Antidepressants and Age in 27 European Countries: Evidence of a U-Shape in Human Well-being Through Life

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Abstract

Some researchers suggest that human well-being is U-shaped through our lives. If it exists, such a curve could be classified as a truly fundamental discovery about humans. Yet sceptics point to the difficulty of relying on questions in which people are asked to describe subjective feelings – and the result is then an impasse. This paper suggests a way to try to break that intellectual deadlock. We deliberately eschew information on well-being. Instead, we draw upon data on the use of antidepressants in randomized samples from 27 European countries. Such data are surprisingly little-studied by social scientists. We show that the probability of taking antidepressants follows an inverted U-shape curve that peaks in people's late 40s. This result -- a new one across various research fields -- is an important one because it is strikingly consistent with the life-course claims made in the literature on subjective well-being.

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1. Introduction

This study provides a new form of evidence for the much-debated idea that happiness and mental well-being follow an approximate U-shape through the life course. The contribution of our study is that it does this without having to rely on data on subjective well-being. Our work fits within a strand of social science that has built upon the seminal ideas of Richard Easterlin (1974, 1978), although it disagrees with one significant part of his recent work, such as Easterlin (2006). It addresses the same topic as do modern writings such as Layard (2006) and Stone et al. (2010).

We exploit a simple idea. It is that of using data on antidepressant consumption as an indirect measure of (low) well-being within a population. Although antidepressants -- medications to alleviate mood disorders -- are in principle a particularly interesting commodity for economists and social scientists of many kinds (because in a crude sense people might be said to 'buy' happiness, or at least less unhappiness, and because such data potentially provide signals of mental distress within a population), their consumption has so far been surprisingly little-studied by social scientists. We draw upon information on approximately 27,000 randomly sampled individuals to estimate equations for the probability of the consumption of anti-depressants.

The paper's central finding is that the use of antidepressants reaches a peak in midlife (in people's late 40s). People in middle age are approximately twice as likely to be taking antidepressants as individuals -- with the same characteristics -- who are under the age of 25 or over the age of 65. These data are thus consistent with, and seem to offer

new and independent corroboration for, recent claims that mental well-being follows an approximate U-shape through the lifespan. The paper's later Figure 2 illustrates the paper's key result in a simple graphical way.

In a sense, this study is an attempt to break the deadlock in the current well-being literature, by building upon the longstanding idea of 'revealed preference' in the economics literature that it may be possible to understand people's underlying preferences and feelings by observing their actions rather than their words.

2. Background and Overview

Moncrieff (2008) documents the history of antidepressant use. Newman and Hassan (1999) is one of the few studies to measure use among elderly people; the authors' data are from Canada and they find that approximately 4% of the population take antidepressants. Kuhn, Lalive and Zweimuller (2009) and Ludwig, Marcotte and Norberg (2009) are concerned with economic issues. The first of these studies shows that job loss caused by plant closure leads to greater antidepressant consumption; the second argues that an increase in sales of one particular antidepressant -- selective serotonin reuptake inhibitors (SSRIs) -- by 1 pill per capita produces a large reduction (of 5%) in a country's suicide rate. Work by Gunnell et al. (2003) and Markowitz and Cuellar (2007) also argues that, for certain population groups, there is evidence of beneficial effects from antidepressants upon suicide rates. A further exception in the wider literature is Askitas and Zimmermann (2011), which examines data on the timing of people's Google searches on antidepressants' side-effects. An empirical source for health-economics researchers in Europe is Knapp et al. (2007). The authors document a near-doubling of antidepressant consumption (their Table 7.5 on p. 154) in the ten years from 1990 to

2000. Recent data from the OECD reveal a continuing upward trend: antidepressant consumption in daily-doses per thousand population rose from 32.4 in 2000 to 52.1 in 2007 (source: OECD 2009).

The background to the study is growing interest among quantitative researchers in the study of human well-being. The inhabitants of the industrialized nations lead what are arguably the richest, longest, and most comfortable lives in human history. As Offer (2007), Layard (2006, 2010) and others have suggested, however, there are reasons to believe that not all is ideal in the industrialized countries. Some citizens display signs of mental turmoil amid the prosperity of modern living (the data in McManus et al. 2009 suggest that at any one time approximately 15% of people in the UK suffer from a mental disorder: their p.11) and Richard Easterlin's seminal doubts (Easterlin 1974, 2003) remain. Such concerns are mirrored in recent work by the 2009 Stiglitz Commission on the Measurement of Economic Performance and Social Progress: the authors argue that traditional ways of measuring social and economic progress are out-of-date (www.stiglitz-sen-fitoussi.fr). In the mental-health literature, too, there have been long-standing debates about the rates of clinical depression in modern society (Paykel 2006). A related literature, written partly by economists and partly by social psychologists, has recently sprung up. It examines direct survey measures of well-being and mental health (and includes Theodossiou 1998; Kunzmann et al. 2000; Frey and Stutzer 2002; Easterlin 2003; Blanchflower and Oswald 2004; Van Praag and Ferrer-I-Carbonell 2004; Groot & Van den Brink 2006; Graham 2005, 2008; Van den Berg and Ferrer-I-Carbonell 2007; Helliwell and Huang 2008; Clark et al. 2008; Deaton 2008; Dolan et al. 2008; Dolan and

Kahneman 2008; Pacek and Radcliff 2008; Biswas-Diener et al. 2010; Oswald and Wu 2010; Powdthavee 2010; Green 2010).

In this study, we conclude that:

(i) One in thirteen Europeans took an antidepressant in the previous twelve months;

(ii) The rates of antidepressant use are greatest in Portugal, Lithuania, France and the UK;

(iii) Adjusting for other characteristics, the probability of taking an antidepressant is greatest among those middle-aged, female, unemployed, poorly educated, and divorced or separated;

(iv) A strong hill-shaped age pattern is found -- for males and females and in Western and Eastern Europe -- that peaks in people's late 40s.

(v) We argue that this pattern is powerfully consistent with, and thus might be seen as striking independent corroboration of, the claim in the well-being literature that happiness and mental health follow an approximate U-shape through life. Various authors in the subjective well-being literature have replicated versions of the U-shape finding. Blanchflower and Oswald (2008) provide a summary of the modern studies. There has, nevertheless, been much debate -- with some authors for and some against -- surrounding that claim (Glenn 2009; Lelkes 2009; Blanchflower and Oswald 2008, 2009; Fischer 2009; Stone et al. 2010; Gwozdz and Sousa-Poza 2010; Easterlin 2006; Van Landeghem 2008, 2011; Lang et al. 2011) and many social scientists continue to wonder whether happiness survey answers should be

treated as meaningful. Smith and Kington (1997) discuss related issues using other measures.

One interpretation of the paper's results, therefore, is that the apparent life cycle U-shape in human well-being -- which emerges in a different way here in data on antidepressant consumption -- requires urgent explanation.

A secondary contribution of the paper is to provide statistically representative estimates for a large number of European countries. Most previous work, such as Colman et al. (2006), Ohayon and Lader (2002) and Pagura et al. (2011), has had to rely on single or small numbers of nations, or, like Knapp et al. (2007), on data on actual total sales of antidepressant pills which, while valuable, do not allow researchers to learn about the micro patterns of consumption by the different individuals who consume them.

3. Empirical Approach

Antidepressants are prescribed by physicians. Hence it is natural to begin by thinking of the probability, *P*, of taking an antidepressant as given by the joint probability of going to a doctor or psychiatric professional for help with a mental health problem, *p*, and being in a nation with a rate-of-prescribing probability, *r*. Assume that *p* is a function of personal characteristics, *x*, and of national characteristics, *n*. Then $P = p(x,n).r(n) = P(personal\ characteristics,\ country\ characteristics)$. Initially, we concentrate on estimation of the reduced-form probability of antidepressant use, which is the function $P(..)$. At the end of the paper, we examine data on the $p(x,n)$.

Our data set provides information on approximately 1000 randomly sampled individuals from each of 27 nations. The source is Eurobarometer survey #73.2, February-March 2010. The data cover the countries listed in Table 1. The exact question

(numbered QD5 on page 52 of the questionnaire codebook) to which people responded was:

"*Have you taken any antidepressants in the last 12 months? Yes, regularly for a period of at least 4 weeks. Yes, regularly for a period of less than 4 weeks. Yes, from time to time when I felt the need. No, not at all.*"

Table 1 provides a description of the raw patterns in the data set. It gives the mean figure for each European country's use of antidepressants. For Europe as a whole, approximately 8% of people use antidepressants (within a single year).

In Austria, for example, Table 1 shows that 91% of individuals said they had not taken any antidepressant in the previous twelve months; 4% answered "from time to time"; 1% said "regularly, for less than 4 weeks; 3% said "regularly, for more than 4 weeks".

Portugal stands out in the data as the nation with the highest rate of antidepressant consumption (in the sense of the proportion of people taking such medication). Approximately 16% of Portuguese citizens took antidepressants in the previous year, and 9% did so for a long period (that is, more than 4 weeks). Other countries with relatively high consumption, according to Table 1's data, are France (9%, with 6% having done so for a long period), Lithuania (11%, with 3% having done so for a long period), Malta (10%, and 4%), and the UK (9%, and 7%). Data on the total prescriptions within some of these nations are given for the year of 2002 in Rose (2007), within Knapp et al. (2007), as Table 7.14 on their page 163. Although many of the patterns are consistent with our Table 1, Belgium tops Rose's (2007) table, for his somewhat different set of countries.

The numbers here in Table 1 are raw (i.e. unadjusted) means of antidepressant use. Later tables give regression-equation-adjusted rates.

It could be argued that people's detailed memories -- particularly in answering questions of this kind about lengths of time -- are likely to be imperfect. The cell sizes here, for some categories of answer, are also small.

For these reasons, the paper's later analysis chooses not to put a heavy weight on the exact number of weeks the individuals say that they consumed antidepressants. Instead its focus is on the distinction between taking any antidepressants and taking none; this is because individuals are likely to have an appreciation for whether they were taking no antidepressant pills at all. There is potentially some loss of statistical efficiency from this approach. As a check, therefore, a full ordered logit equation is also estimated.

Bauer et al. (2008) and Sleath and Shih (2003) argue that prescribing norms vary by country -- for what arguably appear to be cultural or sociological reasons -- so it will be necessary in the later analysis to allow for country differences. This is done by the inclusion of separate country dummies. These act as intercept shifters in the pooled-data regression equation. Consistent with the likely role of social and attitudinal influences on doctors' prescribing norms, Pagura et al. (2011) suggest that in the US almost one quarter of antidepressant prescriptions are to people who do not, in fact, have serious psychiatric conditions.

The characteristics of those in Europe who are most likely to use antidepressant medication can be read in a systematic way by using the information in Table 2. That table reports three regression equations. In each case, the dependent variable can be thought of as a measure of the probability of antidepressant use. The sample size is

26,611 individuals. Although it is possible here to include many independent variables for demographic and personal characteristics, one is necessarily absent.

The data set does not contain an income variable. However, a person's age at which they left schooling, denoted ALS in the later tables, is a strong correlate with earnings, and this is available in the data set. We use ALS as a measure of a person's level of education.

The first column of Table 2 reports the estimates from an Ordinary Least Squares (OLS) linear probability model in which the data are coded 1 for any positive level of antidepressant use and 0 otherwise. Column 2 of Table 2 estimates an otherwise equivalent Probit equation. Column 3 is an Ordered Logit in which the dependent variable can take one of four values (No, not at all, ... Yes, regularly for a period of at least four weeks). The estimated structure of the three equations, however, is in each case similar.

Because of the simple nature of the estimator in column 1 of Table 2, the results in that column can be interpreted in the following way. First, and crucially for this study, a hump-shaped age profile in people's use of antidepressants is found in the coefficients on the separate age dummy variables from 'Age 25-34' up to 'Age greater than or equal to 65'. The base category in the regression equation is those people in the Eurobarometer survey aged 15-24 years old. It can be seen that in Table 2's column 1, the probability of taking antidepressants rises gradually to reach a high point in the mid-life age band of 45-54. It then falls back, by 65 and above, to approximately the same probability that is found among the youngest group. Experiments with various functional forms -- available upon request -- suggest that the data are fairly well approximated by a simple quadratic.

This hill-shaped result is a new one in the literature. The closest we have been able to find in the existing literature is a result in the third column of Table 1 of Olfson and Marcus (2009) on US data, where it appears that there is a turning point in the estimated curve. However, the authors do not discuss their estimated age profile. Moreover, the Olfson-Marcus estimation results are not truly comparable to ours, because their regression equations hold constant the state of a person's measured mental health

It might be wondered if the mid-life peak in antidepressant use in Table 2 is a result of people in middle age tending disproportionately to have young children. But such an explanation is not supported empirically. When a variable for the number of young children is included in the regression equation, it enters with a very small negative coefficient (the opposite of the sign that might perhaps have been expected) that is never statistically significantly different from zero. These specifications are available on request.

The size of the concave age pattern in Table 2 is not a negligible one. At its peak, in mid-life, it accounts in this specification for an extra approximately 6.5 percentage points in the probability of using antidepressants. In other words, it nearly doubles the risk. The age 45-54 coefficient of 0.0652 in column 1 of Table 2 is also slightly larger than that on known stressful life events such as being unemployed or being divorced/separated.

One way to depict the age profile is to do so graphically, as in Figures 1 and 2. To construct these plots, we use a slightly different and less parametrically restrictive estimation method than in the equations of the Tables. Instead of six age-band variables, a separate dummy variable for (almost) every year of age from 15 up to 90 is now entered

in the antidepressant-use regression equation. There is one caveat; because sample sizes become small at higher ages, the exact approach was the following. Above age 80, we grouped together the people aged 80 to 83 and plotted them on the chart as 81.5 years; similarly, we grouped those aged 84 and 85 and plotted them as 84.5; we grouped all individuals from 86-97 and plotted them as a weighted average assigned on the chart axis to age 88. While simple, this method ensures that sample sizes for dots situated along the sparse part of the age range in the graphs are always based on at least a cell-size of 0.5% or approximately N=200. The same independent variables as before, with the exception of the banded age variables, are also included in the regression specifications in the two charts.

Figure 1 plots the raw data; it is an unadjusted correlation (apart from a set of country dummies). By contrast, Figure 2's scatter is derived from a full regression equation, where each of the dots in the chart corresponds to the probability at that particular age. This has the advantage that it produces in an approximately non-parametric way the same form of age profile as in Table 2's columns. There is strong evidence in Figure 2 of a peak in antidepressant use in mid-life. The intercept on the y-axis in the charts has been normalized by expressing all the plotted probabilities relative to an age-15 probability set to zero. In the raw data, the mean probability of antidepressant use in Europe is approximately 0.08.

As previously in Table 2, the calculation holds constant other factors, so once again is to be viewed as a regression-adjusted or ceteris-paribus relationship. In the raw unadjusted picture of Figure 1, the turn-down in antidepressant-use probability at higher

ages exists, but is less clear in a simple scatter; the standard error bands -- not shown – are, unsurprisingly, large at very high ages.

Other systematic influences are visible in the data. Men, in Table 2, are less likely than women to take antidepressants. The coefficient on Male in column 1 is -0.0372 with a t-statistic over 11. Antidepressant use is highest among those living in the parental home (coefficient 0.0438), the unemployed (0.0520), the retired (0.0733), and those who are divorced or separated (0.0347). Antidepressant use is low among students (-0.0645) and those married (-0.0254). In column 1 of Table 2 there is a discernible monotonic gradient associated with years of education; ALS is age left schooling. Those people who left school at greater than or equal to age 20 are almost 8 percentage points less likely to be taking an antidepressant (the coefficient on ALS>=20 is -0.0781). There are no statistically significant effects associated with being in the living-together category of marital status or being widowed.

The coefficients on the country dummy variables are listed at the foot of Table 2. The base country, against which others are measured, is Belgium. The positive coefficients are Austria, France, Malta, Portugal, the UK, Latvia, Lithuania, and Slovakia. Of these, however, the only one in column 1 of Table 2 with a coefficient that is significantly different from zero at the 95% confidence level is Portugal. These country-dummy coefficients are not small. They vary, in column 1 of Table 2, from 0.0767 for Portugal to -0.0522 in Greece. This implies a spread of 13 percentage points in the likelihood of antidepressant use.

Columns 2 and 3 of Table 2 reinforce the conclusions from the simple OLS linear-probability estimator. There are only marginal differences, when compared to column 1, in variables' qualitative influence or levels of statistical significance.

One interesting and potentially important distinction is that between Western Europe and Eastern Europe. The transition countries have lower levels of Gross Domestic Product and, especially when compared to the western countries, may have rather different medical-prescribing practices. Table 3 therefore calculates results separately for the set of nations from Western Europe (including East Germany, within the nation Germany). The econometric results -- from now on, for simplicity, only OLS linear probability models are presented -- are similar to those in the full sample. However, the coefficient on being unemployed is now slightly larger (at 0.0713 in column 1 of Table 3) and the education gradient becomes steeper (the coefficient on ALS over 20 is now -0.0980).

Table 3 continues to find a well-defined hump shape in the effect of age on the probability of consuming antidepressants. Compared to the young and the old, people in midlife in Western Europe have an approximately doubled probability of antidepressant use.

4. Checks

The main findings are robust across the genders. Columns 2 and 3 of Table 3 compare the male sub-sample to the female sub-sample. Perhaps the most interesting difference in the size of coefficients is for the ALS age-left-school variable. Men in Western Europe have a more pronounced education gradient in the risk of antidepressant medication. At a low, in column 2 of Table 3, the coefficient is -0.1605 for males

compared to -0.0653 among females. In this correlational sense, it could be said that low qualifications appear to be particularly a danger for the mental health of men. It is also noticeable that the coefficient on the Portugal dummy variable is considerably greater for women.

Eastern Europe is examined in Table 4. There are separate regression equations for the full sample, the males, and the females.

A hump-shaped age pattern is again visible. Both for females and males, antidepressant use is at its greatest in people's midlife. The size of the effect at age 45-54 is similar (0.0597 for men and 0.0470 for women); the null of equality of these coefficients in Table 4 cannot be rejected.

In Table 4, however, there is one striking difference between columns 2 and 3: there is no sign of an education gradient in the females sub-sample. In column 3, the coefficient on ALS>= 20 is only -0.0118 with a t-statistic of just 0.21.

In most countries, part of the process of taking antidepressants is first to visit a doctor or health professional. That information is available in the data set. Therefore Table 5 estimates a different form of equation (the p(..) functional form discussed earlier). Here the dependent variable is no longer antidepressant consumption but rather one for consulting a mental-health specialist. The exact survey question is:

"*In the last 12 months, did you seek help from a professional because of a psychological or emotional problem. Yes or no.*"

The mean of this in the data is 11%, so in 2010 approximately one in nine Europeans consulted a professional about mental health problems.

Table 5 reports zero-one OLS equations for the probability of consulting a mental-health professional. To allow for consistency of interpretation with earlier regressions, the set of independent variables is the same as in Tables 2 to 4. For the full sample of column 1 of Table 5 there continues to be evidence of a well-determined age pattern. The probability of seeking help for a psychological or emotional problem reaches its turning point -- adjusting for other factors -- in the 45-54 age band. Males, students, the married, and those with high levels of education are less likely to see a mental-health professional. Those living at home, the unemployed, the retired, and the divorced or separated are more likely to do so. The t-statistics on the relevant coefficients are typically large in column 1 of Table 5.

Results for the West and East are given separately in columns 2 and 3 of Table 5. Particularly for Eastern Europe, some of the coefficients now become fairly poorly defined. For example, an age pattern is now less discernible, with large standard errors. The only variables in the Eastern Europe equations with coefficients that are statistically significantly different from zero are Male, Student, and Retired.

For Western Europe, nevertheless, the existence of a hump-shaped age profile is still sharply in the data. The largest coefficient is 0.0321 (t-statistic 3.46) on age-group 45 to 54.

However, for Western Europe there is little sign of an age-left-school effect on the probability of consulting a mental-health professional.

Despite the different dependent variable, the country dummies in Table 5 therefore produce a similar life-cycle pattern to that found in the earlier antidepressant-use equations. The largest positive coefficient in the full sample of column 1 is for

Romania at 0.1395 with a t-statistic of 10.08. Slovakia and Portugal also have large coefficients. The smallest coefficients in Table 5 are found for Bulgaria (-0.0872, t-statistic 6.24), Cyprus and Greece.

5. Concerns and Counter-Arguments

It is possible to think of various potential objections. Here we list some, and give possible responses.

(i) Prescribing patterns may differ by country and by age: *one possibility is that people who are employed may be more likely to be treated (presumably because physicians want to help people get back to work). In principle, that could create a hill-shaped distribution.*

The econometric estimation controls for country dummies and for whether the person is employed, so the hill-shape cannot here be being generated merely by intercept differences in national medical practices. If it were that physicians felt they should encourage workers back into the workplace, it is difficult to see why the hill-shape would be so noticeably peaked in midlife. It might be expected, instead, that the probability would run fairly flat from people's early 20s to their mid-60s (the usual working-career length).

(ii) This study is unable to follow the same individuals longitudinally through time (as Colman et al. 2006 can), which means that the age variable may be correlated with some form of birth-cohort effect.

This is a justifiable concern and one common to any study of our type. Nevertheless, in this case a multi-country cross-sectional design has one important advantage. Through the decades, it may be that sheer antidepressant-prescribing norms by Europe's

physicians have changed (in a way that alters the link between underlying mental distress and observed antidepressant consumption). That potential bias is not present in the present study; the data come from the same year and the equations allow for different intercept shifters in each nation.

(iii) As people age, the presentation of depression might change, such that older individuals become more likely to present with somatic complaints rather than mood complaints. Physicians may be more likely to treat the somatic symptoms without recognizing an episode of depression.

This is a possible interpretation. However, it is a particular theory, it might be said, of the hill-shape, rather than a criticism of the results.

(iv) Treatment-seeking may differ by age. It could be that younger adults are less likely to seek treatment than middle-aged adults.

This is possible, and unfortunately it is not easily tested in our data set on many nations. However, the potential idea cannot account for an important feature of the data set, namely, the marked drop-off in antidepressant use in older age groups (who presumably tend to be well-informed, when compared to the young, about the concept of antidepressant treatment).

(v) There could be a form of 'survivor' effect -- severe depression is associated with suicide and other chronic diseases that lead to death. The remaining population is therefore healthier and less likely to need antidepressants.

Such an argument seems qualitatively a good one; presumably the mechanism must play some role. However, the annual risk of suicide per-person in an industrialized country is approximately 1 in 10,000, so quantitatively it is not possible for a compositional suicide-

survivor theory to account for a substantial portion of the hill-shape in antidepressant use. Nor could other kinds of deaths explain the sharp drop off shown in the curve in Figure 2 through people's late 50s to early 60s (because in these European nations the mortality rate is so low over that age range), although some version of such a selection effect might be a larger element behind the curve at very high ages in Figure 2. Overall, it is difficult to see how a survivor argument could explain the main pattern in these data.

6. Conclusions

There has recently been debate in the research literature about the claim that mental well-being follows an approximate U-shape through life. If it truly exists, the U-shape could be classified as a significant discovery about the nature of human beings. Yet the literature has critics. Sceptics rightly point to the difficulty of relying on subjective 'happiness' numbers.

This study suggests a new way to examine the persuasiveness of the idea that human well-being is U-shaped through the life course. It studies the patterns of antidepressant use in modern Europe. Methodologically, the paper could be seen as an attempt to build upon the longstanding idea in the economics literature that it may be possible to understand people's underlying preferences and feelings by observing their actions rather than their words.

There are three main conclusions.

First, despite the evident wealth of modern living, 1 in 13 European citizens used antidepressants in the year 2010, and national rates of consumption were notably high in Portugal, Lithuania, France and the UK. One interpretation is that this throws a confirming light on the concerns of the Stiglitz Commission.

Second, the probability of taking antidepressants is greatest among those who are middle-aged, female, unemployed, poorly educated, and divorced or separated. The sign on the variable for being unemployed is interestingly consistent with -- though our study's regressor cannot have the same claim to exogeneity as that in -- the study of Austrian data by Kuhn et al. (2009).

Third, and most importantly for this study, a strong hill-shaped age pattern is found (after adjustment for a full set of covariates, including whether or not there are young children in the household). The concave shape is depicted in Figure 2. People in mid-life are approximately twice as likely to be taking antidepressants as individuals -- with the same characteristics -- who are under the age of 25 or over the age of 65. As statistical experiments in the paper show, this finding stands up to various sub-sample checks, including a division into males and females or into West and East. Robustly in the data, the regression-adjusted probability of using an antidepressant reaches a maximum in people's late 40s. The hill-shaped function traced out in Figure 2 is remarkably consistent with -- it is the mirror image of -- recent suggestions in the well-being literature that happiness and mental health follow an approximate quadratic U-shape over the life course. This study thus provides a new form of corroboration for the idea that there is a U-shape in well-being in the lives of human beings.

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Appendix

The Stiglitz Report's Formal Recommendations (an abbreviated form of the list in the Executive Summary of the Report)

#1: When evaluating material well-being, look at income and consumption rather than production.

#2: Emphasise the household perspective.

#3: Consider income and consumption jointly with wealth.

#4: Give more prominence to the distribution of income, consumption and wealth.

#5: Broaden income measures to non-market activities

#6: Quality of life depends on people's objective conditions and capabilities. Substantial effort should be devoted to developing and implementing robust, reliable measures of social connections, political voice, and insecurity that can be shown to predict life satisfaction.

#7: Quality-of-life indicators in all the dimensions covered should assess inequalities in a comprehensive way

#8: Surveys should be designed to assess the links between various quality-of-life domains for each person, and this information should be used when designing policies in various fields

#9: Statistical offices should provide the information needed to aggregate across quality-of-life dimensions, allowing the construction of different indexes.

#10: Measures of both objective and subjective well-being provide key information about people's quality of life. Statistical offices should incorporate questions to capture people's life evaluations, hedonic experiences and priorities in their own survey.

#11: Sustainability assessment requires a well-identified dashboard of indicators. The distinctive feature of the components of this dashboard should be that they are interpretable as variations of some underlying "stocks".

#12: There is need for a clear indicator of our proximity to dangerous levels of environmental damage (such as associated with climate change or the depletion of fishing stocks.)

Table 1. The Percentage of Europeans by Nation Who Took Antidepressants Over the Previous 12 months (%)

	Not at all	Time to time	Regularly <4 weeks	Regularly >=4 weeks
Austria	91%	4%	1%	3%
Belgium	91	3	1	5
Bulgaria	96	3	0	1
Cyprus	96	2	1	2
Czech Republic	95	3	0	1
Denmark	93	1	1	5
Estonia	93	2	0	4
Finland	94	1	1	4
France	91	3	1	6
Germany	95	1	1	3
Greece	97	1	0	1
Hungary	93	3	1	3
Ireland	95	2	1	3
Italy	94	4	1	1
Latvia	92	6	1	2
Lithuania	89	6	1	3
Luxembourg	94	1	1	3
Malta	90	4	1	4
Netherlands	94	1	0	4
Poland	94	3	1	2
Portugal	84	5	2	9
Romania	93	5	1	1
Slovakia	91	6	1	2
Slovenia	92	5	0	2
Spain	92	2	1	5
Sweden	92	1	0	7
UK	91	1	1	7

Source: Own calculations using data from Eurobarometer #73.2, February-March 2010.

Question. Have you taken any antidepressants in the last 12 months? No, not at all; Yes, from time to time when you felt the need to; Yes, regularly for a period of less than four weeks; Yes, regularly for a period of at least four weeks?

Table 2. Regression Equations for the Probability of Taking Anti-depressants
(Estimated by each of three different methods: an Ordinary Least Squares Linear Probability equation, Probit equation, and Ordered Logit equation)

	OLS	Probit	Ordered logit
Age 25-34	.0289 (3.68)	.0374 (3.81)	.5751 (3.76)
Age 35-44	.0501 (6.06)	.0666 (6.14)	.9361 (6.04)
Age 45-54	.0652 (7.81)	.0858 (7.56)	1.1396 (7.42)
Age 55-64	.0450 (5.08)	.0618 (5.51)	.8507 (5.27)
Age ≥65	.0037 (0.37)	.0222 (2.10)	.3881 (2.27)
Male	-.0372 (11.12)	-.0363 (11.63)	-.6099 (11.42)
Home	.0438 (6.71)	.0468 (6.89)	.6558 (7.28)
Student	-.0645 (2.53)	-.0325 (2.05)	-.5851 (1.91)
Unemployed	.0520 (8.52)	.0587 (8.95)	.7834 (9.40)
Retired	.0733 (12.18)	.0695 (11.73)	.9900 (11.86)
Married	-.0254 (4.99)	-.0228 (4.83)	-.3932 (5.10)
Living together	-.0068 (1.05)	-.0047 (0.78)	-.1204 (1.14)
Divorced/separated	.0347 (4.66)	.0231 (3.40)	.3092 (3.22)
Widowed	.0101 (1.32)	.0025 (0.39)	.0051 (0.05)
AgeLeftSchooling<16	-.0611 (2.53)	-.0285 (1.87)	-.4615 (1.84)
ALS 16-19	-.0706 (2.93)	-.0381 (2.27)	-.5647 (2.25)
ALS >=20	-.0781 (3.23)	-.0408 (2.67)	-.6908 (2.74)
Austria	.0012 (0.11)	.0021 (0.22)	.0184 (0.11)
Cyprus	-.0352 (2.49)	-.0302 (2.65)	-.6592 (2.60)
Denmark	-.0126 (1.09)	-.0108 (1.12)	-.1385 (0.81)
Finland	-.0310 (2.69)	-.0242 (2.70)	-.4604 (2.56)
France	.0057 (0.50)	.0039 (0.39)	.0997 (0.64)
Germany	-.0422 (4.04)	-.0331 (4.26)	-.6945 (4.15)
Greece	-.0522 (4.51)	-.0441 (5.23)	-1.0909 (4.97)
Ireland	-.0280 (2.42)	-.0232 (2.53)	-.4438 (2.45)
Italy	-.0161 (1.40)	-.0134 (1.40)	-.2608 (1.50)
Luxembourg	-.0265 (1.88)	-.0194 (1.70)	-.3783 (1.70)
Malta	.0267 (1.87)	.0187 (1.43)	.2891 (1.56)
Netherlands	-.0166 (1.45)	-.0154 (1.61)	-.2367 (1.34)
Portugal	.0767 (6.56)	.0625 (5.10)	.7622 (5.19)
Spain	-.0045 (0.39)	-.0040 (0.41)	-.0213 (0.13)
Sweden	-.0100 (0.87)	-.0060 (0.62)	-.0920 (0.54)
UK	.0035 (0.32)	.0013 (0.15)	.0836 (0.56)
Bulgaria	-.0443 (3.83)	-.0348 (4.03)	-.7839 (4.01)
Czech Republic	-.0318 (2.77)	-.0257 (2.84)	-.5482 (2.98)
Estonia	-.0196 (1.70)	-.0160 (1.73)	-.2768 (1.63)
Hungary	-.0225 (1.96)	-.0192 (2.13)	-.3504 (2.10)
Latvia	.0027 (0.24)	.0016 (0.16)	-.0099 (0.06)
Lithuania	.0180 (1.56)	.0120 (1.16)	.1670 (1.08)

Poland	-.0251 (2.18)	-.0202 (2.24)	-.3772 (2.21)
Romania	-.0141 (1.23)	-.0112 (1.16)	-.2356 (1.38)
Slovakia	.0081 (0.71)	.0060 (0.59)	.0712 (0.44)
Slovenia	-.0010 (0.09)	-.0019 (0.20)	-.0544 (0.34)
Constant/cut1	.1218		2.5652
Cut2			3.1669
Cut3			3.3706
Adjusted R^2	.0369	.0712	.0568
N	26,611	26,611	26,611

Source: Eurobarometer #73.2, February-March 2010.

t-statistics are given in parentheses.

Notes. Base categories: age 15-24, Belgium, employed, no fulltime education and single. ALS is the age the person left their full-time schooling. Column 1 is estimated as a linear probability model where the dependent variable is 1 for having taken any level of antidepressants and zero otherwise. Column 2 is estimated as a dprobit using Stata. Column 3 is estimated as an ordered logit using all four possible survey answers.

If a variable for the number of young children is included in these regression equations, its coefficient is small and statistically insignificantly different from zero.

Question. Have you taken any antidepressants in the last 12 months? No, not at all; Yes, from time to time when you felt the need to; Yes, regularly for a period of less than four weeks; Yes, regularly for a period of at least four weeks? In columns 1 and 2 the dependent variable is set to zero if 'no, not at all", zero if otherwise. In column 3 'no, not at all=1; from time to time=2 and so on.

Table 3. Regression Equations for the Probability of Taking Anti-depressants in Western Europe (*Estimated with a linear probability model)*

	Full Sample	Males	Females
Age 25-34	.0333 (3.34)	.0336 (2.72)	.0344 (2.25)
Age 35-44	.0583 (5.56)	.0600 (4.59)	.0561 (3.50)
Age 45-54	.0692 (6.54)	.0522 (3.98)	.0819 (5.04)
Age 55-64	.0461 (4.14)	.0173 (1.23)	.0656 (3.87)
Age ≥65	-.0009 (0.08)	-.0235 (1.47)	.0080 (0.43)
Male	-.0293 (6.83)		
Home	.0581 (7.46)	.1308 (4.45)	.0513 (5.34)
Student	-.0763 (2.52)	-.1603 (3.76)	-.0238 (0.56)
Unemployed	.0713 (8.48)	.0828 (8.09)	.0587 (4.46)
Retired	.0655 (8.65)	.0817 (8.52)	.0586 (5.03)
Married	-.0237 (3.80)	-.0213 (2.81)	-.0246 (2.49)
Living together	-.0108 (1.31)	.0000 (0.01)	-.0214 (1.64)
Divorced/separated	.0481 (5.16)	.0320 (2.62)	.0589 (4.27)
Widowed	.0141 (1.45)	.0022 (0.16)	.0188 (1.36)
AgeLeftSchooling<16	-.0754 (2.66)	-.1499 (3.70)	-.0316 (0.81)
ALS 16-19	-.0878 (3.09)	-.1614 (3.98)	-.0436 (1.11)
ALS >=20	-.0980 (3.45)	-.1605 (3.96)	-.0653 (1.65)
Austria	.0018 (0.16)	.0232 (1.61)	-.0171 (0.97)
Cyprus	-.0377 (2.65)	.0016 (0.10)	-.0769 (3.48)
Denmark	-.0092 (0.79)	-.0066 (0.46)	-.0117 (0.65)
Finland	-.0263 (2.27)	-.0211 (1.49)	-.0312 (1.73)
France	.0076 (0.67)	.0075 (0.53)	.0074 (0.43)
Germany	-.0417 (3.97)	-.0237 (1.85)	-.0599 (3.67)
Greece	-.0540 (4.62)	-.0346 (2.42)	-.0739 (4.07)
Ireland	-.0311 (2.66)	-.0200 (1.37)	-.0410 (2.31)
Italy	-.0165 (1.43)	-.0145 (1.01)	-.0191 (1.08)
Luxembourg	-.0254 (1.80)	.0042 (0.24)	-.0508 (2.35)
Malta	.0236 (1.64)	.0242 (1.28)	.0211 (0.99)
Netherlands	-.0145 (1.26)	-.0092 (0.66)	-.0217 (1.21)
Portugal	.0757 (6.39)	.0387 (2.64)	.1054 (5.80)
Spain	-.0087 (0.74)	-.0179 (1.23)	-.0019 (0.11)
Sweden	-.0047 (0.41)	.0033 (0.23)	-.0114 (0.63)
UK	.0054 (0.50)	.0068 (0.51)	.0033 (0.20)
Constant	.0864	.1711	.0920
Adjusted R^2	.0399	.0343	.0392
N	16,512	7713	8799

Source: Eurobarometer #73.2, February-March 2010. t-statistics are given in parentheses.
Notes: see Table 2.

Table 4. Regression Equations for the Probability of Taking Anti-depressants in Eastern Europe (*Estimated with a linear probability model)*

	Full Sample	Males	Females
Age 25-34	.0234 (1.83)	.0335 (2.39)	.0122 (0.58)
Age 35-44	.0352 (2.60)	.0391 (2.60)	.0286 (1.31)
Age 45-54	.0552 (4.02)	.0597 (3.90)	.0470 (2.11)
Age 55-64	.0340 (2.28)	.0281 (1.68)	.0391 (1.62)
Age ≥65	.0095 (0.56)	-.0208 (1.05)	.0303 (1.13)
Male	-.0472 (8.80)		
Home	.0061 (0.49)	.0836 (2.78)	-.0025 (0.16)
Student	-.0394 (0.83)	-.1750 (1.73)	-.0192 (0.32)
Unemployed	.0333 (3.75)	.0225 (2.26)	.0484 (3.38)
Retired	.0871 (8.56)	.1146 (9.67)	.0653 (4.12)
Married	-.0263 (2.98)	-.0305 (3.04)	-.0155 (1.10)
Living together	.0010 (0.10)	.0009 (0.09)	.0038 (0.21)
Divorced/separated	.0138 (1.11)	.0015 (0.10)	.0267 (1.46)
Widowed	.0000 (0.01)	-.0184 (1.00)	.0088 (0.50)
AgeLeftSchooling<16	-.0317 (0.68)	-.1970 (1.95)	.0078 (0.14)
ALS 16-19	-.0347 (0.76)	-.1798 (1.79)	-.0059 (0.11)
ALS >=20	-.0386 (0.84)	-.1829 (1.82)	-.0118 (0.21)
Bulgaria	-.0496 (4.24)	-.0230 (1.65)	-.0692 (3.87)
Czech Republic	-.0365 (3.12)	-.0050 (0.37)	-.0620 (3.41)
Estonia	-.0257 (2.20)	.0051 (0.37)	-.0485 (2.75)
Hungary	-.0286 (2.45)	-.0164 (1.21)	-.0394 (2.18)
Lithuania	.0166 (1.43)	.0053 (0.40)	.0285 (1.57)
Poland	-.0298 (2.53)	-.0087 (0.63)	-.0449 (2.49)
Romania	-.0170 (1.46)	-.0063 (0.48)	-.0264 (1.41)
Slovakia	.0040 (0.35)	.0056 (0.42)	.0040 (0.23)
Slovenia	-.0100 (0.86)	.0061 (0.45)	-.0237 (1.33)
Constant/cut1	.1038	.1878	.0831
Adjusted R^2	.0372	.0352	.0269
N	10,099	4,478	5,621

Source: Eurobarometer #73.2, February-March 2010. t-statistics are given in parentheses.
Notes: see Table 2. Excluded category – Latvia.

Table 5. Regression Equations for the Probability of Seeing a Mental-Health Professional (*Estimated with a linear probability model)*

	Full Sample	Western Europe	Eastern Europe
Age 25-34	.0084 (0.88)	.0179 (2.05)	-.0130 (0.82)
Age 35-44	.0153 (1.53)	.0285 (3.11)	-.0098 (0.58)
Age 45-54	.0310 (3.07)	.0321 (3.46)	.0035 (0.21)
Age 55-64	.0259 (2.41)	.0024 (0.25)	.0103 (0.56)
Age ≥65	.0192 (1.59)	-.0310 (2.83)	.0395 (1.87)
Male	-.0304 (7.49)	-.0198 (5.28)	-.0303 (4.53)
Home	.0296 (3.74)	.0303 (4.45)	-.0023 (0.15)
Student	-.1699 (5.50)	-.0320 (1.21)	-.1218 (2.04)
Unemployed	.0290 (3.93)	.0506 (6.87)	.0122 (1.11)
Retired	.0438 (6.00)	.0437 (6.57)	.0496 (3.91)
Married	-.0170 (2.75)	-.0328 (6.00)	.0021 (0.19)
Living together	-.0109 (1.37)	-.0127 (1.76)	-.0015 (0.11)
Divorced/separated	.0293 (3.24)	.0263 (3.22)	.0222 (1.43)
Widowed	.0056 (0.60)	-.0109 (1.29)	.0102 (0.65)
AgeLeftSchooling<16	-.1278 (4.36)	-.0433 (1.75)	-.0732 (1.26)
ALS 16-19	-.1535 (5.25)	-.0457 (1.84)	-.1025 (1.78)
ALS >=20	-.1622 (5.54)	-.0293 (1.18)	-.1071 (1.86)
Austria	-.0037 (0.27)	-.0290 (2.86)	
Cyprus	-.0757 (4.40)	.0087 (0.70)	
Denmark	-.0090 (0.64)	-.0082 (0.80)	
Finland	-.0515 (3.68)	-.0308 (3.03)	
France	-.0068 (0.49)	.0018 (0.18)	
Germany	-.0473 (3.75)	-.0237 (2.59)	
Greece	-.0863 (6.13)	-.0302 (2.95)	
Ireland	-.0168 (1.20)	-.0297 (2.92)	
Italy	-.0249 (1.79)	.0087 (0.86)	
Luxembourg	-.0503 (2.94)	-.0069 (0.56)	
Malta	-.0166 (0.96)	-.0242 (1.92)	
Netherlands	-.0225 (1.61)	.0271 (2.68)	
Portugal	.0323 (2.28)	-.0125 (1.21)	
Spain	-.0230 (1.63)	-.0081 (0.79)	
Sweden	-.0336 (2.40)	-.0205 (2.01)	
UK	-.0242 (1.85)	-.0469 (0.70)	
Bulgaria	-.0872 (6.24)		-.0894 (6.13)
Czech Republic	-.0209 (1.50)		-.0206 (1.41)
Estonia	-.0132 (0.95)		-.0128 (0.88)
Hungary	-.0445 (3.20)		-.0457 (3.13)
Latvia	-.0040 (0.29)		
Lithuania	.0036 (0.26)		.0077 (0.53)
Poland	-.0676 (4.82)		-.0681 (4.64)
Romania	.1395 (10.08)		.1390 (9.58)
Slovakia	.0513 (3.68)		.0534 (3.67)
Slovenia	-.0421 (3.01)		-.0463 (3.19)
Constant	.2717	.1118	.2208

Adjusted R^2/Pseudo R^2	.0326	.0220	.0515
N	26,800	16618	10182

Source: Eurobarometer #73.2, February-March 2010. t-statistics are given in parentheses.
Notes: Base categories: Belgium in columns 1 and 2, and Latvia in column 3.
Question. In the last 12 months, did you seek help from a professional because of a psychological or emotional problem?

Figure 1. Raw Data on the Probability of Antidepressant Use at Different Ages (with only country dummy variables included as controls)

The y-axis is the proportion of individuals using anti-depressants. Each dot corresponds to use at that particular age.

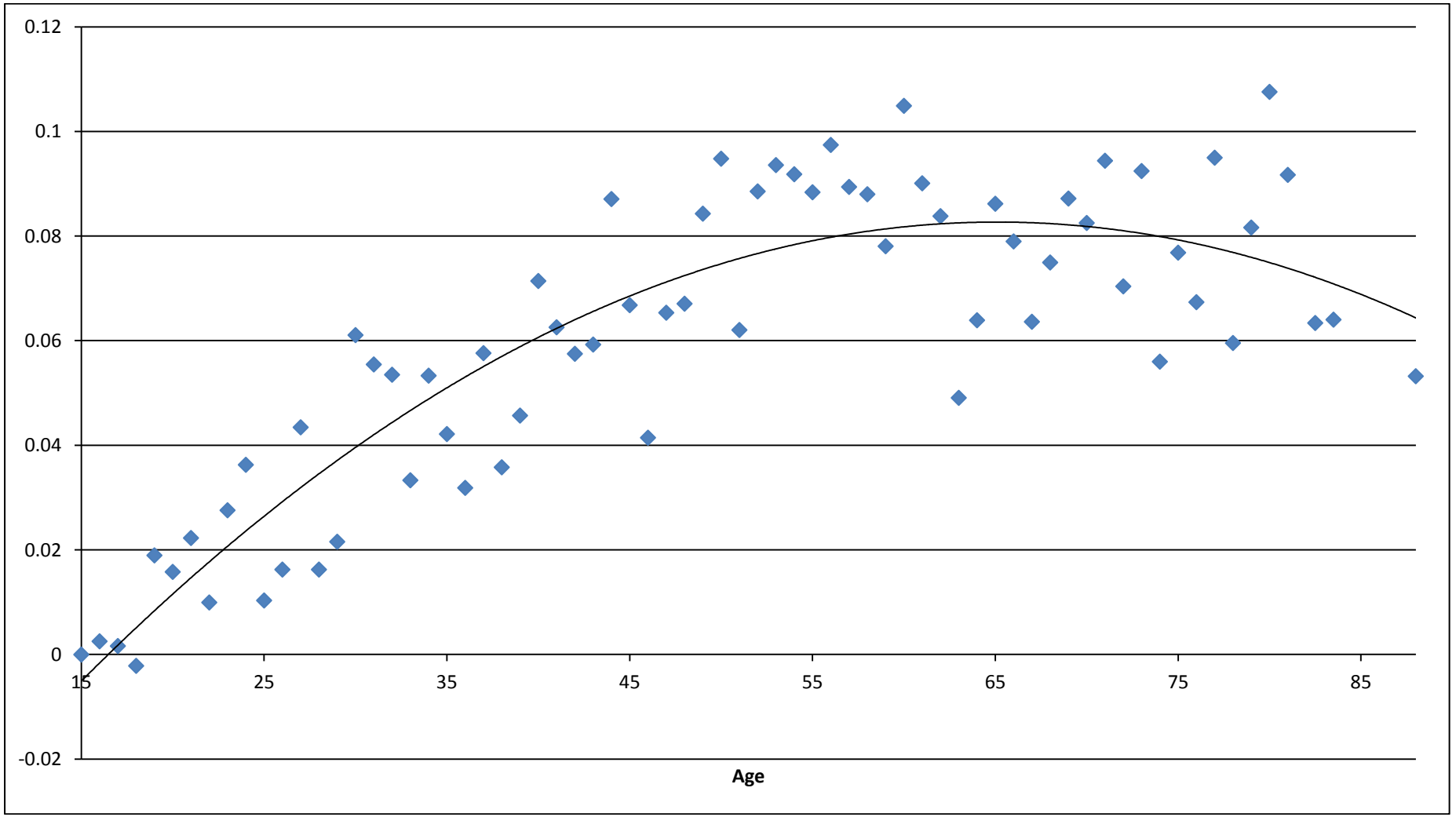

Figure 2. The Relationship Between the Probability of Antidepressant Use and Age (once a full set of controls for confounders are included, as in Column 1 of Table 2)

The y-axis is the proportion of individuals using anti-depressants. Each dot corresponds to use at that particular age.