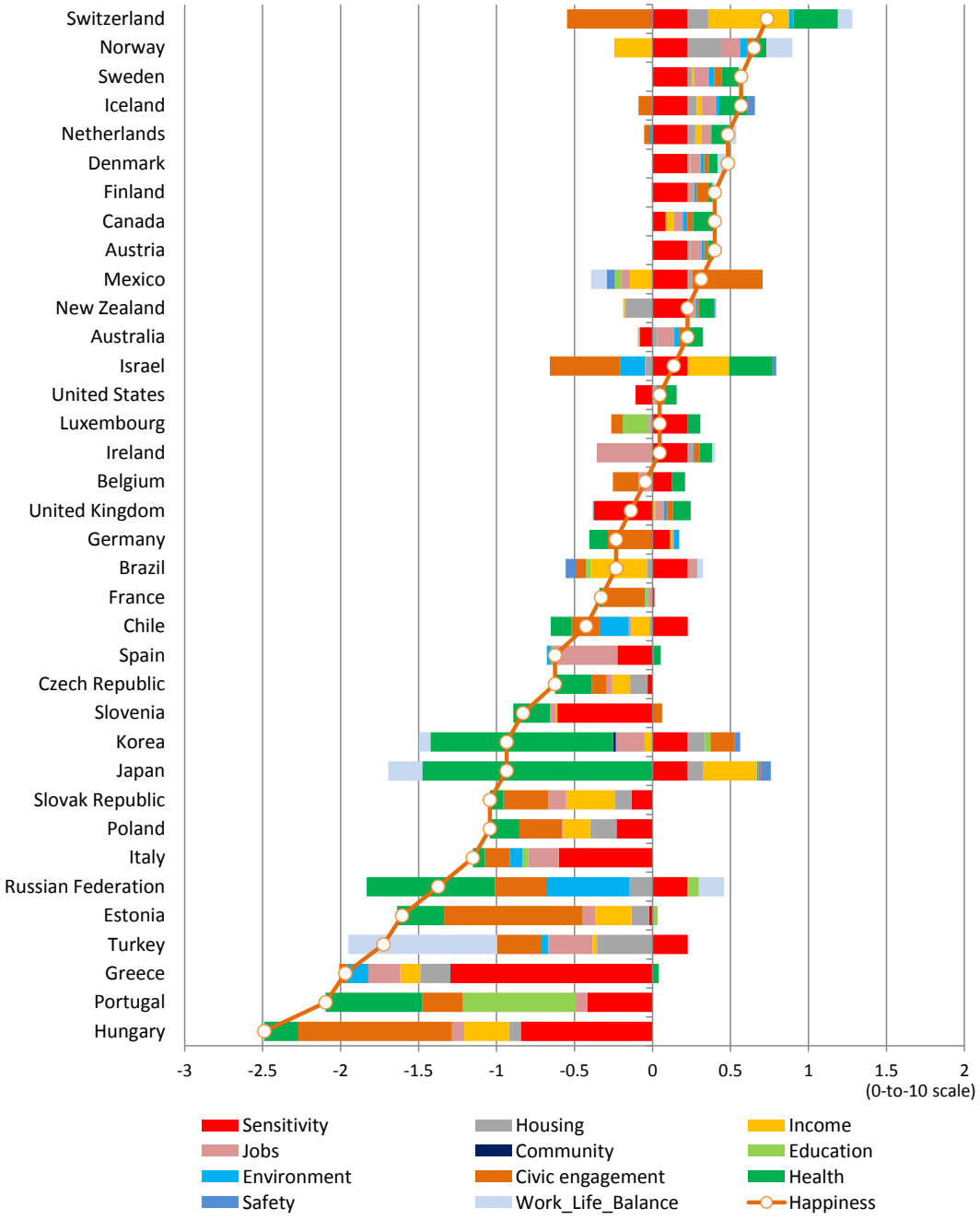

Figure 1: Explaining Differences in Subjective Well-Being Relative to Reference Country (0-10 point scale)

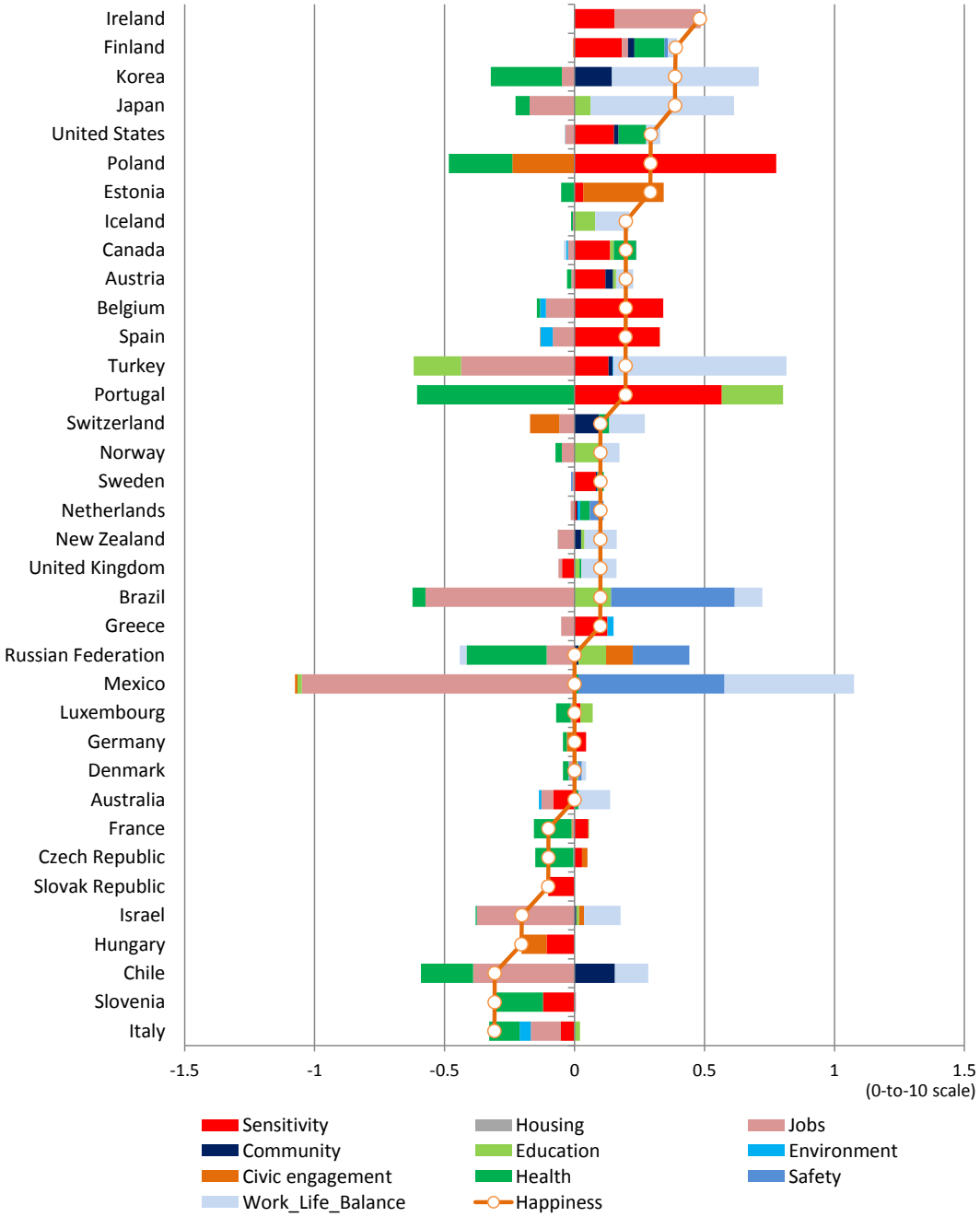

Figure 2: Explaining Differences in Subjective Well-being between Females and Males (0–10 point scale)

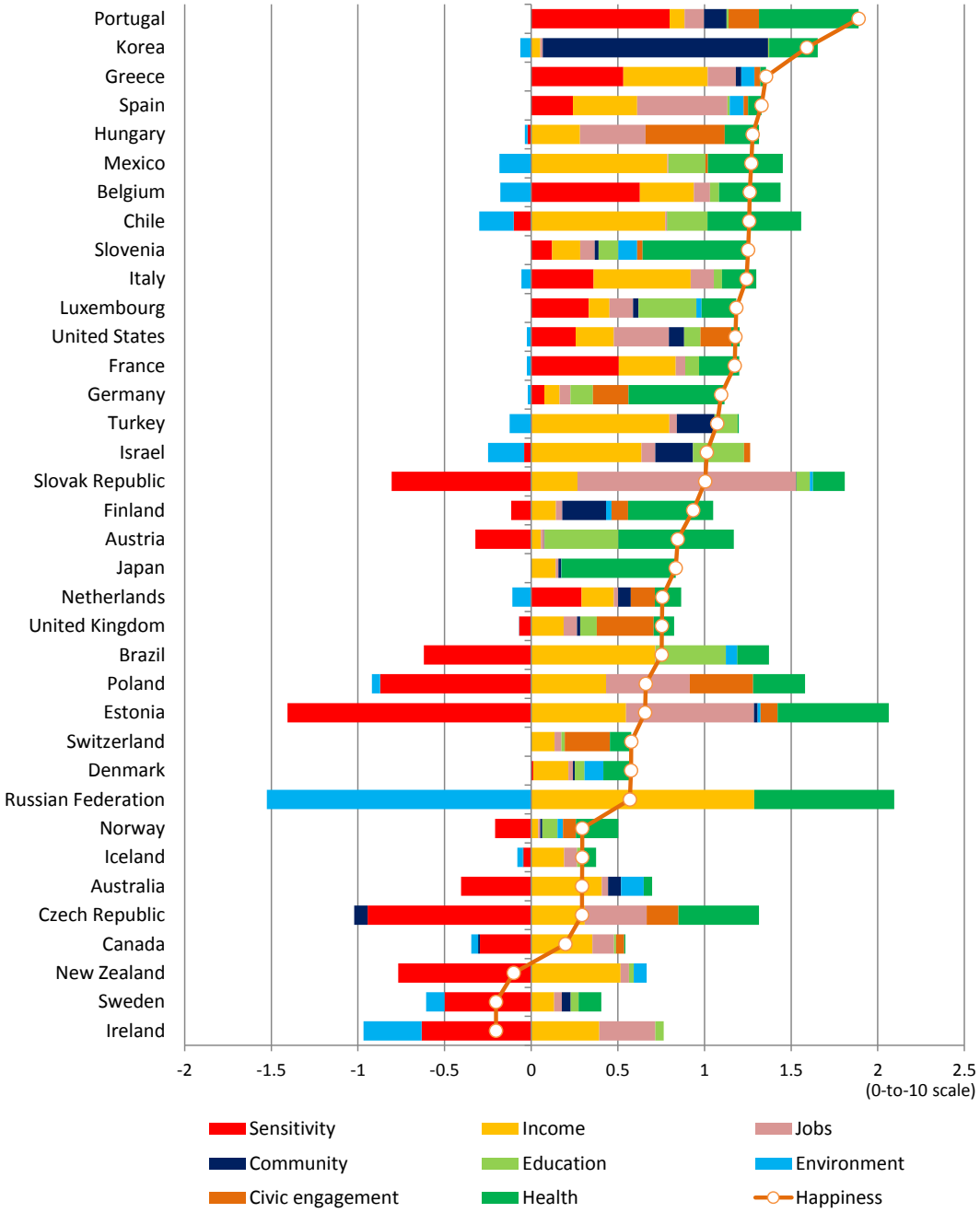

Figure 3: Explaining Differences in Subjective Well-being between High and Low Income Earners (0–10 point scale)

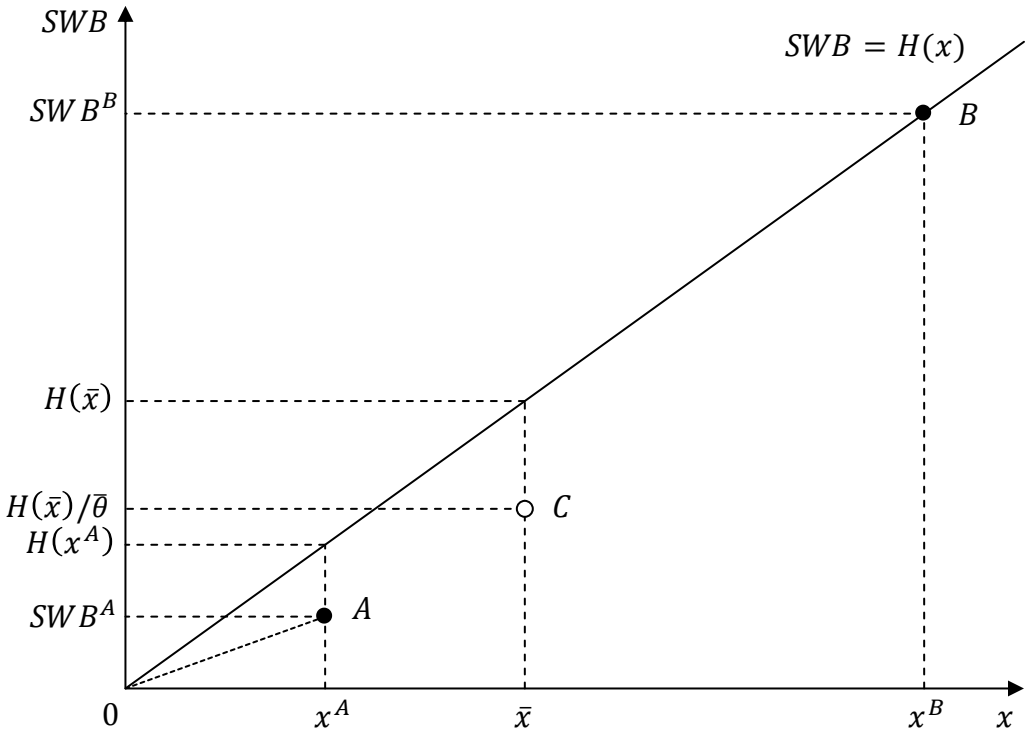

Figure 4: Estimating Sensitivity Term and Happiness Function

Table A1: Correlation among Variables for Total Population

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Subjective well-being																								
0 Life satisfaction	−0.466	0.1015	0.5971	0.5613	0.4158	−0.181	0.7075	0.0369	−0.578	0.5783	0.5436	0.1916	0.1526	0.1238	−0.193	0.6478	0.2356	0.3638	0.433	0.6315	0.0145	0.0062	−0.163	0.2264
Housing																								
1 Dwellings without basic facilities	1.0000	−0.2084	−0.5282	−0.6853	−0.3838	0.5737	−0.4633	0.5116	0.0167	−0.6444	−0.6633	−0.2682	−0.4050	−0.3724	0.4908	−0.5460	−0.3857	0.0572	−0.5400	−0.4625	0.3639	0.3536	0.6374	−0.6686
2 Housing expenditure	−0.2084	1.0000	0.1173	0.1419	0.1018	−0.3641	0.0078	−0.3199	0.1177	0.0767	0.2072	0.1187	0.1290	0.1562	−0.1070	0.3051	0.2080	−0.0736	0.3245	0.3649	−0.2007	−0.3089	−0.0733	0.0577
3 Rooms per person	−0.5282	0.1173	1.0000	0.7562	0.5708	−0.3309	0.5734	−0.2040	−0.1803	0.7620	0.6231	0.2223	0.5631	0.3561	−0.4337	0.6581	0.3257	0.2908	0.6019	0.5449	−0.3739	−0.3411	−0.3037	0.4644
Income																								
4 Household net adjusted disposable income	−0.6853	0.1419	0.7562	1.0000	0.7428	−0.4744	0.4938	−0.3153	−0.2403	0.9249	0.5796	0.3217	0.4941	0.1929	−0.4054	0.6061	0.2730	0.2518	0.6557	0.5022	−0.4280	−0.4512	−0.3351	0.4484
5 Household net financial wealth	−0.3838	0.1018	0.5708	0.7428	1.0000	−0.1573	0.3859	−0.1919	−0.2881	0.7284	0.3701	0.2641	0.3552	0.0159	−0.1412	0.3660	0.0907	0.0928	0.5067	0.3449	−0.2270	−0.2763	−0.0836	0.1830
6 Gini coefficient for disposable income	0.5737	−0.3641	−0.3309	−0.4744	−0.1573	1.0000	−0.3187	0.3926	−0.0182	−0.5053	−0.5505	−0.4893	−0.7218	−0.5617	0.4611	−0.5540	−0.3242	0.0240	−0.5119	−0.0969	0.5225	0.7138	0.4605	−0.4975
Jobs																								
7 Employment rate	−0.4633	0.0078	0.5734	0.4938	0.3859	−0.3187	1.0000	−0.1405	−0.5425	0.4943	0.6387	0.4028	0.4224	0.4215	−0.3838	0.7047	0.2101	0.1353	0.3805	0.2453	−0.2922	−0.1407	−0.3186	0.3712
8 Job security	0.5116	−0.3199	−0.2040	−0.3153	−0.1919	0.3926	−0.1405	1.0000	−0.4146	−0.2545	−0.5975	−0.3993	−0.1530	−0.1952	0.3448	−0.2134	0.1194	0.2519	−0.2611	−0.1471	0.2760	0.4226	0.7193	−0.5434
9 Long-term unemployment rate	0.0167	0.1177	−0.1803	−0.2403	−0.2881	−0.0182	−0.5425	−0.4146	1.0000	−0.2069	−0.0380	−0.1478	−0.1150	0.0447	−0.0975	−0.2805	−0.2003	−0.3257	−0.1033	−0.0785	−0.0191	−0.1458	−0.2712	0.1987
10 Personal earnings	−0.6444	0.0767	0.7620	0.9249	0.7284	−0.5053	0.4943	−0.2545	−0.2069	1.0000	0.6144	0.3217	0.5655	0.2784	−0.3336	0.6119	0.3109	0.2970	0.7001	0.4896	−0.4779	−0.5299	−0.3076	0.4906
Community																								
11 Quality of support network	−0.6633	0.2072	0.6231	0.5796	0.3701	−0.5505	0.6387	−0.5975	−0.0380	0.6144	1.0000	0.4733	0.4553	0.4536	−0.5839	0.6431	0.2114	0.0285	0.4750	0.4363	−0.4790	−0.4520	−0.6229	0.6376
Education																								
12 Educational attainment	−0.2682	0.1187	0.2223	0.3217	0.2641	−0.4893	0.4028	−0.3993	−0.1478	0.3217	0.4733	1.0000	0.5616	0.3121	−0.3179	0.2506	0.1626	−0.2170	0.1351	−0.0637	−0.5926	−0.4331	−0.4156	0.2956
13 Student skills	−0.4050	0.1290	0.5631	0.4941	0.3552	−0.7218	0.4224	−0.1530	−0.1150	0.5655	0.4553	0.5616	1.0000	0.6329	−0.3596	0.4875	0.4498	−0.0913	0.5500	0.0016	−0.7138	−0.7019	−0.2422	0.3804
14 Years in education	−0.3724	0.1562	0.3561	0.1929	0.0159	−0.5617	0.4215	−0.1952	0.0447	0.2784	0.4536	0.3121	0.6329	1.0000	−0.2445	0.4466	0.3325	0.0176	0.4142	0.0118	−0.4644	−0.4798	−0.3414	0.4401
Environment																								
15 Air pollution	0.4908	−0.1070	−0.4337	−0.4054	−0.1412	0.4611	−0.3838	0.3448	−0.0975	−0.3336	−0.5839	−0.3179	−0.3596	−0.2445	1.0000	−0.3106	−0.1461	0.0687	−0.1230	−0.2479	0.3679	0.1554	0.4977	−0.4776
16 Water quality	−0.5460	0.3051	0.6581	0.6061	0.3660	−0.5540	0.7047	−0.2134	−0.2805	0.6119	0.6431	0.2506	0.4875	0.4466	−0.3106	1.0000	0.5161	0.1343	0.6282	0.3933	−0.2852	−0.3677	−0.2569	0.3625
Civic engagement																								
17 Consultation on rule-making	−0.3857	0.2080	0.3257	0.2730	0.0907	−0.3242	0.2101	0.1194	−0.2003	0.3109	0.2114	0.1626	0.4498	0.3325	−0.1461	0.5161	1.0000	−0.2056	0.2657	0.2546	−0.4149	−0.1803	0.0075	0.0491
18 Voter turnout	0.0572	−0.0736	0.2908	0.2518	0.0928	0.0240	0.1353	0.2519	−0.3257	0.2970	0.0285	−0.2170	−0.0913	0.0176	0.0687	0.1343	−0.2056	1.0000	0.2395	0.2016	0.1158	−0.0531	0.1704	0.0511
Health																								
19 Life expectancy	−0.5400	0.3245	0.6019	0.6557	0.5067	−0.5119	0.3805	−0.2611	−0.1033	0.7001	0.4750	0.1351	0.5500	0.4142	−0.1230	0.6282	0.2657	0.2395	1.0000	0.3775	−0.3024	−0.6603	−0.1356	0.3685
20 Self-reported health	−0.4625	0.3649	0.5449	0.5022	0.3449	−0.0969	0.2453	−0.1471	−0.0785	0.4896	0.4363	−0.0637	0.0016	0.0118	−0.2479	0.3933	0.2546	0.2016	0.3775	1.0000	−0.0339	−0.1214	−0.2273	0.1367
Safety																								
21 Assault rate	0.3639	−0.2007	−0.3739	−0.4280	−0.2270	0.5225	−0.2922	0.2760	−0.0191	−0.4779	−0.4790	−0.5926	−0.7138	−0.4644	0.3679	−0.2852	−0.4149	0.1158	−0.3024	−0.0339	1.0000	0.6644	0.2094	−0.2757
22 Homicide rate	0.3536	−0.3089	−0.3411	−0.4512	−0.2763	0.7138	−0.1407	0.4226	−0.1458	−0.5299	−0.4520	−0.4331	−0.7019	−0.4798	0.1554	−0.3677	−0.1803	−0.0531	−0.6603	−0.1214	0.6644	1.0000	0.2616	−0.3432
Work-Life Balance																								
23 Employees working very long hours	0.6374	−0.0733	−0.3037	−0.3351	−0.0836	0.4605	−0.3186	0.7193	−0.2712	−0.3076	−0.6229	−0.4156	−0.2422	−0.3414	0.4977	−0.2569	0.0075	0.1704	−0.1356	−0.2273	0.2094	0.2616	1.0000	−0.7813
24 Time devoted to leisure and personal care	−0.6686	0.0577	0.4644	0.4484	0.1830	−0.4975	0.3712	−0.5434	0.1987	0.4906	0.6376	0.2956	0.3804	0.4401	−0.4776	0.3625	0.0491	0.0511	0.3685	0.1367	−0.2757	−0.3432	−0.7813	1.0000

Table A2: Decomposition of Differences in Subjective Well-Being Relative to Reference Country (%)

	Difference relative to the reference country[a]		Contributions of percentage difference relative to the reference country																							
	0–10 scale	Percentage	Sensitivity		Housing		Income		Jobs		Community		Education		Environment		Civic engagement		Health		Safety		Work–Life Balance	
Australia	0.206	3.226	(11)	−1.560	(28)	0.392	(13)	−0.372	(17)	1.342	(5)	0.000	(1)	0.000	(9)	0.669	(3)	0.682	(6)	2.260	(8)	0.000	(8)	−0.188	(32)
Austria	0.381	5.966	(7)	3.137	(1)	0.224	(16)	0.577	(5)	0.666	(13)	0.000	(1)	0.000	(9)	0.269	(9)	0.354	(10)	0.625	(18)	0.050	(7)	0.065	(14)
Belgium	−0.066	−1.030	(17)	1.498	(23)	0.000	(17)	0.061	(11)	−1.396	(29)	0.000	(1)	−0.044	(28)	0.000	(27)	−2.563	(23)	1.413	(12)	0.000	(8)	0.000	(16)
Brazil	−0.254	−3.972	(19)	3.137	(1)	−0.511	(26)	−5.485	(33)	0.761	(10)	0.000	(1)	−0.490	(32)	0.000	(18)	−1.023	(20)	0.216	(20)	−1.124	(36)	0.547	(9)
Canada	0.381	5.966	(7)	3.137	(1)	5.541	(1)	−12.049	(35)	1.766	(3)	0.000	(1)	0.007	(6)	0.154	(11)	0.065	(16)	5.291	(1)	0.000	(8)	2.054	(3)
Chile	−0.447	−7.002	(22)	3.137	(1)	−0.243	(25)	0.115	(8)	−0.595	(23)	0.000	(1)	0.000	(9)	−2.945	(35)	−4.318	(27)	−2.153	(27)	0.000	(8)	0.000	(16)
Czech Republic	−0.647	−10.127	(23)	−0.919	(27)	−1.701	(30)	−1.512	(24)	−0.709	(24)	0.000	(1)	0.000	(9)	0.000	(18)	−1.551	(22)	−3.736	(30)	0.000	(8)	0.000	(16)
Denmark	0.467	7.308	(5)	3.137	(1)	0.280	(14)	0.068	(9)	1.028	(7)	0.000	(1)	0.000	(9)	0.350	(7)	0.431	(9)	0.972	(15)	0.000	(8)	1.043	(7)
Estonia	−1.632	−25.542	(32)	−0.766	(26)	−1.720	(31)	−3.582	(28)	−1.238	(27)	0.000	(1)	0.428	(2)	0.000	(18)	−13.714	(35)	−4.949	(32)	0.000	(8)	0.000	(31)
Finland	0.381	5.966	(7)	3.137	(1)	−0.039	(24)	0.169	(7)	0.453	(14)	0.000	(1)	0.000	(9)	0.270	(8)	1.167	(3)	0.496	(19)	0.000	(8)	0.313	(11)
France	−0.350	−5.475	(21)	−0.236	(25)	−0.006	(22)	0.366	(6)	−0.413	(21)	0.000	(1)	−0.192	(30)	−0.013	(28)	−4.684	(31)	−0.297	(23)	0.000	(8)	0.000	(16)
Germany	−0.254	−3.972	(19)	2.172	(22)	0.000	(19)	−0.549	(20)	0.359	(15)	0.000	(1)	0.000	(9)	0.685	(2)	−4.671	(30)	−1.968	(26)	0.000	(8)	0.000	(16)
Greece	−1.997	−31.258	(34)	−20.783	(36)	−2.982	(35)	−2.026	(25)	−3.198	(33)	−0.033	(35)	0.000	(9)	−2.165	(33)	−0.747	(19)	0.676	(17)	0.000	(8)	0.000	(16)
Hungary	−2.519	−39.426	(36)	−13.691	(35)	−1.412	(28)	−4.230	(30)	−1.242	(28)	0.000	(1)	0.000	(9)	0.000	(18)	−15.277	(36)	−3.574	(29)	0.000	(8)	0.000	(16)
Iceland	0.551	8.633	(3)	3.137	(1)	0.922	(9)	−0.162	(16)	1.785	(1)	0.000	(1)	−0.048	(29)	0.403	(5)	−1.308	(21)	3.140	(6)	0.764	(2)	0.000	(16)
Ireland	0.026	0.409	(14)	3.137	(1)	0.598	(12)	−1.352	(22)	−4.446	(35)	0.000	(1)	0.000	(9)	0.120	(15)	0.606	(8)	1.415	(11)	0.000	(8)	0.330	(10)
Israel	0.117	1.827	(13)	3.137	(1)	−0.763	(27)	4.243	(3)	−0.110	(20)	0.000	(1)	0.022	(5)	−2.396	(34)	−7.140	(33)	4.463	(3)	0.371	(4)	0.000	(16)
Italy	−1.175	−18.396	(30)	−9.570	(33)	−0.006	(23)	−0.393	(19)	−2.610	(31)	0.000	(1)	−0.606	(33)	−1.109	(32)	−2.728	(24)	−1.375	(24)	0.000	(8)	0.000	(16)
Japan	−0.959	−15.006	(26)	3.137	(1)	1.646	(7)	5.334	(2)	0.000	(18)	0.000	(1)	0.070	(4)	0.142	(14)	0.206	(13)	−23.217	(36)	1.026	(1)	−3.351	(35)
Korea	−0.959	−15.006	(26)	3.137	(1)	1.724	(6)	−0.393	(18)	−2.890	(32)	−0.072	(36)	0.090	(3)	0.000	(18)	2.355	(2)	−18.386	(35)	0.587	(3)	−1.159	(33)
Luxembourg	0.026	0.409	(14)	3.137	(1)	2.040	(4)	−6.799	(34)	0.859	(8)	0.000	(1)	−1.388	(35)	0.000	(17)	0.015	(17)	1.108	(14)	0.000	(8)	1.437	(6)
Mexico	0.294	4.605	(10)	3.137	(1)	0.248	(15)	−1.390	(23)	−1.037	(25)	0.000	(1)	−0.890	(34)	0.000	(18)	6.875	(1)	0.000	(21)	−0.789	(35)	−1.548	(34)
Netherlands	0.467	7.308	(5)	3.137	(1)	0.820	(10)	0.721	(4)	0.694	(12)	0.000	(1)	0.000	(8)	−0.276	(29)	−0.637	(18)	2.061	(9)	0.000	(8)	0.789	(8)
New Zealand	0.206	3.226	(11)	3.137	(1)	−2.727	(34)	−0.126	(15)	0.775	(9)	0.000	(1)	0.000	(9)	0.223	(10)	0.203	(14)	1.539	(10)	0.074	(6)	0.128	(13)
Norway	0.635	9.940	(2)	3.137	(1)	3.460	(2)	−3.773	(29)	1.779	(2)	0.000	(1)	0.000	(9)	0.724	(1)	0.678	(7)	1.324	(13)	0.000	(8)	2.611	(1)
Poland	−1.066	−16.687	(28)	−4.046	(31)	−2.600	(33)	−2.819	(27)	−0.096	(19)	0.000	(1)	0.000	(9)	0.000	(18)	−4.066	(26)	−3.059	(28)	0.000	(8)	0.000	(16)
Portugal	−2.123	−33.238	(35)	−6.998	(32)	0.000	(18)	0.061	(11)	−1.158	(26)	0.000	(1)	−11.366	(36)	0.000	(18)	−3.771	(25)	−10.006	(33)	0.000	(8)	0.000	(16)
Russian Federation	−1.399	−21.906	(31)	3.137	(1)	−2.237	(32)	0.000	(14)	0.000	(17)	0.000	(1)	1.121	(1)	−8.423	(36)	−5.133	(32)	−12.906	(34)	0.000	(8)	2.536	(2)
Slovak Republic	−1.066	−16.687	(28)	−2.519	(29)	−1.661	(29)	−4.888	(32)	−1.724	(30)	0.000	(1)	0.000	(9)	0.000	(18)	−4.447	(28)	−1.448	(25)	0.000	(8)	0.000	(16)
Slovenia	−0.853	−13.353	(25)	−10.015	(34)	0.000	(19)	0.031	(13)	−0.594	(22)	0.000	(1)	0.000	(9)	0.072	(16)	0.900	(5)	−3.748	(31)	0.000	(8)	0.000	(16)
Spain	−0.647	−10.127	(23)	−3.953	(30)	0.000	(19)	0.061	(10)	−6.457	(36)	0.000	(1)	−0.231	(31)	−0.439	(30)	0.130	(15)	0.761	(16)	0.000	(8)	0.000	(16)
Sweden	0.551	8.633	(3)	3.137	(1)	1.044	(8)	−2.681	(26)	1.308	(6)	0.000	(1)	0.000	(9)	0.147	(13)	1.010	(4)	3.168	(5)	0.000	(8)	1.498	(4)
Switzerland	0.717	11.230	(1)	3.137	(1)	2.119	(3)	7.786	(1)	0.000	(16)	0.000	(1)	0.000	(7)	0.589	(4)	−8.395	(34)	4.548	(2)	0.000	(8)	1.447	(5)
Turkey	−1.751	−27.412	(33)	3.137	(1)	−5.529	(36)	−1.196	(21)	−3.736	(34)	0.000	(1)	−0.016	(27)	−0.636	(31)	−4.494	(29)	0.000	(21)	0.000	(8)	−14.941	(36)
United Kingdom	−0.159	−2.490	(18)	3.137	(1)	1.777	(5)	−13.386	(36)	1.629	(4)	0.000	(1)	0.000	(26)	0.147	(12)	0.329	(11)	3.571	(4)	0.122	(5)	0.184	(12)
United States	0.026	0.409	(14)	0.140	(24)	0.746	(11)	−4.708	(31)	0.733	(11)	0.000	(1)	0.000	(9)	0.389	(6)	0.216	(12)	2.893	(7)	0.000	(8)	0.000	(15)
Mean	−0.414	−6.474		−0.149		−0.015		−1.508		−0.492		−0.003		−0.376		−0.362		−2.068		−1.358		0.030		−0.172	
Std. Dev.	0.870	13.619		5.645		1.958		3.948		1.885		0.013		1.920		1.601		4.231		6.084		0.338		2.743	

a) While the difference in the 0–10 scale is subjective well-being of each country minus subjective well-being of the reference country, the difference in percentage is the ratio of subjective well-being of each country to subjective well-being of the reference country minus one.

Table A3: Decomposition of Differences in Subjective Well-being between Females and Males (%)

	Difference between female and male[a]		Contributions of percentage difference between female and male																			
	0–10 scale	Percent	Sensitivity		Jobs		Community		Education		Environment		Civic engagement		Health		Safety		Work–Life Balance	
Australia	0.000	0.000	(23)	−1.138	(33)	−0.635	(21)	0.000	(14)	0.005	(18)	−0.127	(33)	0.000	(5)	0.196	(8)	0.000	(8)	1.699	(11)
Austria	0.197	2.703	(12)	1.622	(11)	−0.168	(14)	0.411	(4)	0.160	(13)	0.000	(4)	0.000	(5)	−0.230	(21)	0.000	(8)	0.908	(14)
Belgium	0.197	2.899	(11)	5.026	(4)	−1.613	(28)	0.000	(14)	0.000	(33)	−0.332	(34)	0.000	(5)	−0.182	(19)	0.000	(8)	0.000	(34)
Brazil	0.099	1.504	(16)	0.000	(19)	−8.683	(35)	0.000	(14)	2.127	(2)	0.000	(4)	0.000	(5)	−0.764	(24)	7.210	(2)	1.614	(12)
Canada	0.197	2.703	(12)	1.875	(10)	−0.352	(19)	0.000	(14)	0.190	(10)	−0.088	(32)	0.000	(5)	1.190	(3)	0.007	(7)	−0.118	(35)
Chile	−0.307	−4.581	(34)	0.000	(19)	−5.826	(33)	2.322	(2)	0.000	(20)	0.000	(4)	0.000	(5)	−2.991	(31)	0.000	(8)	1.915	(7)
Czech Republic	−0.101	−1.575	(30)	0.447	(16)	−0.073	(10)	0.000	(14)	0.000	(20)	0.000	(4)	0.333	(3)	−2.282	(30)	0.000	(8)	0.000	(20)
Denmark	0.000	0.000	(23)	0.000	(19)	−0.288	(18)	0.000	(14)	0.172	(12)	−0.022	(30)	0.000	(5)	−0.289	(22)	0.203	(5)	0.225	(17)
Estonia	0.292	5.609	(4)	0.630	(15)	0.000	(4)	0.000	(14)	0.000	(20)	0.000	(4)	5.965	(1)	−0.986	(27)	0.000	(8)	0.000	(20)
Finland	0.389	5.407	(5)	2.530	(6)	0.326	(2)	0.349	(6)	0.000	(20)	0.000	(4)	−0.077	(31)	1.614	(1)	0.171	(6)	0.494	(16)
France	−0.101	−1.504	(29)	0.792	(13)	−0.117	(13)	0.000	(14)	0.041	(15)	0.000	(4)	−0.052	(30)	−2.167	(29)	0.000	(8)	0.000	(20)
Germany	0.000	0.000	(23)	0.670	(14)	−0.019	(9)	0.000	(14)	0.000	(34)	0.000	(4)	−0.428	(33)	−0.223	(20)	0.000	(8)	0.000	(20)
Greece	0.099	1.980	(15)	2.535	(5)	−1.031	(26)	0.000	(14)	0.000	(20)	0.476	(1)	0.000	(5)	0.000	(10)	0.000	(8)	0.000	(20)
Hungary	−0.204	−4.256	(33)	−2.246	(36)	0.000	(8)	0.000	(14)	0.000	(20)	0.000	(4)	−2.010	(35)	0.000	(10)	0.000	(8)	0.000	(20)
Iceland	0.197	2.632	(14)	0.000	(19)	−0.080	(11)	0.000	(14)	1.056	(6)	0.000	(4)	0.000	(5)	−0.091	(18)	0.000	(8)	1.746	(9)
Ireland	0.482	7.197	(1)	2.306	(8)	4.934	(1)	0.000	(14)	0.000	(20)	−0.043	(31)	0.000	(5)	0.000	(10)	0.000	(8)	0.000	(20)
Israel	−0.203	−2.817	(32)	0.000	(19)	−5.223	(32)	0.093	(10)	0.148	(14)	−0.002	(28)	0.266	(4)	−0.060	(17)	0.000	(8)	1.961	(6)
Italy	−0.308	−5.129	(36)	−0.880	(32)	−1.929	(30)	0.000	(14)	0.346	(8)	−0.719	(35)	0.000	(5)	−1.948	(28)	0.000	(8)	0.000	(20)
Japan	0.387	6.669	(2)	0.000	(19)	−2.978	(31)	0.000	(14)	1.065	(5)	0.000	(4)	0.000	(5)	−0.935	(26)	0.000	(8)	9.517	(3)
Korea	0.387	6.669	(2)	0.000	(19)	−0.836	(24)	2.485	(1)	0.000	(20)	0.000	(4)	0.000	(5)	−4.723	(34)	0.000	(8)	9.744	(2)
Luxembourg	0.000	0.000	(23)	0.329	(17)	−0.213	(17)	0.000	(14)	0.675	(7)	0.000	(4)	0.000	(5)	−0.791	(25)	0.000	(8)	0.000	(20)
Mexico	0.000	0.000	(23)	0.000	(19)	−14.376	(36)	0.000	(14)	−0.225	(35)	0.000	(4)	−0.129	(32)	0.200	(7)	7.699	(1)	6.831	(4)
Netherlands	0.099	1.342	(19)	0.102	(18)	−0.203	(15)	0.057	(12)	0.000	(19)	0.140	(2)	0.000	(5)	0.491	(5)	0.721	(4)	0.035	(18)
New Zealand	0.099	1.379	(18)	0.000	(19)	−0.872	(25)	0.354	(5)	0.185	(11)	−0.001	(27)	−0.005	(28)	0.000	(10)	0.000	(8)	1.719	(10)
Norway	0.099	1.307	(21)	0.000	(19)	−0.642	(22)	0.000	(14)	1.298	(4)	0.000	(4)	0.000	(5)	−0.323	(23)	0.000	(8)	0.975	(13)
Poland	0.292	5.129	(6)	13.620	(1)	0.000	(4)	0.000	(13)	0.000	(20)	0.000	(4)	−4.198	(36)	−4.292	(33)	0.000	(8)	0.000	(20)
Portugal	0.196	4.001	(8)	11.564	(2)	0.000	(4)	0.000	(14)	4.805	(1)	0.000	(4)	0.000	(5)	−12.369	(36)	0.000	(8)	0.000	(20)
Russian Federation	0.000	0.000	(23)	0.000	(19)	−1.923	(29)	0.287	(8)	1.885	(3)	0.000	(4)	1.836	(2)	−5.491	(35)	3.873	(3)	−0.467	(36)
Slovak Republic	−0.101	−1.681	(31)	−1.681	(34)	0.000	(4)	0.000	(14)	0.000	(20)	0.000	(4)	0.000	(5)	0.000	(10)	0.000	(8)	0.000	(20)
Slovenia	−0.308	−4.960	(35)	−1.964	(35)	0.078	(3)	0.000	(14)	0.000	(20)	0.000	(4)	0.000	(5)	−3.074	(32)	0.000	(8)	0.000	(20)
Spain	0.197	3.175	(10)	5.297	(3)	−1.349	(27)	0.000	(14)	0.012	(17)	−0.764	(36)	−0.021	(29)	0.000	(10)	0.000	(8)	0.000	(20)
Sweden	0.099	1.325	(20)	1.094	(12)	−0.090	(12)	0.087	(11)	0.012	(16)	0.000	(4)	0.000	(5)	0.307	(6)	−0.085	(36)	0.000	(19)
Switzerland	0.099	1.290	(22)	0.000	(19)	−0.757	(23)	1.237	(3)	0.000	(20)	0.000	(4)	−1.467	(34)	0.496	(4)	0.000	(8)	1.781	(8)
Turkey	0.196	3.774	(9)	2.514	(7)	−8.402	(34)	0.314	(7)	−3.508	(36)	0.042	(3)	0.000	(5)	0.000	(10)	0.000	(8)	12.814	(1)
United Kingdom	0.099	1.460	(17)	−0.705	(31)	−0.206	(16)	0.000	(14)	0.287	(9)	0.000	(4)	0.000	(5)	0.100	(9)	0.000	(8)	1.985	(5)
United States	0.294	4.256	(7)	2.202	(9)	−0.515	(20)	0.256	(9)	0.000	(20)	−0.017	(29)	0.000	(5)	1.538	(2)	0.000	(8)	0.792	(15)
Mean	0.085	1.331		1.293		−1.502		0.229		0.298		−0.040		0.000		−1.058		0.550		1.560	
Std. Dev.	0.202	3.273		3.230		3.306		0.583		1.135		0.202		1.343		2.542		1.820		3.107	

a) While the difference in the 0–10 scale is subjective well-being of females minus subjective well-being of males for each country, the difference in percentage is the ratio of subjective well-being of females to subjective well-being of males minus one for each country.

Table A4: Decomposition of Differences in Subjective Well-being between High and Low Income Earners (%)

	Difference between high-income and low-income people[a]			Contribution of percentage difference between high-income and low-income people																			
	0-10 scale	Percent		Sensitivity		Income		Jobs		Community		Education		Environment		Civic engagement		Health	
Australia	0.294	4.139	(30)	-5.698	(28)	5.740	(14)	0.510	(26)	1.059	(8)	0.000	(28)	1.839	(2)	0.000	(21)	0.687	(31)
Austria	0.846	12.260	(21)	-4.676	(27)	0.818	(35)	0.260	(31)	0.050	(19)	6.139	(2)	0.000	(14)	0.024	(20)	9.646	(6)
Belgium	1.260	20.661	(10)	10.282	(3)	5.107	(17)	1.528	(14)	0.000	(21)	0.865	(16)	-2.928	(32)	0.000	(21)	5.808	(13)
Brazil	0.753	11.955	(22)	-9.825	(31)	11.346	(6)	0.042	(35)	0.000	(21)	6.450	(1)	1.028	(6)	0.000	(21)	2.913	(21)
Canada	0.197	2.632	(33)	-3.949	(26)	4.720	(19)	1.647	(13)	-0.130	(35)	0.156	(25)	-0.535	(24)	0.630	(14)	0.092	(33)
Chile	1.258	20.972	(9)	-1.672	(24)	12.901	(3)	0.157	(32)	0.005	(20)	3.886	(5)	-3.317	(33)	0.000	(21)	9.012	(8)
Czech Republic	0.293	4.445	(29)	-14.297	(33)	4.682	(20)	5.409	(6)	-1.178	(36)	0.000	(28)	0.000	(17)	2.776	(8)	7.053	(9)
Denmark	0.576	8.004	(27)	0.162	(12)	2.815	(24)	0.362	(27)	0.152	(16)	0.774	(17)	1.514	(4)	0.000	(21)	2.225	(22)
Estonia	0.657	12.629	(20)	-27.054	(36)	10.522	(8)	14.213	(2)	0.389	(13)	0.000	(28)	0.320	(12)	1.905	(10)	12.334	(3)
Finland	0.935	13.353	(19)	-1.645	(23)	2.033	(29)	0.521	(25)	3.626	(3)	0.000	(28)	0.439	(9)	1.362	(11)	7.017	(10)
France	1.175	19.913	(11)	8.569	(4)	5.571	(15)	0.939	(20)	0.000	(21)	1.335	(13)	-0.429	(23)	0.000	(21)	3.929	(16)
Germany	1.095	17.959	(15)	1.247	(11)	1.429	(33)	1.028	(18)	0.000	(33)	2.128	(8)	-0.326	(19)	3.379	(6)	9.074	(7)
Greece	1.356	32.277	(3)	12.655	(2)	11.596	(5)	3.863	(9)	0.753	(9)	0.000	(27)	1.813	(3)	0.812	(13)	0.786	(30)
Hungary	1.278	31.178	(4)	-0.525	(19)	6.877	(12)	9.228	(4)	0.000	(21)	0.000	(28)	-0.358	(20)	11.128	(1)	4.827	(15)
Iceland	0.294	3.922	(31)	-0.594	(20)	2.538	(26)	0.981	(19)	-0.051	(34)	0.362	(21)	-0.424	(22)	0.102	(19)	1.008	(28)
Ireland	-0.203	-2.778	(36)	-8.660	(30)	5.374	(16)	4.444	(8)	0.000	(21)	0.664	(18)	-4.600	(35)	0.000	(36)	0.000	(34)
Israel	1.014	16.093	(17)	-0.638	(21)	10.091	(9)	1.271	(16)	3.451	(4)	4.677	(4)	-3.319	(34)	0.561	(15)	0.000	(34)
Italy	1.242	23.440	(6)	6.790	(5)	10.577	(7)	2.519	(11)	0.000	(21)	0.891	(15)	-1.064	(26)	0.000	(21)	3.726	(17)
Japan	0.835	14.904	(18)	0.000	(14)	2.513	(27)	0.288	(30)	0.289	(14)	0.000	(28)	0.024	(13)	0.000	(21)	11.789	(4)
Korea	1.590	34.575	(2)	0.000	(14)	1.131	(34)	0.311	(29)	28.279	(1)	0.138	(26)	-1.367	(28)	0.000	(21)	6.083	(12)
Luxembourg	1.184	18.492	(14)	5.198	(6)	1.851	(30)	2.141	(12)	0.491	(11)	5.205	(3)	0.481	(8)	0.000	(21)	3.125	(20)
Mexico	1.270	19.237	(13)	0.000	(14)	11.909	(4)	0.091	(34)	0.000	(32)	3.226	(6)	-2.773	(31)	0.231	(18)	6.554	(11)
Netherlands	0.757	10.970	(25)	4.211	(8)	2.703	(25)	0.347	(28)	1.070	(7)	0.000	(28)	-1.572	(29)	2.009	(9)	2.201	(23)
New Zealand	-0.101	-1.361	(34)	-10.366	(32)	6.975	(11)	0.645	(22)	0.000	(21)	0.379	(20)	1.006	(7)	0.000	(21)	0.000	(34)
Norway	0.294	3.922	(31)	-2.779	(25)	0.547	(36)	0.151	(33)	0.149	(17)	1.183	(14)	0.414	(10)	0.993	(12)	3.264	(19)
Poland	0.661	11.394	(24)	-15.032	(35)	7.450	(10)	8.334	(5)	0.000	(21)	0.000	(28)	-0.811	(25)	6.290	(2)	5.165	(14)
Portugal	1.889	46.082	(1)	19.465	(1)	2.121	(28)	2.739	(10)	3.168	(5)	0.274	(23)	0.000	(14)	4.306	(4)	14.008	(2)
Russian Federation	0.569	10.536	(26)	0.000	(14)	23.841	(1)	0.000	(36)	0.000	(21)	0.000	(28)	-28.255	(36)	0.000	(21)	14.949	(1)
Slovak Republic	1.004	17.934	(16)	-14.377	(34)	4.769	(18)	22.524	(1)	0.050	(18)	1.374	(12)	0.327	(11)	0.000	(21)	3.266	(18)
Slovenia	1.252	21.963	(7)	2.103	(10)	2.865	(23)	1.466	(15)	0.392	(12)	2.003	(9)	1.904	(1)	0.544	(16)	10.685	(5)
Spain	1.329	23.733	(5)	4.311	(7)	6.598	(13)	9.306	(3)	0.000	(21)	0.239	(24)	1.421	(5)	0.466	(17)	1.392	(27)
Sweden	-0.203	-2.598	(35)	-6.412	(29)	1.689	(32)	0.584	(23)	0.652	(10)	0.585	(19)	-1.364	(27)	0.000	(21)	1.668	(25)
Switzerland	0.577	7.796	(28)	0.000	(14)	1.813	(31)	0.532	(24)	0.000	(21)	0.277	(22)	0.000	(14)	3.513	(5)	1.662	(26)
Turkey	1.073	21.905	(8)	0.066	(13)	16.204	(2)	0.881	(21)	4.434	(2)	2.731	(7)	-2.536	(30)	0.000	(21)	0.126	(32)
United Kingdom	0.754	11.778	(23)	-1.094	(22)	2.917	(22)	1.209	(17)	0.286	(15)	1.502	(11)	-0.018	(18)	5.136	(3)	1.839	(24)
United States	1.178	19.319	(12)	4.201	(9)	3.618	(21)	5.208	(7)	1.433	(6)	1.549	(10)	-0.413	(21)	2.925	(7)	0.798	(29)
Mean	0.840	15.101		-1.390		6.007		2.936		1.356		1.361		-1.219		1.364		4.686	
Std. Dev.	0.499	10.715		8.546		5.040		4.678		4.768		1.823		4.891		2.353		4.296	

a) While the difference in the 0–10 scale is subjective well-being of high income earners minus subjective well-being of low income earners for each country, the difference in percentage is the ratio of subjective well-being of high income earners to subjective well-being of low income earners minus one for each country.