SCIENTIFIC PAPER

# A NOTE ON THE MEASUREMENT OF THE RELATIONSHIP BETWEEN HAPPINESS AND GDP

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**Abstract:** *This research note compares the results of the measurement of the relationship between happiness and GDP in the EU based upon unweighted data with the results based upon weighted data. The data are weighted in order to correct for the different sizes of the populations in the EU countries concerned. The result of the weighing is an even stronger relationship between happiness and GDP per capita than in the case with unweighted data.*

**Keywords:** *happiness, GDP, EU*

## 1. Introduction

Scientific research on happiness has emerged since the seminal article by Easterlin (1974) on the relationship between raising income and happiness. Since the publication of that paper many scientists have carried out research on the topic of happiness and income. Many have focused on the influence of (relative) income on happiness, which can be done in several ways. A conventional method is to regress happiness rates - as measured through a survey on GDP per capita - for a country or a set of countries. In the European Union (EU), the so-called EuroBarometer published by the European commission provided an insight into the happiness rates of the European Union in both 2006 and 2010 whereas Eurostat provides data on population size and GDP.

This conventional method does not take into account that population sizes differ across the EU. This problem can be addressed by a rather complicated method like a multilevel analysis or in a more simple way like the share method, in which shares of happiness rates and shares of GDP in the overall GDP of the EU are calculated. For the calculation of the shares of happiness rates and GDP, the happiness rates measured by the Eurobarometer as well as the GDP per capita are multiplied by the share of a country's inhabitants out of the total number of EU inhabitants.

The objective of this short research paper is to test this method of measuring the relationship between happiness and GDP for individuals living in the 25 countries of the EU and to find out whether weighted data would generate results that are different from those derived from the analysis done with the unweighted data. This will be done in Section 4. In Section 2 we will discuss our theoretical framework and Section 3 will cover the data and method. Finally, Section 4 contains the conclusion and discussion.

## 2. Theoretical Framework

Easterlin found a positive correlation between income and happiness in his research in 1974. He found that there were clear happiness differences when comparisons of economic status were made within individual countries; groups with a higher income within a country were happier than groups with a lower income within the same country (Easterlin, 1974). Before Easterlin's innovative article in 1974, a somewhat similar conclusion had already been drawn in 1920. Pigou (1920) reasoned that much of the satisfaction of rich people is because of their relative income, and therefore rich people's satisfaction would not be reduced if the income of all the rich diminished at the same time, justifying redistributive taxation (Graham, 2005).

In the US a strong relationship between income and happiness was found for the part of the population in low income groups. A relationship between income and happiness for the higher income group was also found, but this relationship was weaker than the relationship between happiness and income for the low income group. Furthermore, a medium relationship between wealth and life satisfaction was found to exist across countries (Diener et al., 1993).

More recently, in research conducted with data from 29 European countries, evidence has been found for a positive relationship between income per capita and happiness. Also a levelling-off effect was found when income grows (Heijman and van Ophem, 2010). This corresponds with the findings of Veenhoven (1991), who explained the stronger relationship between happiness and income for low income groups through the ideas that aspirations rise with a higher income. Expected happiness gains are therefore diminished by rising aspirations which accompany a higher income. Because the aspirations of the low income group either do not rise, or only do to a

slight extent, the relationship between happiness and income is stronger for low income groups.

Another related theory is the set-point theory. Following this theory, happiness has an upper bound, after which there is no more progress. People's happiness will only increase until that point. People even revert to this maximum level of happiness after important events impacting upon happiness such as winning the lottery or a divorce. This maximum level is the so-called set-point (Graham, 2005).

One study that found evidence for a relationship between GDP and happiness is that of Frijters et al., about the development of life satisfaction after the reunification of Germany. In the Eastern part of Germany, life satisfaction increased. According to the research, 35-40% of this increase was accountable to the increase of real household income (Frijters et al., 2004).

The European Union is also aware of the importance of GDP for the happiness of its inhabitants. Research conducted on behalf of the EU on well-being within the member countries of the European Union concluded that the poorest people in a country are the ones that suffer the most from mental health problems. It is also the poorest in society who have the most negative feelings (Eurobarometer 345, 2010).

There also is a difference between developing and developed countries. On average, people in developed countries feel happier than those in developing countries. Given this difference, there is a suggested threshold beyond which more money doesn't raise reported well-being, and developing countries have not yet crossed this line (Graham and Pettinato, 2001).

The hypothesis there is positive relationship between GDP per capita and the happiness rate across countries. The question, then, is how this hypothesis can be tested when comparing happiness rates and GDP across countries that differ in terms of their size of population and economy. This will be analysed and discussed in Section 4, based on the data and method discussed in Section 3.

## 3. Data and Method

Happiness rates for 2006 and 2010 were retrieved from the EuroBarometer statistics on mental well-being from 2006 and 2010. These surveys were conducted on behalf of the European Commission, and define happiness with the following question: "How often during the past four weeks have you felt happy?". Possible answers are: 1; All of the time, 2; Most of the time, 3; Sometimes, 4; Rarely, 5; Never and 6; Don't know. The number of respondents per country that gave 1 or 2 as their answer are considered to be the happy people, and the total number of these 'happy' respondents in any one country is then divided by the total number of respondents for that country. The resulting ratio is the happiness ratio of the given country. The happiness rates therefore estimate the percentage of happy people in a country.

The data set which was used consists of 27304 respondents in 25 countries. GDP per capita data was retrieved from Eurostat, as well as data on the number of inhabitants (see Appendix).

Two different measurement methods on the relationship between happiness and GDP (per capita) are used. The conventional method weighs the data by using the GDP per capita whereas the new 'share' method makes use of shares of the happiness rates and of the GDP. For the calculation of the shares of the happiness rates, the happiness rates of the Eurobarometer are multiplied by the share of a country's inhabitants in the total number of EU inhabitants. The GDP per capita of a country is multiplied by the share of a country's population in total EU population. All variables are transformed into logarithmic numbers since this leads to a better interpretation of the coefficients. With this data, regression analyses are then conducted to test the relationship between happiness and GDP (per capita) as income is one of the most important predictors of happiness (see previous section). This will first be done with the conventional per capita measurement method, and then with the share method.

## 4. Results

Measuring the relationship with the *conventional method* is done using the following Cobb-Douglas function:

$$H = \alpha Y^{\beta},$$ where $Y$ stands for GDP per capita and $H$ for

happiness. From this the regression function in logarithms can be derived:

$$\ln H = \ln \alpha + \beta \ln Y.$$

The data used for this regression are presented in the appendix. The results for the years 2006 and 2010 are presented in Tables 1 and 2.

*Table 1: Happiness explained by GDP per capita in 2006 and 2010 for 25 EU-countries: Unweighted data (t-values in brackets).*

| Year | $\alpha$ | $\beta$ | $R^2$ | N |
|------|----------|---------|-------|---|
| 2006 | -2.2699 (-6.78) | 0.1846 (5.38) | 0.56 | 25 |
| 2010 | -2.4844 (-7.07) | 0.2003 (5.56) | 0.57 | 25 |

The results in Table 1 demonstrate that GDP per capita has a clearly significant positive effect on the national happiness rates even with unweighted data.

The relationship between happiness and GDP measured with the *share-method* is tested with the following regression function:

$$\ln S_h = \ln \alpha + \beta \ln S_y,$$

where $S_h$ stands for the number of happy people in country as a share of the total EU-population (share of the happy people in the national population multiplied by the share of the national people in the total EU-population), $S_y$ stands for national GDP per capita multiplied by the share of the national population in total EU population, with α and β as coefficients.

*Table 2: Happiness explained by GDP per capita in 2006 and 2010 for 25 EU-countries: Weighted data (t-values in brackets).*

| Year | $\alpha$ | $\beta$ | $R^2$ | N |
|---|---|---|---|---|
| 2006 | -9.0993 (-20.25) | 0.7978 (10.80) | 0.86 | 25 |
| 2010 | -9.4333 (-22.69) | 0.8302 (12.07) | 0.84 | 25 |

The share model (Table 2) finds a strong relationship between happiness and GDP; t-values and R² for the results of share-model are higher than for the results of the conventional model (Table 1).

## 5. Conclusion

The hypothesis that there is a positive relationship between GDP and the happiness rate of a country is confirmed. It can also be concluded that the share method is a better way to measure this relationship than the conventional method. The R² and t-statistics are higher compared to the values found with the help of the conventional method of measuring.

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*Appendix: Data used for the analysis*

| Country | Happiness rates (2006) | Happiness rates (2010) | Gross Domestic Product per capita (2006) | Gross Domestic Product per capita (2010) | Share of national pop. in total EU pop. (2006) | Share of national pop. in total EU pop. (2010) |
|---|---|---|---|---|---|---|
| Austria | 0.60 | 0.55 | 30800 | 31300 | 0.0168 | 0.0168 |
| Belgium | 0.82 | 0.70 | 29500 | 29600 | 0.0214 | 0.0217 |
| Bulgaria | 0.42 | 0.44 | 3200 | 3500 | 0.0157 | 0.0149 |
| Czech Rep. | 0.62 | 0.56 | 10900 | 11400 | 0.0208 | 0.0210 |
| Denmark | 0.71 | 0.68 | 39400 | 37300 | 0.0110 | 0.0111 |
| Estonia | 0.48 | 0.49 | 9200 | 8300 | 0.0027 | 0.0027 |
| Finland | 0.78 | 0.79 | 31200 | 30600 | 0.0107 | 0.0107 |
| France | 0.74 | 0.69 | 27800 | 27400 | 0.1286 | 0.1295 |
| Germany | 0.59 | 0.57 | 28000 | 29100 | 0.1676 | 0.1639 |
| Greece | 0.61 | 0.42 | 18300 | 17100 | 0.0226 | 0.0227 |
| Hungary | 0.57 | 0.48 | 9200 | 8800 | 0.0205 | 0.0201 |
| Ireland | 0.82 | 0.78 | 40300 | 35900 | 0.0086 | 0.0091 |
| Italy | 0.48 | 0.54 | 24900 | 23500 | 0.1194 | 0.1209 |
| Latvia | 0.42 | 0.40 | 6500 | 5900 | 0.0045 | 0.0042 |
| Lithuania | 0.52 | 0.48 | 6900 | 7100 | 0.0067 | 0.0063 |
| Luxembourg | 0.75 | 0.71 | 67200 | 64500 | 0.0010 | 0.0010 |
| Netherlands | 0.83 | 0.82 | 32500 | 33100 | 0.0332 | 0.0332 |
| Poland | 0.60 | 0.52 | 6800 | 8000 | 0.0776 | 0.0765 |
| Portugal | 0.56 | 0.59 | 14800 | 14900 | 0.0214 | 0.0212 |
| Romania | 0.56 | 0.48 | 4000 | 4200 | 0.0432 | 0.0407 |
| Slovakia | 0.63 | 0.66 | 7700 | 8900 | 0.0109 | 0.0108 |
| Slovenia | 0.61 | 0.64 | 15100 | 15300 | 0.0041 | 0.0041 |
| Spain | 0.70 | 0.60 | 21500 | 20600 | 0.0895 | 0.0931 |
| Sweden | 0.70 | 0.65 | 34300 | 34500 | 0.0184 | 0.0187 |
| UK | 0.75 | 0.71 | 31700 | 30500 | 0.1232 | 0.1252 |

*Sources: Special Eurobarometer, 2006, 2010; Eurostat.*