Subjective Well-being and Human Development

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Abstract

In this paper I will assess how well individual self-reported subjective well-being, as measured in the 1998-2004 wave of the World Values and European Values Surveys, is explained by macroeconomic measures. In particular, this paper will attempt to compare how much GDP and the Human Development Index (HDI) developed by the United Nations Development Program contribute to explaining subjective well-being.

This work is innovative in that it is the first analysis which investigates the relationship between HDI and self-reported life satisfaction. Furthermore, it is the first work to consider comparing the ability of GDP and HDI to predict happiness. It is also one of few studies to use the ordered probit model and is the first to use the Clarify Software add-on to STATA to simulate how changes in GDP and HDI affect the predicted probabilities of the different levels of subjective well-being. These results are more accessible for interpretation and comparison than simply using the regression results.

1. Introduction

What makes us happy? This question is as old as time itself. The determinants of human happiness are as diverse as people are. However, in setting out to investigate happiness from an economics perspective, one must define the factors, which an average person would value. Happiness is indeed a wide-ranging term that is often argued to have different meanings. Therefore, it is very important to be clear in how the term is being considered in empirical studies looking into its determinants and it is also important to study it in a way that is comparable among people of differing life conditions as well as from different countries.

This paper will build an ordered-probit model to explain some of the cross-national differences in self-reported happiness collected in the fourth-wave of the World Values Survey from 1998 to 2001. This will be accomplished by analyzing subjective well-being taking into account individual-level augmented with macro economic data.

By building an econometric model of happiness, this paper will show that HDI is more highly related to self-reported happiness than GDP per capita. This suggests that improvements which affect HDI hold a greater potential for governments to try and improve human happiness than by simply following economic policies that maximize economic growth.

First the paper will review previous professional research in the field. Subsequently, it will discuss some of the theoretical issues involved in studying happiness; the data sources and variables being used will be discussed. The methods used to calculate both GDP and HDI will be examined. I will then proceed to build an ordered probit model to compare cross-national differences in subjective well-being. The results and tests will be discussed to evaluate the relevance of measuring subjective well-being in economics.

2. Literature Review

> There is a paradox at the heart of our lives. Most people want more income and strive for it. Yet as Western societies have got richer, their people have become no happier (Layard 2005a, 3).

Richard Layard, begins his book *Happiness: Lessons from a New Science*, with this conclusion that has puzzled researchers for decades. In economic terms, it has been assumed that more of a good is always better (Besanko and Braeutigam 2005, 71). Yet as Layard (2005a, 29) demonstrates, self-reported measures of happiness have remained stagnant in first-world countries while per capita income levels have more than doubled over the last 50 years. The standard economic premise would suggest that as incomes increase, so should happiness. The adage that "money cannot buy happiness" seems to be true at least in the world's wealthiest nations. This paper will show that while this fact does hold true in developed nations, there is a clear positive correlation between income per capita and happiness across all nations.

Before happiness can be studied it needs to be quantified. Philosophers have grappled with the definition of happiness since the beginning of time, but the attempt to measure it in empirical terms dates back only to the 1970s (Bruni and Porta 2005, 2-3). Richard Easterlin, the American economist and demographer, was the first to use empirical happiness research. He gathered his data from two surveys that asked questions about happiness and life satisfaction in 14 countries.

As discussed by Bruni and Porta (2005, 4), Easterlin showed that in a cross-sectional analysis of a given country, people in higher income brackets tend to be happier than those in the lower bracket. However, Easterlin found no clear connection between

income and happiness in a cross-sectional analysis among different countries. He also evaluated happiness scores over a period when income per capita more than doubled and he found little difference across time. Subsequent research in the field has proven that some of Easterlin's early conclusions were incomplete (Frey and Stutzer 2002, 74). The statistical work done in my paper shows, as do others, that the correlation between income and happiness does exist among countries, but is not general if the analysis is restricted to those countries with an income per capita exceeding $15,000 (e.g. Bruni and Porta 2005; Frey and Stutzer 2002; Layard 2005a; Layard 2005b).

The relationship between income and happiness is determined by the following four cases: "within-nation correlations, income change, income change at the national level, and between-nation differences" (Diener et al. 1999, 287-288). They were able to demonstrate that richer people in a given country are on average happier than poorer people. However, the study also shows that income change at a personal and at the national level do not seem to have lasting effects on well-being over time.
In terms of between-nation differences, the relationship between per capita income and well-being is said to be positive and strong.[1] This suggests that using GDP and HDI in a study of self-reported life satisfaction is important to capture the effect that income has on life satisfaction. Yet, they also make the argument that the correlation does not account for the fact that richer nations tend to be more democratic and egalitarian than poorer nations, thus, overstating the correlation between income and average life satisfaction.

According to this research, the relationship between national income and life satisfaction should have a strong positive correlation with life satisfaction in this paper as it is comparing cross-national differences in life satisfaction over a single period. However, as the research suggests, it is difficult to explain life satisfaction using income as the only explanatory variable. The use of a multivariate analysis that controls for other factors that influence life satisfaction is a necessary step in order to more accurately explain changes in life satisfaction. Otherwise, as Diener et al. (1999) assert the effects that democracy and egalitarianism have on subjective well-being would be included in

[1] Diener et al. (1999) note that although the correlation exists, it differs between rich nations and poor nations.

income per capita. This paper will test what sort of effect that political structure and openness of society have on life satisfaction by including a measure of freedom of choice and control in one series of regressions. This will be compared with the explanatory power that GDP and HDI have on life satisfaction when this measure is excluded. Evidence from other research done in the field of happiness studies, makes it clear that income by itself, will not hold clear answers relating to life satisfaction. In order to better explain the determinants of life satisfaction, multiple variables need to be considered at the same time.

This paper used a multivariate analysis of life satisfaction to control for the effects of individual characteristics at the same time as macro economic measures. Accordingly, a measure of income inequality was considered in this model to see if the distribution of income changes matter. Both national rates of unemployment and personal unemployment were considered in the model to see if the national rates of unemployment still affect happiness even when people are not unemployed. Other control variables used in this analysis are age, gender, belief in God, trust in others, personal income, and marital status. These controls are used to ensure that the effect of changes in one of the independent variables is not being overstated by not including one of these variables in the model.

While income is the principle economic measure that researchers have attempted to relate with happiness, unemployment and inflation have also made their way into the discussion of happiness and it correlates (e.g. Frey and Stutzer 2002; Di Tella et al. 2003). The cost of unemployment on happiness is made evident by Di Tella et al. (2001) as they identify that the self-reported happiness of someone who is unemployed is predicted to be about 0.33 units lower on a scale from 1 to 4 (where a response of 4 indicates that someone is "very satisfied") than someone who holds a job but has otherwise similar characteristics. Frey and Stutzer (2002) also came to a similar conclusion in a study of Switzerland, where they identified that people who are classified as being unemployed are 20.6 percentage points less likely to report being "completely satisfied" on a 10-point scale than those who are employed. These results will provide interesting comparisons as this paper will also try to take into account the effects unemployment has on life

satisfaction, both in terms of personal unemployment and high national rates of unemployment.

Given the fact that over time income seems to have an inconclusive effect on overall levels of life satisfaction, psychologists have argued that genes play an immense roll in determining someone's long-term happiness (Diener et al. 1999, 279). Studies that have been conducted of identical and fraternal twins show that identical twins split at birth tend to be more similar in their happiness than fraternal twins regardless of whether they grew up together or apart. Estimations that these studies have conducted of what role genes play in explaining the variance in subjective well-being indicate that almost "40 percent of the variance in positive emotionality, while 55 percent of the variance in negative emotionality" is explained by genes (Diener et al. 1999, 279). The conclusions made in psychology concerning the role that genes play in determining long-term life satisfaction certainly pose a problem to economic explanations of subjective well-being over the long-term, however at any given point in time, the life conditions of a given person certainly would play a role in their happiness. Furthermore, these economic conditions could explain up to 60 percent of the differences in variation.

Some researchers who believe in set-point theories of happiness or that everyone has a genetic disposition to be at a certain long-term level regardless of their life circumstances challenges conventional economic reasoning (Easterlin 2005, 30). Easterlin argues that in economics income and employment are often "believed to have lasting effects on well-being." If life circumstances have no impact on well-being then as Easterlin notes, this sets forth a very "nihilistic view of economic and social policy" as no matter what policy makers do, there little chance to increase subjective well-being in a country. It is as if everyone is running on a "hedonic treadmill" that moves at the same speed or even faster in the opposite direction (Bruni and Porta 2005, 10). Or in other words, people's ideas about which material goods are part of the good life are always changing, so average happiness levels remain constant. However, Easterlin (2005) disagrees arguing that there are certain life circumstances that people never adjust to, namely health problems, divorce, and unemployment. The analysis done in this paper shows that economic conditions affect happiness as Easterlin notes and it is useful to investigate the nature of these effects.

With the dramatic increase in academic interest in the field of happiness studies, more and more criticism is being targeted at the way in which research on subjective well-being is being conducted. Many of these criticisms are made clear by Wilkinson as he argues that "happiness research is seriously hampered by confusion and disagreement about the definition of its subject as well as the limitations inherent in current measurement techniques" (Wilkinson 2007, 4). This paper was careful to have clear notions of the nature of happiness it was considering and it shows the relevance of the research being collected from surveys. Kingwell (2007) supports Wilkinson's criticism in his article as he says "the very idea of quantifiable happiness obscures the most interesting problem." Kingwell believes that no matter how scientific a study measuring happiness tries to be, it is still trying to capture a measure from a research subject known for "their notoriously variable affective states" and he places little weight on the usefulness of the results from said research. Kingwell may indeed be onto something; however, the analysis done in this paper seems to suggest that there are evident similarities in the types of people who are happy and those that are not. Happiness is indeed a very broad term and can be argued to consist of many different factors, which shows the importance of being precise in how it is defined in empirical studies of its determinants.

Contrary to Wilkinson's and Kingwell's arguments, current research indicates that self-reported techniques are fairly accurate at giving a balanced picture of how people are doing. Self-reported responses indicating life satisfaction of a person are closely related to the responses of friends or colleagues of that person when asked the same question in regards to their friend or co-worker (Layard 2005a). Brain wave analysis focused on trying to measure objective states of happiness also seem to coincide with individuals' self-reported assessment of how happy they say they are (Layard 2005a, 20). While certainly there are empirical and conceptual issues that need to be addressed to continue to improve upon the measurement of self-reported well-being, current research points to these measures being accurate depictions of well-being. These arguments show that using data such as that collected from the WVS are good indicators of how happy people actually are. Furthermore, happiness research is concerned with evaluating long-term average happiness, not moment to moment fluctuations.

A final criticism of happiness measurement concerns linguistics. Anna Wierzbicka, an Australian Linguist, argues that "the glibness with which linguistic differences are at times denied in current literature on happiness can be quite astonishing" (Wilkinson 2007, 7). Language certainly may play a role in the outcomes of happiness measurements because it is true that the word happiness may carry different cultural sentiments. However, studies comparing different ways to measure the concept of happiness indicate strong and consistent results across these measures (Layard 2005a, 34). Layard concludes that although language may factor into measuring subjective well-being, it is not an insurmountable problem given his findings of the correlation between different measures of well-being. The result is that more recent surveys about happiness such as the WVS are much more reliable (Layard 2005a).

3. Why Should Economists Measure Happiness?

As the field of happiness studies continues to expand, at a certain point it is important to discuss the implications and validity to this kind of research. Understanding the distribution of life satisfaction across persons and countries around the world is an investigation into one of the fundamental human conditions, as happiness is after all a goal that everyone strives for and accordingly those studying this topic provide insights that are relevant to everyone's life.

The field of happiness studies opens a door to a completely new range of opportunities in economics. Di Tella et al. (2003) have already begun to look at the kinds of exciting calculations and analysis that are possible using happiness research in economics as they compared the traditional evaluation of the costs of business cycles, namely the decline in GDP, with the individual costs in happiness as a result of unemployment. The ability to evaluate traditional economic policy in terms other than the simple impact they have on other economic variables, gives policy makers a deeper understanding of how their decisions affect society. Happiness data allows economists to determine whether certain economic conditions play a role in life satisfaction. This helps to provide answers as to whether government policy can affect happiness.

Understanding the distribution of well-being among persons and countries is an interesting topic to study in economics because it engenders an understanding of how

economic conditions such as income, unemployment, and public policy affect the fundamental human condition of happiness.

Since many governments set economic growth as a primary objective, comparing economic growth with average self-reported happiness appears to warrant consideration.[2] Japan is the country that experienced the greatest economic growth in the post-World War two period as income per capita increased by as much as six times from 1958 to 1991, yet measures of average self-reported happiness have had exhibited almost no variation whatsoever (Frey and Stutzer 2002, 9). Furthermore, Japan is a classic example of the experience of Western nations over the past half-century. The ineffectiveness of GDP in explaining happiness in countries like Japan and among other rich nations suggests other macro measures such as HDI, might offer better insights.

Empirical data analysis of life satisfaction may hold answers to troubling questions that individuals and governments deal with on a day to day basis. If this field of research can provide more precise knowledge of what makes everyone better off, then it is a topic of inquiry that should interest all human beings. Once countries reach a certain level of economic prosperity citizens seem to "adapt" and economic growth has less of an effect on happiness (Bruni and Porta, 10). It is difficult to get a full understanding of happiness, but more research in the filed has sharpened our insight to how economic conditions affect happiness. Happiness may not be the ultimate statistic by which to judge every decision that is made in the world, but incorporating it into the decision making process will add new dimensions to test the effectiveness of policy.

4. What is Happiness?

The fields of psychology, philosophy, and economics have all tried to conceptualize this elusive state. In psychology they have set forth a notion of happiness known as "subjective well-being" (SWB), which has multiple components and can be estimated in different ways (Kim-Prieto et al. 2005, 262). The approach to SWB that this paper concerns itself with "a global assessment of life and its facets" (Kim-Prieto et al. 2005, 263). This involves evaluating life based on "personal judgments of satisfaction

[2] Unfortunately economic growth appears inadequate in explaining well-being across time as suggested by examples as Japan.

and quality of life" (Kim-Prieto et al. 2005, 263). Kim-Prieto et al. (2005) go on to indicate that most of the research that looks at SWB in this way involves using surveys where respondents are asked questions about their assessment of their current life satisfaction. SWB is based on a conception of happiness known as hedonism (Bruni and Porta 2005, 7.) As they indicate, the hedonistic approach to happiness sees the state of being happy as a process of "seeking pleasure and avoiding pain" (Bruni and Porta 2005, 8). This would include things like the acquisition of material goods. This conception of well-being suggests that happiness is something subjective, so it depends on the decisions and preferences of the individual.[3]

For the purpose of this paper, the terms "life satisfaction", "satisfaction", "well-being", "SWB", and "happiness" will be taken to mean the same thing and are assumed to be given as a result of individuals responding to survey questions. The survey questions in this paper were taken from the 1998-2001 wave of the World Values and European Values Surveys (WVS and EVS). This paper will take SWB to be the responses to the question: "All things considered how satisfied are you with your life as a whole these days?" (World Values Survey 2006a). Responses to this question were given on a ten-point scale where a score of 1 indicates that someone is very dissatisfied with life while a score of ten indicates that someone is very satisfied with their life. This question coincides with the idea of subjective well-being because it is asking people to consider how they feel about their life in general. It is also trying to capture how they are doing in terms of meeting their aspirations. The model of life satisfaction that follows in this paper will be trying to find the determinants that influence individuals to give higher-level responses to this question.

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[3] Hedonism stands opposed to a more tradition way of conceptualizing happiness, eudaimonia, which dates back to Aristotle (Nussbaum 2005, 171). According to Nussbaum (2005) eudaimonia is "a kind of living that is active, inclusive of all that has intrinsic value, and complete, meaning lacking in nothing that would make it richer or better" (171). The components of happiness that Aristotle identifies are "ethical, intellectual, and political excellences, and activities involved in love and friendship" (171). This view of well-being is much more organic and objective. It is less concerned about concrete things than hedonic approaches to well-being. The other interesting feature of eudaimonia is that it is less about individual feelings and preferences, but instead about a kind of goalpost of human potential for which everyone should strive for (Bruni and Porta 2005, 7). While the debate on what precisely constitutes human happiness will probably never cease, this paper will be concerned with using the hedonistic approach to well-being to try and uncover some of the life circumstances that increase happiness.

The WVS was first conducted following a study released by the EVS in 1981 of 14 countries in Western Europe (World Values Survey 2006b). This survey evolved and the WVS organization has gone on to conduct new waves of the survey in 1990, 1995, and again in 2000. In this paper, I will be looking at data from the 1998-2001 wave of the WVS and the EVS. These surveys obtained responses from at least 1,000 people in 68 different countries around the world. The countries represent a diverse collection of the global population with countries ranging from African nations to big Western powers (World Values Survey 2006a).

The WVS is a professionally-run survey group that sub-contracts data collection out to various agencies across the world. In order to be included in the large data file several restrictions must be met (World Values Survey 2006c). These include standard techniques for building a suitable collection of respondents that will then be used to approximate movements and trends in data values and satisfaction across the world. Conditions such as requiring a national sample of at least 1,000 individuals 18 years and over and conducting the sample "as close as possible following probability (random) methods" (World Values Survey 2006c, 7). The amount of methodological and sampling information (Metadata) that is provided with the WVS allows for critical assessment of the methods used to collect data in each country. The rigor that is used in putting the WVS together makes it a credible source for empirical research such as this paper has undertaken.

5. The Macro Economic Variables Considered

"The Income and Expenditure Accounts are the centre of macroeconomic analysis and policy-making in Canada" (Statistics Canada 2007b). It is hard to envision discussing the performance of Canadian Economy without mentioning the gross domestic product that has become such a critical element of macroeconomic analysis.

GDP; a leading measure of macroeconomic conditions, is often used as a proxy for social well-being by studying the correspondence between GDP and SWB we can better determine how closely GDP is related to well-being and perhaps come to understand why GDP is viewed as such a useful measure of welfare. GDP measures the total value of all final goods and services produced within a country over a given period

(normally a year). GDP can be calculated in three different ways: by the income, expenditure, or value added approach.

The income approach to GDP measures all the factor incomes accumulating to labour and capital during the production process. The largest portion of GDP according to the income approach is wages, salaries, supplementary labour income, representing over half of GDP. Other income components are corporate profits before taxes, interest and miscellaneous investment income, accrued net income of farm operators, net income of non-farm unincorporated business, and inventory valuation adjustment (Statistics Canada 2007a). As Statistics Canada, notes the summation of these six figures, when we add taxes less subsidies on factors of production gives us Net Domestic Product at basic prices. In order to get GDP at market prices, taxes less subsidies on products as well as the capital consumption allowances and one half of the statistical discrepancy are added to NDP.

The expenditure approach sums up various categories of final purchases of goods and services. Personal consumption of goods and services, which represents over 60 percent of GDP in Canada, is combined with current government expenditure on goods and services, as well as business and government investment spending (Statistics Canada 2007a). The aggregate of these three categories is known as final domestic demand and in order to arrive at GDP, the change in inventories, net exports of goods and services, as well as one-half the statistical discrepancy is added.

The World Bank uses a slightly different calculation method when generating their database of world development indicators each year. GDP in this case is measured using the value added approach, which sums up the gross value added by all domestic producers in the economy (World Bank 2007b). Product taxes minus any subsidies not included in the value of the products added on to reach GDP. This method does not include "deductions for depreciation of fabricated assets or for depletion and degradation of natural resources" (World Bank 2007b).

GDP is quite a powerful statistic given its narrow focus on measuring accounts of economic activity in a country. In terms of describing the economic activity within a given country, there is no available measure that provides a better snapshot of how an economy is doing than GDP (Haggart 2000). The effectiveness of GDP is that is

extremely easy to turn to as a measure for progress because it involves analyzing only one figure.

Changes in GDP, as shown by Haggart (2002), can also be a good indication of many aspects of positive social welfare as changes in GDP often reflect changes in social welfare ceteris paribus. GDP is an attractive measure of social and economic welfare because unlike broader measures, it involves calculating only one number and can be tracked through time, making it an easy reference point to turn to when evaluating the effect of economic and social policy have on social well-being.

Yet economists have always been concerned with the use of GDP as a measure of social well-being (Haggart 2000). In his study of GDP, Haggart (2000) identifies a number of technical problems with GDP. For one, GDP does not account for transactions that occur outside of traditional markets. This can include housework, volunteer work, home childcare, as well as black market activities. These activities could either have a positive or a negative effect on a country's social well-being, yet GDP does not account for them. It also does not take into account negative consequences that are often connected with economic activity. Collection of discarded goods into landfills, depletion of oil and other natural resource reserves inflate GDP while the negative aspect of these actions is not valued. GDP also does not take into account income equality, so if by looking only at the GDP of two similarly wealthy countries, we would have no conception of how that wealth is dispersed among the population.

The simplicity of GDP goes both ways, while it can be used as simple and effective predictor of economic and social well-being, it is also just capturing once aspect of human development. The single dimension of GDP has led people to develop alternative measurements of progress to use in the place of or alongside GDP.

5.1 The Human Development Index

The Human Development Index (HDI) is one such measure. The conception behind HDI was to find a broader and more comprehensive measure of social and economic welfare than GDP could provide (Crafts 1997). Crafts study of HDI shows that although HDI dates back to the original Human Development Report in 1990, the methodology was altered by Amartya Sen and Sudhir Anand in 1994, to be able to make

comparisons over time. The index went from measuring a deprivation of human development in a given country to expressing the human development in a country in terms of attainment (Anand and Sen 1994, 7). HDI measures the average achievements of a country in three categories: longevity, education and knowledge, and standard of living (Wilkins 2006, 394). To arrive to HDI, three separate indices are created for these categories and then each of the categories makes up one-third of the index value of human development.

HDI is a dimension index as it is comprised of three separate dimensions that are compiled into one index values from 0 to 1 (Wilkins 2006, 394). The basic form that each of the three indices take are as follows:

Dimension index = (actual value – min. value) / (max. value – min. value)

The maximum and minimum values are set out by the United Nations Development Programme (UNDP) as "goalpost" values for each of the three categories that allows for comparisons to be made in how countries are doing over time. These "goalpost" values are the perceived to be the expected maximum and minimum values of each component over a long period of time (Crafts 1997, 302).

HDI is then calculated as the number between 0 and 1 resulting from combining the three dimensions together into one index in this fashion:

HDI = (life expectancy index + knowledge and education index + GDP index) / 3

Longevity is the first category that is included in HDI and is measured by life expectancy at birth. The UNDP sets the maximum value for life expectancy at 85 years of age and the minimum at 25.

The knowledge and education index is a combination of the adult literacy rate and the "combined primary, secondary, and tertiary gross enrollment ratio" (Wilkins 2006, 394). A separate dimension index is calculated for both adult literacy and the gross enrollment ratio. These two indices are then added together with adult literacy given two-thirds weighting while the enrollment ratio is given one-third. Accordingly, knowledge index = 2/3(literacy index) + 1/3(education index). As made evident in the

Human Development Report 2006 (Wilkins 2006), the "goalpost values" for the literacy and education indices are both 100 and 0.

The report indicates that the GDP index is generated using GDP per capita in purchasing power parity (PPP) terms, however GDP is adjusted to reflect the fact that infinite amounts of income are not required to attain an adequate level of human development. Therefore, the logarithm of income is used to represent this desired relationship in mathematical terms, since the log function's distribution exhibits diminishing marginal returns. The maximum and minimum values for calculating the GDP index portion of HDI are 40,000 and 100. For example, in 1998, Tanzania's GDP per capita, PPP was $502.777, so its corresponding GDP index would be calculated in the following way (World Bank 2007a):

$$\text{GDP index} = (\log(502.777) - \log(100)) / (\log(40{,}000) - \log(100)) = 0.270$$

After compiling results for all of these indices, it is possible to generate an HDI score from 0 to 1 for every country for which the UNDP is able to collect accurate data for.

The use of HDI as a measure of socioeconomic well-being is advantageous compared to GDP as it puts an emphasis on components of well-being other than income as indicated by Crafts (1997, 303). While GDP is criticized for being a one-dimensional proxy of welfare, HDI adds life expectancy and knowledge as other areas in which countries can improve to raise their level of welfare in terms of HDI. HDI also partially addresses the problem of GDP accounting for negative economic activities as now its effect on measured socioeconomic well-being is reduced by two-thirds and targeted spending in areas such as health and education would now have larger impacts than if only changes in income per capita were taken into consideration. Given the clear evidence that GDP per capita does not hold all the answers in why particular countries report being more satisfied with life than others, as a single statistic, HDI allows for other factors to play a role in trying to explain these differences.

Focusing on HDI to measure socioeconomic welfare rather than a blanket measure such as GDP or another more comprehensive measure also has a number of drawbacks. HDI still does not include a vast majority of factors that contribute to well-being in a society such as indicators of the type of political system or how egalitarian a

society is (Crafts 1997). The choices of what to include in the three categories in HDI reflect decisions made by the architects of the index and depending on ones disposition towards the determinants of well-being we might consider other measures that could be seen to be more meaningful to human development than life expectancy, income, or knowledge.

Anand and Sen (1994) themselves, point to the difficulties with HDI in describing development among advanced industrial nations. Given that literacy rates in most industrialized countries are in the high nineties as Anand and Sen concluded, there is less and less meaningful improvement that can be made in that component of HDI and thus, differences in HDI among rich nations can only be explained in terms of the small differences in life expectancy or income. This problem was partially addressed by the authors as they noted that countries could be divided into categories of human development and different components could be added to the more advanced nations to try and make differences in HDI more discernible among the rich nations. They suggest adding maternal mortality rates in the longevity index, tertiary enrollment in the education index, and in the income index to use Gini-corrected mean national income while those measures would not be included among the lower categories of human development.[4]

The income category of HDI is also problematic in relation to richer nations because it makes use of the logarithm function, the effect of an increase in income when a country has already attained a higher level of income has significantly lower effects than increases in incomes at low levels of GDP per capita (Crafts 1997, 304). This relationship is a reasonable assumption to except given that it is fairly true that after a nation has attained a certain level of wealth, further improvements in income have would have smaller impacts on the overall development of a nation. However, as Crafts (1997) notes, there are many authors who have suggested that the discounting rate that the logarithm function causes at higher levels of income is too extreme and GDP per capita expressed in terms of a percentage of a maximum measured in 1990 international dollars should be used instead. They argue that this would better portray the possibilities that

[4] In Anand and Sen (1994) they note that Gini-corrected mean national income is calculated by taking GDP per capita and multiplying it by (1-G), where G is the Gini index for a given country.

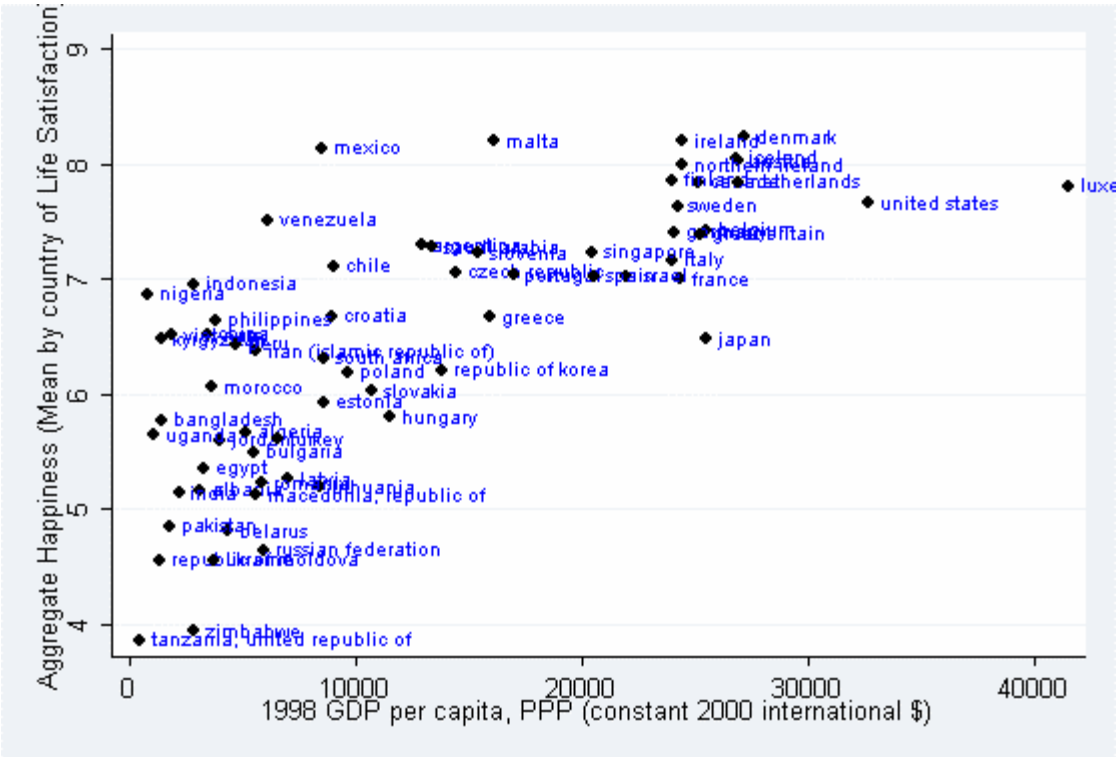
exist for improvements to many areas that make up human development when countries obtain income levels above the point where the logarithm function begins to level off.

In knowing the methods used to calculate these two measures of socioeconomic well-being, it is now possible to discern the reasons behind why HDI might be more effective at explaining SWB than GDP.

7. Happiness and Development Model

In order to build a model to explain cross-national differences in SWB, we start by looking at the basic relationships of our two macro economic measures (GDP & HDI) and life satisfaction as reported by the 2000 wave of the WVS. Exploring the basic relationships between SWB and the two macro economic measures used in this paper, allows for basic predictions to be made on what kind of relationship exists between SWB and the two independent variables that will be compared in this paper.

Figure 1.—Scatter Plot of Gross Domestic Product per capita, in PPP and National Averages of Life Satisfaction



As figure 1 clearly shows, the relationship between country averages of reported life satisfaction and GDP per capita is positive. This figure illustrates that, richer nations, tend to be happier than poorer nations on average. GDP per capita values were taken from the World Bank (2007) and life satisfaction data is from the WVS (2006a). As was also noted by a number of studies cited in the literature review, this relationship is not general across all levels of income per capita (e.g. Layard 2005b). While it is evident that increases in GDP per capita levels below the $15,000 mark, have large positive results on a country's average level of life satisfaction, the same is not true among those countries with the highest levels of income per capita.

Looking at some examples of these relationships, the mean value of life satisfaction in Egypt is 5.36 out of a possible 10. Greece on the other hand, which has a GDP per capita approximately $11,186.67 larger than Egypt, demonstrating the positive relationship between SWB and income, has a mean life satisfaction of 6.67.[5] People living in rich countries, evidently, are on average happier than those living in poorer countries. However, "happiness paradox" that exists among richer nations is made clear by Denmark, which has a GDP per capita in PPP in the high $20,000 range, is noticeably happier than both the United States and Luxembourg even though they have GDPs per capita exceeding Denmark by a fair margin. This suggests that after a country achieves a certain level of income per capita, additional income does not seem to have a large impact of life satisfaction. This is depicted by the distribution of data in figure 1 and it occurs roughly around the $15,000 mark.

As figure 2 suggests, when we move to analyzing the relationship that HDI has with country averages of life satisfaction, there is a movement away from the satisfaction plateau that arises as we try to explain differences in SWB among nations with high GDPs per capita. Unlike GDP, the effect of HDI on life satisfaction seems to persist over higher levels of HDI. HDI also has a positive effect on SWB according to figure 2, although it is not as strong as the effect that GDP has on SWB across low levels of income. This relationship was one of the reasons suggesting that a GDP-HDI comparison

[5] Life satisfaction data used in figure 1 is the average across all responses from each country while GDP per capita in PPP were taken from the year 1998 at the beginning of the 2000 WVS period.

was warranted; there seems to be the potential for greater explanation of cross-national differences in SWB among richer nations by focusing on HDI rather than GDP.

Figure 2.—Scatter Plot of 1995 Human Development Index and average life satisfaction by country

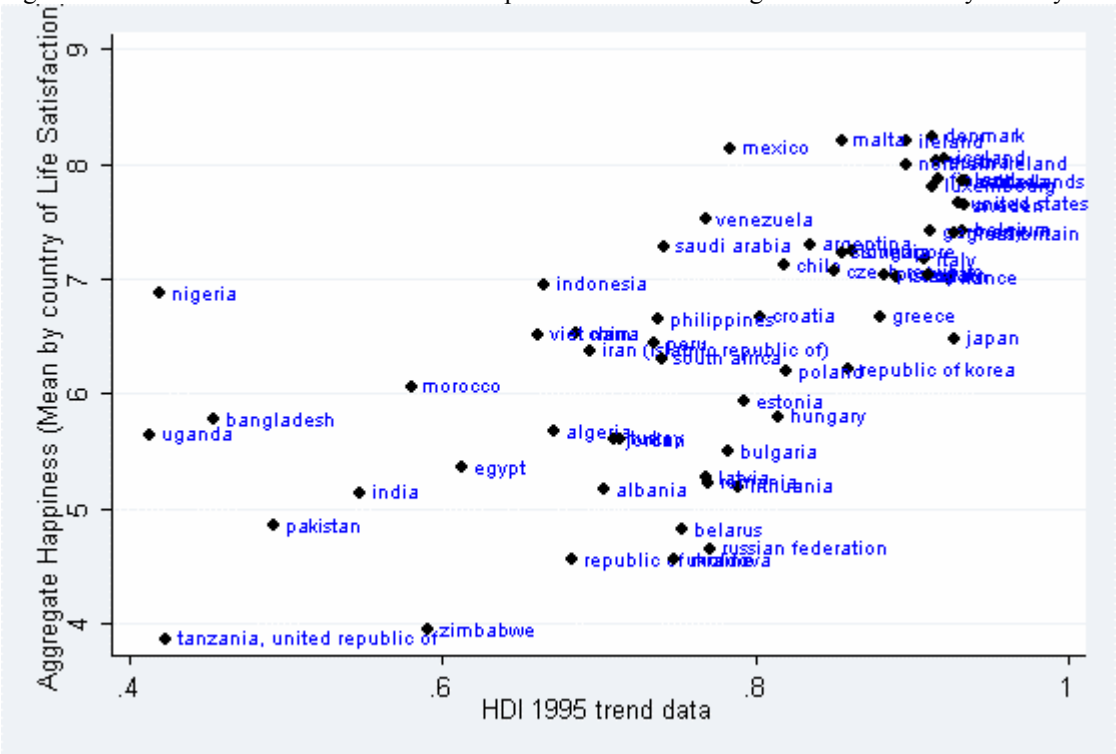


Figure 2 also shows that there are a group of outliers among these HDI data, who seem to be unreasonably unhappy given their level of HDI. It is interesting that many of them seem to be members of the former Soviet Bloc, which might indicate that after going through so much control and hardship under a socialist system, people were used to being unhappy with their life situation and subsequent development has not motivated them to be happier. Another important factor that might account for some of these countries being outliers is that, since HDI is an indexed variable, countries tend to cluster more than when compared with GDP, which has a much larger range of values. Additionally, many of these ex-Soviet States seem to have low GDPs per capita as shown by figure 1, and accordingly, when the relationship is then measured in terms of HDI, because the effect of GDP is muted by two-thirds, these countries are moved ahead in the ranking of socioeconomic progress as a result, leading to the conclusion that they should be happier than they are.

Nigeria is also one of the clear outliers according to figure 2. Despite having one of the lowest levels of human development, they are on par in terms of life satisfaction with countries such as South Korea and Indonesia. Uganda, Zimbabwe, and Tanzania, other countries in Africa that share similar characteristics to Nigeria, do not seem to have the same inflated level of life satisfaction. The macro economic indicators used in this paper could be less important in a country like Nigeria. Achieving high incomes may be less important to the average Nigerian compared with other countries included in the WVS. Another explanation for the elevated levels of life satisfaction in Nigeria could be related to the country adopting a civilian government after 16 years of military rule just prior to the 2000-wave of the WVS (CIA World Factbook, 2007). This change in the political system to a more democratic style of governance might have led the average Nigerian to feel more optimistic towards their current and future life state given no change in their income levels. The Nigerian example suggests that using multivariate analysis to predict happiness will produce a model with more explanatory power than one that focuses simply on income.

These two examples suggests that in some countries, economic measures such as HDI or GDP are not going to be effective at explaining happiness with respect to other countries. Since the World Bank (2007a) does not have any unemployment data for Nigeria, it is not included in the model that controls for rates of unemployment and the difficulty that may arise in trying to explain the life satisfaction of the average Nigerian is avoided. Clearly, when income per capita and HDI are not as effective as explaining a person's life satisfaction, it is evident that there must be other factors that would lead a better prediction of self-reported SWB if they are also taken into account. In the Nigerian context it is clear that when people make considerations on the state of the political and social structures existing in a given country, these measures can have a significant impact on life satisfaction. The ex-Soviet States also show that when countries are used to living in places where their freedom has been constricted, they seem to be less well-off in terms of average happiness levels than they ought to be. Multi-variable analysis allows us to

control for these phenomena, which asserts the importance of considering other variables outside of GDP and HDI in explaining life satisfaction. [6]

One of the key empirical issues to deal with in this project was to build a model that fits the distribution of the life satisfaction variable. Given that life satisfaction is measuring something that is in many ways subjective, it is important to see how responses given in the WVS are distributed in comparison to the standard normal curve. Responses to the life satisfaction question in the WVS were given on a ten-point scale and there distribution is detailed in figure 3.

Figure 3.—Histogram showing the distribution of the Life Satisfaction (a170) variable

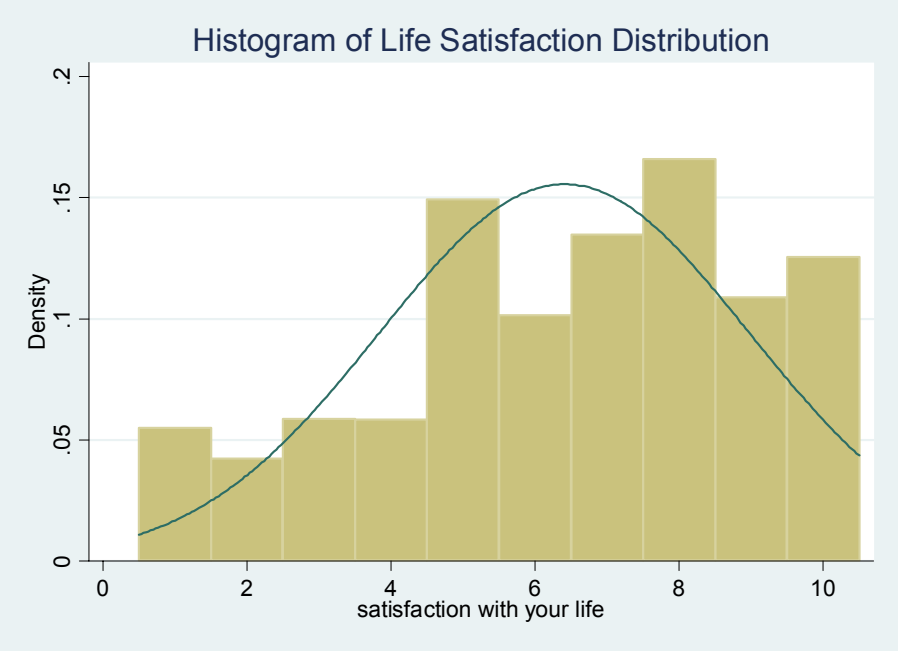


Figure 3 suggests that the distribution of life satisfaction data in the WVS survey is right-skewed. The majority of the respondents answer between 5 to 10 while each of the four lower response categories were given by around 5 percent of all those surveyed. The non-normal distribution of the dependent variable suggests that using a linear regression to explain happiness in this case would be inappropriate given that the dependent variable is not approximately normal by any means and it is also categorical data. This is the reasoning behind turning to the ordered probit statistical model to explain happiness across countries.

[6] Financial satisfaction is a question in the WVS. It was tested as a possible independent variable but the causation could not be determined (since it is measured on the same scale as life satisfaction), so it was excluded although several researchers have noted that relative income does have affect happiness.

The ordered probit model's central premise is that the beneath the ordered responses given by the dependent variable there is a "latent, continuously distributed random variable representing propensity to agree" (Daykin and Moffatt 2002, 158). They point out that this type of empirical data tends to be measured using a Likert scale, which produces data in "the form of ordinal, or ordered, responses" (Daykin and Moffatt 2002, 157). Ordered probit, as a result, produces regression coefficients in terms of maximum likelihood estimates (MLEs). Changes in these parameters can be interpreted as increases or decreases in the propensity of a given respondent to agree with a question. In the case of studying happiness, this would mean that increases in an explanatory variable's coefficient that is positive would make respondents more likely to give higher responses (i.e., to be more satisfied) to the life satisfaction question, whereas explanatory variables with negative coefficients would indicate that increases in those variables would lead people to be more likely to give lower responses to the survey question (i.e., to be less satisfied).

The dependent variable in this paper is a measure of how satisfied respondents are with their lives as taken from the WVS. People who give higher responses can be seen as more strongly agreeing that they are satisfied with their lives, while lower responses show that people more strongly disagree (i.e., they are dissatisfied with their lives on the whole). As Daykin and Moffatt (2002) illustrate, it is difficult to treat all people the same who might select a certain level of agreement to a categorical question when their corresponding levels of agreement might not be congruent. One person may have a different conception of what one category means to them when compared to another respondent. They argue that using a linear regression in the case of an ordinal dependent variable like satisfaction is problematic because a linear model measures the number of units that the dependent variable is expected to change after a one-unit increase in an explanatory variable. The use of the ordered probit model in this paper also addresses the problem that they identify occurring in linear models if people are already at the highest possible category of the dependent variable: an explanatory variables changes in a manner that would suggest their life satisfaction in this case should increase but cannot because it is already at the maximum. This causes, as Daykin and Moffatt (2002) argue, a "bias toward zero in each [linear] regression coefficient" (159). Ordered probit as was

indicated earlier, allows for the same categories to capture differences in how different respondents might interpret them, so it reduces this problem with working with ordinal data.

The use of the ordered probit model in life satisfaction studies is less common than other approaches. The majority of happiness models using the WVS data tend to use some form of linear regression rather than an ordinal model, especially when life satisfaction measured on a 10-point scale is used as the dependent variable (e.g., Layard 2000a and Helliwell 2003). However, in the case when smaller ordinal categories are used to represent SWB such as 4-point scales asking people about happiness, ordered probit seems to be more common (e.g. Di Tella et al. 2003). Only a few studies of the economics of well-being that use a measure of SWB on a 10 or 11-point Likert scale have also turned to the ordered probit model to explain the determinants of SWB (e.g. Clark et al. 2001).

The difficulty in using a complicated mathematical model such as the ordered probit is that the regression results are not as simple to interpret and present as those of a linear model. These types of models are also more difficult to understand for people not as well-versed in statistical analysis. In this paper, these issues were resolved through the use of the statistical add-on to STATA called Clarify (King et al. 2000).[7] Clarify generates predicted probabilities for each response of the dependent variable and is capable of measuring first differences in those probabilities as base characteristics are changed in the model (King et al. 2000).

The ordered probit model of life satisfaction that will be discussed for the rest of this paper will be comprised of a combination of individual-level and macro economic data. The individual data was gathered from questions contained in the 2000-wave of the World Values Survey (2006a) and the macro economic data was taken chiefly from the World Development Indicator Database produced by the World Bank (2007a) with the exception of Human Development Index values, which were produced by the United Nations Development Programme (Human Development Report Office 2006).

[7] For a full discussion on the benefits of using statistical simulation to generate more interpretable and comparable statistics from ordered probit models read the King article.

Table 1 shows the summary statistics for the key individual and macro economic variables used in this paper. The table lists the mean values, standard deviations, minimum, and maximum values, as well as the total number of responses collected for each variable taken from the WVS.[8] Each of the variables will be discussed in depth as it is analyzed.

The summary statistics of the dependent variable, life satisfaction, indicate that of the 100,086 survey respondents answered the question. As mentioned previously the minimum response is 1 and the maximum is 10. For the whole sample in all countries, the average response given was 6.41 out of 10. The potential factors that would lead an individual to give a high or low response question used as the dependent variable will be detailed in the next section.

Table 1.—Summary Statistics[9]

Variable	Mean	Std. Dev.	Min	Max	Observations
satisfaction	6.408509	2.565421	1	10	100086
freechoice	6.596852	2.513011	1	10	96565
Belief	7.617574	3.087872	1	10	98215
Age	41.12099	16.32186	15	101	100931
incscale	4.618177	2.406227	1	10	88033
Male	.4798564	.4995965	0	1	101124
Divorce	.0542892	.2265886	0	1	100683
Married	.6185155	.4857534	0	1	100683
Employ	.6529621	.4760303	0	1	100234
Unemp	.0960852	.2947095	0	1	100234
Trust	.2826543	.450292	0	1	97338
hdi1995	.7664105	.143347	.413	.935	63*
gdp1998	12070.22	9658.275	502.7777	41497.04	66*
Unemp1999	9.759118	4.697661	2	23.3	55*
inflati~1999	14.26967	35.26385	-1.407892	293.6787	65*
Gini2000	36.5837	8.147068	24.7	57.78	66*

Total number of observations in integrated 2000-wave of the WVS and EVS: 101,172
*=number of countries

[8] Table 1 contains macro economic data from the World Bank and the UNDP.
[9] Table A11 in the Appendix provides definitions for all independent variables used in the paper.

5. Results

In order to compare the relative effects that GDP and HDI have on SWB two models were tested simultaneously for their corresponding abilities to explain variation in SWB. The predicted life satisfaction results generated in this section of the report were estimated using the following equations:

$$H_{ij} = f(gdp1998_j, unemp1999_j, inflation1999_j, gini2000_j, incscale_i, belief_i, male_i, age_i, age2_i, divorce_i, married_i, employ_i, unemp_i, trust_i, \mu_{ij}), \quad (1)$$

$$H_{ij} = f(hdi1995_j, unemp1999_j, inflation1999_j, gini2000_j, incscale_i, belief_i, male_i, age_i, age2_i, divorce_i, married_i, employ_i, unemp_i, trust_i, \mu_{ij}), \quad (2)$$

In both these models, H_{ij} is the predicted level of life satisfaction of individual i in country j. This level of life satisfaction is a function of country j's macro economic indicators. In the first equation these macro variables include GDP per capita in PPP (1998), their rate of unemployment in 1999 (unemp1999), the rate of inflation in 1999 (inflati~1999), and country j's Gini coefficient in the year 2000 (gini2000). In the 2nd model GDP is replaces by HDI 1995. The other aspect of life satisfaction as a function of its explanatory variables are the personal characteristics of individual i. These characteristics include their gender (male), their age as well as the squared term of the age (age and age2), how strongly they believe in God, their marital status (divorce and married), unemployment and employment status (unemp and employed), whether or not they generally trust others (trust), and the income scale that the person fits into in their home country (incscale).

Table 2 reports the coefficients, standard errors, z-statistics and their corresponding two-tailed z-tests that result when the first model containing GDP per capita is estimated with the data.[10] The measure of goodness of fit of this model, Pseudo

[10] In tables A3 and A4 listed in the appendix the corresponding models are calculated using a control variable for political structure and the openness of society. This variable was not included in the original model to allow for the chance to compare GDP's and HDI's affect on SWB if the free choice variable is added.

R^2, equals 0.0400. However, this statistic is calculated differently than the goodness of fit measure used in linear regressions as it compares the maximized log-likehood with the restricted log-likehood that are generated in the ordered probit regression and accordingly, it cannot be used to evaluate the amount of variation explained by the independent variables in the same capacity as the R^2 from an Ordinary Least Squares regression. Daykin and Moffatt (2002) do however mention that this measure is best used to discriminate between different models trying to explain the same dependent variable.[11]

Table 2.—Ordered Probit Regression of Life Satisfaction using GDP per capita

Indendepent Variable	Coefficients	S. E.	z	P>|z|
gdp1998	.0000298	6.18e-07	48.24	0.000
unemp1999	-.0157459	.0010888	-14.46	0.000
inflati~1999	-.0064824	.0002122	-30.55	0.000
gini2000	.0106348	.0005774	18.42	0.000
male	-.0295259	.0090552	-3.26	0.001
age	-.0288841	.0016357	-17.66	0.000
age2	.000292	.000017	17.17	0.000
belief	.0306194	.0015064	20.33	0.000
married	.1743557	.0108963	16.00	0.000
divorce	-.0369136	.0193851	-1.90	0.057
employ	-.046725	.011558	-4.04	0.000
unemp	-.3253242	.0171359	-18.98	0.000
trust	.1304763	.0096129	13.57	0.000
incscale	.0723586	.0018077	40.03	0.000

Dependent Variable: life satisfaction, on a scale of 1-10. Number of Observations = 58808
Log Likelihood = -124492.52. $\chi^2(14) = 10384.80$. Pseudo $R^2 = 0.0400$. Cut1 = -1.23. Cut2 = -0.86. Cut3 = -0.59. Cut4 = -0.34. Cut5 = 0.10. Cut6 = 0.40. Cut7 = 0.78. Cut8 = 1.32. Cut9 = 1.80.

The first independent variable in the model is GDP per capita, in 1998, as measured in constant 2000 international dollars.[12] GDP has a high statistical significance to the model as is demonstrated by its z-statistic of 48.24 and its positive coefficient suggests that those individuals who live in countries with higher GDPs per capita have a higher propensity to say that they are very satisfied with life. If the income per capita as measured by GDP of one country is significantly higher than in another country, these results mean that the average person in that country is able to acquire more good and

[11] For a full-discussion of how Pseudo- R^2 is calculated and other aspects of the ordered probit model, refer to Daykin and Moffatt (2002).
[12] Given that the WVS data was collected from 1999-2001, this study faced the issue of choosing from which year to take the measure of GDP.

services that would make them happier. In other words, the average person in a rich nation is happier than the average person in a poor country as was noted in the literature review and is again confirmed by the regression results. An explanation for this relationship might be that as GDP or average income per capita increases an individual is likely to have more money to spend on goods and services that make them happier.

Di Tella et al. (2003) mentioned in their study that adding a single-year time-lag onto GDP per capita makes minor differences in models of SWB, but as larger time-lags are used, the measured effect of GDP per capita on SWB begins to weaken. This was partially observed in this model of SWB as changing the year of GDP had only minor impacts on the pseudo measure of goodness of fit.[13] Preliminary tests suggested that the GDP per capita values in 1998 were the most effective as explaining SWB in this model; advancing the year in which GDP per capita values were taken slightly reduced the Pseudo R^2 despite the fact that some of the countries in the WVS were surveyed in 1999, 2000 and 2001. Given that this wave of the WVS was conducted over a multiple-year period, it might be worthwhile to try and identify a method to specify GDP values according to the year a given country was surveyed but such a method is beyond the scope of this paper. All GDPs per capita were taken from 1998.

The next independent variable in the model is the rate of total unemployment in 1999, given as the percentage of the total labour force that was unemployed. The coefficient on the unemployment variable is negative as expected. This negative coefficient indicates that as the rate of unemployment in a given country increases, a person in that country will have a lower propensity to say that they are very satisfied. The z-statistic of unemployment also indicates that it is statistically significant from zero. Unemployment rates presumably are important in discussing cross-national differences in SWB in a given period because unemployment is a damaging experience to have to go through both pecuniary and psychologically.[14] As Di Tella et al. (2001) discussed, the fear people have of becoming unemployed decreases with unemployment rates, since

[13] The regressions detailing the differences in the measured effect that GDP per capita has on SWB are available upon request.

[14] It is particularly important the unemployment rate has a negative effect on SWB even after controlling for whether the individual respondent is unemployed as captures by the unemp variable. This suggests that even the threat of becoming unemployed as indicated by high national unemployment rates is enough to depress SWB.

presumably lower unemployment rates would lead people to give more favourable responses regarding their SWB.[15]

The rate of inflation in a given country was another of the macro economic variables used in the analysis of SWB. Inflation rates were taken from the year 1999, as measured by the consumer price index. Using the consumer price index tends to overestimate the inflation suggesting that the effect of inflation on SWB might be overstated. Inflation also exhibits the relationship to SWB that one would anticipate; if inflation is higher in a given country then this will lower the propensity that a respondent will say that they are very satisfied with their life. This follows from the idea that if prices are rising significantly in a country while the average income is fixed, then this effectively makes people less able to satisfy their material desires thus making them less satisfied with life. The z-test for inflation in 1999 suggests that is clearly statistically different than zero. Both the years of data used for unemployment and inflation were selected because compared with the results of regressions using the previous or successive year's data, they yielded an ordered probit model with a higher goodness of fit measure.[16]

The final macro-level variable, the Gini coefficient, is an index measuring the distribution of income within a given country j. The data is estimated by comparing how far the distribution of income in a country differs from perfect equality (Avtonomov et al. 1999). As this study by the World Bank institute indicates, this is done by plotting the Lorenz curve, which compares the cumulative percentage of the total income in a country held by percentages of the population ranging from the poorest individual to the richest, against the 45-degree line, which is the case where there is perfect equality. The Gini index is then measured by taking the percentage of the total area underneath the 45-degree line that is bounded between it and the Lorenz curve of a given country. The

[15] The World Bank database (2007a) of unemployment rates for some of the developing countries that are included in the 2000-wave of the WVS are not available in the years over which the survey was done and as a result, 14 countries are excluded from the analysis when national unemployment rates are used. This exclusion does not make a significant difference in how per capita income affects life satisfaction. In fact, as shown by the first differences in table A4 of the appendix, the effect of including unemployment rates is relatively small. If an individual went from living in the poorest country in this wave of the WVS to living in the richest country, then their likelihood of being satisfied would increase by only an additional 2 percent as compared with the model controlling for national unemployment rates.

[16] The regressions detailing these Pseudo- R^2 values are available upon request.

closer to zero this index is, the more equally income is distributed. The Gini coefficients appearing in this model were taken from the year 2000.[17]

In this model the z-statistic for the Gini index shows that its effect on life satisfaction is significantly different from zero. However, the coefficient on the Gini index is surprising. The positive sign, suggests that the higher the level of inequality in a country the more likely someone is to report high life satisfaction. This relationship may exist amongst the data because some of the OECD nations, which have relatively high average levels of happiness, such as the United States, have Gini coefficients around 40 percent, which would mean that some level of inequality in the model is correlated people being happier, but in countries with more extreme inequality, this relationship might reverse. This hypothesis was tested by including a quadratic of the Gini coefficients in the regressions. This led to the coefficient estimated on the Gini index to become negative as might be suggested, but the quadratic term was positive, so this would seem to contradict the notion that the Gini index at first raises life satisfaction and then further increases would lead to lower life satisfaction. Helliwell (2003) also noted that the Gini coefficient seemed to have a strange effect on life satisfaction, and in his model, he concluded that it "added no explanatory power to the well-being equation" so he removed it. In comparison, there is still a measured effect on life satisfaction from the Gini index in our model, yet its relationship is elusive and further investigation needs to be done into its underlying functional form. Perhaps, this would be possible with a more wide-reaching survey of both developing and developed nations; however this depends on data availability in the developing world on income distribution. The regressions detailing these puzzling relationships are depicted in appendix tables A1 and A2.

While many of the macro-level variables used in the regression were continuous, the majority of personal factors included in the model are dummy variables. The gender of the i^{th} respondent is given by the variable male. In the event that the gender of the respondent is male, they are predicted to have a marginal decrease in their probability of saying that they are very satisfied with life. The variable is statistically insignificant from

[17] For a few countries data in the year 2000 was not available from the World Development Indicator database, but Gini index values for the year previous or in one or two cases only the preceding year were available and these were used to allow for inclusion of more countries in the model controlling for income inequality.

zero at the 0.001 level, so it is one of the least important variables in the model. It could be the case that women for some reason are predisposed to saying they are happier with their lives for cultural reasons.

While gender was fairly insignificant to predicted SWB, a respondent's age does a have more of an influence on SWB. The squared-term of age was also included in the model because as Helliwell (2003) among others (e.g. Frey and Stutzer 2002) have noticed that age seems to have a relationship with SWB in clear U-shaped pattern. These results are confirmed by this analysis. The coefficients on the age terms show that while the probability of being very happy seems to decrease as people move from youth into middle age, as people get older their this probabilities reverses and they are again more likely to report being very satisfied with life. Middle-age is often burdened with some of the biggest and most difficult decisions one makes in a lifetime such as marriage, having children, and buying a home. Also, people in middle age tend to focus on family more than themselves and have less time to pursue their own interests, so this might explain the reason for the decline in happiness. Moreover, as people get older they tend to have more time to devote to their own needs again and their SWB increases.

Spirituality also seems to play a role in determining SWB. The variable "belief" was a question from the WVS that asked on a scale of 1 to 10, how important God was to your life, where a response of 1 would indicate little importance, whereas a score of 10 would indicate that God greatly mattered. The results from the regression show that on average, those people who value religion or in this case belief in God, have a higher likelihood of reporting being satisfied. An argument explaining this might be that respondents who are more spiritual might be more likely to believe that their current life circumstances are more suitable than those people who lack this quality.

The next two variables are dummy variables that try to capture the effect that marital status has on SWB. The coefficients of both married and divorce are logical, as those who report being married are more likely to be happy and those people who are either divorced or separated, have a lower propensity to say they are very satisfied with their life circumstances. The z-test on the divorce variable indicates that at the 5 percent significance level, the affect of divorce on happiness is not statistically significant. At the 10 percent significance level, however, it is still significant. Since divorce can be

presumed to have a negative effect on SWB, the displayed p-value is for a two-tailed test, so it would probably be more appropriate to use a one-tailed test testing whether the coefficient of divorce is less than zero. In this case, the p-value could be halved, making the measured effect of being divorced or separated more significant to the model. One of the reasons for the minor effect of divorce is that according to the summary statistics, just over 5 percent of the population reports being either divorced or separated and that could lead there to be too few data points to make any kind of reasonable conclusion on how divorce affects SWB. Marriage on the other hand is clearly statistically significant, so there it is the case that on average married people are more likely to be happier than people who are not married, given the sign of the coefficient.

Personal employment status was also included in the regression using information from the WVS to create employment and unemployment dummy variables. They were generated from a question asking employment status where a choice of eight different categories was given. The effect of being unemployed on personal well-being is shown to be significant and its coefficient is negative meaning that if someone becomes unemployed, then it is expected that they would be less likely to give high scores of SWB. Personal unemployment still has this clear cost on SWB while just under 10 percent of all those surveyed reported being unemployed. Conversely, whether someone is employed or not does not really add any explanatory power to the model. The coefficient on employment is opposite in direction than would be expected. Although, this curious relationship between personal employment and SWB is not by any means powerful as the z-statistic for the employment variable was -4.04, which is one of the lowest z-statistics in the entire model. This stems from the fact that a majority, over 65 percent, of those interviewed in the WVS reported being employed and with this large group of people with the same personal characteristic you could expect there would be a great variation in reported SWB, so knowing whether someone is employed or not does not add much to our happiness model.[18]

The final dummy variable in the model was generated from a question asking whether or not people in general trust others. The idea of this variable was to be able to

[18] Another of the reference categories in this question from the WVS is "not in the labour force", so perhaps people who do not have to work are in fact happier.

try and capture how trusting people are of those that they deal with in society to see if more optimistic people would be more likely to report being satisfied with life. Of all those surveyed approximately 28 percent of 97338 respondents reported that "most people can be trusted." The results in table 2 suggest that those who trust others are more likely to give higher scores of SWB. Helliwell (2005) identifies that trust is often a consequence and catalyst of stronger social capital. While he identifies the casual relationship of these two variables is hard to determine, trust seems important to the well-being of a society as it makes people more likely to establish networks in society and also seems to suggest that a society that is closer and trusting of one another will be better off than a more individualistic, and pessimistic society.

The scale of individual income for each respondent was also included in the model to try and see how personal levels of income help to explain life satisfaction in comparison with aggregate measures. The income scale is broken into 10 categories of income for each country and respondents are asked to indicate between which scales of income their income resides.[19] Personal income seems to strongly affect SWB as if people rise up the scales of income then they will have a higher probability of reporting that they are satisfied. Income seems to be a great deal more important the measure of spirituality we used from the WVS. Both income and belief are measured on a scale from 1 to 10 and the coefficient on income is 0.072 while for belief it is 0.031. So while spirituality and income are in no way measured in the same terms, given that their scales are identical, it seems that a change in income seems to be of more importance to SWB than if someone were to become a more spiritual person. Supporting the relevance of personal income further, table A8 in the appendix shows that the mean SWB of someone in the top scale of income is 7.53, while the mean SWB for the average person in the lowest scale is only 5.41. This confirms that people with higher levels of personal income within a country are on average happier. This certainly paints a negative portrait of the values humanity holds, it is immediately evident that financial security is a huge

[19] The WVS first breaks income into country specific scales from one to ten (where one represents the least well-off people in society and 10 represents the highest category of income in a country), and then aggregates them together by placing everyone who fell in their respective income scale within their own country in the corresponding category from one to ten in the non-country specific income scale in order to get a income scale that is comparable across countries (WVS 2006a).

area of concern for the average person in the world, so it is not hard to fathom it mattering more to people than spirituality.

With the same personal characteristics that were just analyzed combined with the macro-level determinants, human development will take the place of per capita income in this succeeding model of SWB. The model using HDI will differ because of the three dimensions that comprise HDI versus the single focus of per capita income, but HDI still includes a measure of GDP per capita and accordingly the results will in some manner have some similarity to the original model of SWB.

Listed in table 3 are the results of the ordered probit regression of life satisfaction using HDI in the place of GDP per capita. The HDI values used in this regression are the 1995 time trend values as given in by the Human Development Report Office (2006). This year was selected because HDI historical measures are done by five-year intervals (HDI data is only available in 5-year increments save the current year of the Human Development Report) and given that they change the calculation methods or source data every year, it is impossible to compare HDI values from the current Human Development Report with earlier calculations. The 1995 levels for HDI were also more relevant to the SWB model than the 2000 values as determined by the Pseudo R^2 statistic.[20]

Table 3.—Ordered Probit Regression of Life Satisfaction using HDI

Indendepent Variable	Coefficients	S. E.	z	P>|z|
hdi1995	2.829428	.0549751	51.47	0.000
unemp1999	-.0236554	.0010795	-21.91	0.000
inflati~1999	-.0069442	.0002065	-33.63	0.000
gini2000	.0111727	.000604	18.50	0.000
male	-.0151624	.0091741	-1.65	0.098
age	-.0299447	.0016506	-18.14	0.000
age2	.0002961	.0000172	17.26	0.000
belief	.0401801	.0015768	25.48	0.000
married	.1747461	.0110049	15.88	0.000
divorce	-.0397841	.0195711	-2.03	0.042
employ	-.0557129	.0116277	-4.79	0.000
unemp	-.3238944	.0172794	-18.74	0.000
trust	.1490215	.0096879	15.38	0.000
incscale	.0736006	.0018304	40.21	0.000

[20] The results from these regressions are available upon request.

Dependent Variable: life satisfaction, on a scale of 1-10. Number of Observations = 57666 Log Likelihood = -121849.08. $\chi^2(14) = 10550.54$. Pseudo $R^2 = 0.0415$. Cut1 = 0.62. Cut2 = 0.99. Cut3 = 1.27. Cut4 = 1.51. Cut5 = 1.96. Cut6 = 2.26. Cut7 = 2.64. Cut8 = 3.18. Cut9 = 3.66.

The relationships between the explanatory variables and SWB remained effectively the same. Nevertheless, amongst the personal factors there are a few alterations. Gender seems to be even less important in the HDI-model as now gender is statistically insignificant at the 5 percent level and is just short of being statistically no different from zero at the ten percent level. The divorce dummy variable also altered slightly as its z-test fell from 0.057 to 0.042, meaning that it is slightly more important in the HDI model. Again divorce should probably be stated as a one-tailed test, so it is well-enough under the 5 percent statistical significance level.

While the changes in personal factors did not seem to follow any pattern, the other macro-level determinants in this model all increase in relevance when compared with their coefficients and z-scores as stated in table 2. In particular the increase in the magnitude of the coefficient on the unemployment rate of a country is significant as it changed from -0.016 in the first model to -0.024 when included with HDI. The improvement in country unemployment rates in the HDI model could have resulted from the fact that with income less prominent in the HDI measure, other macro measures such as unemployment now take greater importance in explaining differences in SWB, especially between richer countries where life expectancy and the logarithm of income are minor.

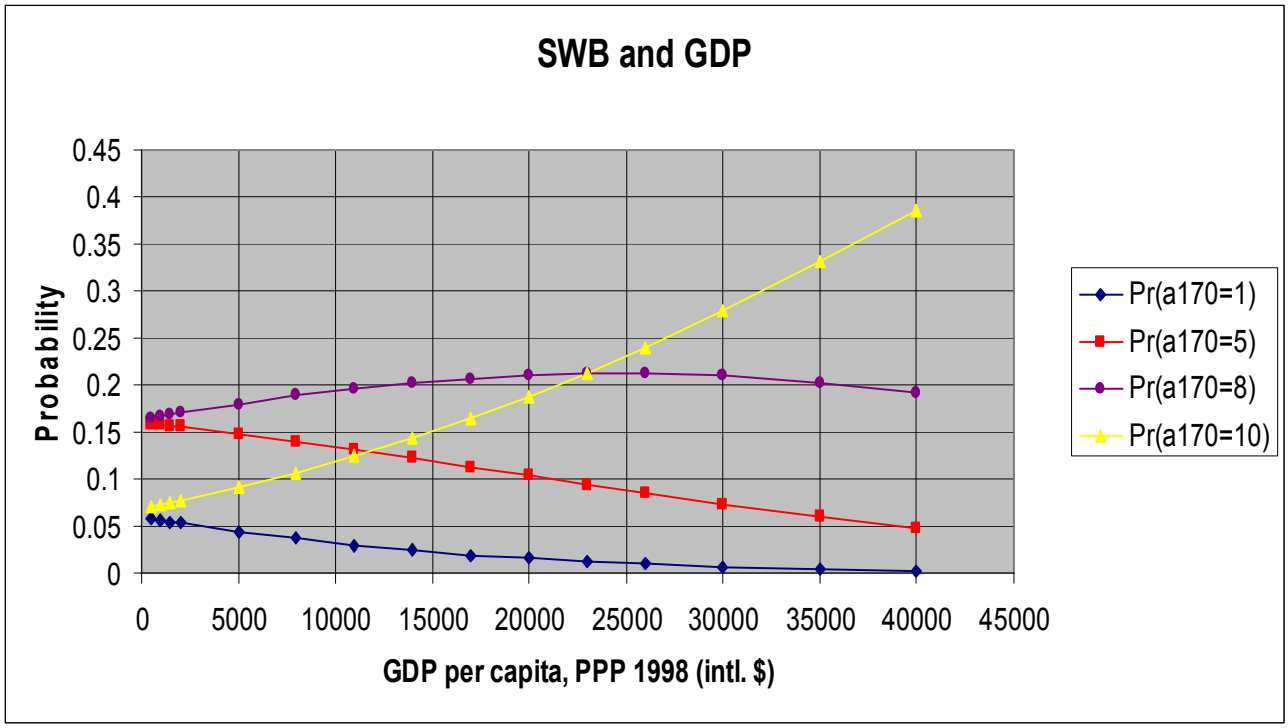
When trying to compare which model is more effective at explaining SWB, it is important to recognize the completely different scales used by both GDP and HDI. The result is that coefficients on HDI and GDP are not immediately comparable. Using the Pseudo $R^{2'}$s of the two models, it is possible to discern that the HDI model is slightly more favourable to the GDP per capita model, but the difference is only 0.0015 as the HDI model has a Pseudo $R^2 = 0.0415$. Given the minute difference, it can be concluded that the HDI model is only slightly better at explaining SWB as compared to one including GDP. Further analysis of which socioeconomic indicator is a better measure of SWB will use an approach that has not yet been utilized in the field of economics and happiness. The ordered probit results of both models were converted into predicted

probability distributions across each possible response of the dependent variable using statistical simulation generated in the STATA add-on Clarify that is detailed in (King et al. 2000).

6. Explaining Life Satisfaction changes using GDP and HDI

Figure 4 illustrates the change in probabilities of giving a particular response to the SWB question in the WVS across all levels of per capita income. As the results indicate GDP per capita greatly affects the likelihood of an individual reporting that they are very satisfied if they live in a rich country. In fact, if a person were to move from the poorest country in this study, Tanzania, to the richest country in terms of per capita income, the United States with over $32,000 in 1998, then that person would be around 23 percent more likely to report that they are very satisfied with life compared with when they lived in Tanzania. These results make it self-evident that when it comes to cross national differences in SWB, income really does matter. The predicted distribution of other responses is shown by the three other lines. The difference between the number of people who would give responses of 8 to the life satisfaction question is not significantly different if we use our Tanzania-United States comparison once again. Someone who moved from Tanzania to the United States would only be about 4 percent more likely to give a response of 8 relating to their SWB. Increases in GDP per capita also markedly reduce the likelihood that someone would give a SWB score of 5 and 1. Again, if a citizen of Tanzania were to move to the United States, then they would be approximately 10 percent less likely to report a SWB score of 5 according to figure 4.

Figure 4.—Graph of the predicted probabilities of giving a certain response to the life satisfaction question across varying levels of income per capita.



But, how might huge movements of income compare with smaller increases given that someone is already living in a country with a comfortable standard of living? This case can be evaluated with the use of figure 4 by measuring the how much the probability of being very satisfied would change in a more-developed country given a change in income per capita.[21] If a country with an income per capita of approximately $20,000 were to somehow increase the income by around $2,500 per person, then this would lead to an approximately 3 percent increase in people who say they are very satisfied with life.

While the last example explained the effects on SWB resulting from smaller changes in per capita income, the drastic increases in the predicted probability distribution of giving a response indicating that someone was very satisfied is most likely less accurate over higher levels of income per capita. Going from the minimum GDP per capita to the maximum GDP per capita according to figure 4, would lead someone to be more than 30 percent more likely to say that you are very satisfied with life. The reason

[21] The predicted probabilities used in figure 4 were created by building 1000 simulations of the ordered probit model using Clarify. These results were generated by setting all the explanatory variables at the means, except for employment status which was set at 1, marital status which was set at 1 and trust, which was also set at 1 (indicating a person is employed, married, and trusts others)

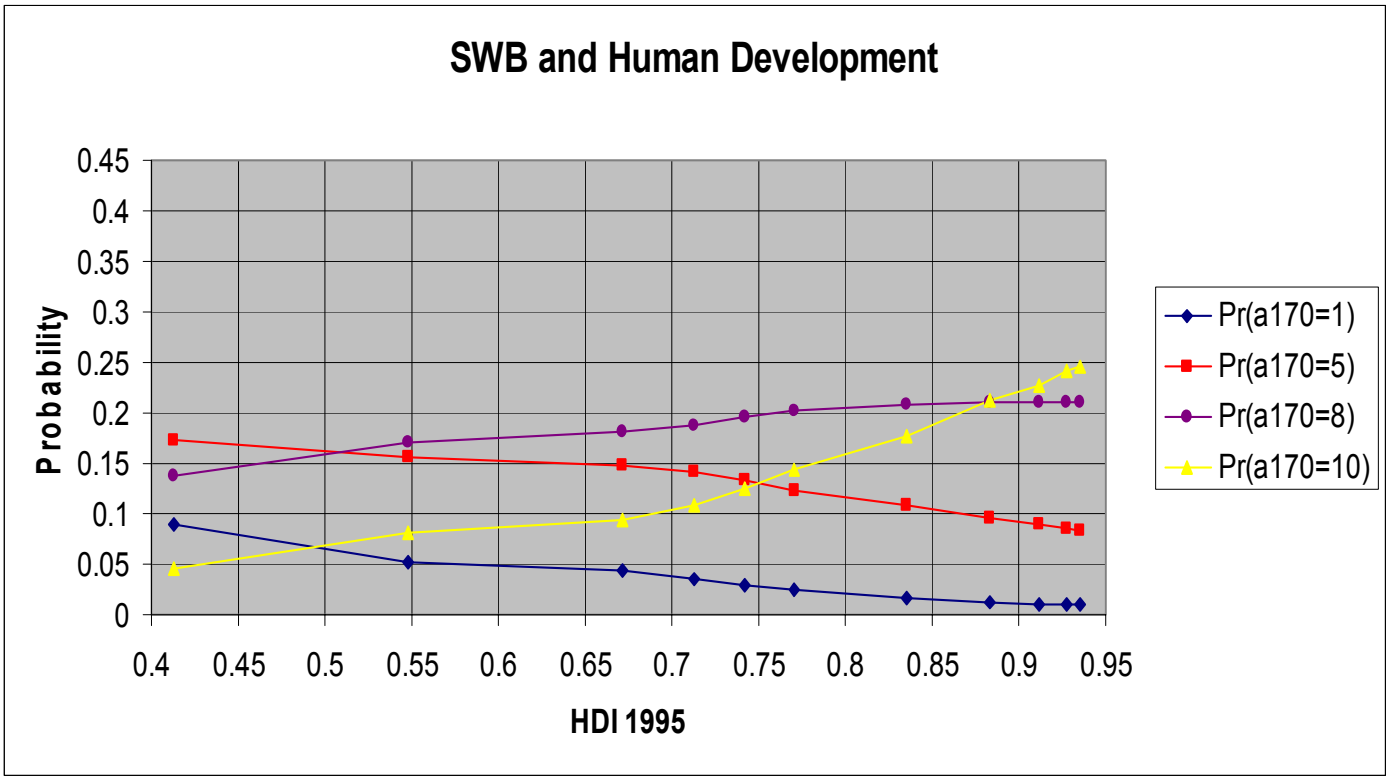
for the inaccuracy towards the higher GDPs per capita is that there are only two countries in the sample with incomes per capita that exceed $30,000, the two countries being the United States and Luxembourg. The other issue that leads to misestimating this relationship at higher levels of GDP is that the majority of the countries that are between the $25,000 to $30,000 are mainly Western social democracies such as Canada, Denmark, the Netherlands, Finland, Ireland, and so on, who all have higher than expected aggregate SWBs given their level of per capita income. In comparison, the Untied States's and Luxembourg's aggregate SWBs are lower than would be expected given they are at the most materially well-off countries. When making the simulations, Clarify probably takes into account these happier than normal countries and builds the first differences more heavily on their resulting SWBs if their income were increased because they outnumber the two outliers.

In trying to assess whether GDP or HDI is a better predictor of life satisfaction, it will be useful to apply the previous analysis to data from the HDI SWB model. The results of plotting the same predicted probabilities across all possible levels of the human development index are detailed in figure 5. It is immediately clear that the extent to which the likelihood of saying someone is completely satisfied with their life does not have as steep or steady of a slope as was the case in figure 4. There are several things to consider about the differences in the explanatory variables we are comparing that could explain some of the clear differences in the two graphs. The human development index does not have nearly the same variation as GDP because all the variation that the three components of HDI have are all compressed into an index from 0 to 1, whereas the GDP data varies from just over $500 to over $40,000. One of the consequences of HDI being an index variable, is that it pulls the distribution of countries across socioeconomic lines closer together because there are fewer possible values of HDI that a country could take on. The other important distinction to make is that the movement from $15,000 to $30,000 in terms of GDP on figure 4 is the equivalent jump in socioeconomic well-being as measured by HDI from 0.85 to 0.935. Therefore, a similar lateral movement in terms of country socioeconomic status is about twice the distance horizontally on the x-axis of figure 4 compared to figure 5. It follows that significant increases in HDI will seem compressed because of the way it is measured, so naturally there will not be the same sort

of steady upward slope that the GDP graph illustrates because of the greater range of values simulated respondents could have.

HDI still has an obvious effect on SWB as pictured in figure 5. If someone were to immigrate to Canada from Tanzania, Zimbabwe, or another country with a low level of human developing, ceteris paribus, according to figure 5, they would be 20 percent more likely to say that they are at the top level of life satisfaction. This effect is almost identical to the one exhibited by GDP in figure 4. Accordingly, if we want an even more direct comparison between the effects of HDI versus GDP, then given that Canada is the country with the highest level of human development in 1995 and their income per capita in 1998 was just over $25,000 we could compare on average how much more likely would someone moving from the worst-off country in the study to say that they are completely satisfied if they came to Canada. As we have seen, the increase in probability according to HDI is around 20 percent, whereas the same country movement in terms of GDP, from the minimum to Canada's GDP of $25,000 would lead to only about a 16 percent increase in the likely of being very satisfied. Given this result it appears that HDI is a better predictor of life satisfaction if we compare the two measures over similar movements up in terms of socioeconomic well-being.

Figure 5.—Graph of the predicted probabilities of giving a certain response to the life satisfaction question across varying levels of HDI



These results were generated by setting all the explanatory variables at the means, except for employment status which was set at 1, marital status which was set at 1 and trust, which was also set at 1 (indicating a person is employed, married, and trusts others).

Although, the effect of raising GDP from its minimum to its maximum was not used, it was not an overly bias comparison given the 95th percentile of GDP 1998 is $26897.64, just marginally above Canada's per capita income while the maximum level of income over $41,000. Whereas, if we compare the same range of values in terms of HDI 1995, the maximum value is 0.935 and the 95th percentile is 0.932. The result would have been the same if we compared both GDP's and HDI's effect on the probability of reporting 10 on the life satisfaction scale if the change in the explanatory variables was from the minimum to the 95th percentile. It is evident that HDI is a slightly better predictor of SWB in comparison to GDP as the pseudo measures of goodness of fit also indicated.

While the data seems to indicate that GDP is slightly less effective at explaining cross-national differences in SWB, the difference between it and HDI are marginal. This is in a way disconcerting given that it would be expected that the broader measure of human development and progress would be better at estimating the subjective well-being then a measure of well-being that puts all its focus into income. Yet, all things considered, GDP remains an exceptional one number proxy for how a society is doing, at least in terms of cross-sectional analysis of SWB. While it certainly has its drawbacks when trying to explain differences in happiness levels among advanced industrialized nations, it is not significantly worse at predicting life satisfaction than HDI.

HDI after all is only a three-dimensional story of human development and given that literacy rates among rich nations are nearly identical and there are only minor differences in life expectancy, it is not surprising to expect that HDI will do little better than GDP at explaining life satisfaction. First of all, HDI is not available every year and is produced with a time lag, which makes it inconvenient to use in empirical analysis. Helliwell (2003) offers a suggestion for why HDI is only marginally better at explaining satisfaction: in his analysis of the WVS satisfaction data, average life expectancy had no relevant effect. If his conclusion is true, than already one-third of the index has already greatly diminished in its ability to uncover the key determinants of life satisfaction. Additionally, the fact that only one-third of the HDI is made-up by income per capita, if

income per capita has a significant effect on SWB, then GDP will be better at predicting the aspect of SWB that is explained by income levels. While HDI is most likely a more desirable measure for comparing cross-national differences in SWB, its similarity to the effect produced by using GDP in its place suggests that future research needs to look into ways to either revise the components of HDI or find another socioeconomic measure that does not have the same negligible effect on happiness at high levels of income per capita such as GDP.

7. Do you trust your friends?

While macro economic factors have clear effects on SWB, it is also important to note the relevance of personal factors, such as trust, on SWB. The effects that trust, unemployment, as well as freedom of choice and control will all be estimated by measuring the changes in the propensity to be happy corresponding to a change in an explanatory variable.

The level of trust that people have in the society in they live has clear effects on how people answer questions about life satisfaction. In figure A1 and A2 found in the appendix, the same graphs of HDI and GDP are shown, except in this case the base individual considered distrusts people on the whole. As these two graphs show, in both cases there is almost a 5 percentage point drop in the probability that the base individual will be very happy, across all levels of the socioeconomic indicator. This shows the importance to well-being that simple characteristics such as trust can realize in human beings. A trusting society would most likely be a more cohesive population, which is probably one of the reasons that on average those people who live in trusting societies are on average happier. Table A10 in the appendix details means of life satisfaction according to specific conditions of the explanatory variables and the ones concerning trust reiterate that trust matters when it comes to inferring how happy people are. People who say that they trust others are on average answer 0.50 higher on the Likert scale used to measure life satisfaction.

Unemployment is another factor that can detrimental to SWB. In table A5, the first differences are calculated using Clarify to see how a change in the unemployment

rate, holding all else equal, from the mean of 8.7 percent to the minimum level of 2 percent would change the probabilities of our base individual across every satisfaction category. This is essentially measuring the effect on average well-being if a country was to go from a recession to full-employment. Table A5 shows that the average person in that country would be just over 4 percent more likely to report being completely satisfied with their lives. Country-wide unemployment clearly makes people less likely to be happy. The effects of personal unemployment of happiness can also be seen by comparing the mean SWB of someone who reports being unemployed in comparison to someone who currently has a job. Their respective mean SWBs are 5.43 compared with 6.51.

Table A7 in the appendix details the changes in likelihood across every category of SWB that would occur if an individual moved from the worst country in terms of HDI to the best. If this person happens to be unemployed and does not trust people, then the positive effects of a beneficial development policy on this person's well-being are much smaller. A respondent with these personal characteristics is only 12 more likely to say that they are very happy as compared with 20 percent when the person was employed and trusted others. This sort of individual is relevant to the Canadian context or another industrialized nation. When the average immigrant from a developing nation moves to an advanced industrial nation, they are most likely in the process of finding new employment in their field of interest and are probably unsure of whether they can trust people in their new country. Given the problem of recognition for foreign credentials in societies like Canada, this leads to newcomers unable to find an efficient role in the labour market. As a result of the SWB of this group of people would be substantially lower than would be expected among other groups of Canadians. Furthermore, if we were trying to optimize agents' SWB then having strict labour regulations concerning skills recognition of immigrants is economically inefficient. As long as the average Canadian resident is not made worse off by opening up the labour market then a significant portion of newcomers to Canada should have higher levels of life satisfaction. The conclusion here is that economic policies that improve socioeconomic well-being are less effective on people who are unemployed or pessimistic.

Testing the effect that the level of freedom of choice and control shows that the political and societal structure of a country has a dramatic influence on how happy people say they are. Tables A8 and A9 in the appendix demonstrate how much happier someone would be if they moved from the country with the lowest socioeconomic status to the country with the highest socioeconomic status, other things being equal.[22] The difference between the data presented in these tables and the graphs presented earlier is that these models control for the level of personal freedom each respondent experiences. This is measured in the WVS again on a 10-point Likert scale with a response of 1 indicating that people feel they have little freedom of choice and control in their lives while 10 would demonstrate that they feel a great sense of freedom. Incorporating this proxy for the type of political and social climate significantly reduces the effects that the measures of socioeconomic well-being have on SWB across the varying levels of per capita income and human development.

If again we run our experiment of moving from the lowest level of GDP per capita to the highest, then a person's probability of being very satisfied would increase by 28 percent as compared to almost 40 percent when the measure of free choice and control was not included in the model. A similar decline is noted in the case of the HDI model, as the change in probability of being very happy originally was 20 percent, but in the free choice model the effect of varying HDI from its minimum to its maximum only leads to a 16 percent increase in the number of respondents who would be expected to say that they are very happy. As was discussed in the literature review, it seems to be the case that the political dynamics of a country and social structure tend to be more open when the given development measures are higher, especially for GDP. This means that the effect of income on happiness in high income countries is overstated because part of their explanatory power is from developed nations being more open, both politically and socially, since it is a clear correlate of happiness. This fact is proven by the decline in relevance in per capita income as well as HDI when freedom of choice and control is factored into the model. It should also be noted that as shown by tables A3 and A4 in the appendix the Pseudo-R^2 measures of each model dramatically increases when the

[22] Tables A3 and A4 in the appendix also detail the results of regressions of Life Satisfaction using HDI and GDP with the free choice variable included in each model.

freedom of choice and control measure is added to each regression. This suggests that this variable is, again, a strong correlate of life satisfaction. Clearly, the inclusion of this proxy for people's attitudes on their level of self-determination drastically improves the ability to predict life satisfaction of both models.

8. Conclusions

As this paper has shown, subjective well-being has a broad range of determinants that influence its distribution across nations. While the Human Development Index certainly has a strong positive correlation with self-reported life satisfaction, its relationship is not significantly different than the one derived from comparing happiness and per capita income. This implies that, in seeking to consider happiness in economic and social decisions that we make, an index that covers a more broad range of the determinants of subjective well-being would be maybe slightly more effective than GDP. But GDP does pretty well and is easy and fast to calculate in comparison with other socioeconomic indicators currently available.

Before looking at what kinds of things society can do to try and put more value in improving life satisfaction, we must first consider whether life satisfaction is an objective condition worth optimizing. Traditionally in economics, we try to discover which choices make people better off, and see whether people are able to achieve these. This is done by comparing decisions that individuals make to discover their preferences. Could happiness be treated in the same way? It comes down to whether or not the idea of measurable and reportable happiness is something that humanity values.

Happiness or life satisfaction is something that every member of society values regardless of what income group they might fit into because it is a human condition that can be maximized regardless of what part of society someone belongs to, although as this analysis has clearly shown, it is more likely for people in certain economic conditions to be happier. Furthermore, studying happiness allows for more ways to compare whether decisions we make as a society are beneficial to all. It also allows us to see how well our current macro economic measures are at explaining the cross-national differences in a fundamental human condition such as SWB.

In terms of its merits to economics, the study of happiness could open policy-makers' eyes to the various and strong ways in which economic life circumstances impact well-being (Frey and Stutzer 2002). There is an inherit value in understanding how economic shocks will affect not only traditional economic measures but also the level of subjective well-being. Allowing for optimization in terms of happiness might lead to conclusions that might otherwise have been passed over if we stuck to just traditional economic variables. While building utility models from the observed behaviours that individuals make, certainly is an effective way to understand the incentives that lead people to pursue wants and desires, perhaps when utility models as (Frey and Stutzer 2002) indicate struggle to describe selfless behaviour, turning to happiness might allow for an more direct understanding of why humans behave the way they do. The prospects that subjective well-being measures have for economics are only in their early stages and with continued research in the field, perhaps we will be able to solve some of the many paradoxes that happiness exhibits.

While HDI does slightly better than GDP at explaining happiness, in building a better macro measure of socioeconomic well-being, there are several things that seem important to consider. Since the openness of the political and social environment of a country has evident effects of life satisfaction, incorporating this kind of information into a development index would allow for a more complete picture of how well-of some nations are.

Certainly income is by no means an insignificant factor in human happiness. The analysis in this paper clearly showed that both personal and per capita income have strong positive effects on happiness and thus including them in any measurement of well-being is important. Therefore, including GDP in HDI each year is never a bad starting place. To improve a socioeconomic measure such as HDI, it would be useful to test to see whether other information collected in the Human Development Report has a strong correlation with happiness, which could then be included in calculated HDI to make a more complete macro economic measure of well-being (Watkins 2006). If happiness is the criteria for determining how effective macro economic measures are at capturing the social welfare of a given society, then HDI needs to be revised, or more broad indexes need to be developed to show how well a society is doing. Happiness itself, could be

used as a measure that would dictate how well policy-makers are living up to society's expectations.

Criticisms of GDP being used as a proxy for social welfare are numerous. Many advocates of newer indices that take into account many of the things that GDP does not measure have suggested that GDP is an ineffective measure of how well a society is doing. GPI Atlantic, who are currently working on developing a more sustainable measure of economic progress show this by arguing that even Simon Kuznets, the principal designer of GDP argued: "the welfare of a nation can scarcely be inferred from a measurement of national income" (GPI Atlantic 2007). The evidence from happiness research seems to weaken this argument. While GDP may indeed not take into account the environmental consequences that come with improving economic well-being, it certainly is a strong correlate of self-reported happiness. If we take happiness to be an aggregation of all the factors of life that can influence a person to be satisfied with life or dissatisfied, then clearly, GDP could be argued to be a good indicator of "the welfare of a nation" as societies with higher GDPs are certainly happier. Using GDP as a measure of prosperity is still thought to be problematic as GPI Atlantic argues against the use of GDP again by evaluating what it measures:

> Since the GDP measures only the quantity of market activity without accounting for the social and ecological costs involved, it is both inadequate and misleading as a measure of true prosperity. (GPI Atlantic 2007)

But what is true prosperity? If high levels of happiness in a society indicate that a society is prosperous then it is clear that GDP is fairly good at indicating which countries are moving towards "true prosperity" because as was clearly shown, richer societies are happier.

This by no means indicates that taking into account the environmental damage that results from expanding an economy would lead to lower levels of happiness but it would be useful to see whether instituting policies that tackle the big environmental challenges of our time (i.e., Global Warming) would lead to increased life satisfaction. Income per capita may fall in the short-term if societies set drastic restrictions on carbon emissions, but if happiness would increase as a result then this shows that collecting information about individual happiness would be a useful guide for policy makers.

While the literature review showed that some psychologists often argue that explaining SWB lies mainly in genetics, this analysis has shown that economic conditions have a clear and strong effect on life satisfaction. Macro economic measures, individual characteristics, and societal values are all factors that lie outside of genes, yet have clear affects on happiness. GDP and HDI show that countries with higher incomes per capita or human development are generally better-off in terms of happiness. Additionally, people who are unemployed are generally less happy than those who are employed. As well, people living in societies that have more open political and social structures are also significantly more likely to be satisfied with their lives. These results that were all demonstrated in this paper show to explain differences in life satisfaction, economic conditions should be included in the analysis.

As was mentioned earlier, given that this paper is based on the findings of a survey conducted in over sixty different countries across the world, it is important that there are no great differences in the interpretation of words such as "happiness", "life satisfaction", or "well-being" across cultures. This suggests that studies of life satisfaction across countries are valid and useful in trying to understand the distribution of happiness across cultures and countries.

The underlying determinants of happiness are still not certainties. While, we do have a fairly good idea of factors that have significant effects on self-reported measure of happiness, the empirical investigation into human happiness has only begun. Some of these important determinants were illustrated in this paper, but by no means is this analysis meant to be the final treatment of SWB and economics. In future analysis regarding economics and happiness, it would be useful to see if there is any clear connection between productivity levels and self-reported happiness as this would provide another valid reason for economics to be interested in the empirical results of happiness research.

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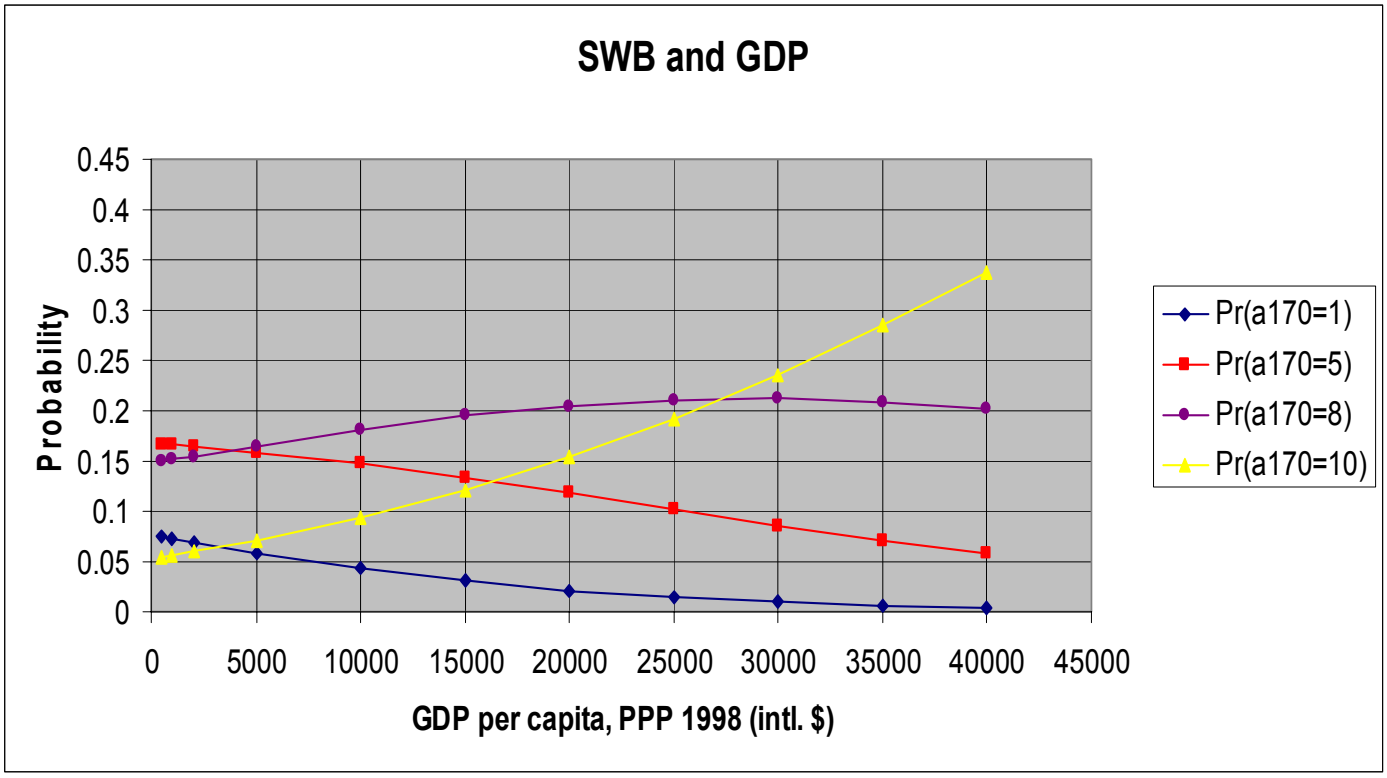
APPENDIX

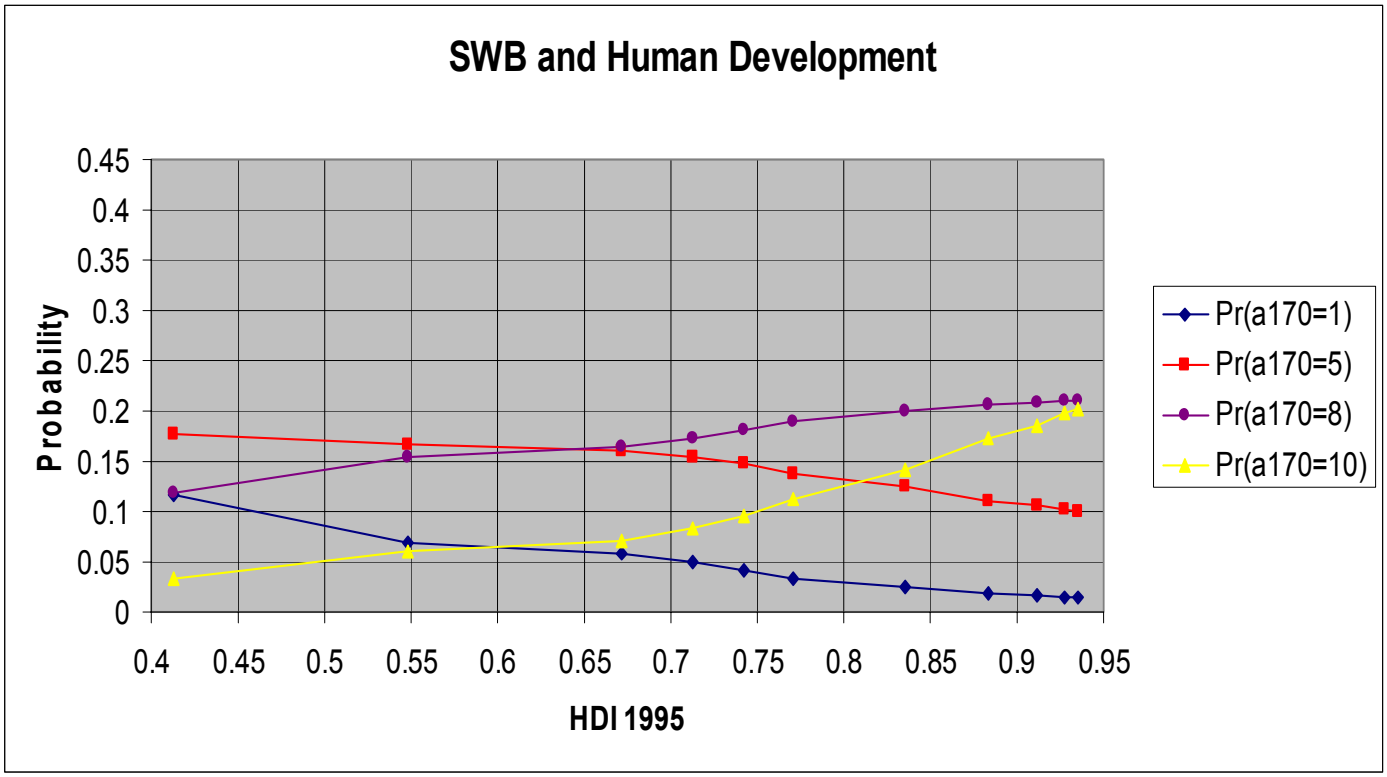
1. Figures

Figure A1.—Graph of the predicted probabilities of giving a certain response to the life satisfaction question across varying levels of GDP



These results were generated by setting all the explanatory variables at the means, except for employment status which was set at 0, marital status which was set at 1 and trust, which was also set at 0 (indicating a person is unemployed, divorced or separated, and does not trust others).

Figure A2.—Graph of the predicted probabilities of giving a certain response to the life satisfaction question across varying levels of HDI



These results were generated by setting all the explanatory variables at the means, except for employment status which was set at 0, marital status which was set at 1 and trust, which was also set at 0 (indicating a person is unemployed, divorced or separated, and does not trust others).

2. Tables

Table A1.— Testing the Gini Coefficient in models of Life Satisfaction with $(Gini2000)^2$ using GDP

Independent Variable	**Coefficients**	**S.E.**	**z**	**P>|z|**
gdp1998	.0000297	6.18e-07	48.14	0.000
unemp1999	-.0178535	.0011024	-16.20	0.000
inflati~1999	-.0058144	.0002189	-26.56	0.000
gini2000	-.0413034	.0042373	-9.75	0.000
Ginisq	.0006362	.0000514	12.37	0.000
Male	-.0257876	.0090609	-2.85	0.004
Age	-.0291951	.001636	-17.85	0.000
age2	.0002934	.000017	17.25	0.000
Belief	.0336749	.0015266	22.06	0.000
married	.1724877	.0108979	15.83	0.000
divorce	-.0434116	.0193935	-2.24	0.025
employ	-.0536402	.0115723	-4.64	0.000
Unemp	-.334118	.0171511	-19.48	0.000
trust	.1301757	.0096135	13.54	0.000
incscale	.0719549	.0018081	39.79	0.000

Dependent Variable: life satisfaction, on a scale of 1-10. Number of Observations = 58088
Log Likelihood = -124415.96. $\chi^2(15) = 10537.92$. Pseudo $R^2 = 0.0406$. Cut1 = -2.25. Cut2 = -1.87. Cut3 = -1.60. Cut4 = -1.36. Cut5 = -0.91. Cut6 = -0.61. Cut7 = -0.23. Cut8 = 0.31. Cut9 = 0.79.

Table A2.—Testing the Gini Coefficient in models of Life Satisfaction with $(Gini2000)^2$ using HDI

Independent Variable	Coefficients	S.E.	z	P>|z|
hdi1995	2.788744	.0552096	50.51	0.000
Unemp1999	-.0247227	.0010879	-22.72	0.000
inflati~1999	-.0065388	0002127	-30.74	0.000
gini2000	-.0232983	.0043791	-5.32	0.000
Ginisq	.0004185	.0000527	7.95	0.000
Male	-.0132092	.0091777	-1.44	0.150
Age	-.0301574	.0016508	-18.27	0.000
age2	.0002973	.0000172	17.33	0.000
Belief	.0419957	.0015933	26.36	0.000
married	.1731742	.0110069	15.73	0.000
divorce	-.0437799	.0195782	-2.24	0.025
employ	-.0592614	.0116367	-5.09	0.000
Unemp	-.3291293	.017292	-19.03	0.000
Trust	.147911	.0096892	15.27	0.000
incscale	.0735203	.0018305	40.16	0.000

Dependent Variable: life satisfaction, on a scale of 1-10. Number of Observations = 57666 Log Likelihood = -121817.5. $\chi^2(15) = 10613.71$. Pseudo $R^2 = 0.0417$. Cut1 = -0.87. Cut2 = 0.29. Cut3 = 0.56. Cut4 = 0.80. Cut5 = 1.25. Cut6 = 1.55. Cut7 = 1.93. Cut8 = 2.47. Cut9 = 2.95.

Table A3.—Testing the Free Choice Variable in models of Life Satisfaction using GDP

Independent Variable	Coefficients	S.E.	z	P>|z|
gdp1998	.0000277	6.31e-07	43.86	0.000
unemp1999	-.0126105	.0011027	-11.44	0.000
inflati~1999	-.0046893	.0002157	-21.74	0.000
gini2000	.0069957	.0005884	11.89	0.000
freechoice	.1461503	.0018302	79.86	0.000
male	-.0516329	.0092319	-5.59	0.000
age	-.0264023	.0016751	-15.76	0.000
age2	.0002807	.0000175	16.08	0.000
divorce	-.0691263	.0196425	-3.52	0.000
married	.1744674	.0111359	15.67	0.000
employ	-.0701226	.0117877	-5.95	0.000
unemp	-.335277	.0174539	-19.21	0.000
belief	.0294971	.0015379	19.18	0.000
incscale	.0577508	.0018464	31.28	0.000
trust	.1127326	.0097841	11.52	0.000

Dependent Variable: life satisfaction, on a scale of 1-10. Number of Observations = 56926 Log Likelihood = -117249.42. $\chi^2(15) = 16416.52$. Pseudo $R^2 = 0.0654$. Cut1 = -0.52. Cut2 = -0.12. Cut3 = 0.17. Cut4 = 0.43. Cut5 = 0.90. Cut6 = 1.22. Cut7 = 1.63. Cut8 = 2.12. Cut9 = 2.71.

Table A4.—Testing the Free Choice Variable in models of Life Satisfaction using HDI

Independent Variable	Coefficients	S. E.	z	P>|z|
hdi1995	2.463809	.0562522	43.80	0.000
unemp1999	-.02078	.0010933	-19.01	0.000
inflati~1999	-.0053964	.0002098	-25.72	0.000
gini2000	.0074153	.0006159	12.04	0.000
freechoice	.1410258	.0018501	76.23	0.000
male	-.0398311	.009355	-4.26	0.000
age	-.0274591	.0016906	-16.24	0.000
age2	.0002866	.0000176	16.27	0.000
divorce	-.0671064	.0198318	-3.38	0.001
married	.1732549	.0112476	15.40	0.000
employ	-.0757732	.0118581	-6.39	0.000
unemp	-.3327224	.0176023	-18.90	0.000
belief	.036782	.0016127	22.81	0.000
incscale	.0594419	.0018693	31.80	0.000
trust	.1303533	.00986	13.22	0.000

Dependent Variable: life satisfaction, on a scale of 1-10. Number of Observations = 55798 Log Likelihood = -114917.32. $\chi^2(15) = 16026.20$. Pseudo $R^2 = 0.0652$. Cut1 = 1.02. Cut2 = 1.42. Cut3 = 1.71. Cut4 = 1.97. Cut5 = 2.44. Cut6 = 2.76. Cut7 = 3.16. Cut8 = 3.73. Cut9 = 4.24.

Table A5.—First Differences if the unemployment rate in 1999 for the base individual' falls from the mean to the minimum (from 8.7% to 2%)

Quantity of Interest	Mean	S.E.
dPr(satisf~n = 1)	-.0085572	.0003989
dPr(satisf~n = 2)	-.0087289	.0004077
dPr(satisf~n = 3)	-.0092094	.0004303
dPr(satisf~n = 4)	-.0097766	.0004524
dPr(satisf~n = 5)	-.0194054	.0009145
dPr(satisf~n = 6)	-.0105589	.0005493
dPr(satisf~n = 7)	-.0064791	.0004653
dPr(satisf~n = 8)	.0079434	.0004429
dPr(satisf~n = 9)	.018891	.0008563
dPr(satisf~n = 10)	.045881	.0022692

Table A6.—First Differences if the GDP 1998 goes from its minimum to its maximum for the base individual; unemployment rate is not included in the model

Quantity of Interest	Mean	Std. Err.
dPr(satisf~n = 1)	-.0655967	.0016342
dPr(satisf~n = 2)	-.0540424	.0011384
dPr(satisf~n = 3)	-.0690742	.0012715
dPr(satisf~n = 4)	-.0652806	.0011734
dPr(satisf~n = 5)	-.1452788	.0018391
dPr(satisf~n = 6)	-.0738442	.0014082
dPr(satisf~n = 7)	-.0576749	.0018438
dPr(satisf~n = 8)	.0179449	.0022948
dPr(satisf~n = 9)	.0976983	.0017118
dPr(satisf~n = 10)	.4151486	.0068758

Table A7.—First Differences if hdi1995 is raised from its minimum to its maximum for the base individual while this person is both unemployed and does not trust others.

Quantity of Interest	Mean	Std. Err.
dPr(satisf~n = 1)	-.1504267	.0047785
dPr(satisf~n = 2)	-.0802092	.0020543
dPr(satisf~n = 3)	-.0600477	.001477
dPr(satisf~n = 4)	-.0458408	.001259
dPr(satisf~n = 5)	-.0464908	.0023068
dPr(satisf~n = 6)	.0061655	.0016836
dPr(satisf~n = 7)	.0496667	.0020378
dPr(satisf~n = 8)	.1130574	.0022408
dPr(satisf~n = 9)	.0968297	.0021105
dPr(satisf~n = 10)	.1172959	.0036349

Table A8.—First Differences if hdi1995 is raised from its minimum to its maximum for the base individual; freechoice question is included in the model.

Quantity of Interest	Mean	Std. Err.
dPr(satisf~n = 1)	-.056878	.0021737
dPr(satisf~n = 2)	-.0525621	.0016893
dPr(satisf~n = 3)	-.0506229	.0014781
dPr(satisf~n = 4)	-.0504125	.0013914
dPr(satisf~n = 5)	-.0856544	.0018865
dPr(satisf~n = 6)	-.0345045	.0010525
dPr(satisf~n = 7)	-.0011483	.0013655
dPr(satisf~n = 8)	.0741312	.0022261
dPr(satisf~n = 9)	.0984073	.0022382
dPr(satisf~n = 10)	.1592443	.0038278

Table A9.—First Differences if gdp1998 is raised from its minimum to its maximum for the base individual; freechoice question is included in the model.

Quantity of Interest	Mean	Std. Err.
dPr(satisf~n = 1)	-.0409826	.0014313
dPr(satisf~n = 2)	-.0455918	.0013453
dPr(satisf~n = 3)	-.0493439	.001305
dPr(satisf~n = 4)	-.0554916	.001361
dPr(satisf~n = 5)	-.1135454	.0025815
dPr(satisf~n = 6)	-.0666469	.001866
dPr(satisf~n = 7)	-.0475878	.002114
dPr(satisf~n = 8)	.0339312	.0021994
dPr(satisf~n = 9)	.106429	.0021598
dPr(satisf~n = 10)	.2788298	.0081572

Table A10.—Means of Life Satisfaction, measured on a scale from 1-10, conditional on certain aspects being true of one of the explanatory variables.

Condition	Observations	Mean of Life Satisfaction
Unemp=1	9567	5.43
Trust=1	27287	6.79
Trust=0	69147	6.27
Employ=1	64795	6.51
Married=1	61628	6.47
Divorce=1	5425	6.00
Incscale=1	7798	5.41
Incscale=10	3172	7.53
Freechoice=1	4659	4.38
Freechoice=10	14627	7.53
Unemp1999>7.0%	55	6.19
Unemp1999<7.0%	55	7.20
Inflation1999>3.0%	65	5.94
Inflation1999<3.0%	65	6.98

Table A11.—Independent Variable Definitions

Variable	Defintion
satisfaction	Life Satisfaction, measured on a scale from 1-10, where 1 indicates someone is dissatisfied with life and 10 indicates that a respondent is very satsified with their life
freechoice	Freedom of Choice and Control, measured on a scale from 1-10, where 1 indicates that a respondent feels like they have little freedom of choice and control in their lives while 10 indicates that they feel like they have significant freedom of choice and control in their lives.
Belief	How Important is God in your Life, measured on a scale from 1-10, where 1 indicates that God is not important at all, and 10 would indicate that God is very important in a respondent's life.
Age	The age of a respondent.

age2	The squared-term of age of a respondent. It is included to capture the U-shaped relationship that age has in terms of happiness.
incscale	The scale of income that a respondent's household belongs to, where 1 indicates the lowest income group in a country, whereas 10 indicates that their household is part of the highest income group in their country. The results from each country are then translated to a common scale from one to ten, for all countries.
Male	Gender, where a response of 1 means that the respondent is male, 0 means they are female.
Divorce	Dummy Variable generated from question X007 in the WVS, a response of 1 indicates that the respondent is divorced or separated while a 0 indicates that they are not. (X007 has 8 categories: married, living together as married, divorced, separated, Widowed, Single/Never Married, Divorced, Separated or Widow, Living apart but steady relation (married, co-habitation).
Married	Dummy Variable generated from question X007 in the WVS, a response of 1 indicates that the respondent is married while a 0 indicates that they are not. This variable only used a response to the category married to generate the dummy variable response of 1.
Employ	Dummy Variable generated from question X028 in the WVS, a response of 1 indicates that the respondent is employed while a 0 indicates that they are not (X028 has 8 categories: Full-time, Part-time, Self-Employed, Retired, Housewife, Student, Unemployed, Other). This variable considered anyone saying that they were working either full-time or part-time or self-employed were considered to be employed.
Unemp	Dummy Variable generated from question X028 in the WVS, a response of 1 indicates that the respondent is unemployed while a 0 indicates that they are not (X028 has 8 categories: Full-time, Part-time, Self-Employed, Retired, Housewife, Student, Unemployed, Other).
Trust	Dummy variable generated from question A165, which asked people whether they agreed with the statement: most people can be trusted. A response of 1 indicates that the respondent generally trusts others while a response of 0 indicates that they do not.
hdi1995	A country's Human Development Index value in the year 1995. Measured on a scale from 0 to 1, where 1 indicates the highest possible level of human development.
gdp1998	A country's GDP per capita in PPP in the year 1998.
Unemp1999	National rate of unemployment as a percentage of the total labour force in 1999
inflati~1999	National rate of inflation in the year 1999 as measured by the Consumer Price Index.
Gini2000	The Gini coefficient for a country in the year 2000. Ranges from 0 to 100, where 0 would indicate perfect income equality and 100 would indicate complete inequality.