

What Is the Nature of the Relation Between Income and Subjective Well-Being?



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<p>Abstract: The purpose of this research is to study different qualities of the relation between income and subjective well-being. In this case, subjective well-being is defined as happiness and life satisfaction.</p> <p>Studies have found the relation between income and subjective well-being to be positive and limited in the sense that a higher income ceases to increase experienced well-being after certain amounts of income. Moreover, the effect of income is found to be stronger on life satisfaction than on happiness. These findings are further supported in this study.</p> <p>However, preceding studies find the satiation points to occur at higher incomes in wealthy regions than in poor ones. The suggested explanations to this difference underscore the role of relative income in the assessment of subjective well-being.</p> <p>In this thesis, I find that satiation points do occur in wealthy countries, but not in poor ones. With this empirical support, I argue that the relation between income and subjective well-being is, in fact, positively diminishing so that an increasing income has a decreasing positive effect on subjective well-being. Furthermore, I argue that this positively diminishing relation can be explained with theory of human needs.</p> <p>A detailed research of the qualities of the relation between income and subjective well-being is important for an accurate understanding of the relation. The understanding of the relation between income and subjective well-being, in turn, is important for the optimization of happiness and life satisfaction in individual lives, as well as in societies.</p>	
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1. Introduction

In this chapter, the research space, purpose, and gist of the implications of this thesis are presented.

1.1 Research space

The first objective of this thesis is to examine the qualities of the statistical correlations between income and subjective well-being. In this case, subjective well-being is defined as subjective happiness and life satisfaction.

The second objective is to compare these qualities in relatively wealthy and poor countries.

An imperative assumption for these objectives, then, is that there are relations between income and both happiness and life satisfaction to begin with. Fortunately, studies have found evidence supporting these relations.

For example, Richard A. Easterlin observes 30 surveys comprising 19 countries and finds that in each survey the high-income groups show higher average levels of happiness than the poorer groups (Easterlin, R. A., 1974). In addition, the applied measures differ among the surveys so that both happiness and life satisfaction are studied.

Similarly, Betsey Stevenson and Justin Wolfers investigate the relations in the United States and find that the reported average levels of happiness and life satisfaction seem to move consistently with the income groups so that the lowest income groups report the lowest average levels of happiness and life satisfaction and the highest income groups, respectively, report the highest average levels of both happiness and life satisfaction (Stevenson, B., & Wolfers, J., 2013).

Moreover, when Stevenson and Wolfers attempt to find satiation points for the relation between income and life satisfaction in 25 countries, their regression-lines show no signs of flattening; the correlations stay positive at the highest observed incomes.

Like Stevenson and Wolfers, Daniel Kahneman and Angus Deaton find that life satisfaction keeps rising all the way to the highest observed incomes in their study of the

relations between income and both life satisfaction and emotional well-being in the United States (Kahneman, D., & Deaton, A., 2010).

Kahneman and Deaton do, however, discover a statistical limit for the effect of income on their measure for emotional well-being, including happiness. They estimate that after an annual income of approximately \$75,000, the positive effect of a higher income on emotional well-being disappears.

With these findings, then, Kahneman and Deaton conclude that a high income improves life satisfaction but not emotional well-being.

Andrew T. Jebb et al. expand the research by Kahneman and Deaton to comprise other world regions (Jebb A. T. et al., 2018). By applying similar measures as Kahneman and Deaton, Jebb et al. set out to find satiation points for the effect of income on life satisfaction and emotional well-being. According to their results, the effect of income on life satisfaction is, as Kahneman and Deaton argue, stronger than the effect of income on emotional well-being. However, Jebb et al. also find that both emotional well-being and life satisfaction do satiate and, additionally, that satiation takes place at higher incomes in wealthier nations.

To advance existing research, this thesis provides a look into differences in potential satiation points among countries. Because the observation of a single country fails to provide a wide picture of differences in satiation points, but, conversely, the examining of entire world regions may become too general with regard to demography, culture, economic status etcetera, a more detailed, yet diverse, description of differences in satiation points can be achieved by comparing countries.

1.2 Purposes

The purpose of this thesis is to develop existing explanations about the relations between income and both happiness and satisfaction with life. The analysis of these relations is important on many levels.

Primarily, it is important for people who aspire to be happy to understand that riches do not necessarily guarantee one happiness, and that a striving toward a high income may, in

fact, be a worthless path that does not lead to a life of contentment. In the *Nicomachean Ethics*, Aristotle states that: “The life of money-making is one undertaken under compulsion, and wealth is evidently not the good we are seeking; for it is merely useful and for the sake of something else.” (Brown, L., 2009, p. 7). Instead of wealth, then, Aristotle argues that the good we are seeking is happiness.

From a governmental perspective, the knowledge of limited effects of income on happiness and life satisfaction may be seen as an argument for a progressive taxation. In other words, it may be argued that rich people should be taxed more because they do not benefit from more money as much as people with low incomes would after a redistribution by the government. One advocate for an unequal redistribution of this sort was the American philosopher John Rawls (1921-2002), who argued that social and economic inequalities should be organised in favour of the indigent people (Rawls, J., 1971).

Additionally, chiefs who wish to motivate their workers can benefit from the insight that raises and bonuses may become inefficient for this purpose after certain limits. Some support for this defectiveness of wages as motivators is presented by Frederick Herzberg who argues that it is not salary, but recognition, advancement, responsibility etcetera, that makes workers satisfied with their jobs (Herzberg, F. M., & Mausner, B., 1959).

As a final point, although the purpose of this thesis is to clarify the relation between income and both happiness and life satisfaction, it is necessary to assert that income is only part of what makes people happy and satisfied with their lives, and that happiness cannot be explained in a general manner due to individual differences in experienced emotion. Hence, the purpose of this thesis is not to be interpreted as a description of what makes people happy, but as a description of differences in emotions at different levels of income.

1.3 Results

The results give rise to 4 inferences.

The 1st inference is that there are positive relations between income and both happiness and life satisfaction.

The 2nd inference is that the relation between income and life satisfaction is stronger than the relation between income and happiness.

The 3rd inference is that the relation between income and life satisfaction stops increasing in wealthy countries with high incomes.

The 4th inference is that the relation between income and life satisfaction does not stop increasing in poor countries with low incomes.

With these inferences, then, the nature of the relation between income and subjective well-being is portrayed.

2. Theories and hypotheses

In this chapter, theories about the nature of the relations between income and both happiness and life satisfaction are presented together with the 4 hypotheses that form the base of the research in this thesis.

2.1 The positive relations between income and both happiness and life satisfaction

Hypothesis 1: there are positive relations between income and both happiness and life satisfaction.

The theory of a positive relation between goods and utility is one of the basic assumptions in microeconomics, namely the assumption of non-satiation. The assumption of non-satiation asserts that: “A consumption bundle x' will be preferred to x'' if x' contains more of at least one good and no less of any other, i.e. if $x' > x''$.” (Gravelle, H., & Rees, R., 2004, p. 13). Furthermore, the assumption of non-satiation maintains that a consumer always wants more goods and is, in other words, never satiated. As more goods are attained with more money, it follows that a higher income enables a higher utility which, in theory, always makes a consumer happier and more satisfied.

The American economist Thorstein Veblen (1857-1929) took a different approach toward the purpose of consumption. The prime reason for consumption, according to Veblen, is to use its conspicuous quality to lift one’s status in the eyes of others (Veblen, T., 1899). Thus, happiness and life satisfaction are still positively linked to a higher income, but the reason for the improvements is not the consumption, but the higher status it enables.

In addition to the enablement of an abundant consumption, the positive relation between income and both happiness and life satisfaction can be argued for with the theory that a higher income correlates positively with good health and a long life expectancy through, for example, access to high quality health care.

There are empirical studies which support this theory. For example, Johan P. Mackenbach et al. compare rates of mortality and self-assessed health among different socioeconomic groups in 22 European countries and find that, in almost every country, the lower

socioeconomic groups showed higher rates of mortality and worse self-assessments of health than the high socioeconomic groups (Mackenbach, J. P. et al., 2008).

There are, in other words, reasons to believe that a higher income will improve experienced happiness and life satisfaction. However, none of the aforementioned theories describe a positive effect of a higher income on specifically happiness or life satisfaction.

This is a relevant distinction as happiness and life satisfaction do not parallel to each other. Happiness may, for example, be described as “A relative permanent state of well-being characterized by dominantly agreeable emotions ranging in value from mere contentment to positive felicity.” (Hartman, G., W., 1934, p. 202). Life satisfaction, in turn, requires self-reflection, and may be argued to apply as a concept “only when a person more or less knows what he wants and assessed the degree to which his wants are met.” (Veenhoven, R., 2013, p. 27).

Fortunately, this distinction between happiness and life satisfaction is not completely unscrutinised.

Daniel Kahneman and Angus Deaton take it into consideration in their article “High income improves evaluation of life but not emotional well-being”. With empirical support from the results of their research, Kahneman and Deaton argue that the positive effect of an increased income ceases sooner for emotional well-being, including happiness, than it does for satisfaction with life.

As an explanation for this, they suggest that an increased income may, after a certain point, become inefficient for enabling people to do things that enhance their emotional well-being. These things, then, include: “spending time with people they like, avoiding pain and disease, and enjoying leisure” (Kahneman, D., & Deaton, A., 2010, p. 16492).

Furthermore, they emphasize the difference between feelings experienced while, on the one hand, thinking about life and, on the other hand, living it; the assessment of life satisfaction is associated with reasoning more so than the assessment of happiness, which is, in turn, more susceptible to emotion.

The argued relevance of this distinction for the effect of income on life satisfaction and emotional well-being, then, is that income is more important for the reasoned assessment of life, than it is for felt happiness.

Hypothesis 2: the relation between income and happiness is weaker than the relation between income and life satisfaction.

2.2 Theories for a limited positive effect of income on happiness and life satisfaction

Hypothesis 3: the positive relations between income and both happiness and life satisfaction cease after certain limits.

Although there are reasons to believe that there are positive relations between income and both happiness and satisfaction with life, there are also reasons to believe that these relations are limited.

For example, Thorstein Veblen's theory of a higher income raising the status of a person in the eyes of others, and in this way improving the evaluation of life for this person, may be deemed as limited because there are no ranks to achieve after one has reached the highest income group.

Similarly, once a person can afford high quality healthcare, there is no more room for improvement in this aspect of life and so, consequently, no more room for improvement in life evaluation or happiness.

In addition, the realism of the microeconomic axiom of non-satiation may be questioned as the theory that a greater consumption always makes a person happier or more satisfied relies on an assumption of a most materialistic person.

As Daniel Kahneman and Richard H. Thaler write in their article "Anomalies: Utility maximization and experienced utility": "to maximize utility successfully, one must start by making a forecast about how the various possible outcomes will be experienced" (Kahneman, D., & Thaler, R. H., 2006, p. 231). In other words, for the axiom of non-satiation to be believable, people must be assumed to forecast a maximized utility simply by consuming as much as possible. This is a crude assumption.

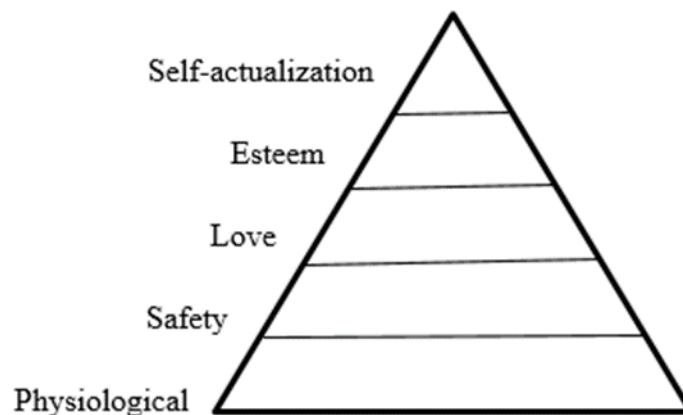
2.3 Need theory

A more realistic theory than the axiom of non-satiation is the theory of a restriction of the positive effect of a higher income on happiness and life satisfaction.

This restriction may, to some extent, be explained with so-called need theory, i.e. theory about human needs. One comprehensive need theory is the hierarchy of needs by Abraham H. Maslow.

According to Maslow, “There are at least five sets of goals, which we may call basic needs. These are briefly physiological, safety, love, 'esteem, and self-actualization... These basic goals are related to each other, being arranged in a hierarchy of prepotency” (Maslow, A. H., 1943, p. 18).

Figure 2.1 Maslow’s hierarchy of needs



The physiological need refers to the need to keep one’s body nourished, in other words the need to eat and drink, and it is prepotent in relation to the other needs. Thus, a person without any of the five basic needs would, according to Maslow, long for food more than anything else.

The safety need encompasses a society where people do not have to feel threatened by violence, extreme temperatures, disorder, and so forth, and it is the second most prepotent need in Maslow’s hierarchy.

The love need entails a longing for friends, a companion, children, or a feeling of belongingness to a group, and it will arise once the physiological and safety needs are gratified if not completely, then at least to some extent.

The esteem need refers to the desire for a high evaluation of oneself based on achievements and the feeling of adequacy on the one hand, and respect and recognition from others on the other hand. It emerges after the love need.

The need for self-actualization, the final need in Maslow's hierarchy, implies that doing what one is suited to do, e.g. singing if one is a singer, is a prerequisite for ultimate happiness. In other words, a person cannot be completely satisfied without an outlet for self-actualization, even if the other four sets of needs are being gratified.

The support from the hierarchy of needs to the theory of income having a limited effect on happiness, then, is that income is of great assistance to the satisfaction of physiological and safety needs, whereas the higher needs are more difficult to gratify by means of more money.

As both the quality and quantity of food, and the standard of accommodation, being an imperative part of safety, are essentially reliant on the wealth of a person, a higher income directly supports an upgrade of them.

That is not to say that a high income will guarantee a safe society, but that a higher income directly enables an improvement of the safety of one's accommodation through, for example, location and security.

This is not the case for the higher needs.

A higher income does not, for example, directly enable people to do what they are most suited to do. The level of income does not, for example, directly determine whether a singer will or will not sing.

Likewise, the level of income does not directly dictate the number of friends that a person has.

Of course, a higher income can make it easier to pursue a self-actualizing activity, engage in social activities, and, as Thorstein Veblen argued, improve self-esteem through a higher status.

Still, the connections are largely indirect.

2.4 Theories for satiation points at higher incomes in wealthy nations than in poor

Hypothesis 4: in wealthy countries, the limits after which a higher income no longer contributes to experienced happiness and life satisfaction occur at higher income levels than the limits in poor countries.

A theory for this hypothesis is the so-called Easterlin paradox by Richard A. Easterlin.

The Easterlin paradox infers that there is a contradiction in the relation between income and happiness; namely that a higher income increases the happiness of individuals, but a higher GDP/c does not increase the overall happiness in a country (Easterlin, R. A., 1974).

From this controversy, Easterlin concludes that the decisive factor for the effect of income on happiness is not so much the absolute amount of income as it is the relative amount of income when compared to the average levels of income within a country. Thus, argues Easterlin, the gained happiness from a higher income is determined through a comparison to the levels of income among other countrymen.

According to this theory, then, citizens of countries with relatively high wages need higher incomes in order to increase their happiness and life satisfaction than citizens of countries with relatively low wages.

Another theory for the satiation points occurrence at higher incomes in wealthy nations is the so-called hedonic treadmill by Philip Brickman and Donald Campbell (Brickman, P., & Campbell, D. T., 1971). The hedonic treadmill suggests that people have a fixed level of happiness that is based on expectations about life standards drawn from their respective surroundings. As the life standards are higher in wealthier nations, it follows that the fixed level of happiness is achieved with a higher income in these nations than it is in poor nations; the satiation points occur at higher incomes in wealthy nations.

An alternative theory is presented by Ruut Veenhoven. In his article, titled "Is happiness relative?", Veenhoven criticises the evidence for the decisive role of relative income presented by Easterlin (1974) as misleading, and argues for his interpretation of Easterlin's results instead (Veenhoven, R., 1991). The argued interpretation is that the value of income for experienced happiness and life satisfaction grows smaller as income grows higher.

According to this concept, then, satiation points occur at high incomes, but do not occur at low incomes. Thus, wealthy countries with high incomes are more likely to indicate satiation points than poor countries with low incomes.

3. Preceding studies

In this chapter, preceding studies about the relations between income and both happiness and life satisfaction are presented along with studies about the limitation of the relations.

3.1 Studies about the positive relations between income and both happiness and life satisfaction

In the article “Does Economic Growth Improve the Human Lot? Some Empirical Evidence”, Richard A. Easterlin provides evidence for the positive relation between income and both happiness and life satisfaction in different countries (Easterlin, R. A., 1974). The evidence is derived from 30 surveys.

The surveys Easterlin observes in order to study the relation between income and happiness make use of multiple-choice questions (with the options “Not very happy”, “Fairly happy”, and “Very happy”). By distributing the answers by economic status, Easterlin finds that in every case the answer “Not very happy” is, on average, chosen more often in the groups with lower economic status than the groups with high economic status.

The surveys Easterlin observes in order to study the relation between income and life satisfaction, in turn, make use of Cantril’s Self-Anchoring Striving scale (Cantril, H., 1965). The Self-Anchoring Striving scale is a scale from 0 to 10 where 0 stands for the interviewed person’s worst imaginable life scenario and 10, respectively, stands for the best imaginable life scenario for this person. The idea of the scale is to employ the interviewed person’s idea of a good and bad life in order to make the life evaluation representative of individual and unbiased thought.

Having distributed the reported placements on the scale by economic status, Easterlin finds that in every observed country, the average rates of life evaluation are higher among the groups with high economic status than the groups with low economic status.

Although the applied statistical methods are simple, the quantitative aspects of each survey showing that people with high economic status on the average either report to be unhappy more seldom, or evaluate their lives higher than people with low economic status

still makes Easterlin's findings convincing of the idea that there are positive relations between income and both happiness and life evaluation.

Similarly, Betsey Stevenson and Justin Wolfers make use of simple multiple-choice questions for both happiness (with the options "Not Too Happy", "Fairly Happy", and "Very Happy") and life satisfaction (with the options "Very dissatisfied", "Somewhat dissatisfied", "Somewhat satisfied", and "Very satisfied") in their study about the relations between income and happiness and life satisfaction in the United States (Stevenson, B., & Wolfers, J., 2013).

However, instead of observing the economic status of people, like Richard A. Easterlin (1974), Stevenson and Wolfers observe the distribution of reported emotions in 11 different categories for annual household income (ranging from <\$10k to >\$500k).

Again, although the statistical method is uncomplicated, the consistent positive change in the percentage of people reporting the greatest alternatives for happiness and life satisfaction when moving up and down the range of annual household income makes for a steady piece of empirical evidence for the positive relation between income and both happiness and life satisfaction.

3.2 Studies about the limited effect of income on happiness and life satisfaction

In addition to the observation of the distribution of happiness and life satisfaction among different income groups, Betsey Stevenson and Justin Wolfers study the extent of the positive relation between income and life satisfaction, measured with Cantril's Self-Anchoring Striving scale, in 25 countries (Stevenson, B., & Wolfers, J., 2013).

To do this, Stevenson and Wolfers estimate the relations separately for each country by means of so-called local linear regressions.

The resulting regression lines do not show signs of decline in any country. Instead, the effect of a higher income on life satisfaction seems to be as large at the low incomes as it is at the high incomes.

With these results, then, Stevenson and Wolfers present an apparent lack of empirical support for the theory of a limited effect of income on life satisfaction.

Daniel Kahneman and Angus Deaton conduct slightly different research about the relations between income and both life satisfaction and emotional well-being in the United States (Kahneman, D., & Deaton, A., 2010).

By analyzing the results from a survey comprising answers from more than 450,000 US residents, they find a stronger relation between income and life satisfaction, measured with Cantril's Self-Anchoring Striving scale, than between income and emotional well-being, measured with 3 different indicators.

The first measure for emotional well-being is labeled "positive affect". Kahneman and Deaton define this measure as the average of positive feelings, such as happiness or enjoyment, felt during the previous day.

Similarly, "blue affect" is defined as negative feelings, such as worry and sadness, felt during the day before. When illustrating this measure in a graph, however, Kahneman and Deaton present the average fraction of population not feeling "blue" instead of the fraction experiencing "blue affect". They do this by subtracting the average fraction of population feeling "blue" from 1, i.e. the entire population.

The third measure for emotional well-being is labeled "stress free", and it is defined as the absence of reported feeling of stress during the previous day.

The measure for income is the natural logarithm of annual household income. This measure is not optimal due to the fact that a household income can represent the income of a single person, a couple, or a family, meaning that the measure is not strictly representative of the income of the person reporting the level of subjective happiness and life satisfaction. Nonetheless, it is the applied measure.

In order to depict the relations between the measured emotions and income, then, Kahneman and Deaton plot them by different income groups and percentages of the observed population feeling them (see figure 3.1).

Figure 3.1 Results from Kahneman and Deaton, 2010

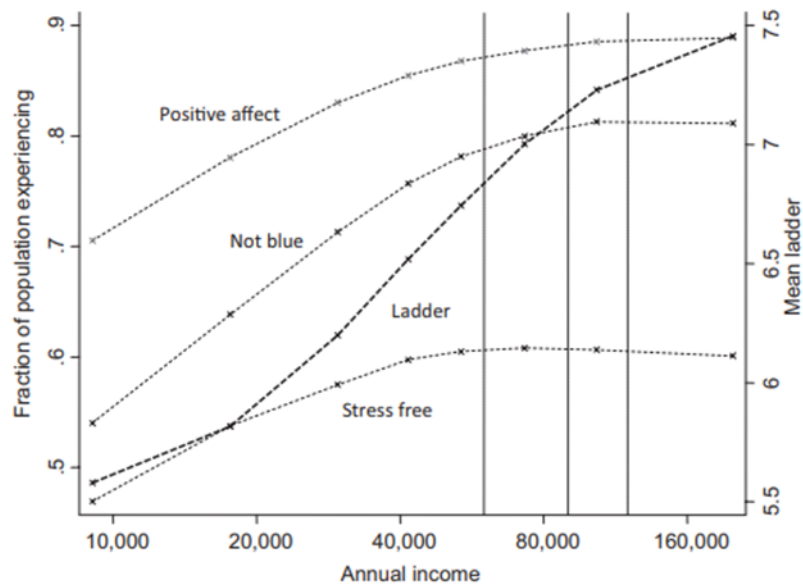


Figure 3.1 illustrates how the measure for life satisfaction, i.e. the line titled “Ladder”, maintains a positive relation with the measure for annual household income throughout the observed levels of income. Like the results presented by Stevenson and Wolfers (2013), this maintaining of a positive relation suggests that the positive effect of a higher income on life satisfaction does, in fact, not satiate.

Every measure for emotional well-being, on the other hand, cease to rise along with the measure for annual household income once they reach a certain level of income. Kahneman and Deaton estimate this level to be approximately \$75,000, and conclude that after this, in the United States, a higher income is still beneficial for the evaluation of life, but ineffective for an increased experience of happiness, as well as for a lessening of experienced unhappiness and stress.

Andrew T. Jebb et al. investigate whether or not this satiation is found in countries worldwide (Jebb, A. T., et al., 2018). In order to do this, they use data with answers to comparable questions as the ones included in the survey used by Kahneman and Deaton. For example, the measure for life evaluation is, again, Cantril’s Self-Anchoring Striving scale.

Likewise, the measures for emotional well-being are positive and negative feelings felt during the previous day.

While the measure for income is essentially the same as the one used by Kahneman and Deaton, i.e. the natural logarithm of household income measured in US dollars, Jebb et al. aim to make the measure for income more representative for the interviewed person alone. To achieve this, they apply a square root equivalency scale in which the income of a household is divided by the square root of the number of people living in the household.

The data comprise observations from a total of 164 countries. With such comprehensive data, Jebb et al. are able to divide the observations geographically so that they represent 9 regions, namely, Sub-Saharan Africa, Middle-East/North Africa, Northern America, Latin America/the Caribbean, East Asia, Southeast Asia, Australia/New Zealand, Eastern Europe/the Balkans, and Western Europe/Scandinavia.

Jebb et al. also make use of a different method than Kahneman and Deaton. Instead of observing differences in feelings among separate income groups, they create continuous regression curves by means of so-called cubic splines (cubic splines are explained in chapter 5.).

Unlike the results provided by both Stevenson and Wolfers (2013) and Kahneman and Deaton (2010), the results indicate satiation points for each measure of emotions, i.e. life evaluation, positive affect, and negative affect.

Moreover, these results are found in every observed region except for Southeast Asia, for which the estimated relations between income and both positive and negative affect were not positive.

In addition to finding satiation points in almost every observed region, Jebb et al. strengthen the statement made by Kahneman and Deaton about a stronger relation between income and life evaluation than income and emotional well-being. This strengthening is derived from the fact that in every observed region, apart from Southeast Asia, the income at which the positive effect of a higher income on life evaluation is estimated to cease is higher than the income at which the positive effect of a higher income on experienced positive affect is estimated to cease. Furthermore, only two regions, namely Middle

East/North Africa and Sub-Saharan Africa, show estimated satiation points at higher income levels for experienced negative affect than for life evaluation. In other words, the results imply that a high income improves life evaluation to a longer extent than emotional well-being.

The second key finding derived from the results is that the estimated satiation points occur at higher incomes in wealthier regions. For example, the estimated satiation points for life evaluation and positive affect are annual incomes of \$105,000 and \$65,000 in Northern America, but \$35,000 and \$30,000 in Latin America/the Caribbean. Similarly, the estimated satiation points for life evaluation and positive affect are annual incomes of \$100,000 and \$50,000 in Western Europe/Scandinavia, but \$40,000 and \$35,000 in Sub-Saharan Africa.

4. Data

In this chapter, the utilized data and applied measures are presented. In addition, to acknowledge the challenge of measuring happiness and life satisfaction, potential measuring biases are explained.

4.1 Applied measures

The data utilized in this thesis were gathered by World Values Survey (Inglehart, R. et al., 2014). More specifically, the observed answers are from survey wave 6, which was initiated in 2010, and completed in 2014.

The data are chosen because they include separate measures for happiness and life satisfaction. Moreover, the data consist of answers from many different countries, and so enable a comparison of the relations between income and both happiness and life satisfaction in relatively wealthy and poor nations.

In the questionnaire, happiness is measured with a multiple-choice question with the options “Very happy”, “Rather happy”, “Not very happy”, and “Not at all happy”. Before answering the question, the interviewed person is asked to evaluate a comprehensive scheme of their life.

Instead of applying the original coding of the measure for happiness, in which “Very happy” has the lowest ordinal value of 1 and the other alternatives rise sequentially to “Not at all happy” with the highest ordinal value of 4, the codes are reversed so that “Very happy” is given the highest ordinal value of 4 and the other alternatives fall sequentially to “Not at all happy” with the lowest ordinal value of 1. Without this reversion of the coding the correlation between happiness and income group would, rather illogically, be negative.

In addition, the measure for happiness is converted to the natural logarithm of it. This conversion is made in order to improve the statistical significance of the results, and to make the interpretation of them more articulate; instead of describing change in categories the natural logarithm enables a description of change in percentages. More specifically, the interpretation of the estimated coefficient β is that a rise from one income group to a

higher one will produce an expected increase in the natural logarithm of the measure for happiness of β units. In terms of happiness, then, the expected value of happiness is multiplied by e^β (Benoit, K., 2011).

The measure for life satisfaction is, on the other hand, applied as it is, namely as a scale ranging from 1 to 10, where 1 stands for completely dissatisfied and 10, respectively, stands for completely satisfied. Before the placement on the scale, the interviewed person is, again, asked to judge his or her life as a whole.

Both the measure for happiness and the measure for life satisfaction are dependent variables in their respective models. The variable for happiness is named “Lnhappy” and the variable for life satisfaction is named “Satisfied”.

Income, i.e. the independent variable, is also measured with a scale ranging from 1 to 10, where 1 represents the lowest 10 the highest income group in the interviewed person’s home country. Consequently, the scale is presumed to represent high incomes in wealthy countries with e.g. relatively high wages, and, respectively, to represent low incomes in poor countries with e.g. relatively low wages.

Furthermore, the answer is requested as a household income in which every source of income is included. Once again, household income is not optimal for the examination of the relation between income and happiness because it does not represent an individual income. Therefore, the household income is divided by reported marital status so that people who report to be single, widowed, separated, or divorced count as a single person household, i.e. the household income divided by 1, whereas people who report to be either married or living together as married count as a household of 2 people. In order to make the reported income of the latter groups more representative of an individual income, then, their household income is divided by 2.

In order to factor in variations in life circumstances along with presumable differences in reference groups, i.e. other people to whom one compares one’s life, a set of control-variables are included.

The applied control-variables are: “Age”, “Woman”, “Children”, “Married”, “Separated”, and “Widow”.

The variable “Age” is the age of the interviewed person and it is measured in years.

The sex of the interviewed person is observed as a dummy-variable that is recoded from the original values (2 for female and 1 for male) as 1 for female and 0 for male and, hence, named “Woman”.

The variable “Children” is also a dummy-variable, and it is coded as 1 for people who report to have children, and 0 for people who report to have no children.

Marital status is controlled for with the dummy-variables “Married” (coded as 1 for people who report to be married or married and living together), “Separated” (coded as 1 for people who report to be separated or divorced), and “Widow” (coded as 1 for people who report to be widowed). The reference group, i.e. the group to which these dummy-variables are compared to, is people who report to be single. The effect of being single, then, is described when all the dummy-variables for marital status are 0.

Also, in the original data, missing or inapplicable answers are coded as negative values and so, in order to keep them from biasing the regressions, they have been recoded as “missing values”.

4.2 Problems with measuring happiness and life satisfaction

It can be difficult to answer how happy or satisfied with one’s life one is. Moreover, the judgement may be unreliable, i.e. not represent genuine emotion, because of various biases.

One of these potential biases is the mood bias. In his book “Thinking, Fast and Slow”, Daniel Kahneman explains that the mood bias means that an answer will be positively biased if the respondent is in a good mood, and, respectively, that an answer will be negatively biased if the respondent is in a bad mood (Kahneman, D., 2011).

In this case, then, the mood bias would cause respondents who are in a good mood to answer that they are happier and more satisfied with their life than they actually are, and vice versa.

Another bias is the expectation bias. In the article “Does economic growth improve the human lot? Some empirical evidence.”, Richard A. Easterlin points out that answers to questions regarding income and happiness may become biased by the expectations that rich people are happy, and that poor people are, in turn, miserable (Easterlin, R. A., 1974). Thus, rich people may answer that they are happier than they actually are because they are supposed to be happy and vice versa.

With regard to the reliability of the results presented in this study, then, potential biases of this kind necessitate the assumption that people have the ability to truthfully assess how happy and satisfied with their lives they are.

4.3 Observed data

To create generic correlations, which enable the observation of the hypothesized qualities of the relations at large, the entire dataset is utilised. The data comprise 60 countries (more specific descriptive statistics are presented in appendix B.).

To produce more detailed correlations, in order to study the differences in the relations amongst economically developed and undeveloped countries, a few wealthy and poor countries are observed.

The observed wealthy countries are Sweden, Australia, and Japan, and the observed poor countries are Zimbabwe, Nigeria, and Pakistan.

Although the countries are chosen mainly by economic prosperity, a deliberate geographic variation is factored in the choices so as to avoid potentially biased results produced by external factors that countries geographically close to each other may have in common.

The argued wealth and poverty of these countries is supported with their GDP/c for the respective year of observation (databank.worldbank.org).

Table 4.1 GDP/c of the wealthy and poor countries

Country	Year of observation	GDP/c
Sweden	2011	\$44,503.70
Australia	2012	\$42,826.80
Japan	2010	\$34,987.00
Zimbabwe	2012	\$2,534.50
Nigeria	2012	\$5,392.10
Pakistan	2012	\$4,228.50

Table 4.1 makes the sizeable differences in economic prosperity between the wealthy and poor countries clear, thus endorsing the asserted economic statuses.

5. Method

In this chapter, the method that is used for the creation of the econometric models, the econometric models themselves, and the method that is used for the interpretation of the results produced by the econometric models are presented.

5.1 Splines

Originally, splines are strips of wood used in construction (Wegman, E. J., & Wright, I. W., 1983). They are used specifically to create curves through given points by means of strategically placed weights.

In statistics, then, splines are defined as “piecewise polynomials of degree n whose function values and first $n - 1$ derivatives agree at the points where they join” (Smith, P. L., 1979, p. 57).

The advantage of dividing samples into pieces is that it enables the observation of changes in the correlation. Since the objective of this thesis is to observe how the effect of income on happiness and life satisfaction differs at different income levels, it is sensible to make use of a spline model.

5.2 Cubic splines

The spline model applied in this study is a so-called cubic spline. A cubic spline is, in accordance with the definition by Smith, a piecewise polynomial of degree 3 whose function values and first derivatives of degree 2 match at the intersections (also known as knots). The cubic spline model is used because it produces a curve that runs smoothly through the knots and presents the correlation in a more legible and continuous manner than, for example, a linear spline model.

The specific sort of cubic spline regression that is applied in this study is called a restricted cubic spline.

The particular advantage of the use of a restricted cubic spline is that it creates an explicit function that is linear before the first knot, a piecewise cubic polynomial between knots, and again linear after the last knot (Harrell, F. E., 2001).

5.3 The creation of restricted cubic splines

Restricted cubic splines can be described to be created in 3 steps (Marrie, R. A. et al., 2009).

First, the range of the independent variable X , in this case income group, is divided by n number of knots.

The chosen number of applied knots depends on how well the models depict the correlations with regard to continuity and statistical significance. Too few knots may, for example, produce a curve that describes the relation in more simple trends than they actually are. Too many knots may, on the other hand, produce a curve that includes statistically insignificant splines, which, in spite of making the description of the relation more specific, do not improve the description of the relation in any way.

Second, “for each of the k knots, create a new variable that is a third order polynomial in X above that knot, and zero below it” (Marrie, R. A. et al., 2009, p. 513).

Third, the splines and the original linear variable are fitted together so that their function values and first derivatives of degree 2 match at the knots. However, before the first knot and, respectively, after the last knot, the function is restricted to be linear.

The outcome of the completion of these steps is a total number of variables (without control variables) of $n - 1$ (the linear variable and $n - 2$ cubic variables).

5.4 The econometric models

With the generated spline variables, along with the control variables, the econometric models are created.

The econometric model for the computation of the relation between income and happiness is described as:

$$\begin{aligned} \mathbf{Lnhappy}_{it} = & \beta_0 + \beta_1 * \mathbf{Income}_{it} + \beta_2 * \mathbf{Spline1}_{it} + \beta_3 * \mathbf{Age}_{it} + \beta_4 * \mathbf{Woman}_{it} + \\ & \beta_5 * \mathbf{Children}_{it} + \beta_6 * \mathbf{Married}_{it} + \beta_7 * \mathbf{Separated}_{it} + \beta_8 * \mathbf{Widow}_{it} + \varepsilon_{it} \end{aligned}$$

The econometric model for the computation of the relation between income and life satisfaction is described as:

$$\mathbf{Satisfied}_{it} = \beta_0 + \beta_1 * \mathbf{Income}_{it} + \beta_2 * \mathbf{Spline1}_{it} + \beta_3 * \mathbf{Age}_{it} + \beta_4 * \mathbf{Woman}_{it} + \beta_5 * \mathbf{Children}_{it} + \beta_6 * \mathbf{Married}_{it} + \beta_7 * \mathbf{Separated}_{it} + \beta_8 * \mathbf{Widow}_{it} + \varepsilon_{it}$$

In the models, the letter “ ε ” stands for the error term, i.e. the disparity between expected values and actual values.

Furthermore, the spline term “*Income*” is equal to the original linear variable for income, i.e. income group, whereas the cubic spline term “*Spline1*” is a function of the original variable for income, the number of knots, and the spacing between knots (Orsini, N., & Greenland, S., 2011). The mathematics of the cubic spline term is presented in appendix A.

The number of knots applied in these models is 3, thus giving rise to 1 cubic spline term, and they are placed at the income groups with the ordinal values of 3, 5 and 7.

5.5 Plotting the results

The results from the restricted cubic spline regressions are the calculated coefficients for the respective variables in the models.

As such, however, the results are not particularly articulate with regard to a localisation of potential satiation points in the relations.

Therefore, estimations of the relations are plotted from the results by means of a so-called `xb1c`-command.

According to Orsini and Greenland, “`xb1c` computes point and interval estimates for predictions or differences in predictions of the response variable evaluated at different

values of a quantitative covariate modeled using one or more transformations of the original variable” (Orsini, N., & Greenland, S., 2011, p. 5).

With these estimations, then, the potential flattening of the relations can be visualised.

6. Results

In this chapter, the results of the econometric models are presented and interpreted. The results for every observed country together are presented first, followed by the results for the wealthy and poor countries.

6.1 Results for every observed country together

Table 6.1 shows the results of both econometric models for every observed country together.

Table 6.1 Results for every observed country together

VARIABLES	Lnhappy	Satisfied
Income	0.00569*** (0.000459)	0.462*** (0.00733)
Spline1	0.00362*** (0.000704)	-0.180*** (0.0112)
Age	-0.000592*** (3.54e-05)	0.00190*** (0.000566)
Woman	0.00263*** (0.000966)	0.0926*** (0.0154)
Children	0.00711*** (0.00157)	0.0483* (0.0250)
Married	0.0243*** (0.00181)	0.991*** (0.0290)
Separated	-0.0188*** (0.00252)	-0.316*** (0.0402)
Widow	-0.000520 (0.00270)	-0.446*** (0.0430)
Constant	1.186*** (0.00232)	4.651*** (0.0370)
Observations	83,862	84,088
R ² (adj.)	0.015	0.074

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Apart from the estimated coefficient for the dummy-variable “Widow” in the model with happiness as the dependent variable, the coefficients are statistically significant, in this case meaning that they have p-values of less than 0.1.

In fact, apart from the estimated coefficient for the dummy-variable “Children” in the model with life satisfaction as the dependent variable, the coefficients have p-values of less than 0.01.

For the variables with these coefficients, then, there is considerable statistical support for the rejection of their respective null hypotheses, i.e. that there are no relations between them and happiness or life satisfaction (Goodman, S., 2008).

Both coefficients for the dummy-variable “Children” are, nonetheless, statistically significant and positive, indicating that having children improves both happiness and life satisfaction. A potential explanation to this is that people have biological predispositions, i.e. evolved preferences, for children (Morgan, S. P., & King, R. B., 2001).

Furthermore, the interpretation of the coefficients for the model with happiness as the dependent variable is, as described by Benoit (2011), that the expected value of happiness is multiplied by e^β .

For example, the estimated effect of being married is a factor of $e^{0.0243}$, which amounts to approximately 1.0246. In other words, being married is estimated to increase the level of happiness with approximately 2.46 percent compared to being single.

In fact, Benoit (2011) explains that in a model where the dependent variable is given as its natural logarithm, the percentual effect of coefficients near zero may be roughly interpreted as the coefficient multiplied with 100.

Thus, the results for the model with happiness as the dependent variable may be read as approximate effects in percentages. For example, being separated has the estimated coefficient of -0.0188, offering an approximated effect of -1.88 percent in the level of happiness. Compared to the calculated effect, i.e. $e^{-0.0188}$, which amounts to a factor of 0.981..., corresponding to a percentual change of -1.862..., the approximation, and so the method for interpretation, may be deemed as fairly accurate.

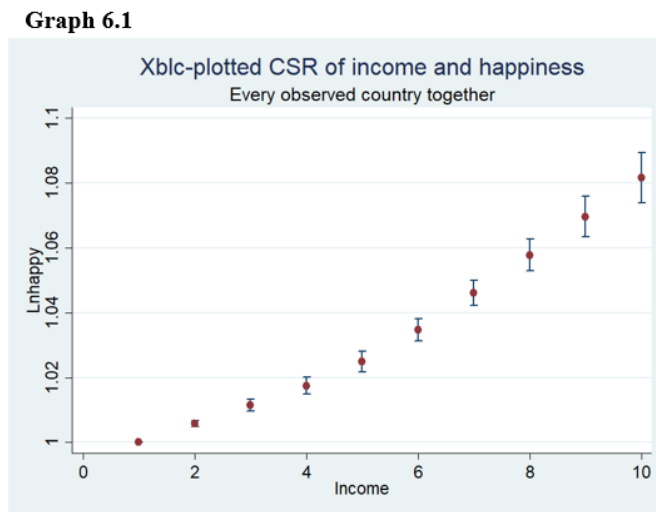
The interpretation of the coefficients for the model with life satisfaction as the dependent variable, in turn, is that the coefficients are added as they are to the expected value of life satisfaction.

For example, the expected value of life satisfaction for a widow is -0.446 lower than that of a single person (on the scale from 1 to 10).

Unlike the coefficients of the control-variables, the coefficients of income cannot be interpreted as direct effects. Instead, the effects of income are derived from the plotted estimations of their cubic spline regressions (abbreviated as “CSR” in the graphs).

In the graphs, the estimated values for the dependent variables are depicted as dots which correspond to their respective income group. The vertical lines running through these dots represent confidence intervals with confidence levels of 95 percent, meaning that the probability of the true value of the dependent variables being included in the intervals is 95 percent (Dekking, F. M., et al., 2005).

Graph 6.1 shows the plotted result for happiness in every observed country together.



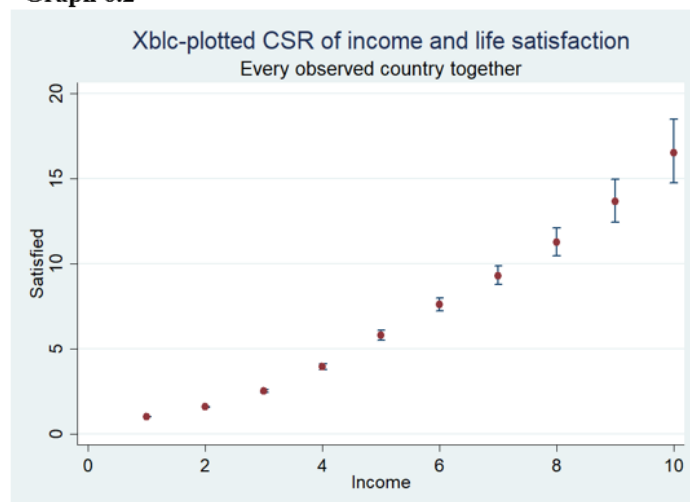
The interpretation of the graph, and the other graphs with happiness as the dependent variable, is that the development of the relation between happiness and the income groups is percentual.

Thus, the y-axis is a scale from 1 to 1.1, where 1 stands for the lowest income group and a point of reference, whereas 1.1 stands for a happiness level that is 10 percent higher than that point.

The pattern in graph 6.1, then, may be viewed as a fairly linear percentual change reaching a happiness level that is approximately 8 percent higher at the highest income group than it is at the lowest income group.

Graph 6.2 shows the plotted result for life satisfaction in every observed country together.

Graph 6.2



Unlike the graphs with happiness as the dependent variable, the graphs with life satisfaction as the dependent variable are not interpreted as patterns which depict percentual changes. Instead, the y-axis stands for life satisfaction as it is originally measured, i.e. a scale from 1 to 10.

Looking at graph 6.2, then, the estimations for the 3 highest income groups may not be deemed as very accurate, because they exceed the interval of measurement.

Even so, the pattern as a whole may be viewed as strictly positive, i.e. lacking signs of flattening.

In addition to the plots, the interpretation of the results is furthered with an assessment of the adjusted coefficients of determination, or adjusted R^2 . The coefficient of determination

describes the percentage of variation in the dependent variable that can be predicted from the variation in the independent variables, and the adjusted coefficient of determination factors in the number of independent variables, so as to account for the tendency of the coefficient of determination to increase merely because of added independent variables (Theil, H., 1961).

Thus, the results indicate that 1.5 percent of the variation in the measure of happiness can be predicted from the variation in the independent variables with the number of variables factored in, whereas the corresponding percentage for the measure of life satisfaction is 7.4.

6.2 Results for the wealthy countries

Table 6.2 shows the results for happiness in Sweden, Australia, and Japan.

Table 6.2 Results for happiness in the wealthy countries

VARIABLES	Sweden Lnhappy	Australia Lnhappy	Japan Lnhappy
Income	0.0124** (0.00485)	0.0116*** (0.00366)	0.00444* (0.00249)
Spline1	-0.0112 (0.00703)	-0.00346 (0.00652)	-0.000234 (0.00443)
Age	-0.000605** (0.000280)	0.000139 (0.000277)	-0.000666*** (0.000238)
Woman	0.0226*** (0.00843)	0.0204*** (0.00749)	0.0124** (0.00628)
Children	0.0176 (0.0119)	0.00278 (0.0115)	0.00806 (0.0119)
Married	0.0595*** (0.0140)	0.0388*** (0.0146)	0.0607*** (0.0146)
Separated	0.0172 (0.0159)	-0.0244 (0.0181)	0.00539 (0.0181)
Widow	0.00248 (0.0238)	-0.000734 (0.0211)	0.0152 (0.0210)
Constant	1.148*** (0.0220)	1.123*** (0.0211)	1.162*** (0.0148)
Observations	1,138	1,405	1,885
R ² (adj.)	0.034	0.021	0.032

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

Among the control-variables, statistical significance is rather scarce. Indeed, the coefficients of the control-variables “Children” “Separated”, and “Widow” lack statistical significance altogether.

The remaining control-variables with statistical support for the rejection of their respective null-hypothesis are “Age”, “Woman”, and “Married”, with the exception of “Age” for Australia.

For Sweden and Japan, age is expected to have a negative effect on happiness; people are expected to grow unhappier with time. A potential reason for this is the decline in vitality that comes with time (Veenhoven, R., 2013).

Being married, in turn, is expected to have a positive effect on happiness. In fact, the expected increase in happiness is approximately 6 percent compared to being single in both Sweden and Japan. This may, to some extent, be attributed to the social support, e.g. reassurance of one’s value as an individual, that a spouse can provide (Cobb, S., 1976). Conversely, the lack of this support may explain unhappiness among single, separated, and widowed people.

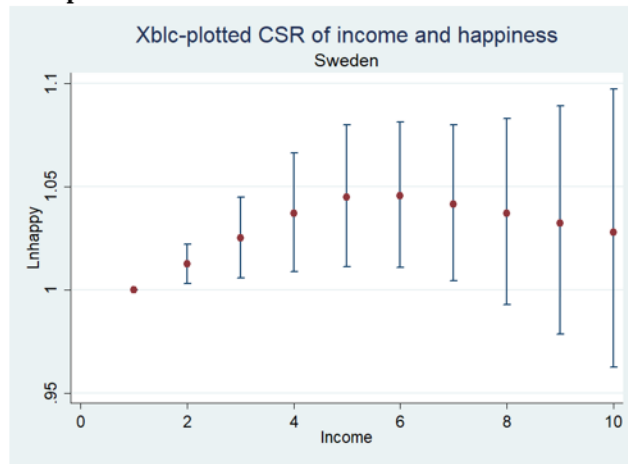
Moreover, being a woman is expected to have a positive effect on happiness. In Sweden and Australia, the expected increase in happiness is approximately 2 percent compared to men, whereas the corresponding percentage in Japan is approximately 1. A suggested explanation to this is that “women are more “optimistic” than men and tend to value in a more positive way the objective characteristics of their lives” (Arrosa, M. L., & Gandelman, N., 2016, p. 2).

Furthermore, the coefficients of the most relevant variable “Income” are statistically significant, and a rise from an income group to a higher one is expected to have a positive effect on happiness. However, the lack of statistical significance among the cubic terms makes the expected non-linear developments of the relations between income and happiness uncertain.

Even so, the plotted results are presented, as the patterns of the relations cannot be derived from the table.

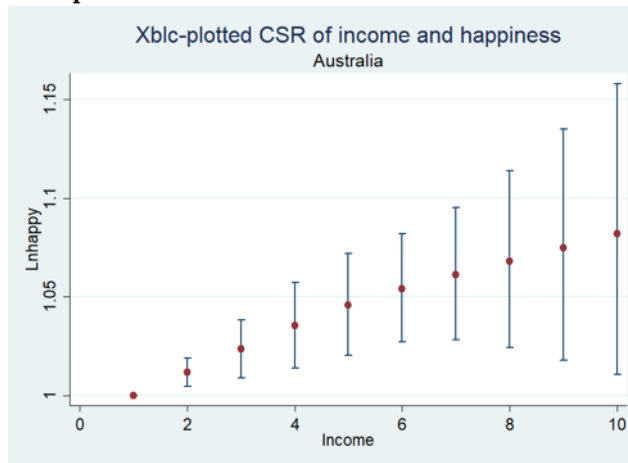
Graph 6.3 shows the plotted result for Sweden.

Graph 6.3



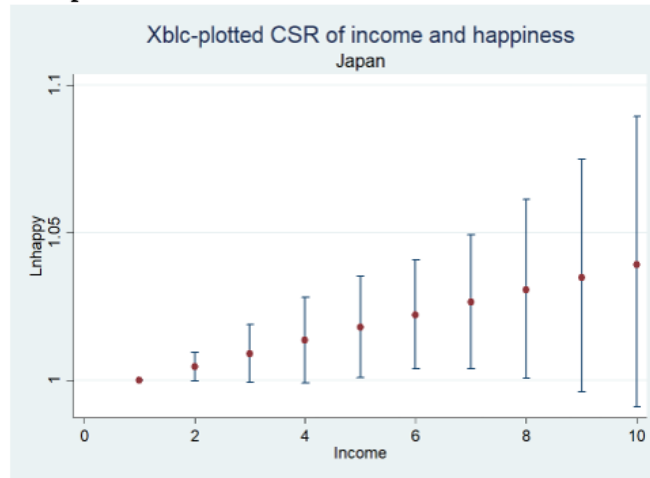
Graph 6.4 shows the plotted result for Australia.

Graph 6.4



Graph 6.5 shows the plotted result for Japan.

Graph 6.5



The estimated patterns for Japan and Australia indicate a strictly positive relation, whereas the estimated pattern for Sweden indicates a decline in the positive relation.

However, due to the statistical insignificance of the coefficients with which the patterns are created, these indications are unreliable. The uncertainty is also illustrated by the lengthy confidence intervals.

Thus, the outcome from which conclusions about the strength of the relation between income and happiness are drawn is shifted to the adjusted coefficients of determination.

The adjusted coefficient of determination for Sweden suggests that 3.4 percent of the variation in the measure for happiness can be predicted from the variation in the independent variables. For Australia and Japan, the respective percentages are 2.1 and 3.2.

Table 6.3 shows the results for life satisfaction in Sweden, Australia, and Japan.

Table 6.3 Results for life satisfaction in the wealthy countries

VARIABLES	Sweden Satisfied	Australia Satisfied	Japan Satisfied
Income	0.366*** (0.0554)	0.439*** (0.0496)	0.278*** (0.0343)
Spline1	-0.256*** (0.0803)	-0.262*** (0.0882)	-0.159*** (0.0611)
Age	0.0103*** (0.00320)	0.0168*** (0.00374)	0.00674** (0.00327)
Woman	0.0519 (0.0964)	0.349*** (0.101)	0.371*** (0.0863)
Children	-0.162 (0.136)	-0.117 (0.156)	-0.264 (0.165)
Married	1.187*** (0.160)	1.428*** (0.198)	1.291*** (0.201)
Separated	0.216 (0.183)	-0.119 (0.244)	-0.374 (0.250)
Widow	0.0553 (0.271)	0.268 (0.285)	0.561* (0.287)
Constant	5.246*** (0.251)	4.097*** (0.286)	4.996*** (0.201)
Observations	1,137	1,403	1,894
R ² (adj.)	0.093	0.113	0.102

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

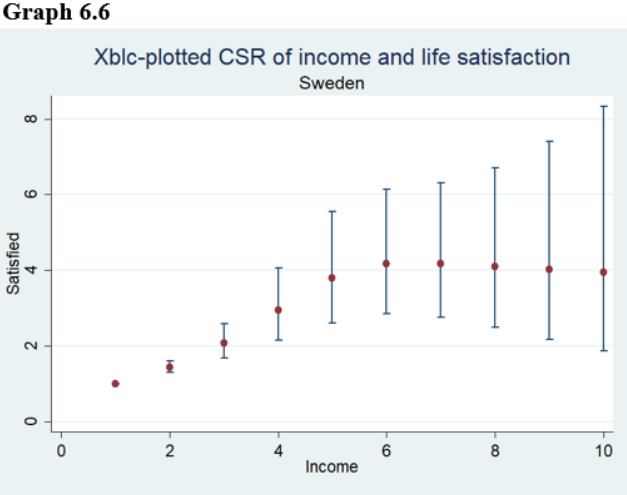
Again, the control-variables with the most statistically significant coefficients are “Age”, “Woman”, and “Married”.

However, unlike the estimated effect of age for happiness, the estimated effect of age for life satisfaction is positive. This may, to some extent, be explained by the tendency of personal wealth to be accumulated with time, and, hence, to seldom be abundant at early stages of life.

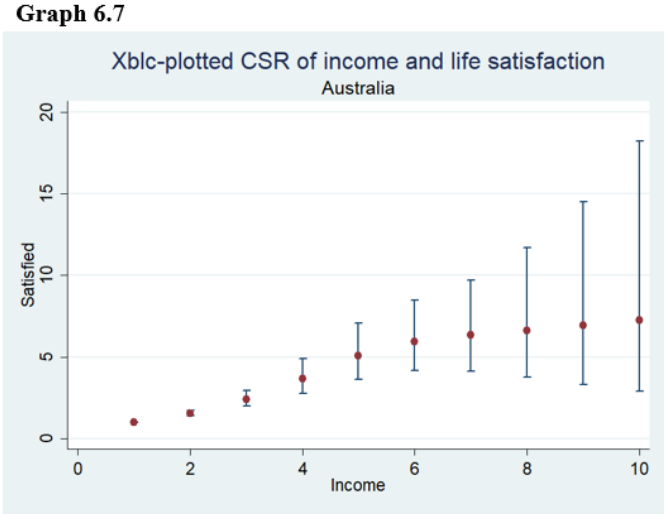
Regarding the other control-variables, the reoccurring statistical insignificance of their respective coefficients does not necessarily mean that they have no relation to happiness and life satisfaction. In fact, that would be controversial with the results for every observed country together. Instead, the lack of statistical significance may be caused by a poor representation of separated and widowed people in the samples (see appendix B.).

Nevertheless, both the most relevant variable “Income” and the cubic term “Spline1” show statistically significant coefficients for each country. Thus, unlike the previous plots, the plotted results gain credibility.

Graph 6.6 shows the plotted result for Sweden.

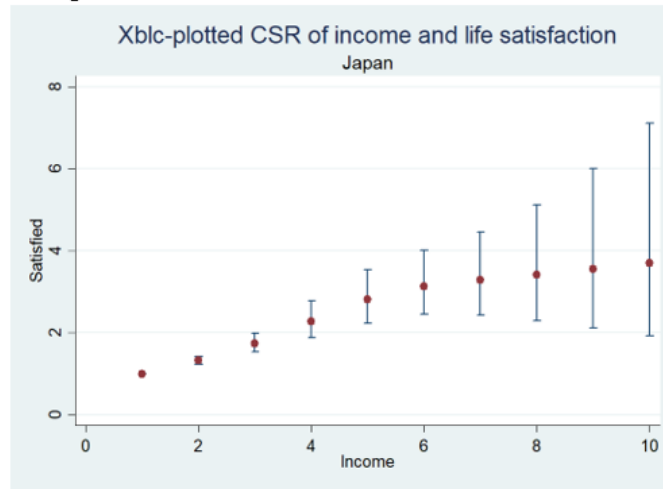


Graph 6.7 shows the plotted results for Australia.



Graph 6.8 shows the plotted result for Japan.

Graph 6.8



The patterns illustrate a diminishing of the positive effect of income around the 6th income group. In fact, there is no considerable increase in the estimated life satisfaction after this point. For example, the pattern for Sweden stays at an approximate life satisfaction value of 4 after the 6th income group, whereas the corresponding estimation for Japan is between the values 3 and 4.

However, the main interest does not lie in the values of life satisfaction at which income is predicted to lose its effect, but in the fact that income is predicted to lose its effect.

The adjusted coefficients of determination, described as percentages, are 9.3 for Sweden, 11.3 for Australia, and 10.2 for Japan.

6.3 Results for the poor countries

Table 6.4 shows the results for happiness in Zimbabwe, Nigeria, and Pakistan.

Table 6.4 Results for happiness in the poor countries

VARIABLES	Zimbabwe Lnhappy	Nigeria Lnhappy	Pakistan Lnhappy
Income	0.0143*** (0.00396)	0.0153*** (0.00357)	0.0154*** (0.00426)
Spline1	-0.00309 (0.00558)	-0.00767* (0.00426)	-0.00145 (0.00552)
Age	-0.000489 (0.000344)	9.27e-05 (0.000359)	0.000619 (0.000435)
Woman	-0.00234 (0.00767)	0.00254 (0.00696)	0.00195 (0.00838)
Children	-0.0122 (0.0137)	0.0226* (0.0122)	0.000678 (0.0209)
Married	0.0262* (0.0153)	0.00422 (0.0146)	-0.00677 (0.0237)
Separated	-0.0156 (0.0188)	0.0530 (0.0404)	0.0330 (0.0572)
Widow	-0.0259 (0.0205)	0.000467 (0.0276)	-0.0560 (0.0430)
Constant	1.194*** (0.0196)	1.198*** (0.0181)	1.172*** (0.0230)
Observations	1,500	1,759	1,198
R ² (adj.)	0.031	0.015	0.032

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

Among the control-variables, statistical significance is almost nowhere to be found, indicating that age, sex, and marital status are irrelevant for experienced happiness. Again, this is controversial to the results for each observed country together, and a more complex measure for happiness would presumably fix the statistical shortcoming.

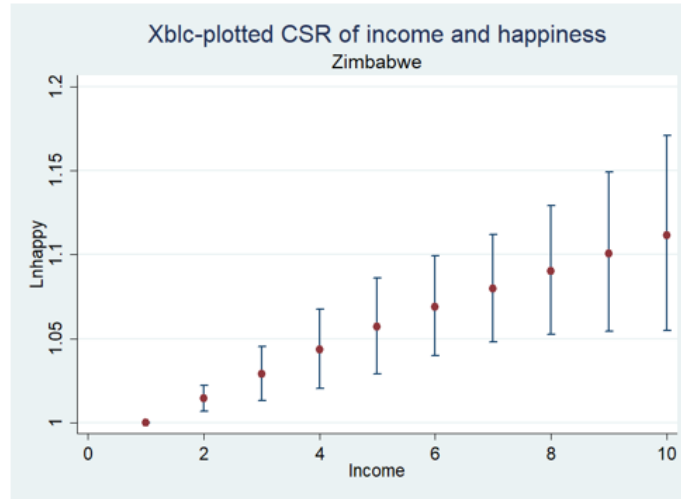
Nevertheless, income does not seem to be irrelevant to experienced happiness, as the variable “Income” shows coefficients with p-values that denote statistical significance. The rise from one income group to a higher one is expected to increase happiness with approximately 1.5 percent in Nigeria and Pakistan, and approximately 1.4 percent in Zimbabwe.

However, the cubic terms are, once again, too uncertain for credible conclusions.

Still, the plotted results are presented, as the table does not convey the development of the relation between income and the measure for happiness.

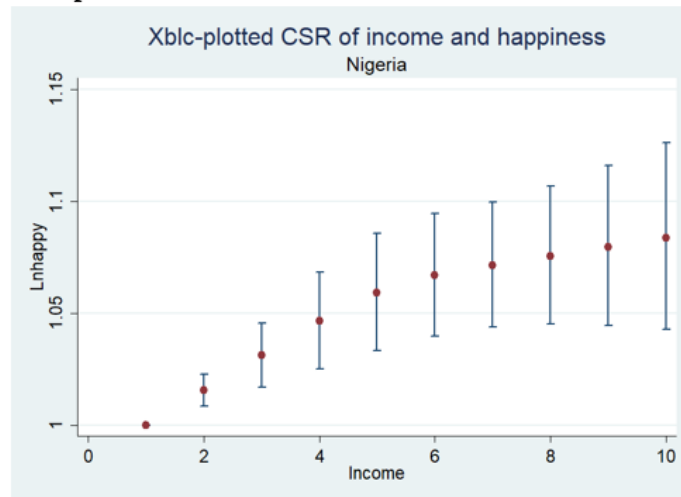
Graph 6.9 shows the plotted result for Zimbabwe.

Graph 6.9



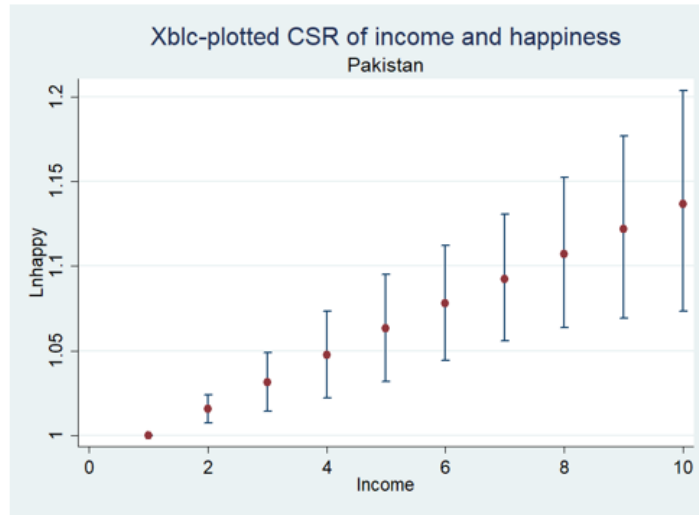
Graph 6.10 shows the plotted result for Nigeria.

Graph 6.10



Graph 6.11 shows the plotted result for Pakistan.

Graph 6.11



The plots show strictly positive patterns for Zimbabwe and Pakistan, whereas a slight decrease in the positive pattern appears in the plot for Nigeria. The estimated increase in happiness at the highest income groups are about 10 percent for Zimbabwe, and almost 15 percent for Pakistan, but less than 10 percent for Nigeria. Moreover, the estimated value of happiness at the highest income group does not differ substantially from the 6th income group in the plotted result for Nigeria. However, these observations are too uncertain to draw conclusions from.

Thus, the comparison of the strengths of the relations between income and happiness, and income and life satisfaction is focused to the adjusted coefficients of determination.

The adjusted coefficients of determination, described as percentages, are 3.1 for Zimbabwe, 1.5 for Nigeria, and 3.2 for Pakistan.

Table 6.5 shows the results for life satisfaction in Zimbabwe, Nigeria, and Pakistan.

Table 6.5 Results for life satisfaction in the poor countries

VARIABLES	Zimbabwe Satisfied	Nigeria Satisfied	Pakistan Satisfied
Income	0.772*** (0.0577)	0.631*** (0.0552)	0.537*** (0.0596)
Spline1	-0.410*** (0.0813)	-0.251*** (0.0660)	-0.236*** (0.0774)
Age	-0.00635 (0.00502)	0.00656 (0.00555)	-0.00522 (0.00609)
Woman	0.267** (0.112)	0.164 (0.108)	-0.512*** (0.117)
Children	-0.416** (0.199)	-0.136 (0.189)	0.261 (0.292)
Married	1.604*** (0.223)	0.865*** (0.226)	0.274 (0.331)
Separated	-0.0763 (0.275)	0.204 (0.625)	-0.222 (0.802)
Widow	0.136 (0.299)	-0.586 (0.427)	-0.837 (0.602)
Constant	3.004*** (0.286)	3.349*** (0.280)	5.770*** (0.322)
Observations	1,500	1,759	1,200
R ² (adj.)	0.160	0.133	0.112

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

Unlike the results for life satisfaction in the wealthy countries, the effect of age lacks statistical significance. This may partly be explained by a meagre development in personal assets over time compared to wealthy countries.

Among the other control-variables, statistical significance is rather scattered.

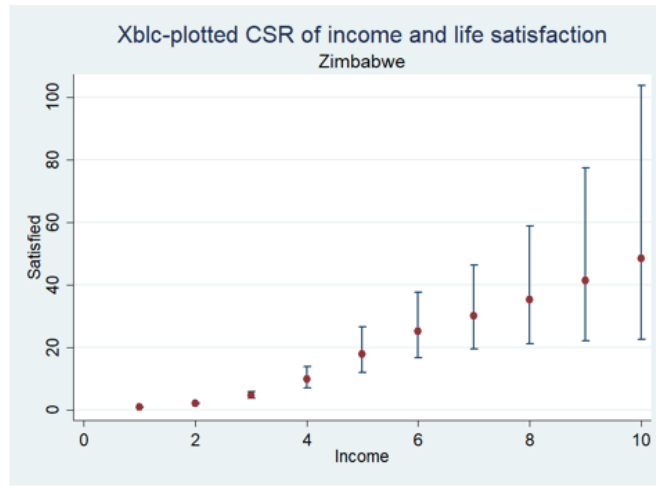
For example, the variable “Married” continues its role as a significant positive element for life satisfaction, but Pakistan makes for an exception from that significance.

Likewise, the sex of a person appears to be irrelevant for life satisfaction in Nigeria, but not in Zimbabwe and Pakistan. However, the effect of being a woman is positive for Zimbabwe, but negative for Pakistan. The negative result for Pakistan is conceivable because of dehumanizing attitudes, e.g. the acceptance of violence, that Pakistani women face (Niaz, U., 2004).

The variable “Income” and the cubic term “Spline1” have statistically significant coefficients, and so they may be used for the creation of credible plots.

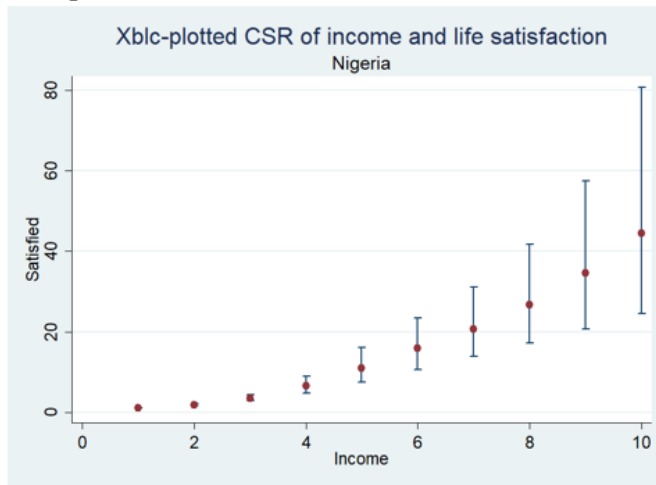
Graph 6.12 shows the plotted result for Zimbabwe.

Graph 6.12



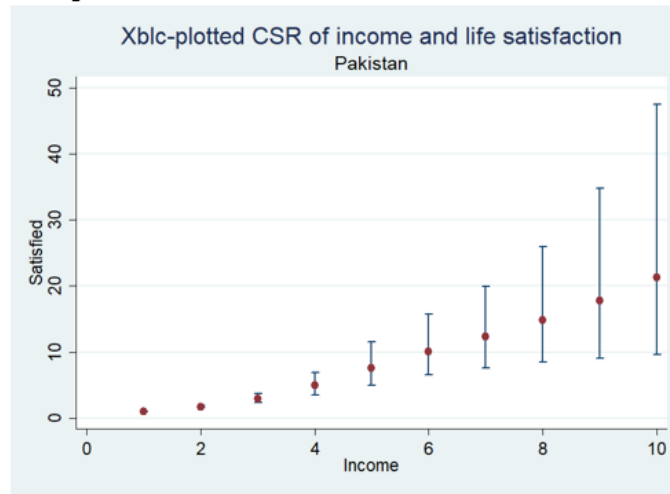
Graph 6.13 shows the plotted result for Nigeria.

Graph 6.13



Graph 3.14 shows the plotted result for Pakistan

Graph 6.14



Like the plotted result of life satisfaction for every observed country together, the estimated values exceed the original interval on which life satisfaction is measured, i.e. the scale from 1 to 10. With regard to accuracy, this is unsatisfactory.

Thus, rather than focusing on what the plotted patterns do show, focus is put on what the plotted patterns do not show: none of the patterns show signs of flattening that would indicate a diminishing of the positive effect of income in the way that the patterns for the wealthy countries do.

The adjusted coefficients of determination, described as percentages, are 16.0 for Zimbabwe, 13.3 for Nigeria, and 11.2 for Pakistan.

7. Conclusions

In this chapter, the conclusions about the hypotheses and theories are presented along with the implications they carry with regard to the suggested purposes of the research.

7.1 Conclusions about the hypotheses

Hypothesis 1: there are positive relations between income and both happiness and life satisfaction.

All results, i.e. the results for every observed country together and the results for the observed wealthy and poor countries, show statistically significant positive correlations between income and both happiness and life satisfaction.

This is convincing empirical evidence for hypothesis 1, and there is no disagreement with preceding studies.

Hypothesis 2: the relation between income and happiness is weaker than the relation between income and life satisfaction.

Instead of the plotted results of every observed country together, which do not show signs of flattening, or the results for the observed wealthy and poor countries, which cubic terms for the models with happiness as the dependent variable lack statistical significance, the empirical evidence for hypothesis 2 is derived from the adjusted coefficients of determination. Although the method of comparison is different from preceding studies, namely Kahneman and Deaton (2010) and Jebb et al. (2018), the conclusion is the same.

All results show considerably lower adjusted coefficients of determination for the models with happiness as the dependent variable than the models with life satisfaction as the dependent variable. This means that the variation in income and the control-variables can explain the variation in life satisfaction to a greater extent than the variation in happiness, and that income is, in this aspect, more strongly related to life satisfaction than happiness.

Of course, the measure for happiness is simpler than that of life satisfaction; it is more difficult to predict variation with variation when there is less of it.

Still, the statistical significance of the relations between income and the measure for happiness renders the adjusted coefficients of determination relevant.

Hypothesis 3: the positive relations between income and both happiness and life satisfaction cease after certain limits.

Regarding happiness, it cannot be maintained that income has a limited positive effect on it. This is because the coefficients for the cubic terms lack statistical significance in the results for the observed wealthy and poor countries, and because the plotted result for every observed country together does not show a flattening pattern.

Life satisfaction, however, can partly be argued to have a limited relation with income. The assertion is partial because only the plotted results for the observed wealthy countries show flattening patterns.

This differs from the results presented by Kahneman and Deaton (2010) in that the effects of income on life satisfaction are estimated to satiate.

Hypothesis 4: in wealthy countries, the limits after which a higher income no longer contributes to experienced happiness and life satisfaction occur at higher income levels than the limits in poor countries.

As no results indicate credible limits for the effect of income on happiness, hypothesis 4 can only be considered with regard to life satisfaction.

The plotted results for the observed wealthy countries do suggest limits after which a higher income no longer contributes to experienced life satisfaction.

The plotted results for the observed poor countries, in turn, do not show signs of such limits.

The implication of these results, then, is that the income levels in the poor countries are not high enough to give rise to a satiation of experienced life satisfaction, whereas the income levels in wealthy countries are able to do so.

This differs from the results presented by Jebb et al. (2018) in that satiation points are only found in wealthy countries.

7.2 Conclusions about the theories

The positive effects of income on both happiness and life satisfaction do not only support hypothesis 1, but also the theories that advocate it.

The supported theories, then, are the microeconomic axiom of non-satiation, and Thorstein Veblen's (1899) theory of happiness through a higher status gained from a higher income.

The microeconomic axiom of non-satiation is, however, only supported for the part that a higher consumption makes people more content, and the suggested endlessness of this relation is not supported.

The sizeable difference in the adjusted coefficients of determination between the results for happiness and the results for life satisfaction, in turn, provide further support for Daniel Kahneman's and Angus Deaton's (2010) explanation of a stronger relation between income and life satisfaction than income and happiness. The supported explanation, then, is that income is more relevant for the reasoned assessment of life than it is for the assessment of happiness, which is more susceptible to emotion.

Furthermore, the diminishing of the positive relations between income and life satisfaction in the wealthy countries provide reason to believe in theories of a limited effect of income on life satisfaction. Thus, the endless aspect of the theory of contentment through a higher consumption is not only unsupported but argued against. The supported theory, in turn, is the decreasing relevance of income described with Maslow's (1943) hierarchy of needs; income is more valuable for the prepotent needs of food and safety than it is for esteem, love, and self-actualization.

The lack of flattening patterns among the poor countries does not, however, mean that Maslow's hierarchy of needs is an irrelevant concept in poor countries. Instead, it may reflect that, compared to wealthy countries, the lower needs, i.e. physiological and safety needs, are more prominent in poor countries in the sense that the highest incomes are still largely used to pay for food and accommodation.

Furthermore, the lack of flattening patterns among the poor countries means that the theories of relative income being the decisive element for the assessment of life satisfaction are not supported. For Richard Easterlin's (1974) theory of an assessment of the adequacy of income through comparison to other countrymen, or the "hedonic treadmill" to be supported, the patterns of life satisfaction over the range of income groups should be flattening in the same manner as the corresponding patterns in the wealthy countries in spite of the lower incomes that the income groups of the poor countries are presumed to represent.

Instead of these theories, which are argued for by Jebb et al. (2018), the results support Ruut Veenhoven's (1991) theory of the positive effect of income on life satisfaction growing smaller as income grows higher.

The relation between income and life satisfaction corresponding to this support, then, may be described as positively diminishing: the higher the income, the lower the positive effect on life satisfaction.

7.3 Conclusions about the purposes of the research

The purposes of the research regard the limitedness of the positive effect of income on happiness and life satisfaction. Thus, conclusions can only be made with regard to life satisfaction.

The suggested purposes are governmental, work-related, and individual.

From a governmental perspective, a redistribution of income from the rich to the poor may be argued to improve the overall level of life satisfaction among citizens. According to John Rawls (1971), a redistribution of this kind would lessen the inequality of opportunities that e.g. inborn talents and family wealth give rise to.

From a work-related perspective, a higher compensation may be argued to become inefficient for the improvement of life satisfaction, and so lose its value as motivation. The superior sources of satisfaction, as advocated by Frederick Herzberg (1959), include e.g. recognition, advancement, and responsibility.

From an individual perspective, the striving for an ever-higher income may be argued to be in vain with regard to an expected mutual return in life satisfaction. Instead of moneymaking, then, Aristotle argues that the good life is achieved with moral virtues such as courage, justice, and temperance (Brown, L., 2009).

The relevance of these perspectives, however, is evidently tied to high incomes, and, consequently, to wealthy countries.

In poor countries with low incomes, in turn, these perspectives are not so much relevant concerns, as they are economic problems to strive towards.

Summary in Swedish

Det första syftet med min avhandling är att undersöka inom vilka gränser ökade inkomster ökar känslan av lycka och välbefinnande, och var gränsen är uppnådd så att bättre ekonomi inte längre gör människan mer belåten med livet.

Det andra syftet är att jämföra dessa ramar i rika och fattiga länder.

Relevansen av att undersöka inkomstens effekt på lycka och belåtenhet med livet är bland annat att hjälpa människor som strävar efter ett lyckligt liv att förstå att rikedomar inte garanterar lycka, och att ett strävande efter en hög inkomst kan vara en värdelös väg som inte leder till ett liv av belåtenhet.

Det är inte frågan om någon alldeles ny undersökning, utan tidigare studier har behandlat ämnet.

Andrew T. Jebb med flera undersöker till exempel mättnadspunkter för sambanden mellan inkomst och både lycka och emotionellt välmående i olika regioner, och finner att båda sambanden är begränsade, men att sambanden slutar stiga vid högre inkomster i relativt rika regioner (Jebb, A., T., 2018).

För att utveckla slutsatser som dragits i tidigare studier skapar jag en mer detaljerad jämförelse av sambanden genom att jämföra länder i stället för regioner.

Min undersökning är empirisk, och går ut på att söka statistiskt stöd för fyra hypoteser.

Hypotes 1: det finns positiva samband mellan inkomst och både lycka och belåtenhet med livet.

Hypotes 1 får teoretiskt stöd bland annat av det mikroekonomiska axiomat om icke-satiation som hävdar att en varukorg x' kommer att prefereras över x'' om x' innehåller mer av åtminstone en vara och inte mindre av någon annan, det vill säga om $x' \succ x''$ (Gravelle, H., & Rees, R., 2004, s. 13).

Hypotes 2: sambandet mellan inkomst och lycka är svagare än sambandet mellan inkomst och belåtenhet med livet.

Jag hittar både empiriskt och teoretiskt stöd för hypotes 2 hos Daniel Kahneman och Angus Deaton som undersöker sambanden i USA, och finner att den positiva effekten av en högre inkomst slutar öka fortare, det vill säga vid lägre inkomster, för emotionellt välmående, inklusive lycka, än för belåtenhet med livet (Kahneman, D., Deaton, A., 2010). Som en förklaring på detta föreslår Kahneman och Deaton att i och med att inkomst är starkare kopplat till ett rationellt bedömande än lycka, som i en större utsträckning beror på upplevda känslor, har inkomst också en större inverkan på bedömningen av livet än upplevd lycka.

Hypotes 3: de positiva sambanden mellan inkomst och både lycka och belåtenhet med livet upphör efter vissa gränser.

Begränsningen av den positiva effekten av en högre inkomst kan delvis förklaras med hjälp av Abraham H. Maslows behovshierarki (Maslow, A. H., 1943). Förklaringen går ut på att en större inkomst inverkar positivt på både lycka och belåtenhet med livet, men att den har en avgörande roll endast för de två mest primära behoven i Maslows behovshierarki, det vill säga trygghet och fysiologiska behov.

Hypotes 4: i rika länder uppnås gränserna efter vilka en högre inkomst inte längre bidrar till lycka och belåtenhet med livet vid högre inkomstnivåer än i fattiga länder.

En teori bakom hypotes 4 är Richard A. Easterlins teori om relativ inkomst (Easterlin, R. A., 1974). Teorin går ut på att människor bedömer hur belåtna de är genom att jämföra sig med sina landsmän. I och med att en högre levnadsstandard ger upphov till en rikare referensgrupp krävs det mer pengar för att uppleva belåtenhet.

I min undersökning tillämpar jag data från World Values Survey, och mer specifikt används våg 6 som är skapad mellan år 2010 och 2014 (Inglehart, R., 2014).

Först studerar jag hela datamaterialet, och sedan separerat några rika och fattiga länder.

Som beroende variabler används ett mått för lycka (med en skala från 1 till 4) och ett mått för belåtenhet med livet (med en skala från 1 till 10).

Den oberoende variabeln har formen av 10 inkomstgrupper som representerar inkomstgrupper i den intervjuade personens hemland.

Som kontrollvariabler används ålder, kön, och olika civilstånd som jämförs med att vara singel.

Jag använder en så kallad spline-funktion (cubic spline regression). Jag använder metoden eftersom den möjliggör en fördelning av regressionerna vid olika ordinala värden på den oberoende variabeln, det vill säga inkomstgrupperna. Utvecklingen av lycka och belåtenhet med livet i olika inkomstgrupper kan således observeras. Observationen sker genom estimerade mönster som skapas med hjälp av ett så kallat xblc-kommando. Mönstren visar alltså ett platt samband om den positiva effekten av en högre inkomst upphör.

Resultaten för modellerna med belåtenhet med livet som beroende variabel blir statistiskt signifikanta med avseende på inkomstvariablerna, och de estimerade mönstren kan användas. Resultaten för de kubiska termerna i modellerna med lycka som beroende variabel saknar däremot statistisk signifikans, och mönstren saknar därmed trovärdighet.

Hypotes 1 får ändå empiriskt stöd genom att samtliga resultat visar statistiskt signifikanta positiva samband mellan inkomst och både lycka och belåtenhet med livet.

Hypotes 2 får i sin tur empiriskt stöd genom att resultaten för modellerna med lycka som beroende variabel visar betydligt mindre förklaringsgrader än vad som är fallet med resultaten för modellerna med belåtenhet med livet som beroende variabel.

Hypotes 3 får endast empiriskt stöd gällande sambandet mellan inkomst och belåtenhet med livet. Stödet utgörs av resultaten för de observerade rika länderna, som visar estimerade mönster där det positiva sambandet slutar öka och blir platt.

Hypotes 4 får liksom hypotes 3 endast stöd gällande sambandet mellan inkomst och belåtenhet med livet. Stödet utgörs av att resultaten för de observerade rika länderna visar estimerade mönster där det positiva sambandet slutar öka, medan de estimerade mönstren för de observerade fattiga länderna inte visar tecken att det positiva sambandet upphör.

Gällande inkomst och lycka kan jag av min undersökning dra slutsatsen att det finns ett positivt samband mellan dessa.

Till slutsatserna gällande relationen mellan inkomst och belåtenhet med livet hör också att sambandet är positivt, men därtill att det är starkare än sambandet mellan lycka och inkomst i den bemärkelsen att inkomst kan förklara en större andel av variationen i variabeln för belåtenhet med livet än variationen i variabeln för lycka.

I och med att den positiva effekten först avtar vid absolut sett höga inkomster, det vill säga sett till inkomster i rika länder, medan de låga inkomsterna i de fattiga länderna inte ger upphov till en mättnad när det gäller belåtenhet med livet, tyder inte heller resultaten på att den relativa inkomsten skulle spela någon avgörande roll, utan på en positivt avtagande effekt där den absoluta storleken på inkomsten är avgörande.

Till skillnad från tidigare studier argumenterar jag alltså för att det inte finns några mättnadspunkter för sambandet mellan inkomst och belåtenhet med livet i fattiga länder, och för att det positivt avtagande sambandet mellan inkomst och belåtenhet med livet kan förklaras med teori om mänskliga behov.

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Appendix

Appendix A. A general restricted cubic spline model

A general restricted cubic spline model may be written as:

$$g(X) = b_0 + b_1X_1 + b_2X_2 + \dots + b_{n-1}X_{n-1}$$

In the model, X_i is equivalent to the original variable X , whereas the subsequent spline terms are functions of the original variable X , the number of knots, and the spacing between the knots.

The functions may be defined as:

$$u_i = \max(X - k_i, 0)^3 \text{ with } i = 1, \dots, n$$

$$X_i = \{u_{i-1} - u_{n-1}(k_n - k_{i-1})/(k_n - k_{n-1}) + u_n(k_{n-1} - k_{i-1})/(k_n - k_{n-1})\}/(k_n - k_1)^2$$

with $i = 2, \dots, n - 1$

(Orsini, N., & Greenland, S., 2011, p. 3).

Appendix B. Descriptive statistics

The descriptive statistics include the number of observations (Obs), the arithmetic mean (Mean), the standard deviation (Std. Dev.), and the lowest (Min) and highest (Max) observed value.

Differences in the number of observations are due to varying numbers of missing or inapplicable values.

The argued poorness of the representation of the control-variables “Separated” and “Widow” is demonstrated by the low arithmetic means of these variables.

Every observed country together

Variable	Obs	Mean	Std. Dev.	Min	Max
Lnhappy	88,807	1.201648	.1379326	1.098612	1.386294
Satisfied	88,979	6.834219	2.274908	1	10
Income	86,237	3.284483	1.892934	.5	10
Age	89,382	41.93813	16.55229	16	102
Woman	89,474	.5225093	.4994959	0	1
Children	87,898	.7025871	.4571224	0	1
Married	89,321	.6273217	.4835202	0	1
Separated	89,565	.0560598	.2300385	0	1
Widow	89,321	.0606017	.2385995	0	1

Sweden

Variable	Obs	Mean	Std. Dev.	Min	Max
Lnhappy	1,203	1.220333	.1421891	1.098612	1.386294
Satisfied	1,204	7.620432	1.674099	1	10
Income	1,143	3.676728	1.684196	.5	10
Age	1,206	47.34826	19.41441	18	85
Woman	1,206	.5281924	.4994117	0	1
Children	1,205	.6373444	.4809662	0	1
Married	1,177	.5938828	.4913157	0	1
Separated	1,206	.1069652	.3091972	0	1
Widow	1,177	.0475786	.2129634	0	1

Australia

Variable	Obs	Mean	Std. Dev.	Min	Max
Lnhappy	1,464	1.205118	.1389585	1.098612	1.386294
Satisfied	1,462	7.382353	1.977849	1	10
Income	1,426	3.092567	1.685184	.5	10
Age	1,468	53.8624	16.76609	18	95
Woman	1,477	.5578876	.4968059	0	1
Children	1,469	.7610619	.42658	0	1
Married	1,465	.6969283	.4597429	0	1
Separated	1,477	.0914015	.2882768	0	1
Widow	1,465	.065529	.2475415	0	1

Japan

Variable	Obs	Mean	Std. Dev.	Min	Max
Lnhappy	2,366	1.197343	.1366134	1.098612	1.386294
Satisfied	2,381	6.911802	1.97755	1	10
Income	1,946	2.392343	1.826849	.5	10
Age	2,443	50.74212	16.29775	18	80
Woman	2,443	.5182153	.4997704	0	1
Children	2,416	.7442053	.4363973	0	1
Married	2,423	.699546	.4585501	0	1
Separated	2,443	.0581253	.2340281	0	1
Widow	2,423	.0515889	.2212413	0	1

Zimbabwe

Variable	Obs	Mean	Std. Dev.	Min	Max
Lnhappy	1,500	1.227686	.1431287	1.098612	1.386294
Satisfied	1,500	6.041333	2.240306	1	10
Income	1,500	3.538	1.943212	.5	10
Age	1,500	33.772	13.51342	18	92
Woman	1,500	.54	.4985636	0	1
Children	1,500	.682	.4658548	0	1
Married	1,500	.55	.4976596	0	1
Separated	1,500	.072	.2585741	0	1
Widow	1,500	.0806667	.2724133	0	1

Nigeria

Variable	Obs	Mean	Std. Dev.	Min	Max
Lnhappy	1,759	1.268376	.1415262	1.098612	1.386294
Satisfied	1,759	6.262081	2.332705	1	10
Income	1,759	3.936043	2.261308	.5	10
Age	1,759	31.22399	11.68714	18	98
Woman	1,759	.4951677	.5001188	0	1
Children	1,759	.470722	.499284	0	1
Married	1,759	.5122229	.4999927	0	1
Separated	1,759	.0073906	.0856745	0	1
Widow	1,759	.0216032	.1454253	0	1

Pakistan

Variable	Obs	Mean	Std. Dev.	Min	Max
Lnhappy	1,198	1.242453	.1439011	1.098612	1.386294
Satisfied	1,200	7.478333	2.104334	1	10
Income	1,200	3.527917	1.951308	.5	10
Age	1,200	34.3375	11.86441	18	85
Woman	1,200	.4816667	.4998721	0	1
Children	1,200	.7075	.4551004	0	1
Married	1,200	.73	.4441446	0	1
Separated	1,200	.0058333	.0761849	0	1
Widow	1,200	.0133333	.1147455	0	1

Appendix C. Robust results

In order to ensure that the coefficients of the independent variable “Income” are robust with regard to the dependent variables “Lnhappy” and “Satisfied”, robust estimates of variance are calculated.

A robust estimate of variance provides standard errors that are robust to an unidentical distribution of the error term and the independent variable. Thus, the error term and independent variable do not need to be assumed to be identically distributed in order to hold the coefficients valid (Huber, P. J., 1967).

The results are presented with the unadjusted coefficient of determination, as the tendency of the coefficient of determination to increase automatically when control-variables are added does not need to be accounted for.

Every observed country together

VARIABLES	Lnhappy	Satisfied
Income	0.00425*** (0.000253)	0.205*** (0.00409)
Constant	1.188*** (0.000944)	6.156*** (0.0167)
Observations	85,579	85,787
R ²	0.003	0.029

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The wealthy countries

VARIABLES	Sweden Lnhappy	Sweden Satisfied	Australia Lnhappy	Australia Satisfied	Japan Lnhappy	Japan Satisfied
Income	-0.00378 (0.00243)	0.0289 (0.0329)	0.00313 (0.00217)	0.0999*** (0.0321)	0.00174 (0.00171)	0.132*** (0.0251)
Constant	1.234*** (0.00997)	7.526*** (0.134)	1.195*** (0.00760)	7.062*** (0.118)	1.193*** (0.00513)	6.603*** (0.0786)
Observations	1,142	1,141	1,414	1,412	1,895	1,906
R ²	0.002	0.001	0.001	0.007	0.001	0.015

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The poor countries

VARIABLES	Zimbabwe Lnhappy	Zimbabwe Satisfied	Nigeria Lnhappy	Nigeria Satisfied	Pakistan Lnhappy	Pakistan Satisfied
Income	0.00988*** (0.00188)	0.348*** (0.0286)	0.00665*** (0.00145)	0.344*** (0.0228)	0.0139*** (0.00200)	0.321*** (0.0306)
Constant	1.193*** (0.00755)	4.809*** (0.123)	1.242*** (0.00675)	4.909*** (0.110)	1.193*** (0.00828)	6.347*** (0.131)
Observations	1,500	1,500	1,759	1,759	1,198	1,200
R ²	0.018	0.091	0.011	0.111	0.036	0.088

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Apart from the results for happiness in the wealthy countries, and life satisfaction in Sweden, the robust results provide further support for the positive relations between income and both happiness and life satisfaction.

The sizeable differences in the coefficients of determination between the robust results for happiness and life satisfaction, in turn, endorse the assertion of income having a stronger influence on life satisfaction than on happiness.