

Homeostasis and Well Being

John Malcolm Dowling, Yap Chin Fang
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Malcolm Dowling and Yap Chin-Fang*

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Summary: The paper suggests that maintenance of a homeostatic equilibrium provides a rationale for many actions of economic agents. Homeostatic equilibrium has physical, economic, emotional, psychological and environmental dimensions. The characteristics of this equilibrium include feelings of safety, trust, connectedness with friends, family and community, and a predictable and welcoming social and work environment. Individuals generally make decisions that help them move toward and achieve this state of equilibrium. Departure from homeostasis reduces well being and stimulates agents to take actions that will return them to a state of homeostasis. This hypothesis is tested with probit analysis using sample responses from the four waves of the World Values Surveys conducted between 1980 and 2002. Results generally support the homeostasis hypothesis. Variables that reflect departure from homeostasis such as divorce and poor health are highly significant, pointing to a reduction in well being. Variables that reflect the importance of friends, family, a trusting social and work environment have significant impacts to raise well being.

I. INTRODUCTION

A growing number of economists, psychologists and other social scientists have become interested in research on the determinants of happiness (See Ferrer-i-Carbonell and Frijters 2004, Easterlin 2001a, Easterlin 2001b, Frank 1988, Lane 2000, Layard 2005, Di Tella et al 2003 and Veenhoven 1994 among others). The basic approach in these studies has been to compare self reported levels of happiness or well being from questionnaire surveys with several explanatory variables. The initial results from this research took many economists by surprise. It showed, for example, that well being and income were not closely related over time. While income and happiness are positively correlated across countries up to a middle level of per capita income, the relationship flattens out quickly. Happiness in most industrialized countries is about the same no

* Dowling (corresponding author) is visiting professor of economics at Singapore Management University, 90 Stamford Road, Singapore 178903. Email: johnmalcolm@smu.edu.sg. Yap teaching economics at Tampines Junior College, Singapore. Email: yaphome2003@yahoo.com. We would like to thank Colin Ash and Markus Karner for helpful comments.

matter what the level of per capita income. Furthermore, aggregate levels of happiness and well being are not appreciably higher now than they were at the end of World War II, even though per capita income has increased by several hundred percent. Relationships between well being and gender, race, education, age, life style, employment status and health have also been investigated.

While psychologists have developed some models of behavior modification and mental reinforcement to help people achieve an elevated state of well being (Seligman 2002) and economists have used theories of consumer behavior to give insights into the importance of relative income in explaining variations in well being (for example Duesenberry (1949), Friedman (1957), Veblen (1994) and Scitovsky (1976), there have been fewer attempts to develop a more general theory of well being that incorporates both economic and psychological factors.

In this paper we propose a behavioral theory of well being and happiness based on the biological concepts of homeostasis and allostasis. The theory has several components.

First, individuals achieve a higher state of well being and happiness when they are in a homeostatic equilibrium. This equilibrium state has physical, emotional, psychological and environmental dimensions. The characteristics of this equilibrium include feelings of safety, trust, connectedness with friends, family and community, and a predictable and welcoming social and work environment. Individuals make decisions that help them move toward and achieve this state of equilibrium.

Second, when individuals are displaced from this equilibrium as a result of abrupt and strong changes (shocks) in the overall environment, well being and happiness are affected. If the shock is positive (marriage, birth of a child, promotion, windfall inheritance), the individual experiences an increase in well being. If the shock is negative (death of a child, parent or spouse, falling seriously ill, demotion or getting fired), well being is adversely affected.

Third, behavior adjusts to restore the individual to homeostatic equilibrium through a combination of physical, emotional, behavioral and psychological adjustments. This behavioral readjustment is known as allostasis.

Fourth, this process of adjustment to external shocks creates physical, emotional and psychological stress.

To develop this theory, the concept of homeostasis as it relates to human, ecological and physical systems is developed. We pay particular attention to the impact of external shocks (such as unemployment, deteriorating health, divorce, emotional challenges) on agents and how agents react to these shocks. These behavioral adjustments by agents are then related to the concept of homeostasis and allostasis, and to research findings on the determinants of happiness and well being.

The structure of the paper is as follows: The second section discusses the proposed unifying framework of homeostasis and allostasis, and its usefulness in explaining the behavior of organisms, sociological and ecological systems. The results of this review suggest that departures from a position of homeostasis result in displacements in states of well being and happiness. As individuals readjust to these displacements through adjustments in emotional and cognitive states through an allostatic process, they find a new equilibrium and balance in well being. Empirical support for the theory is developed in section 3. In this section we initially discuss the determinants of well being and happiness that have been reported in the literature. Within the context of this literature, variables that impact on individuals happiness and their homeostatic equilibrium are reorganized and classified in general terms as to whether they are a demographic control variables (gender, age, educational level), work related variables (employment status, work environment) or life circumstances (health, leisure, friends and family.) The results of existing empirical studies are reviewed from this perspective and the impact on happiness is discussed. Next we undertake a new analysis of happiness using questionnaire results from different waves of World Value Surveys. These results are then summarized and compared with the literature surveyed and conclusions drawn.

II. HOMEOSTASIS AND HAPPINESS

The objectives of this section are threefold. The first is to explain the concepts of homeostasis and allostasis as they relate to physiological systems in animals, humans and the general environment. The second is to derive a model of behavior that postulates that happiness is attained when a homeostatic equilibrium is reached. In particular, a model of dynamic behavioral and emotional adjustment is developed to explain what happens when these states are disturbed and how agents attempt to return to a state of homeostatic equilibrium. Finally, the section goes on to explore how the results from happiness research summarized in the previous section fits into to a model of behavior based on such homeostatic and allostatic responses of biological, ecological and other systems.

To begin, we can define a few key concepts. The first is homeostasis. Homeostasis is a term coined by Walter Cannon in 1932 (see <http://en.wikipedia.org/wiki/homeostasis>) which refers to the use of term homeostasis in biology and other fields) to describe a process observed in biological systems. It has subsequently been used to describe ecological systems, the balance of forces in nature and other natural and human systems. Homeostatic mechanisms are present in all levels of living systems down to the cellular and molecular levels, including the organisms themselves and their populations. In complex organisms, such as humans, it involves a constant monitoring and regulation of oxygen and carbon dioxide levels, nutrients, hormones, organic and inorganic substances. The concentrations of these substances in the body fluids remain unchanged, within limits, despite changes in the external environment.

Homeostasis in organisms is exemplified by the operations of the endocrine system. The hormone-synthesizing activities of the endocrine glands are regulated by events occurring in the systems that the hormones regulate. For example, a rise in blood-glucose levels stimulates the pancreas to secrete insulin, which acts to accelerate the removal of glucose from the blood by conversion into storage products like glycogen and fat. The sensations

of hunger and thirst are also homeostatic mechanisms - they help the organism maintain optimum levels of energy, nutrients, and water.

Homeostatic mechanisms also operate to regulate the size of populations. An example is the relationship between the populations of predatory animals and their prey. If prey becomes abundant, so do their predators, until predation diminishes the supply of prey and causes a decline in the predator population. This allows the prey population to build up again, and the cycle is repeated. In this manner, the populations of both prey and predator oscillate around a mean.¹

One important aspect of homeostasis that is particularly relevant for human behavior is that the regulatory system is sensitive to **changes** in stimuli and environments rather than to the maintained level of activity or equilibrium. When the level of activity is as expected, the system is in homeostatic equilibrium. When there are shocks or stress on the system, homeostatic mechanisms act to return the system to equilibrium. This process of adjustment is referred to as **allostasis**. As the system responds, it is subjected to an **allostatic load**. A common example in animals is the fight or flight response to danger. In the case of everyday life, there are stressful situations experienced by people which we can call the wear and tear of existence. We call this wear and tear allostatic load (See B.S. Mc Ewen and T. Seeman 1999). In cases where the shocks are severe and /or prolonged, the system experiences evolutionary changes that result in a movement to a new equilibrium. In cases of extreme shock, the system may experience permanent or lasting damage. Extreme shocks in the natural ecological balance can lead to the extinction of species. In the case of people, it can result in psychological and emotional problems such as post traumatic stress syndrome and intense anxiety. Generally, the greater the allostatic load and the higher the level of stress, the greater is the potential for increasing mortality and morbidity. "Social ordering in human society is ...associated with gradients of disease, with an increasing frequency of mortality and morbidity as one descends the

¹ Anthropologists studying the evolution of mankind through the ages believe that for the period of more than 100,000 years prior to the development of agriculture about 10,000 years ago when hunting and gathering were the primary economic activities that mankind was in a homeostatic equilibrium with the rest of the natural environment. Population densities were quite low and human settlements were widely dispersed. (See for example the work of Paul Shepard (1996)).

scale of socioeconomic status that reflects both income and education.” Mc Ewen (1999, p. 30). For example in the UK, life expectancy of boys born into professional class homes had a life expectancy of nearly 80 years in 2000, while those born into homes of unskilled laborers could expect to live almost a decade less. (See Office of National Statistics Longitudinal Survey Development Team, 2004 and <http://www.gad.gov.uk/life> tables)

The concepts of homeostasis and allostasis present an opportunity for economists to integrate these ideas into a theory that explains the motivation of decision makers. Whether they are maximizing utility or satisfaction or happiness, emotional and social forces are interacting with genetic imperatives in the decision making process. As we begin to understand how this process works, we may be able to build more realistic and broader models of behavior and understand more clearly the mechanisms that drive the search for happiness and well being.

We can look at the determinants discussed in the previous section from the point of view of these biological mechanisms. The determinants of well being accumulated from these surveys reported above suggest that individuals get more satisfaction from predictable and friendly environments and are negatively impacted by unexpected and negative changes in their environment. To explain these changes in life circumstance as determinants of well being, we need to assume that the physical and emotional state in equilibrium before the displacement was associated with a more satisfactory state of well being and happiness than after the displacement. This assumption requires that we believe that homeostasis is generally associated with well being. If we equate well being with general genetic fitness, this seems like a reasonable assumption.

When people are in a nurturing and free environment where there is trust, stability, good health, a satisfactory work environment, companionship with friends and family, people are generally happy and have a strong sense of well being. This represents the attainment of a homeostatic equilibrium at the environmental social, emotional and psychological level.

As time passes people experience shocks to this equilibrium. Some of these shocks may be positive – a better job, promotion, birth of a child, marriage, movement to a better and more desirable living environment, greater security and trust, development of a more well integrated social life, exercise and more robust health, enjoyment of hobbies, friends and family, and so on. This would lead to a higher level of well being as the individual moves to a new homeostatic equilibrium.

On the other hand, a downward displacement from a homeostatic equilibrium would lead to a lower level of well being. Well being is adversely impacted by events that change the status quo in a negative direction. The factors causing this displacement could include abrupt lowering of income perhaps associated with job loss, break up of important relationships such as divorce, death of spouse or close relative (parent/child), separation from loved ones, illness or illness of relatives or close friends, frequent shifts in residence, being subject to discrimination, a reduction in the safety of the living environment (civil disorder, increase in crime, or war), increased vulnerability to disaster, a feeling of isolation brought on by disagreements with work associates, friends or family.

How does this description of the dynamics of homeostasis applied to well being and happiness relate to the research results surveyed above in the previous section? These results are consistent with much of the research which are reviewed in Section 3 below. Divorce and separation have a negative relationship on happiness (compared with marriage) as do unemployment and poor health. Other variables, such as trust and spiritual values are also important. In one sense, the importance of friends and family is indirect and arises mainly from higher labor productivity and better general work performance. However, the results from the Day Reconstruction Survey (Kahneman, Krueger, Schkade, Schwartz and Stone (2004) provide more direct evidence for the strong importance of these factors. Other factors such as racial discrimination, sex, age and educational differences are not strong determinants of well being.

Therefore, the data on the determinants of happiness is generally supportive of the homeostasis hypothesis. In addition, the idea that systems return to equilibrium by making adjustments in their response to shocks is consistent with the results that people

seem to recover their level of well being after some time, even when the severe disruptions involve disabling injuries and loss of loved ones.

There are other results of happiness research such as the results of time allocation and the various emotional reactions that do not seem to fit nicely into the homeostatic framework of decision making. The question of why people continue to spend on a wide variety of consumer goods when this spending has such a limited impact on the overall well being of society remains unanswered. One possible explanation for such behavior is that survival mechanisms that are still in place as part of our genetic inheritance prompt us to show off to our peer group of friends, family and work associates. Positional goods are a good way to do this. As others catch up, the desire to acquire new positional goods is aroused and a new spending spree begins. In terms of homeostasis and allostasis, the accumulation of wealth would satisfy the need for individuals to feel part of, and acceptance into a peer group community of friends and work associates.²

At a more fundamental level however, the underlying model and motivations that drive behavior in a model of homeostatic and allostatic adjustment are different from the maximizing calculus of microeconomic theory. Rather than decision being motivated by purely cognitive factors, the adjustment mechanism that drives behavior in the case of homeostasis involves a combination of cognitive and emotional imperatives. As a result, the decision making process is richer and broader than the underlying economists' model and involves changes in external factors and tastes as motivation to return to equilibrium.

While tastes may change, the economist assumes they are exogenous. Once they become endogenous, as they are in models involving homeostasis, the decision making process becomes more complex. Tastes enter the decision making apparatus in the form of

² Some individuals are also motivated to excel, explore and seek new and sometimes risky challenges in both work and leisure environments. They become easily bored being forced into a repetitive and humdrum low risk life. It is easy to incorporate this kind of behavior into the homeostatic model by recognizing that the behavior of risk taking people is regulated by a somewhat different adjustment mechanism. Risk lovers will also make adjustments to behavior to bring themselves to a higher equilibrium level of risk and excitement. Nevertheless the adjustment process need not be qualitatively different from the behavior of the risk averse who avoids danger and risky situations. The risk taker will also return to his homeostatic equilibrium through an allostatic adjustment process. While the allostatic load may be different the process itself remains the same.

adjustments to behavior which are required to achieve an enhanced state of well being and involve physical, emotional and cognitive factors which could also be responses to external shocks and different environmental and physical stresses.

Within the context of behavioral adjustments and pursuit of well being, there are a number of examples of how people adjust behavior to maintain homeostasis. Research in neuroeconomics³ suggests that the very presence of ambiguity alone tends to activate the limbic system which is associated with emotional decision making (rather than logical reasoning). This implies that the emotions become more actively involved in decision making when individuals are in a new situation, in unfamiliar surroundings or with unfamiliar people. Because of this, individuals are often reluctant to face new challenges, or experience stress when doing so and are anxious to return to their own comfort zone or familiar equilibrium niche. Furthermore, neuroscience also suggests that agents are comfortable in groups where there is trust and stability (See Camerer et al 2005). Neuroscience has also shown that the tendency to discriminate, for example racial discrimination against minorities, which is often subliminal, dissipates when knowledge and familiarity are increased. This suggests that there is less tension and discord in familiar surroundings (See Healy 2004, Mc Evily et al 2003, and Camerer et al 2005).

Another reflection of the desire to return to equilibrium is evident from behavior of bettors at horse races who generally play long shots as the day progresses. Kahneman and Tversky (1979) argue that this kind of behavior supports the hypothesis that a failure to adapt to losses or to attain an expected gain induces risk seeking. We can also interpret this kind of risk seeking behavior as a desire to return to an equilibrium level of wealth. This motivation is particularly strong when losses are involved. After a gain, gamblers may also take greater risks. This behavior, sometimes called the house money effect, suggests that agents are more willing to gamble away gains just so long as they maintain their equilibrium initial endowment. This initial endowment is the homeostatic equilibrium or set point.

³ See Camerer, Loewenstein and Prelec (2005) for a review of this new field.

The desire to get back to an equilibrium level or set point is also reflected in experiments by Kahneman, Knetsch and Thaler (1991) who argue that losses and gains are calculated in terms of departure from a reference point. In a series of experiments dealing with different initial positions they observed that in departures from a reference point experimental subjects were more sensitive to losing than winning, i.e. the emotional impact of a loss is significantly greater than that of a gain.

Business firms also operate to bring about a return to an equilibrium set point. Firms take more risks when they stray from the set point. This analysis results in a U shaped risk – return relationship with an inflection point (minimum) occurring around the target rate of return (see Figure 2). Fiegenbaum and Thomas' 1988 study of US firms confirms this relationship between risk and return. To the far left of the inflection point, firms will engage in more risky behavior in order to get back to a target rate of return and they will also take on more risk once they have gone substantially above the target rate to the right of the inflection point.

[Insert Figure 1 here]

Another aspect of the relationship between risks and the homeostatic equilibrium relates to behavior that has been dubbed risk homeostasis. This behavior implies that there is an optimum or equilibrium level of risk that people are generally comfortable with. If this is true, then efforts to decrease risk may be met by riskier behavior. Consider the case of farm tractors and road design. When tractors were designed for greater stability, farmers used them on steeper slopes and the accident rate remained constant. When highways were designed to be safer, drivers increased their speed and took more risks and the accident rate remained at previous levels (See Slovic 1984 for details). Ample evidence also illustrates that when individuals are placed in dangerous situations where there is risk of injury or death, they experience a higher level of stress (Spitzer et al 1995) which

implies that they have the urge and motivation to take action to return to their equilibrium level of stress which is consistent with their desired comfort zone. .

The nature of individual's disposition also affects the rate of return to the equilibrium set point. For example, research suggests that optimistic patients live longer than pessimistic patients (Palmore 1969a, 1969b). Happy people recover faster and some diseases can be cured or treated more effectively when the patient has a happy and upbeat attitude (Diener and Seligman 2004). As a corollary to this, a pleasant mood seems to lower blood pressure and that a high level of stress reduces the ability of the immune system to fight of disease. Furthermore, depression and anxiety, two major forms of mental illness, lead to significant declines in well-being (Spitzer et al 1995, and Packer et al 1997). On the other hand, there is evidence that happy people show low signs of mental illness (Diener and Seligman 2002). In addition, duration of unemployment and well being are negatively related, and absenteeism and turnover rates are lower when workers are happier (Clegg 1983, Clark 2001 and Akerlof et al 1988).

There is also ample evidence that agents who experience negative shocks that reduces well being make persistent attempts to return to the homeostatic equilibrium and to increase their levels of well being and happiness. Those who are unemployed look for work.⁴ Those who are sick go to the doctor.⁵ Those who are divorced begin to date and often remarry⁶. Those who move to a new city or neighborhood make efforts to make new friends.

While the desire to return to a set point or homeostatic equilibrium may not always be synonymous with an increase in happiness and well being, the various behaviors just described do suggest that the motivation to return to such an equilibrium set point is

⁴ In the United States while some people may become discouraged and drop out of the labor force, there is great persistence in trying to find work. The numbers of unemployed looking for work after 26 weeks in the US is still about 60 percent of the number of workers unemployed for five weeks or less looking for work.

⁵ Over 15% of GDP is spent on health care in the United States (see Heffler et al (2005)

⁶ In the United States over 95% of all adults are married or have been married. 75% of all divorced people remarry, half within three years.(see <http://www.census.gov/prod/2002pubs>)

strong and highly desirable in a wide variety of circumstances. As such, this behavioral pattern generally reflects a desire to return to or move toward the familiar, predictable and comfortable, and away from undue stress and aggravation. To the extent that these states of equipoise and relaxation are preferred, we can infer that they are also positively associated with higher levels of well being and happiness. When life circumstances such as stress, death of relatives/close friends and other negative social developments disrupt this equilibrium, well being is also compromised.

Other researchers have pinpointed the importance of such a homeostatic set point in determining the level of well being. For example, Cummins and Nistico (2000) suggest that life satisfaction responses from questionnaires, on average, are not free to vary over the full range of possible outcome (say from being very unhappy to very happy). Instead, the distribution of responses is confined to a narrow range in the happy to very happy neighborhood. Cummins and Nistico (2000) argue that this is because of the operation of such a homeostatic mechanism. They suggest that high self esteem control, optimism about life's circumstances and the understanding that we are in control of our own destiny help to constrain responses to a narrow range. This optimistic approach to life in general serves as a psychological buffer against misfortune, if and when it arises. Furthermore, this narrow range of variation in average subjective well being is reinforced by observations that people's feeling of well being respond quickly following misfortune. Even those who have suffered serious accidents involving paralysis return to a fairly optimistic view of life after some time. Such a view of behavior stresses the powerful psychological forces that lead to a return to a set point or homeostatic equilibrium.

Psychologists refer to this belief pattern as positive cognition bias. This bias leads to a variety of observed behaviors that buffer the psyche. These include people's need to preserve their self esteem by downplaying the ability of others; to control essentially random outcomes (like roll of dice) by mental concentration or to predict many more positive than negative outcomes when asked to think about the future.

We should, however, not interpret the strong desire to return to a set point as a reason to forsake explanations for variations in observed well being. Despite the relatively small variation in responses (vis a vis the full range of possibilities), models which try to describe the causes of well being are only successful in accounting for a small proportion of the variation. In large cross-sections such the world value surveys or US General Social Surveys, less than 10 percent of the variation in individual response is explained. Furthermore, where panel data are available, analysis suggests that happiness over time varies directly and significantly with several dimensions of people lives including family life, health, work and social environment (Easterlin 2001a).

None of this work contradicts the results of happiness analysis which is reviewed in conducted in the next section or the interpretation of these results within a framework of homeostasis. Rather it reinforces the findings from a slightly different perspective by introducing dynamics of behavior more explicitly through the use of panel data. Easterlin argues, for example, that satisfaction with work and family results in a slight increase in happiness until middle age and that beyond midlife happiness decreases slowly as health deteriorates.⁷ These changes are quite small relative to the size of the happiness coefficient for different age cohorts. His analysis also reinforces the conclusion that family life, financial situation, work and health are all important determinants of well being. With the exception of health, the order of importance also corresponds closely to the conclusions drawn in this paper which is more concerned with displacement from equilibrium and not the general pattern of well being over time. There are also interaction effects that must be taken into account. Unemployment, divorce and health effects in combination have a negative impact on all four of Easterlin's explanatory variables.

⁷ The impact of age on well being is not very strong in any of the probit results presented in section 3.

III. DETERMINANTS OF HAPPINESS AND WELL BEING – RESULTS FROM THE LITERATURE

Much of what goes on in our lives reflects two opposing, yet complementary sets of motivating factors. On one hand, we are drawn to security, safety, predictability and the comfort of a loving home and work environment. On the other hand, we are drawn by our curiosity to adventure and risky behavior as an antidote to the boredom which results when life becomes routine and humdrum. We could still be swinging from the branches of trees in Africa if we hadn't developed curiosity and overcome our fear of moving outside our comfort zone. Yet cooperation and a sense of community are key ingredients in the evolution of modern society, beginning with settled agriculture and the formation of stable farming settlements and moving eventually to more complex industrialized societies.

Most of the literature on happiness and well being focuses on the variables that impact subjective or hedonic well being⁸. We confine our analysis to variables that have been identified in self reporting questionnaire responses. Generally, evidence from surveys suggests that well being is dependent upon three sets of variables. The first are those variables dealing with work and the workplace, such as job and employment status, and whether the work environment is friendly or hostile, challenging or humdrum. We define this vector of variables as **W**. Variables dealing with leisure and life circumstances, such as relationships with family and friends, marital and health status as well as the political and social environment also has an impact on well being. We define this vector of variables as **L**. Finally, there is a set of demographic variables which includes gender,

⁸ Psychologists have developed some ways to define and measure happiness or well being (see Seligman 2002). They suggest that there are two kinds of well being. The first is **subjective well being**, sometimes called hedonic well being. Hedonic or subjective well-being focuses on positive affects such as satisfaction with work and life in general, and the frequency of pleasant or unpleasant emotions in the context of self-reporting. Another way to gauge happiness and well being is by measuring an individual's ability to take control of situations, assume a leadership role or achieve some status in the world. Called **psychological or eudemonic well being**, it is related to personal growth, purpose in life, positive relations, dealing with challenges, working with others and self-acceptance.

race, education and age that also has a potential impact on happiness which is not likely to change (with exception of education). We define this vector of variables as **D**.

Therefore, happiness or well being, defined as **H**, is determined by these three sets of independent variables.

Combining we have the fundamental happiness equation, we have

$$\mathbf{H} = \mathbf{f}(\mathbf{D}, \mathbf{L}, \mathbf{W}) \quad (1)$$

Self reporting measures of happiness are a concrete way of reflecting an individual's feeling of well being and of determining how these three factors rank as determinants of happiness. Much of the literature on happiness focuses on subjective well being as reflected by these self-reported responses to survey questions.^{9,10}

The results of these researches can be summarized briefly. For each variable or set of variables we designate whether they fit into the **D**, **L** or **W** categories.

1. Demographics variables such as age, marital status, education and gender and considered in (D)

Demographic variables capture the fixed effects of variations in individual characteristics but not individual traits. If we could relate changes in happiness to

⁹ There are fewer studies concerned with measuring psychological well being and/or devoted to carefully distinguishing between psychological and subjective well being. Triandis (2000) suggests an interesting dichotomy between individual attributes and circumstances (personality characteristics, stress, health, education, employment and marital status) and cultural forces (income per capita, political freedom, civil conflict, physical vulnerabilities, trust, and corruption) and their impact on well-being.

¹⁰ There are a number of surveys that have been conducted throughout the world over the past few decades and, more intensively, in industrial countries. These include the Euro-Barometer Surveys conducted in several European countries by the European Commission and the World Value Surveys conducted in many countries around the world (view at [http:// www.europeanvalues.nl/](http://www.europeanvalues.nl/) and <http://www.worldvaluessurvey.org/>). A more recent wave of World Value Surveys is available on CD Rom. In addition there are individual country surveys that have been used by researchers. Some examples are Di Tella et al (2003) for the US, John Helliwell (2005) for Canada, Clark and Oswald (1994) for the UK, and Frey and Stutzer (2002b) for Switzerland.

changes in the explanatory variables through the use of time series or panel data we could hope to eliminate individual traits. However most of the studies have not done so (See Ferrer-i-Carbonell and Frijters 2004).

These individual traits are captured by differences in genetic make up. Much of our emotional and cognitive makeup is determined by the hardwiring of our brains and bodies as a result of our genetic inheritance. Studies of identical twins show that their happiness levels are very similar even if they were raised in separate environments (Layard 2005 and Lykken 2000). Twins, for example, might have the same reported well being if one was raised in a country with a higher per capita income and the other in a country with a low per capita income. Psychologists estimate that about half of our happiness is determined by genetic factors that are determined by our genetic makeup and our predisposition to be happy or sad in a particular social setting. The remainder is determined by the environment we are raised in.

The impact of *Age* on happiness is interesting in its own right, either as a proxy for variations in age cohort effects on happiness or of deterioration in health or other unobserved social factors. The World Values Study Group (1994) found a small positive effect reflecting either that the happy live longer (Argyle 1999) or that they feel more in control of their environment (Ryff 1995) or have come to grips with life and have fewer expectations (Campbell et al 1976). Other results show a U shaped pattern of well-being is observed over the life cycle, with a low point in the mid forties to early fifties age groups for both men and women (Helliwell 2005, Frey and Stutzer 2002a, 2002b, and Blanchflower and Oswald 2004a), perhaps reflecting what is commonly referred to as mid life crisis. However, Alesina et al (2001) and Easterlin (2001a) found happiness increases with age up until between 40 and 45, after which happiness begins to decrease. The explanation given by Easterlin for differences between his result and the U shaped pattern reported by Helliwell, Blanchflower and Oswald and others is that these other studies included life cycle variables such as work marital and economic status. In any event, the impact of age on well being, while statistically significant, is never large.

Like age, gender plays a very small role in determining levels of well being. Other things equal, men are marginally less happy than women, (Helliwell 2005, Di Tella et al 2003, and Blanchflower and Oswald 2004a) although, as Helliwell (2005) points out, the attempted suicide rate for women is higher.

Marriage has a significant positive impact on well being. People who are married or living with partners are happier than those who are single, divorced, separated or widowed. Further, the impact of marital status seems to be independent of the argument that happy people are able to stay married longer (Helliwell 2005, Di Tella et al 2003, Argyle 1999, Veenhoven et al 1994, and Gerlach and Stephan 1996).

Minorities are generally less happy probably because of discrimination both at work and by society in general (Blanchflower and Oswald 2004a, Easterlin 2001a and Helliwell 2005).

2. Variables dealing with work and the workplace, such as income, jobs and employment status are considered in W.

Relative income has a small positive impact on well being, particularly in high per capita income countries. Studies by Blanchflower and Oswald (2004a) Frank (1989), Lane (2000), Helliwell (2005), Easterlin (2001a), Di Tella et al (2003) and Layard (2005) reach this conclusion. For individuals living in a high per capita income country, being above the median relative income has a small impact on well being. Di Tella (2003) found small but significant impact on well being for the three highest quartiles of the income distribution. Also, Blanchflower and Oswald (2004a) conclude that people look upward rather than downward when making relative income comparisons. However, since movements within the income distribution tend to cancel each other, the impact of changes in relative income doesn't affect the aggregate level of happiness.

This accounts for the fact that the *level of income* or the absolute levels of income per capita has virtually no impact on well being above a minimum level of per capita income.

This result holds for a wide spectrum of countries (see Table 1, Lane and Honohan (2000), Frey and Stutzer (2002a and 2002b), Diener and Seligman (2004) and Blanchflower and Oswald (2004a)).¹¹ Even when people unexpectedly acquire large sums of money from winning the lottery or inheritance, there are minimal long term effects on happiness (Argyle, 1999). This is probably because people quickly adapt to their new levels of wealth.

[Insert Figure 2 here]

Unemployment has a strong negative impact on well being (Layard 2005, Oswald 1997, and Clark and Oswald 1994, Di Tella et al 2003). Clark and Oswald suggest that job loss had a greater depressing effect on well-being than any other single characteristic, including other important negative impacts such as divorce and separation. Similar results are observed in Germany, Australia and the United States, and reviewed in more detail by Frey and Stutzer (2000). One of the reasons why the impact of unemployment is so strong is that in addition to the economic effect of losing a job, there are additional psychological and social impacts. The psychological costs are loss of self-esteem and self worth, which can lead to depression and hopelessness, particularly if the duration of unemployment is prolonged. The social costs relate to the fact that work often defines social position and status -- loss of work has a strong negative impact on social status. Furthermore, an increase in unemployment can cause distress and anxiety among those employed who starts to fear for their jobs. It also has a negative impact on the family members of those who have become unemployed. Unemployment is a heavier burden in societies where being employed is an important social norm. In addition, there is some evidence that an increase in the general level of unemployment makes the rest of society feel worse! (Di Tella, MacCulloch and Oswald 2003, and Helliwell 2003) Helliwell

¹¹ However, Di Tella et al (2003) found that the level of GDP and the rate of change of GDP do have a significant effect on well being at the aggregate level across a dozen European nations from 1975 to 1992. This could be because the level of income is related to other variables that indirectly affect well being.

finds that unemployment has a greater negative impact on well being in high per capita nations than in low per capita countries. This could be because the psychological impact of loss of self-esteem is greater where there is greater emphasis on material success. This reaction is also consistent with findings that unemployment has a larger deleterious effect on men than women. Men identify more with their jobs as a status symbol than women who have children and the family as additional sources of emotional support which are not always available to men.

Satisfying and stable work environments are key ingredients to a high level of self esteem, self worth, well being and happiness. Furthermore, happy workers are more productive workers. There is a considerable amount of research that suggest job satisfaction and positive attitudes both contributed to raising worker productivity. Experiencing more positive emotions at work is also associated with higher levels of organizational citizenship, as well, as better performance. There is also lower turnover, less absenteeism, more punctual attendance and cooperation when employees are happier (Spector 1997, Miner 2001, and Diener and Seligman 2004). This evidence suggests that not only are happy workers more productive, happy workers also contribute to raising productivity for other workers. Having happy employees also result in higher levels of consumer satisfaction since customers like being served by happy employees. Because of these favorable consumer attitudes, firms got repeat business which resulted in greater sales turnover and higher profits. It is well known that paying workers a higher salary than the norms in the industry – the so-called efficiency wage argument – can be a contributing factor in raising productivity (Campbell 1993). It is also possible that efficiency wages may also increase workers' feelings of well being by making them feel more appreciated and thus more valuable to the firm.

3. Personal interactions, health, economic and social stability and the social environment are important textural influences on happiness. These variables are considered in L.

Social organization and freedom of expression impact on well being. Helliwell (2003 and 2005) concluded that people with the highest feeling of well being are those who live in societies where social and political institutions are effective, have a high degree of mutual trust and a low level of corruption. Other studies (Inglehart and Klingemann 2000, Veenhoven 1994 and 2001, and Layard 2005) found that economic freedom was positively related to happiness, particularly in poorer countries. Diener, Diener and Diener (1995) suggested that human rights and individual freedom are also correlated with well being. Frey and Stutzer (2002b) explored the relationship between democracy and indices of subjective well being in Switzerland. They found a highly significant relationship between life satisfaction and democracy using data from Swiss cantons. Furthermore, they found that a stronger democratic environment raised the well being coefficients across the board for a wide range of individuals in the entire society, not just a select few. Repressive regimes reduced the sense of well being (Frey and Stutzer 2000, and Veenhoven 2001). On the other hand, stability in a society is also an important component in establishing a feeling of well being. Low happiness scores were reported in the Soviet Union in the unstable years following liberation from Soviet oppression (Inglehart and Klingemann 2000, Veenhoven 2001 and Layard 2005). These low levels are evident from a quick look at Figure 2. The lowest happiness scores were recorded in countries that used to be part of the Soviet Union.

It is possible that widespread well being is necessary for democracy to prosper as suggested by Inglehart (1990), although high levels of well being could legitimize democracy and promote its survival as suggested by Doyle (2002). But democracy is not a necessary condition for happiness. For example, as reflected in Figure 2, well being in China (a communist state) is higher than in India (a parliamentary state). This implies a reverse causality between happiness and the establishment of democratic institutions which tend to bias estimates in models where happiness is posited as a function of the institutional setting.

Another factor to consider in judging the importance of the institutional setting is how the organizational norms of society and the degree of tolerance to departures from these

norms impacts on well being. For example, Arrindell et al (1997) and Triandis (1994 and 1995) argue that in tight societies with rigid enforcement of rules, e.g. Japan (Iwao 1993), people are more prone to experiencing high levels of anxiety. They fear that they will be sanctioned or even ostracized if they fail to adhere to proper behavioral norms.

Recent work comparing the Americans with Europeans suggests that the social context and government policy have important impacts on well being, particularly to those in the lower levels of the income distribution. For example, Alesina et al (2001) found that when income in Europe is more unequally distributed, the level of happiness is reduced. This suggests that just observing greater income inequality makes Europeans unhappy. However in the United States the distribution of income doesn't generally have a significant effect on happiness. They suggest two possible explanations – Europeans prefer more equal societies, and that social mobility is higher in the United States. Alesina et al (2001) found evidence in the US that only the rich liberals were unhappy about the level of income inequality, whereas in Europe, both the poor and rich liberals alike were unhappy about the level of inequality. The results suggest that there is greater popular demand for governments to fight inequality in Europe than in the United States. This could explain why the “dole” is generally less popular as a method for redistributing income in the United States than it is in Europe.

Life *disruptions* have a strong negative and very strong impact on happiness and well being. As noted previously, divorce reduces well being. Social mobility as reflected by the number of moves also has a significant negative impact on well being. Making more moves tend to reduce trust, while fewer moves tend to increase trust and social cohesion in neighborhoods. Magdol (2002) conclude that frequent moves have a detrimental impact on families, particularly in wives. Long distance mobility discourages individuals in forming long-lasting community ties and has a negative impact on well being. Illness, mental anguish and death in families also have a very strong negative impact on well being (Di Tella et al 2003, Layard 2005, and Diener and Seligman 2004). Disruption in the form of vulnerabilities to floods, hurricanes, earthquakes, tornadoes and other natural disasters, also results in lower levels of well being (Veenhoven 1994).

Poor health and illness diminishes well being quite dramatically as shown in several studies (World Values Study Group 1994, Packer, Husted, Cohen and Tomlinson 1997, Diener and Seligman 2004, and Gerlach and Stephan 1996). Depression and other psychiatric illness together make up about 30 percent of the various causes of disability. This is a much higher rate than disability from alcohol and drug addiction (together 10%), respiratory illness, cancer and heart trouble (together 15%) (Layard 2005, Chapter 11). There is also evidence that happy people show fewer signs of mental illness (Diener and Seligman 2004).

Rewarding social interactions are key components of well being (Baumeister and Leary 1995). This entails frequent and pleasant interactions with a few people within the context of a stable, trusting and mutual caring environment (Zak and Knack 2001). Ongoing relationships, within a framework of mutual concern, provide a stronger and more substantive bond and feeling of belonging than one based on self interest alone (Clark 1984, and Clark and Mills 1979). Furthermore, superficial social contacts can not substitute for deeper and more intimate relationships (Weiss 1973, 1979 and Baumeister and Leary 1995). Positive social bonds are associated with positive emotions and higher levels of well being (see Sternberg 1986 and McAdams 1985). Conversely, the loss of friends leads to loneliness and depression (Leary 1990) as well as anxiety (Baumeister and Tice 1990). Other research shows that intimate relationships and close social and family ties are highly valued by respondents and, in the case of sexual intimacy, results in a significantly high increase in well being. (Kahneman et al 2004, Diener and Seligman 2002, and Blanchflower and Oswald 2004b)

Two specific events that have a strong impact on a person's need to belong are *divorce and death*. Even though marriages that end up in divorce court may not have been joyful, divorce nevertheless results in negative feelings and reduced well being (Weiss 1979, Price and Mc Kenry 1988). The death of a spouse, child or close friend rank high on the list of stressful and difficult events and can result in a period of depression (Holmes and Rahe 1967 and Weiss 1979).

4. Summary

The results of happiness research suggest that people are happier in environments that are fair, trusting and predictable and where social and work relationships are satisfying and rewarding. People are adversely affected by negative disruptions such as illness, unemployment and divorce yet they recover more rapidly than they expect from these disruptions. People value their freedom and are adversely affected by rigid constraints and governmental controls. People value friends, family and social relationships more than work and yet they spend more time involved in activities they don't like including work and commuting. Extra income increases happiness less and less as people get richer. Motivation for maintaining the status quo (being comfortable) is consistent with homeostasis and is reinforced by our social nature and search for trust.

To look at the relative importance of these various factors, consider the Layard (2005) summary of the results from Helliwell's study (2003) of over 90,000 people from the World Value Survey.¹² These results are reported in Table 1.

¹² Di Tella et al (2003) find a similar set of factors and degrees of importance in determining the level of well being.

Table 1 Happiness and social characteristics

Characteristics	Fundamental happiness category	Reduction in happiness – points out of 100
Financial security – family income down by one third	W	2
Unemployed rather than employed	W	6
Job insecure rather than secure	W	3
Unemployment rate up 10 percentage points	W	3
Divorced rather than married	L	5
Separated rather than married	L	8
Widowed rather than married	L	4
Never married rather than married	L	4.5
Cohabiting rather than married	L	2
In general people can be trusted -percentage answering yes down by 50 percent	L	1.5
Subjective health down one point on a five point scale	L	6
Quality of government – Belarus 1995 rather than Hungary 1995	L	5
God is important in my life – no rather than yes	L	3.5

Source: Modified from Layard (2005)

Note: There were no D variables in the Helliwell paper. Generally demographic variables such as age and gender and education were not statistically significant in studies looking at the determinants of happiness.

These results suggest that the most important factors affecting happiness are *shocks to unemployment, marital status and health*.¹³ Demographic variables (**D**) (gender, age, education, race), which were generally either not significant or marginally significant in other studies of happiness, are omitted. The importance of these significant variables

¹³ Quality of government is also an important variable and is consistent with the results reported in this section. However the size of the coefficient also reflects the comparison of two specific countries and is therefore not as general as the other results.

reflects the extent of life disruptions as general explanatory influences and, in the case of divorce and unemployment, the feeling of rejection and isolation. With regard to economic factors, it took a large shock in income to have an impact on well being and other studies have generally found the level of income to be a minor factor in determining happiness. Relative income is more significant.

IV. PROBIT ANALYSIS OF WELL BEING

To supplement the results of the studies already reviewed, an ordered probit analysis is conducted for the 1999-2002 wave of the World Value Survey. These represent the 3rd and 4th waves of these surveys which have been conducted periodically since the early 1980s. The means, variances and range of these variables are displayed in Table 2.

Earlier work by Helliwell (2003), Veenhoven (1993) among others used earlier waves of the survey.

Table 2. Descriptive Statistics*

	Mean	Standard Deviation	Minimum	Maximum
Happiness	1.91	0.75	1	4
Family	1.09	0.32	1	4
Friends	1.68	0.73	1	4
Work	1.27	0.53	1	4
Health	2.05	0.83	1	5
Health Squared	4.91	3.80	1	25
Sex	1.39	0.49	1	2
Age	37.13	12.19	15	95
Age Squared	1527.10	1010.02	225	9025
Marital Status	0.65	0.48	0	1
Education	4.70	2.30	1	8
Unemployment	0.17	0.37	0	1
Social Class	3.32	0.98	1	5
Income Decile	4.73	2.44	1	10
Trust	1.75	0.43	1	2
Work vs Leisure	3.79	1.21	1	5

Total number of observations: 31,669

* See appendix for definitions of variables

General model assumptions for well being equations where responses are ordinal in a bounded range¹⁴ have been discussed by Carbonell and Frijters (2004). The ordered probit model requires that satisfaction is ordinal rather than cardinal and that interpersonal comparison can be made on that basis. If general satisfaction is reflected by the ordinal response to the question of, say, “How happy are you with your life as a whole at the present time?”, then this general satisfaction (gs) for individual i at time t (gs_{it}) is a monotonic transformation of an underlying metaphysical concept called welfare (w_{it}). If $gs_{it} > gs_{iu}$ for all times $t, u = 1 \dots n$, then $w_{it} > w_{iu}$

To estimate the ordered probit as a model of causation, the error terms in the ordered probit – whether they are time varying e_{it} or time invariant v_i , - are either unrelated to observed factors or their relationship is known. Ordinarily we assume the former. This structural framework has been used by Blanchflower and Oswald (2004b), Frey and Stutzer (2000) among others.

How do time invariant fixed effects, including personal characteristics, impact on happiness? To examine this question, Ferrer-i-Carbonell and Frijters (2004) compare the results from ordered probit models of this type with other models used primarily by psychologists. These models assume cardinality and as a result psychologists were able to introduce controls for fixed effects. Economists are not willing to assume cardinality and as a result they have generally relied on probit or logit models of the type just described.

¹⁴ Respondents were asked to answer questions such as “Taking all things together would you say you are very happy, quite happy, not very happy, not at all happy?”; “On the whole are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead?”; “Taken all together, how would you say things are these days – would you say you are very happy, pretty happy or not too happy?”

¹⁵ In this type of model it is not advisable to introduce fixed effects in the model, since this would make the estimators inconsistent (Madalla 1983).¹⁴

After reviewing the results using different estimating techniques, Ferrer-i-Carbonell and Frijters (2004) conclude that the differences in model structures, i.e. cardinality or ordinality, don't make much difference to the significance of the estimates. They do, however, note that introducing time invariant fixed effects, which is possible when panel data are available, did reduce the impact of income on well being. Although they didn't perform any tests, they speculate that the impact of these time invariant fixed effects may also change the significance of other explanatory variables. In another study, Graham et al (2004) report probit results from panel data created from Russian Longitudinal Monitoring Survey which covered almost 13,000 Russians per year from 1992 to 2001. Using panel data constructed from these surveys for 1995 and 2001, changes in happiness between 1995 and 2001 were related to changes in variables such as income, getting divorced (change in marital status) and leaving school, becoming unemployed and retiring. These results were not much different from level results also reported in the paper although unemployment and retirement lost significance in the panel findings.

For future research, Ferrer-i-Carbonell and Frijters (2004) suggest including as regressors time-invariant personality traits that may have a large influence on general satisfaction. These would be in addition to the usual demographic characteristics such as age, gender and level of education attained.¹⁵

As a possible response to this suggestion and also to address the importance of individual social relationships and bonding, the model includes additional explanatory variables that reflect the importance of family and friends as well as the usual demographic variables and marital status.

Taking these factors into account as well as the identification of important variables from the review in the previous section the model then becomes

¹⁵ Another approach suggested by Ferrer-i-Carbonell and Frijters (2004) is to work with a model which combines the ordinality assumption with individual fixed effect estimators employed by Winkelmann and Winkelmann (1988) and Hamermesh (2001).

$$\begin{aligned}
\mathbf{H} = \mathbf{f}(\mathbf{D}, \mathbf{L}, \mathbf{W}) = & \mathbf{b}_0 + \mathbf{b}_1 \mathbf{Age} + \mathbf{b}_2 (\mathbf{Age})^2 + \mathbf{b}_3 \mathbf{Gender} + \mathbf{b}_4 \mathbf{Income} \\
& + \mathbf{b}_5 \mathbf{Married} + \mathbf{b}_6 \mathbf{Health} + \mathbf{b}_7 (\mathbf{Health})^2 + \mathbf{b}_8 \mathbf{Unemployment} + \mathbf{b}_9 \mathbf{Education} + \\
& \mathbf{b}_{10} \mathbf{Family} + \mathbf{b}_{11} \mathbf{Friends} + \mathbf{b}_{12} \mathbf{Work} + \mathbf{e}
\end{aligned}
\tag{2}$$

The error term, **e** is independent of all explanatory variables. **Income** is calibrated by quartile of respondent's income in his own country; **Married** is whether respondent is married or cohabiting. **Health** is respondents answer to the question how is the state of your health. **Unemployment** is in response to the question are you now unemployed. Education is response to question what is highest education level attained. **Family**, **Friends** and **Work** variables are responses to the questions how important are family, friends and work to you. Definitions of the variables are shown in the Appendix.

The results from the estimation of equation 2 and variations are displayed in Tables 3 and 4.

Table 3 Ordered Probit Regression Statistics on Happiness

	Coefficient	Std. Error	z-Statistic
Family	0.167	0.020	8.526
Friends	0.1013	0.009	11.58
Work	0.037	0.012	3.047
Health	0.680	0.035	19.61
Health Squared	-0.053	0.008	-6.990
Sex	-0.115	0.013	-8.735
Age	0.026	0.003	8.347
Age Squared	-0.0003	3.63E-02	-8.192
Marital Status	-0.232	0.015	-15.36
Education	0.009	0.003	2.883
Unemployment	0.189	0.018	10.73
Social Class	0.102	0.007	13.92
Income Decile	-0.035	0.003	-12.09
Trust	0.043	0.015	2.852

Work vs Leisure	-0.030	0.005	-5.576
Log Likelihood	-32101.35		
Pseudo R ²	0.0755		
Number of observations	31,668		

In Table 3 all the independent variables are statistically significant¹⁶.. These overall results are basically consistent with evidence on the determinants of well being discussed above in the previous section.

Looking at the control variables first we see that *age* follows a remarkable similar parabolic pattern as reported by Easterlin (2004) and Alesina et al (2001). Well being is an inverse U shape which peaks at age 44 and then declines slowly thereafter Alesina et al (2001) and Easterlin (2004) also found happiness increases with age up until between 40 and 45, after which happiness begins to decrease. Results by others show a different pattern (U shaped rather than inverse U shaped) of well-being is observed over the life cycle, with a low point in the mid forties to early fifties age groups for both men and women (Helliwell 2005, Frey and Stutzer 2001, 2002a, 2002b, and Blanchflower and Oswald 2004a). This could reflect what is commonly referred to as the mid life crisis. The explanation given by Easterlin for differences between his result and the U shaped pattern reported by Helliwell, Blanchflower and Oswald and others is that these other studies included life cycle variables such as work, marital and economic status. Easterlin suggests that the inverse U is a result of not including control for these changing life circumstances.

However, the explanation offered by Easterlin (2001a) does not apply to the analysis presented here since we also included controls for changing life circumstances. We are therefore led to believe that the inverse U shape is a more robust description of the relationship between well being and age than Easterlin imagined. In any event, whatever the shape of the relationship between age and well being the overall impact is small in comparison with the importance of other variables.

The *marital status* variable is highly significant although the coefficient itself is smaller than reported by di Tella et al (2003). This could be a result of the choice of a different

¹⁶ In interpreting the signs of the coefficients the reader should be aware that happiness is coded so that low numbers indicate happiness and high numbers indicate unhappiness.

range for the dependent variable. In any event being married or with a steady partner has a definite significant, powerful positive impact on well being.

The *gender* variable was also significant suggesting that women are marginally happier than men. This result is consistent with the findings by di Tella et al (2003) and Blanchflower and Oswald (2004a).

As suggested above, rewarding social interactions are key components of well being. This is reflected by the strong significance of the three variables *friends, family and work* in both Table 3 and Table 4. Friends and family are the stronger influences as reflected by larger regression coefficients while work is less significant in terms of overall impact on well being.¹⁷ Nevertheless, taken together, the significance of these three variables provides strong evidence of the importance of the social and work environment in determining well being.

Income, as measured by where respondents classified their income decile, is statistically significant at a high level and is similar to the results of Di Tella et al (2003) who found small but significant impacts on well being for the three highest quartiles of the income distribution.

Health is the most important single explanatory variable. It has the highest z statistic and the largest coefficient value. This result is consistent with previous research results (World Values Study Group 1994, Packer et al 1997, Diener and Seligman 2004, and Gerlach and Stephan 1996) and highlights the importance of returning to good health to achieve greater well being.

In his analysis of the determinants of well being conducted using earlier waves of the World Value Surveys, Helliwell (2003) introduced a number of additional explanatory variables to reflect other fixed effects including regional factors (which act in addition to income decile to reflect the level of per capita income), differences in culture such as

¹⁷ We can make these comparisons since the range of all three variables is the same.

trust and the availability of social capital. Many of these variables were statistically significant. Also the overall variation in wellbeing, which can be thought of as the combination of variation within a country and among countries, is heavily influenced by the latter. Kahneman et al (2004) assert, for example, that the standard deviation of country means of overall satisfaction is almost half of the average standard deviation of individuals within countries. The question is whether their exclusion in our analysis will bias the coefficients of the included variables.

A bias will occur only if the excluded variable is correlated with the included explanatory variables. This is unlikely. First is the size of the sample which is quite large and second is the results of several experiments which we made by including several additional variables to reflect fixed effects. However significance levels would be affected by the exclusion of relevant variables. Therefore we do include another regression which contains several additional variables.

$$\begin{aligned}
 \mathbf{H} = \mathbf{f}(\mathbf{D}, \mathbf{L}, \mathbf{W}) = & \mathbf{b}_0 + \mathbf{b}_1 \mathbf{Age} + \mathbf{b}_2 (\mathbf{Age})^2 + \mathbf{b}_3 \mathbf{Gender} + \mathbf{b}_4 \mathbf{Income} \\
 & + \mathbf{b}_5 \mathbf{Married} + \mathbf{b}_6 \mathbf{Health} + \mathbf{b}_7 (\mathbf{Health})^2 + \mathbf{b}_8 \mathbf{Unemployment} + \mathbf{b}_9 \mathbf{Education} \\
 & + \mathbf{b}_{10} \mathbf{Family} + \mathbf{b}_{11} \mathbf{Friends} + \mathbf{b}_{12} \mathbf{Work} + \mathbf{b}_{13} \mathbf{Social\ Status} + \mathbf{b}_{14} \mathbf{Trust} + \quad (3) \\
 & \mathbf{b}_{15} \mathbf{Work/Leisure} + \mathbf{b}_{16} \mathbf{Region1} + \dots + \mathbf{b}_{20} \mathbf{Region5} \\
 & + \mathbf{b}_{21} \mathbf{Country\ Income} + \mathbf{e}
 \end{aligned}$$

In Equation (3), a dummy variable to reflect *country income* is included. This variable categorizes a country according to whether their per capita income is in low and low-middle income category versus the upper-middle and high income category.¹⁸ The presumption is that income level will be statistically significant, i.e. richer countries will show a higher level of well being and the regression results confirm this. However the regression results reported in Table 4 show that it is not significantly different from zero.

¹⁸ Income class is determined according to World Bank web site classification (2005).

Secondly we include a series of *geographically motivated dummy variables* a la Helliwell (2003). They reflect different regions (former Soviet Union, Eastern Europe, Latin America, Asia and other developing countries designated as Region1 to Region 5 with industrial countries being the control group). The geographic dummy variables are statistically significant. Using industrial countries as the baseline, the former Soviet Union and Eastern Europe are much less happy than industrial countries while other developing countries and Asia are marginally less happy. Latin America is somewhat happier. These regional effects are similar to those reported by Helliwell (2003).

We included a *trust* variable to reflect the social cohesion and the desirability of the respondent's society. Trust is marginally significant and its coefficient is relatively small, suggesting that the trustworthiness of society makes a relatively small impact on happiness and well being.

Finally we include two variables to reflect whether the *work/leisure choice* and *social class* had significant impacts on well being. The results suggest that both social class and work/leisure attitudes are important determinants of well being. Work creates a greater sense of well being since those who put higher weight on work appear to be happier according to the results in Table 4. From the estimates reported in Table 3 we know that those in higher income bracket are happier than those in the lower brackets. In addition those who view themselves as being a member of higher social classes also seem to be happier than their peers. Furthermore the regression coefficients for the income and social class variables suggest that social class has a somewhat stronger impact on well being.

The Pseudo-R² value for the probit regression is 0.09. This is similar to the results reported by di Tella et al for European panel data from 1975 to 1992 with over 130,000 observations and not an unusually low Pseudo-R² for large cross sections samples.

In addition, we also conducted an ordered probit analysis for the earlier waves of the World Value Survey 1981 to 1995¹⁹. Probit results from earlier World Value Survey waves data are generally consistent with our findings (see Table 4). The independent variables are mostly statistically significant. Family, friends, health and unemployment status all are important determinants of well-being. However there are a few interesting deviations from the 1999-2002 results. Firstly, the 1981-1995 results suggest that men are marginally happy than women. This result is the reverse of our earlier results for the 1999 – 2002 period and also the findings by di Tella et al (2004) and Blanchflower and Oswald (2004a). This could be because there have been changes in work and social circumstances between the 1980s and late 1990s. Greater equality and a wider range of employment opportunities for women in business and industry could be responsible for an increase in their well being. This is consistent with the general findings that minorities are generally less happy probably because of discrimination both at work and by society in general (Blanchflower and Oswald 2004a, Easterlin 2001a and Helliwell 2005). The same may apply for women who were discriminated against more systematically in the past. Work circumstances for women are likely to have improved over time and hence explaining our current results that women are happier than men. However the difference is only marginal.

Secondly, another difference between the two sets of findings is that in the analysis of 1981-1995 data, it appears that the relationship between the impact of leisure and work on well being has shifted. Respondents appear to have put greater emphasis on leisure in the earlier sample although the coefficient was not statistically significant. Values and attitudes may have changed in the late 1990s, as there has been a greater emphasis on work and its importance in determining well-being. The latter data set from 1999-2002 shows that work creates a greater sense of well-being since those who put greater weight on work appear to be happier. (see Table 4).

¹⁹ Data downloaded from <http://nds.umdl.umich.edu/cgi/s/sda/hsda2>

Table 4 Ordered Probit Regression Statistics with Dummy Variables on Happiness

	WVS waves 1999- 2002		Earlier WVS waves* 1981 -1990 -1995	
	Coefficient	z-Statistic	Coefficient	z-Statistic
Family	0.190	9.597	0.366	10.759
Friends	0.120	13.55	0.220	10.241
Work	0.031	2.462	0.047	1.813
Health	0.692	19.780	1.321	14.737
Health Squared	-0.059	-7.834	-0.071	-4.263
Sex	-0.120	-9.083	0.101	3.264
Age	0.024	7.886	0.082	5.681
Age Squared	-0.0003	-7.547	-0.001	-6.419
Marital Status	-0.278	-18.106	-0.543	-15.822
Education	0.006	1.789	0.160	7.295
Unemployment	0.122	6.853	0.370	8.712
Social Class	0.114	15.37	0.357	18.336
Income Decile	-0.027	-8.973	-0.028	-4.254
Trust	0.038	2.477	0.311	8.592
Work vs Leisure	-0.027	-4.884	0.004	0.271
FSU	0.602	17.72		
EEUR	0.592	18.187		
LATAM	-0.059	-2.272		
ASIA	0.150	5.324		
OTHERDEV	0.242	9.491		
COUNTRYINC	-0.001	-0.083		
Log Likelihood	-31,507.15		-13,613.93	
Pseudo R ²	0.0927		0.156	
Number of observations	31,668		28,463	

* A simple Probit test was carried out for the earlier wave study from 1981-1995. The dependent variable was simply coded with a range of 0-1, with 0 as happy and 1 as unhappy.

V. CONCLUSIONS

If we piece together the results of happiness research with the concepts of homeostasis and allostasis, we notice the motivating forces behind decision making in particular

situations. These include income and social status, whether respondents are working (as opposed to being unemployed) and whether they are healthy and enjoying friends, family and a congenial and trusting environment. Individuals act in response to shocks or stresses in their lives including loss of job, poor health, lack of satisfying emotional and social relationships (such as marital difficulties).

They try to make decisions that facilitate a return to a homeostatic equilibrium. While it is difficult to measure these allostatic effects because of lack of available information on the circumstances underlying these actions, we do know that individuals seek return to the old homeostatic equilibrium and this could involve adapting to their new circumstances. These decisions involve the interplay of cognitive and emotional factors. By studying these interactions, we are better able to understand what motivates behavior. We are also better able to gauge what kind of environments result in less stress and are more conducive to happiness and an elevated sense of well being. Toward this end, public policy can be directed to develop these kinds of environments.

APPENDIX : WORLD VALUE SURVEY VARIABLES AND DEFINITION

A008: Feelings of happiness

Taking all things together, would you say you are

- [1] Very happy
- [2] Quite happy
- [3] Not very happy
- [4] Not at all happy

A001 – Family, how important is it in your life?

A002 – Importance of Friends, how important is it in your life?

A005 – Importance of Work

- [1] Very important
- [2] Rather important
- [3] Not very important
- [4] Not at all important

A009 – State of health. All in all, how would you describe your health these days?

- [1] Very good
- [2] Good
- [3] Fair
- [4] Poor
- [5] Very Poor

X001 – Sex of respondent

- [1] Male
- [2] Female

X003 – Age of respondent. This means that you are _____ years old

(Uncoded)

X007 – Marital Status: Are you currently

- [1] Married, Living together as married
- [0] otherwise

X025 – Education: What is the highest education level that you have attained?

- [1] Inadequately completed elementary education
- [2] Completed compulsory elementary education
- [3] Incomplete secondary school: technical/vocational
- [4] Completed secondary school: technical/vocational
- [5] Incomplete secondary school: university preparatory school
- [6] Completed secondary school: university preparatory school
- [7] Some university without degree
- [8] University degree

X025R – Education recoded

- [1] Low
- [2] Middle
- [3] High

X028REC – Unemployment Recoded

[1] Unemployed

[0] otherwise

*excluding pensioners/retirees/housewives and students

X045 – Social Class

[1] Upper class

[2] Upper middle class

[3] Lower middle class

[4] Working class

[5] Lower class

X047 – Income (country specific) We would like to know what group your household fall under, counting all wages, pensions and other income that comes in, before taxes and deductions. From lowest to highest

A165 – Trust

[1] Generally most people can be trusted

[0] Need to be very careful

C008 – Which point on the scale most clearly describes your weight on Work (including homework and housework as compared to leisure or recreation?

[1] It is leisure that makes life worth living, not work

[2] 2

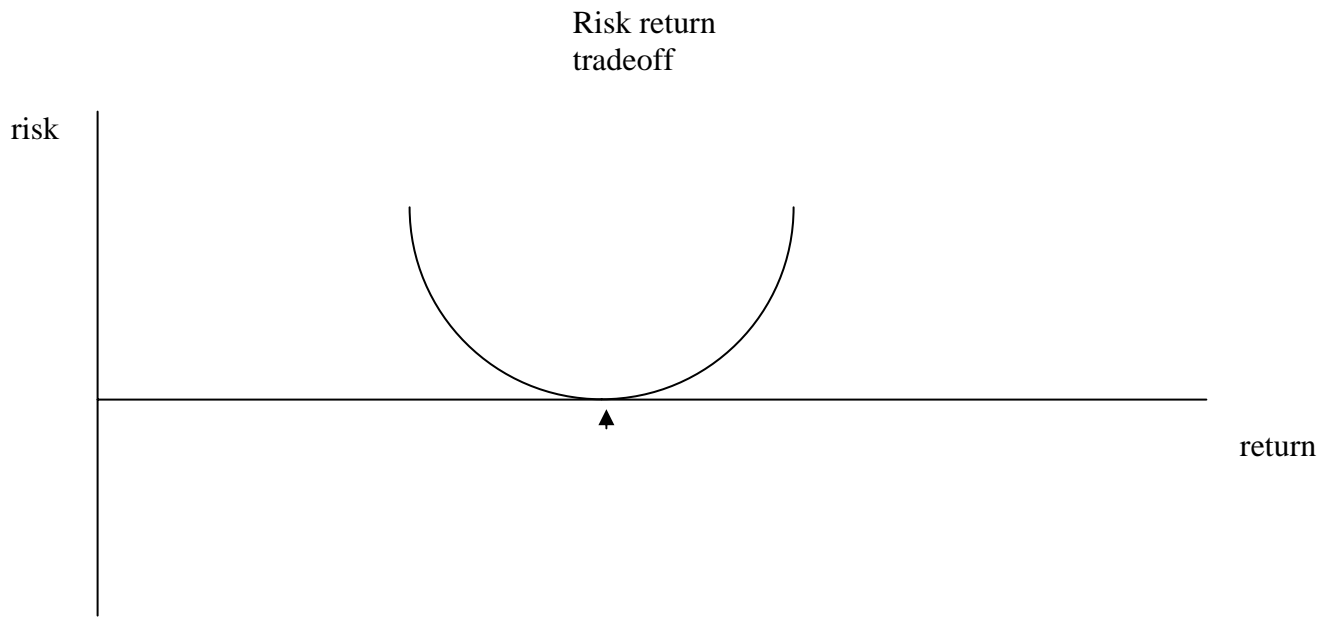
[3] 3

[4] 4

[5] Work is what makes life worth living, not leisure

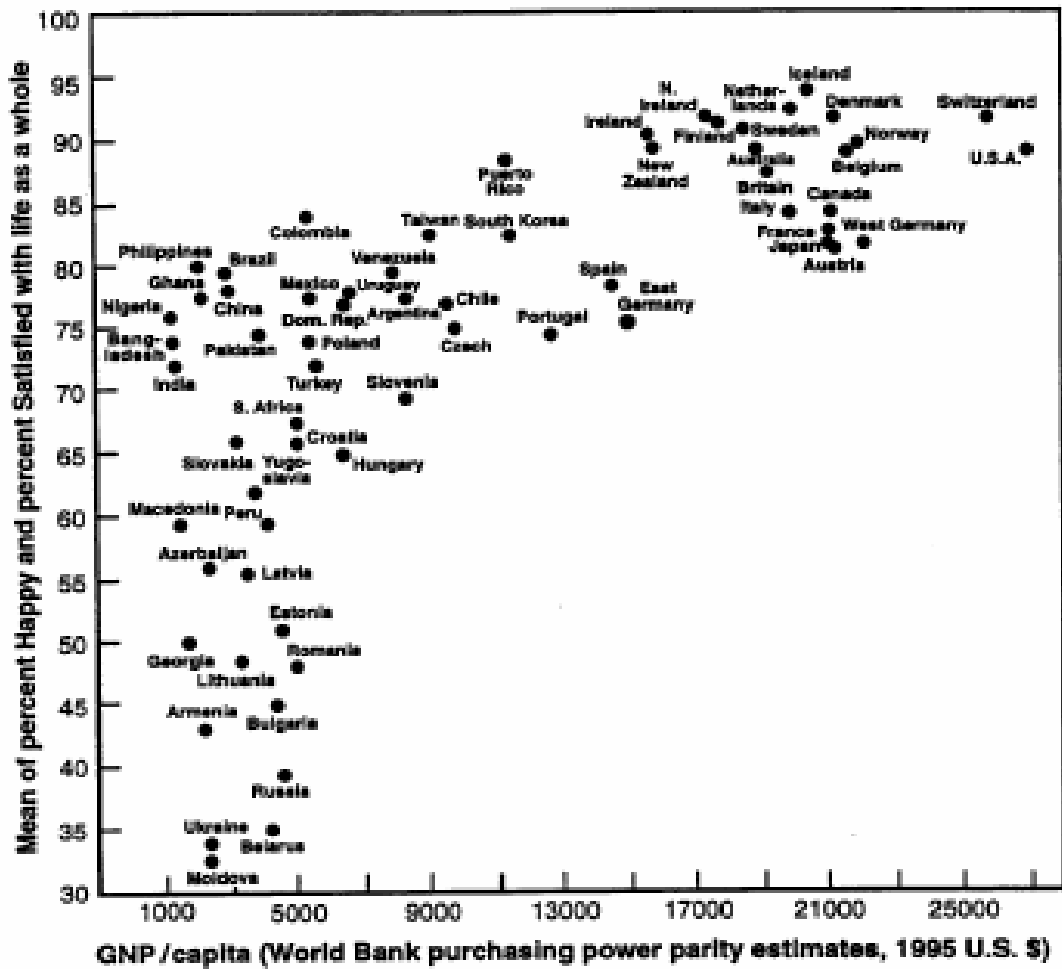
Figures

Figure 1 Risk-return trade off



Source: Fiegenbaum and Thomas (1988, p. 98, Figure 1)

Figure 2. Income and Happiness across Countries



Source: Frey and Stutzer (2002b).

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