Emitting Happiness? Using Model-Based Cluster Analysis to Group Countries By Wealth, Development, Carbon Emissions, and Happiness

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Abstract

This exploratory study uses model-based cluster analysis to group countries based on statistical similarities in terms of income, development, carbon emissions, and self-reported happiness. Several characteristics of the resulting clusters are noted. The least developed cluster, generating just 5% of the carbon emissions and earning on average 14% the income of the most developed cluster, experienced an average of 89% of the happiness of that of residents of the most developed cluster. The least developed cluster would have had an even higher level of average happiness had countries with unusually negative recent experiences such as Egypt and Iraq been excluded. Between the two clusters with the highest self-reported happiness, one emits just 57% the carbon dioxide emissions of the other. Average happiness is lowest in the two clusters with medium levels of income and development. These observations, among others, are very salient to deciding how to further happiness at the individual, firm, and societal levels while reducing emissions and other negative environmental impacts. The results should provoke further work in measuring, understanding, and fostering conditions conducive to well-being.

Keywords: sustainability, happiness, indicators, HDI, GNI, cluster analysis

Introduction

The realms of science, business studies, humanities, and spiritual traditions all contain important observations about what makes people happy. Increasingly, the study of happiness as it relates to business and development appears to be gaining popularity and urgency. Yet, in both the arenas of academic studies and management of organizations, several key challenges exist. The first and most basic is widespread awareness of commonly accepted definitions of – and sharp differences between – words such as happiness vs. well-being vs. human development vs. prosperity. Using indicators of happiness – whether in the management of firms or public policy or other contexts – is still in its nascent stages. Most critically, given that individuals, firms, and societies want to both improve their circumstances and reduce their carbon emissions, a better understanding of the relationship between wealth, development, carbon emissions, and well-being is needed. This article reviews literature and then uses model-based cluster analysis to reveal groups of countries with shared characteristics in terms of self-reported happiness, wealth, human development, and carbon emissions. This exploratory work should provoke further thought and progress on several fronts, including the desire to understand key performance indicators (KPIs) and their integration into the management of human affairs in several contexts, including companies and public policy.

Literature Review

Happiness and its connection to business and economics

There is a rich literature dissecting, defining, and discussing methodologies for measuring happiness (Hervás & Vázquez, 2013). Psychologists have established that neither money nor consumption guarantee greater happiness (Csikszentmihalyi, 1999). Indeed, Maslow's hierarchy of needs – emphasizing that, for example, self-respect and serving greater purposes gain in importance once basic needs are met – is even a staple of business education (Maslow, 1943). Consistent with this theory are observations that, for example, happiness of employees is not correlated to financial performance, but is directly and positively impacted by the extent to which a firm has a green reputation (Walsh & Sulkowski, 2010). A review of interdisciplinary research identified common proximal mediators of life satisfaction such as quality of work life, quality of non-work life, and feelings of self-worth, career satisfaction, job performance, turnover intentions, and organizational commitment (Erdogan at al., 2012).

The topic of happiness and satisfaction in the workplace is a vital area in business scholarship, given that these feelings among employees boost all measures of firm performance, including financial results (Edmans, 2011, 2012). In terms of practical application, Google has tested and deployed a free meditation course for its employees based on the science of happiness and mindfulness (Tan, 2012). As discussed below, aspects of happiness have been identified and specifically defined, but for the present moment, suffice it to summarize that emotional states of individuals clearly have an impact on organizational performance.

Clearly, just as individual and firm-level attitudes and activity cumulatively result in country-level economic conditions, sentiments of individuals and within firms collectively are reflected in national-level surveys of self-reported happiness – the connection between emotional states of people and health of businesses and entire economies has long been observed (Akerlof & Shiller, 2009, Shiller, 2006).

Strangely, for purposes of both managing people and organizations and in the public policy arena, much more attention has been given to the development, implementation, and maximization of a completely different set of measures than those related to happiness. Indeed, public economics "fails to explain the recent history of human welfare and it ignores some of the key findings of modern psychology" (Layard, 2006). An overemphasis on a narrow range of metrics (typically GDP, company revenues and profits, stock returns and indices, income, and other measures of material wealth and consumption) at the individual, firm, and national level, among other widely-acknowledged-as-erroneous assumptions at the foundation of economics (Sen, 1977) has resulted in real problems. For several decades, other indicators reflect very real, growing, and global crises, particularly with respect to climate change, ecosystem collapse, and related problems (Brown, 2009; IPCC, 2007; Lovelock, 2006, 2010; McKibben, 2010). Incredibly, even the creator of GDP warned against using his creation as a gauge of the success of an economy (Kuznets, 1934).

An emerging trend: measuring happiness

Over the past few decades a body of research and literature has flourished around the topic of combining knowledge about happiness and economics to better inform policy-making (Graham, 2012). Widely-cited literature in the field of positive psychology on subjective well-being (SWB) argues that the components of SWB and their underpinnings in terms of culture and temperament as well as sampling methodologies are advanced enough to produce national indicators of happiness (Diener, 2000). Indeed, some believe that the pursuit of happiness rather than constant growth of consumption may be the organizing principle that replaces our current predominant fixation in business and economics. Among these are Peter Senge (Senge, 2006; Senge et al., 2008), who argues that that a substantial change of mindset, or metanoia, is needed. The Brundtland Commission's definition of sustainability, i.e., 'meeting the needs of the present without compromising the ability of future generations to meet their needs' (Brundtland, 1987) somewhat presaged current awareness that humanity may be better served by moving away from pursuit of growth of consumption as an organizing principle.

Several solutions have been proposed and to some extent implemented based on the twin truisms that "we manage what we measure," and that "we are statistically blind to the ecological and societal dimensions of our activities." New types of Key Performance Indicators (KPIs), such as the Genuine Progress Indicator, the Gross National Happiness Indicator, the UN's Human Development Indicator, and the Calvert-Henderson Quality of Life Indicators have been developed as ways of focusing attention away from material and financial growth.

Famously, in 1972, the King of Bhutan, Jigme Singye Wangchuck, suggested the development and growth of a Gross National Happiness Index of his country, which is now being applied globally (Bates, 2009). In 1990 Mahbub ul Haq and Amartya Sen initiated the U.N. Human Development Index, which reflects average life expectancy, years of education, and income – in ul Haq's words: "just one number which is of the same level of vulgarity as the GNP – but a measure that is not as blind to social aspects of human lives as the GNP is" (Jahan, 2004). In 2010, the Inequality-adjusted HDI (IHDI) was introduced, which adjusts down a countries' overall score as inequality increases in each of the three dimensions of the HDI (health, education and income).

Since 2000, interest among country governments in full-spectrum evaluations of national well-being has greatly increased. In 2006 China created a green GDP index that adjusts for costs of environmental harm; by this standard, 3 percentage points of annual GDP growth should have been subtracted from official statistics (Li & Lang, 2010). In 2008 the United States began funding of the

State of the USA project to create a "key national indicator system" with new data points to supplement standard GDP measures based on a review of best practices (Government Accountability Office, 2011). In 2009 the French government released a report co-authored by Nobel Prize-winning economist Joseph Stiglitz, suggesting an end to "GDP fetishism" (Commission on the Measurement of Economic Performance and Social Progress, 2009). By 2010, the UK government announced that surveys of happiness will be taken and considered together with other economic measures.

To summarize, the governments of the UK, France, and the USA have started to catch up with Bhutan in terms of giving serious consideration to tracking happiness as an indicator along with other measures of success. The Bhutanese experiment in defining and implementing a Gross National Happiness (GNH) Index is based in what has been characterized as a Buddhist perspective (that material and spiritual development can complement each other rather than compete) but the Index could be readily applied elsewhere in other cultural contexts. The four essential aspects of the GNH are: (1) conservation of the natural environment; (2) preservation of cultural values; (3) good governance; and (4) ecologically sustainable development (Tideman, 2011). The Center for Bhutan Studies collaborated with empirical researchers to arrive at specific measurable contributors to happiness: physical, mental and spiritual health; time-balance; social and community vitality; cultural vitality; education; living standards; good governance; and ecological vitality (Zurick, 2006).

What cross-national comparisons reveal

Two efforts to arrive at national rankings that are related to human happiness are particularly noteworthy: the World Happiness Report (Helliwell et al., 2012) and Happy Planet Index, or HPI(http://www.happyplanetindex.org/). The HPI takes a holistic view of well-being, taking into account objective measures such as longevity and environmental footprint as well as happiness and economic activity. The World Happiness Report starts with self-reported emotional state as measured by the Worldwide Independent Network of Market Research/Gallup International Association's End of Year annual global survey – hereinafter: Gallup global survey (http://www.wingia.com/en/survey/end_of_year_survey/) and adds layers of interpretation to the raw data.

The World Happiness Report and Happy Planet Index are therefore both useful and valuable, with the caveat that they are not raw, unadulterated reflections of subjective emotional state. One key observation of these reports is that countries can still have happy populations while, on an average per capita basis, exacting much less harm on the natural environment as others, as in the case of the HPI score of Costa Rica.

For a discussion of data about national happiness – that is, subjective emotional state, unaltered by a formula that includes objective information about societal conditions or environmental footprint – the basis for the World Happiness Report can be used: the annual Gallup global survey. Among other questions, 1,000 respondents in each country answer whether they are happy, and Net Happiness is calculated as the percent answering "yes" minus those answering "no" or the equivalent of "don't know" or a failure to respond.

Appendix 1 lists the raw data used in the present study, sorted by Net Happiness (the first column) available online from the Gallup global survey. As described in the section on data below, these countries are all of those for which the authors could find the last two publicly available lists of results. One of the most obvious features about the ten countries at the top of the list is that seven

are countries that are nothigh in GNI nor HDI. The Gallup global survey has a thirty-seven year history and, while one might suspect occasional problems in surveying, it is doubtful that this pattern is a result of widespread errors or intentional deception. Further adding to the credibility of the results is that, for the most part, they do not vary wildly year-on-year.

There is therefore a phenomenon worthy of exploration: would a statistical analysis reveal clusters of countries, with some characterized as having lower per capita income and levels of development and lower accompanying carbon dioxide emissions footprints yet higher self-reported levels of happiness?

Several factors contribute to happiness levels; for example, in developed countries, it has been found to depend on whether respondents live stable relationships, life satisfaction is related to respondents' feelings of control, and social capital of a country is an important predictor of happiness (Gundelach & Kreiner, 2004). However, greater levels of wealth and development carry their own set of stresses and miseries. The World Happiness Report dedicates a chapter to mental health problems of depression, anxiety and stress, which persist – or could even be exacerbated by features of economic development such as consumerism and the phenomena of unnatural diets, dislocation and destruction of social connections and connections to nature and traditions and lifestyles and sleeping patterns (Helliwell et al., 2012). Compounding everything else, one would expect, based on susceptibility of people to seasonal affective disorder, that warmer, more tropical countries have an important variable positively impacting net happiness.

Overall, social interconnectedness, foreseeability of basic needs being met into the future, leisure time and autonomy, aspiration effects, and lack of extreme social/economic inequality (especially inasmuch as it devastates self-esteem) are all factors that can impact national happiness levels.

Especially in the context of research and actions in the realms of sustainable development and sustainable business, a key question is whether human prospering and well-being can be decoupled from constant growth in consumption and associated ecological devastation, including carbon emissions. Per capita environmental footprint – especially carbon dioxide emissions – tends to increase dramatically along with conventional approaches to economic development (White & Sulkowski).

Based on the foregoing research, the authors seek to establish – using an objective statistical test – whether there exist clusters of countries defined by similar levels of average wealth, development, carbon-emissions, and self-reported happiness, and what kind of comparisons or contrasts can be drawn between them.

Test

Model-based cluster analysis is a data reduction technique appropriate for identifying relationships that are not readily apparent in a given a data set. It is critical to point out that model-based cluster analysis is used purely as a tool of exploratory research in this context – there is not a hypothesis in this study *per se*, but rather a suspicion that an interesting pattern may exist in the data. It may be appropriate to propose a model or test a hypothesis based on the patterns that are observed in this study. Therefore, while the authors are not testing correlation between any of the variables below, the results do serve as valuable observations about reality that can inform and serve as a foundation for further research.

Variable Definition

The authors selected variables that reflect self-reported well-being, human development, per capita carbon dioxide emissions, and per capita income.

Methodology

To determine the extent of similarities and differences between countries, the technique of model-based cluster analysis is employed. The goal of cluster analysis is to identify homogeneous groups in a given population based upon the data being analyzed (Hair et al., 2006). One of the limitations of cluster analysis is, however, that determination of the optimal number of clusters is more art than science (e.g., it depends on researcher interpretation). The technique of model-based cluster analysis addresses this limitation by defining the optimal solution using a multivariate Gaussian mixture (Fraley and Raftery, 2002; 2005; 2006):

$$f(x_i \mid K, \theta) = \sum_{k=1}^{K} p_k \phi(x_i \mid m_k, \Sigma_k)$$

where the p_k's are the mixing proportions and $\phi(. \mid m_k, \Sigma_k)$ denotes a Gaussian density with mean m_k and variance matrix Σ_k. This analysis is used in conjunction with a Bayesian criterion (BIC) to determine the optimal model based upon a given data set. The Bayesian criterion approximates the integrated likelihood of the data:

$p(x|m) = p(x|m, \theta m)\pi(\theta m)d\theta m$, $\pi(\theta m)$ being a prior distribution for parameter θm.

BIC is calculated as:

$$BIC(m) = \log p(x|m, \hat{\theta}m) - \frac{vm}{2} \log(n).$$

A model-based cluster analysis is a useful method for establishing cohorts of entities that are statistically similar to each other (homogeneous groupings). In this case, the method is used to establish cohorts of countries, based on measures of happiness, development, and income, which are similar to each other. Most importantly, one may examine the countries within a cohort to speculate on what underlying factors explain each cohort's similarities.

Data

As an indicator of material wealth, Gross National Income per capita data from the World Bank from the year 2010 is included in the analysis. It does not change drastically year-to-year. Carbon dioxide (CO_2) emissions per capita from the year 2010 (also from the World Bank) is included and likewise does not drastically change year-to-year.

As an indicator of happiness, self-reported Net Happiness data from the annual Gallup global survey is used. As mentioned previously, at the end of each calendar year, a survey by Gallup and its affiliates is executed asking, among other questions, whether respondents are happy. The statistic for each country reflects the percentage responding "yes" minus the percentage answering "no" minus the percentage for which there is no response or a reply equivalent to "I don't know." The average

of end-of-year 2011 and 2012 was used (or otherwise the statistic for the available year if only one year of data is public). This approach – using most-recently available data and averaging the recent results of annual surveys on happiness – was adopted by the authors of the World Happiness Report.

The following observations about the data are noteworthy. First, in a few cases, this self-reported "happiness" statistic can change a lot year-on-year, which was one reason for using the average of the available years. The last available year for which emissions data is available from the World Bank (the most comprehensive source) is 2010 – the best defenses for using 2010 GNI and emissions data are that these two statistics do not drastically differ year-on-year (nor between World Bank data and what the Netherlands public agency that publishes emissions in its widely-cited database) and if income and emissions really track with (or determine) happiness, then we would expect to 2010 very-high-income/very-high-emission countries to generally still be happy in 2011 and 2012, with the super-low-income/super-low-emitters still comparatively very unhappy 2011-2012.

Net Happiness data is only available for end-of-2011 and end-of-2012, but, as in the context of the measures of income and emissions, in most cases this indicator does not wildly fluctuate year-on-year. However, an important rationale for using Net Happiness averaged between 2011 and 2012 was that taking an average of the two years more likely conveys the background or default level of happiness relative to other countries.

The HDI of each country was also included. This served several purposes. One was to explore whether there was a connection between HDI and happiness. The HDI is determined by not just GNI per capita adjusted for purchasing power, but also life expectancy at birth, mean years of schooling, expected years of schooling, and, since 2010, it is adjusted for income inequality. Therefore, to the extent that health, education, and absence of vast income differences should affect levels of happiness, one might expect to see a closer connection between HDI and happiness than GNI and happiness when characteristics of the clusters are finally compared.

Results and Interpretation

The data was analyzed using the R statistical package (R Development Core Team, 2013) module for model-based cluster analysis. Model-based cluster analysis identified five clusters as the optimal solution for the data set.

Given the data, model-based cluster analysis identified an EVI (diagonal, equal volume, varying shape) model with 5 components:

log.likelihood	n	df	BIC	ICL
-943.1975	61	40	-2050.83	-2056.657

Clustering summary

Cluster	1	2	3	4	5
Number of Countries	21	16	10	10	4

Figure 1

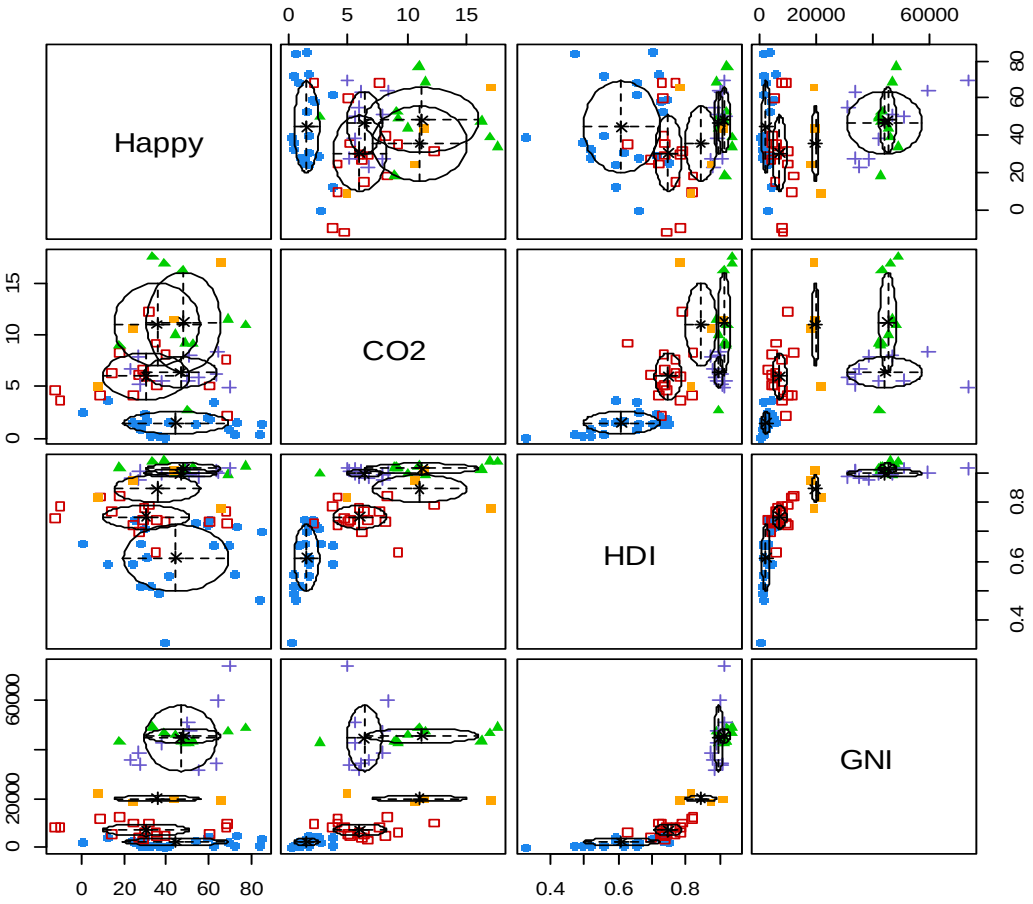
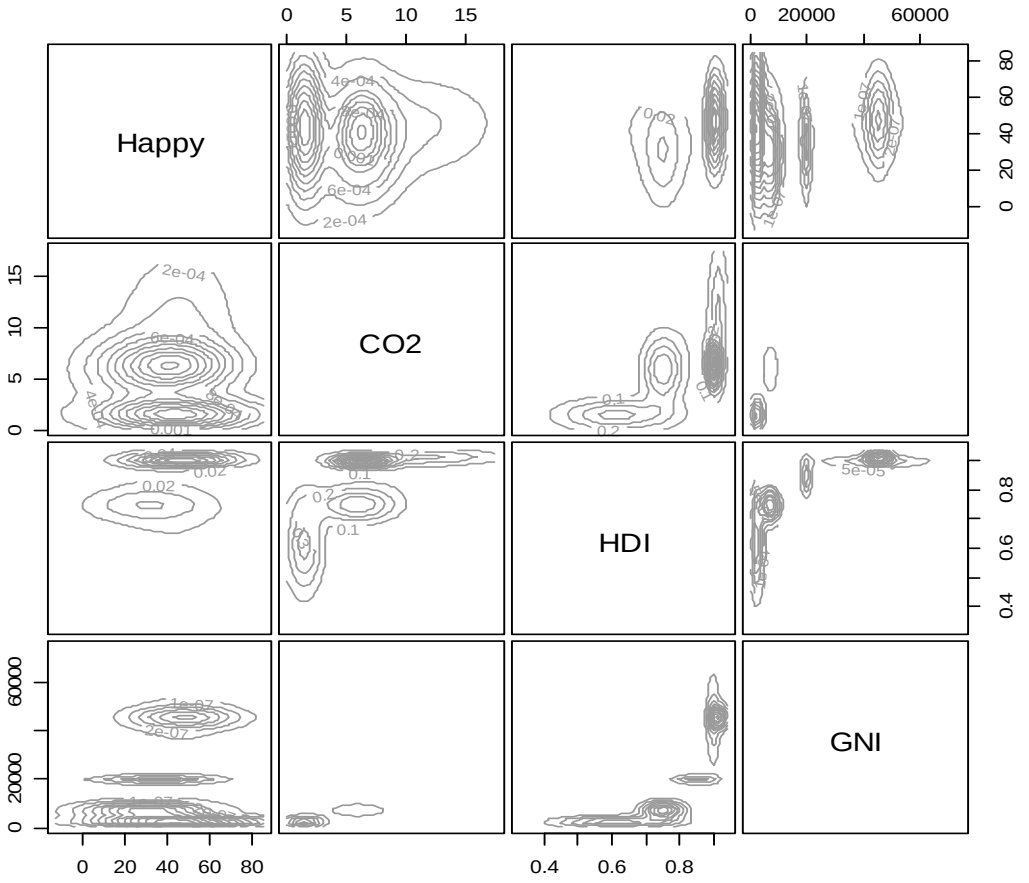


Figure 2



Appendix 2 presents individual results for each of the 61 countries included in the analysis.

In summary, the five clusters may be identified as follows:

Table 1: Countries, Grouped by Cluster Membership

Cluster	Cluster Members
Not Wealthy & Developed, Low CO2, Happy	Fiji, Nigeria, Colombia, Ghana, Philippines, Uzbekistan, Peru, Ecuador, Armenia, India, Mozambique, Cameroon, Kenya, Vietnam, Tunisia, Moldova, Pakistan, Georgia, Morocco, Iraq, Egypt
Lower Middle Wealthy & Developed, Middle CO2, Less Happy	Brazil, Malaysia, Azerbaijan, Bosnia and Herzegovina, Macedonia, South Africa, Russian Federation, Bulgaria, Ukraine, China, Turkey, Poland, Serbia, Lithuania, Romania, Lebanon
Wealthy & Developed, High CO2, Happy	Netherlands, Finland, Germany, Singapore, Japan, Canada, Belgium, Australia, United States, Ireland
Wealthy & Developed, Middle CO2, Happy	Switzerland, Denmark, Iceland, Spain, Austria, Sweden, France, Hong Kong, United Kingdom, Italy
Medium Wealthy & Developed, High CO2, Medium Happy	Saudi Arabia, South Korea, Czech Republic, Portugal

Table 2: Cluster Means

	Happiness	CO2 per capita	HDI	GNI per capita	Cluster
Wealthy & Developed, High CO2, Happy	48.0	11.31	0.914	45086	3
Wealthy & Developed, Middle CO2, Happy	46.9	6.43	0.897	44663	4
Medium Wealthy & Developed, High CO2, Medium Happy	35.5	11.02	0.845	19830	5
Lower Middle Wealthy & Developed, Middle CO2, Less Happy	29.2	6.22	0.750	7364	2
Not Wealthy & Developed, Low CO2, Happy	44.8	1.54	0.616	2467	1

The statistical clusters in the two tables above are noteworthy for at least three reasons, all of which are clarified in the table and graph below. First, among wealthy countries, happiness, HDI, and GNI levels are barely distinguishable, despite Cluster 4 (Wealthy & Developed, Middle CO2, Happy) having a mean of 57% of the emissions as that of Cluster 3 (Wealthy & Developed, High CO2, Happy). Second, the poorest and least polluting cluster, Cluster 1 (Not Wealthy & Developed, Low CO2, Happy), while enjoying a mean of 89% of the happiness as the happiest cluster, has a mean carbon footprint of 14% - and a mean income of 5% - of the happiest cluster, Cluster 4 (Wealthy & Developed, High CO2, Happy). Third, the poorest and least polluting cluster has a mean happiness higher than two of its counterparts (Clusters 5 and 2), even though one of these wealthier counterparts contains countries that, on average, emit seven times more CO2 per capita (Medium Wealthy & Developed, High CO2, Medium Happy).

These results would be even more dramatic if Iraq and Egypt had been excluded on the grounds of their having experienced recent violent upheavals. Had their low rates of net happiness (zero in the case of Egypt) been excluded, the poorest-but-third-happiest cluster, with an average per capita income a twentieth and carbon dioxide emissions less than one-seventh of the wealthiest-and-most-emitting, would have a mean net happiness ninety percent as high as that of the wealthiest-and-most-emitting cluster. Two more observations could be made: while the mean HDI of the clusters tracks with GNI, it does not drop as drastically down the income ladder, and HDI does not appear to track well with net happiness (the poorest-but-third-happiest cluster has a mean HDI of 67% of that of the wealthiest-and-most-emitting cluster).

Table 3: Indexed Average of Indicators in Each Country Cluster,
Displayed as a Percent of the Highest Value for Each Indicator

	Happiness	CO2 pc	HDI	GNI pc	Cluster
Wealthy & Developed, High CO2, Happy	100%	100%	100%	100%	3
Wealthy & Developed, Middle CO2, Happy	98%	57%	98%	99%	4
Medium Wealthy & Developed, High CO2, Medium Happy	74%	97%	92%	44%	5
Lower Middle Wealthy & Developed, Middle CO2, Less Happy	61%	55%	82%	16%	2
Not Wealthy & Developed, Very Low CO2, Happy	89%	14%	67%	5%	1

Graph 1: Indexed Average of Indicators in Each Country Cluster,
Displayed as a Percent of the Highest Value for Each Indicator

It is worth noting that, while it may seem dubious or revolutionary to argue that wealth and consumption cannot buy happiness, the truism that the "best things in life are free" has deep roots in practically every culture. The notion that material resources are not essential to fulfillment is consistently echoed across religions and wisdom traditions – explicit rejection of wealth and material possessions as anathema to spiritual fulfilment are clearly found, for example, in the texts of Christianity and Buddhism. Clearly, human history proves how much "higher" callings beyond personal gain can be used to manipulate people to sacrifice materially and even bodily (for example, for the sake of religion, patriotism, or concepts or ideals such as freedom). Indeed, Buddhism and virtue ethics are mentioned several times in the World Happiness Report as significant to the discussion of what determines happiness.

Limitations

An obvious weakness in the data that may also be one of the big take-away observations of this study is as follows. Could the question "are you happy" be interpreted differently across cultures and in different languages, and if so, should (at the firm level and country level) we further develop baseline definitions, methods, metrics, and databases of this vital measure?

This question has been investigated to some extent and cultural differences tend not to be a significant obstacle to international comparisons of happiness (Diener & Oishi, 2000). Others have

explored differences in methodologies of gauging happiness, finding that they ultimately do not yield vastly varying results (Ferrer-i-Carbonell & Frijters, 2004).

It bears repeating that the goal of this study is just to test for interesting aspects of reality; it is not to propose and test specific hypotheses. An inherent limitation, therefore, is that correlation or causality between variables is not being tested at this stage. There could be a variety of causal relationships proposed and tested moving forward.

Conceivably more countries could be included, as well as more variables, such as measures of average daylight-hours-per-day, mean temperature, and average leisure time per capita, but these are more fairly viewed as ideas for future studies rather than critical weaknesss in this study.

Implications for Future Work

Just as the environmental footprint of a country cannot be divorced from the environmental footprint of commerce, neither can we separate the happiness of a society from the happiness of employees of businesses. Therefore, there are several implications for managers, policy-makers, and management scholars in the results of this study.

One vital implication for businesses, scholars, policy-makers, and other individuals in wealthy, developed countries is that role models, best practices, and good ideas should not chauvinistically be assumed to be found exclusively in their own countries. Less wealthy countries where there are high levels of happiness and well-being could be a source of ideas worthy of emulation or adaptation.

The corollary for developing or undeveloped countries is not to imitate blindly the practices – nor unquestioningly to follow the advice – of more developed countries. To some extent this has occurred, and the clusters described here may hint at this: an example of this is the "leap-frogging" of stages of development in telecommunications infrastructure, with developing countries adopting cellular phone and data networks rather than building the physical infrastructure of transmission lines. The result is advancement in connectivity with a comparably lower amount of negative environmental externalities (relative to imitating the stages of development of historically wealthier countries).

A critical question – though obviously a provocative one in the realms of both public policy and management – is what is either an optimal level of compensation and consumption, and development, or else what are the tipping points of the factors that contribute to happiness? If governments decide to cease treating constantly increasing consumption of material goods and GDP growth as policy goals, then understanding alternative KPIs will continue to gain importance. If the trend of dematerialization continues to take hold, beyond emphasis on renewability and supply loops and servicing (Reiskin et al., 2008; Rothenberg, 2007; White et al., 1999) to a fundamental downsizing of possessions and materially consumptive lifestyle, what will be the KPIs of successful organizations and economies?

Besides joining others who have called for development and adoption and use of an expanded range of key performance indicators (KPIs) for both firms and economies, the authors believe that there is a need to specifically focus on measures of happiness and using them in the management. Potentially, the annual publication of statistics on the happiness of employees may become as commonplace as reporting on environmental and societal impacts and governance (ESG or

sustainability reporting). 95% of the Global Fortune 250 now engage in this practice, along with thousands of other organizations (KPMG 2011). Inasmuch as it has been established that financial performance of firms is positively impacted by having happier employees, it is logical that not only employees and clients, but also investors would gain from including company happiness indicators in annual reporting practices.

Conclusions

This study evaluated data on relative wealth, development, carbon emissions, and self-reported happiness. A novel approach – model based cluster analysis – was then employed to identify clusters of similar countries. The clusters contribute to the body of evidence challenging the widely-held belief that average happiness and well-being inevitably and inexorably increase as average income rises. A cluster is observed where mean net happiness is higher for a comparatively much less wealthy, less developed, and less emitting group of countries.

Second, when one considers the immense differences in income and carbon emissions between the least and most developed clusters, one could label the wealthiest countries with the highest emissions as being highly inefficient in terms of generating per capita happiness and well-being. A third observation is that average happiness actually is lowest in a cluster of countries that are medium-developed. Fourth, net happiness differences do not track perfectly with HDI, and finally, among the most developed, wealthy, and happy countries, there exist two very distinct clusters, with one emitting only 57% the carbon dioxide as the other

There are several implications for managers, management scholars, and policy-makers. One is that the dynamics of what makes people happy – at the individual, company, and national levels – continues to be a topic meriting attention. Most provocatively, it could be very useful to develop an understanding of the tipping points of certain variables – including compensation (possibly compensation relative to others within an organization), relative to other factors – at which emotional states change. Measures of happiness and well-being of employees could assist in performing similar studies at the firm level. Finally, the authors suggest that perhaps, just as companies are expected to publish financial indicators and now ESG data, it might eventually be a boon for all stakeholders, including investors, if data on the happiness and well-being of employees were published.

References

Akerlof, G. A. and Shiller, R. J. (2009). *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism.* Princeton, NJ: Princeton University Press.

Bates, W. (2009). Gross national happiness. *Asian-Pacific Economic Literature, 23*(2), 1-16.

Brown, L. R., Plan B 3.0, & Earth Policy Institute. (2009). *Plan B 4.0 : Mobilizing to save civilization* (1st ed.). New York: W.W. Norton.

Brundtland, G. H. (1987). *Report of the world commission on environment and development: "our common future."* New York: United Nations.

IPCC (2007). *Report of the Nineteenth Session of the Intergovernmental Panel on Climate Change (IPCC).* Geneva, Switzerland.

Commission on the Measurement of Economic Performance and Social Progress, Stiglitz, J. E., Sen, A., & Fitoussi, J. P. (2009). *Report by the commission on the measurement of economic performance and social progress.*

Csikszentmihalyi, M. (1999). If we are so rich, why aren't we happy? *American Psychologist, 54*(10), 821-827.

Dickinson, E. (January/February 2011). GDP: a brief history, *Foreign Policy*.

Eccles, R. and Krzus, M. (2010). *One Report.* Hoboken: John Wiley & Sons.

Diener, E. (2000). Subjective Well-Being: The science of happiness and a proposal for a national index. *American Psychologist, 55*(1), 34.

Diener, E., & Oishi, S. (2000). Money and happiness: Income and subjective well-being across nations. In E. Diener & E. M. Suh (Eds.). *Culture and Subjective Well-being* (pp. 185-218). Cambridge, MA: MIT Press.

Edmands, A. (2011). Does the stock market fully value intangibles? Employee satisfaction and equity prices. *Journal of Financial Economics*, 101, 621-640.

Edmands, A. (2012). Then link between job satisfaction and firm value, with implications for corporate social responsibility. *Academy of Management Perspectives*, in press.

Erdogan, B., Bauer, T. N., Truxillo, D. M., & Mansfield, L. R. (2012). Whistle While You Work A Review of the Life Satisfaction Literature. *Journal of Management, 38*(4), 1038-1083.

Ferrer-i-Carbonell, A., & Frijters, P. (2004). How Important is Methodology for the estimates of the determinants of Happiness? *The Economic Journal, 114*(497), 641-659.

Government Accountability Office (2011). *Key Indicator Systems: Experiences of Other National and Sub-National Systems Offer Insights for the United States.* Washington: GAO.

Gundelach, P., & Kreiner, S. (2004). Happiness and life satisfaction in advanced European countries. *Cross-Cultural Research, 38*(4), 359-386.

Graham, Carol (2012). *The Pursuit of Happiness: An Economy of Well-Being*, Washington, DC, Brookings Institution Press.Hartmann, B. (2010). Rethinking climate refugees and climate conflict: Rhetoric, reality and the politics of policy discourse, *Journal of International Development, 22*(2), 233–246.

Helliwell, J., Layard, R., & Sachs, J. (Eds.) (2012) *World Happiness Report.* The Earth Institute, Columbia University, New York, USA.

Hervás, G & Vázquez, C. (2013). Construction and validation of a measure of integrative well-being in seven languages: The Pemberton Happiness Index, *Health & Quality of Life Outcomes, 11*(1), 66-79,

Jahan, S. (2004). Measuring Human Development: Evolution of the Human Development Index. *Journal of Social Studies - Dhaka*, 21-42.

KPMG. (2011). *KPMG international survey of corporate responsibility reporting 2011*. Switzerland: KPMG, doi: http://www.kpmg.com/PT/pt/IssuesAndInsights/Documents/corporate-responsibility2011.pdf.

Layard, R. (2006). Happiness and Public Policy: a Challenge to the Profession. *The Economic Journal*, *116*(510), C24–C33.

Li, V., & Lang, G. (2010). China's "Green GDP" experiment and the struggle for ecological modernisation. *Journal of Contemporary Asia, 40*(1), 44-62.

Kuznets, S. (1934). *National Income 1929–1932*. A report to the U.S. Senate, 73rd Congress, 2nd Session. Washington, DC. US Government Printing Office.

Lovelock, J. (2006). *The revenge of gaia : Earth's climate in crisis and the fate of humanity*. New York: Basic Books.

Lovelock, J. (2010). *The vanishing face of gaia : A final warning* (Pbk. ed.). New York: Basic Books.

Maslow, A. H., (1943). A Theory of Human Motivation. *Psychological Review, 50*(4), 370–96.

McKibben, B. (2010). *Eaarth: Making a life on a tough new planet* (1st ed.). New York: Times Books.

Reiskin, E. D., White, A. L., Johnson, J. K., & Votta, T. J. (2008). Servicizing the chemical supply chain. *Journal of Industrial Ecology, 3*(2-3), 19-31.

R Development Core Team (2013). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. doi: http://www.R-project.org/.

Rothenberg, S. (2007). Sustainability through servicizing. *MIT Sloan Management Review, 48*(2), 83-91.

Sen, Amartya K. (1977). Rational Fools: A Critique of the Behavioral Foundations of Economic Theory. *Philosophy & Public Affairs, 6*(4), 317-344.

Senge, P. M., Smith, B., Kruschwitz, N., Laur, J., & Schley, S. (2008). *The necessary revolution: How individuals and organizations are working together to create a sustainable world*. New York: Crown Business.

Senge, P. M. (2006). *The fifth discipline : The art and practice of the learning organization*. New York: Doubleday/Currency.

Shiller, R. J. (2006). *Irrational Exuberance*, 2nd ed. New York: Doubleday/Currency.

White, D. S. & Sulkowski, A. J. (2010). Relative Ecological Footprints Based on Resource Usage Efficiency Per Capita: Macro-level Segmentation of 121 Countries. *International Journal of Sustainable Economy, 2* (2), 224-240.

Tan, C.-M. (2012). *Search Inside Yourself*. New York: Harper Collins.

Tideman, S. G. (2011). Gross National Happiness. In L. Zsolnai (Ed.), *Ethical Principles and Economic Transformation – A Buddhist Perspective 30* (pp. 133-153). Amsterdam: Springer.

Walsh, C. & Sulkowski, A.J. (2010). A Greener Company Makes for Happier Employees More So Than Does a More Valuable One: A Regression Analysis of Employee Satisfaction, Perceived Environmental Performance and Firm Financial Value. *Interdisciplinary Environmental Review, 11*(4), 274-282.

White, A. L., Stoughton, M., & Feng, L. (1999). Servicizing: The quiet transition to extended product responsibility. *Tellus Institute, Boston,* doi: http://infohouse.p2ric.org/ref/17/16433.pdf.

Zurick, D. (2006). Gross National Happiness and Environmental Status in Bhutan, *Geographical Review 96*(4), 657-681.

Appendix 1: Country Data, Listed By Level of Happiness

Country	Net Happiness	Happiness, % of max	CO2	CO2, % of max	HDI	HDI, % of max	GNI	GNI, % of max
Fiji	85	100%	1.5	9%	0.70	75%	3670	5%
Nigeria	84	99%	0.5	3%	0.47	50%	1240	2%
Netherlands	77	91%	11.0	62%	0.92	98%	48530	66%
Colombia	73	86%	1.6	9%	0.72	77%	5460	7%
Ghana	72	85%	0.4	2%	0.56	59%	1260	2%
Switzerland	69.5	82%	5.0	28%	0.91	97%	73680	100%
Finland	69	81%	11.5	66%	0.89	95%	47140	64%
Philippines	69	81%	0.9	5%	0.65	70%	2060	3%
Brazil	68.5	81%	2.2	12%	0.73	78%	9520	13%
Malaysia	68	80%	7.7	44%	0.77	82%	8150	11%
Saudi Arabia	66	78%	17.0	97%	0.78	83%	19360	26%
Denmark	64	75%	8.3	48%	0.90	96%	59590	81%
Iceland	63.5	75%	6.2	35%	0.91	97%	33900	46%
Uzbekistan	62	73%	3.7	21%	0.65	70%	1300	2%
Azerbaijan	60	71%	5.1	29%	0.73	78%	5370	7%
Peru	59.5	70%	2.0	11%	0.74	79%	4720	6%
Ecuador	58.5	69%	2.2	12%	0.72	77%	4330	6%
Spain	55	65%	5.9	33%	0.89	94%	31420	43%
Armenia	53	62%	1.4	8%	0.73	78%	3330	5%
Germany	52.5	62%	9.1	52%	0.92	98%	43300	59%
Austria	51	60%	8.0	45%	0.90	95%	47060	64%
Singapore	50	59%	2.7	15%	0.90	95%	42530	58%
Sweden	50	59%	5.6	32%	0.92	98%	50860	69%
Japan	49	58%	9.2	52%	0.91	97%	42190	57%
Canada	47.5	56%	16.2	92%	0.91	97%	43250	59%
Belgium	44	52%	10.0	57%	0.90	96%	45840	62%
Korea, Rep (South)	43.5	51%	11.5	65%	0.91	97%	19720	27%
India	40.5	48%	1.7	9%	0.55	59%	1290	2%
Bosnia and Herzegovina	39.5	46%	8.1	46%	0.74	78%	4640	6%
Australia	39	46%	16.9	96%	0.94	100%	46310	63%
Mozambique	39	46%	0.1	1%	0.33	35%	430	1%
France	38	45%	5.6	32%	0.89	95%	42280	57%
Cameroon	36	42%	0.4	2%	0.50	53%	1130	2%
Macedonia	35.5	42%	5.2	29%	0.74	79%	4580	6%
South Africa	35	41%	9.2	52%	0.63	67%	6100	8%
United States	33.5	39%	17.6	100%	0.94	100%	48960	66%
Kenya	32.5	38%	0.3	2%	0.52	55%	800	1%
Russian Federation	31.5	37%	12.2	70%	0.79	84%	10000	14%

Vietnam	30.5	36%	1.7	10%	0.62	66%	1270	2%
Bulgaria	29.5	35%	5.9	34%	0.78	83%	6320	9%
Tunisia	29.5	35%	2.5	14%	0.71	76%	4150	6%
Ukraine	29	34%	6.6	38%	0.74	79%	2990	4%
Moldava	28	33%	1.4	8%	0.66	70%	1820	2%
Pakistan	28	33%	0.9	5%	0.52	55%	1060	1%
Hong Kong	27.5	32%	5.2	29%	0.91	97%	33630	46%
China	27	32%	6.2	35%	0.70	75%	4240	6%
United Kingdom	27	32%	7.9	45%	0.88	93%	38690	53%
Georgia	25	29%	1.4	8%	0.75	79%	2680	4%
Czech Republic	24.5	29%	10.6	60%	0.87	93%	18370	25%
Turkey	24.5	29%	4.1	24%	0.72	77%	9980	14%
Morocco	24	28%	1.6	9%	0.59	63%	2880	4%
Italy	23	27%	6.7	38%	0.88	94%	35520	48%
Ireland	18	21%	8.9	51%	0.92	98%	42810	58%
Poland	18	21%	8.3	47%	0.82	88%	12400	17%
Serbia	14.5	17%	6.3	36%	0.77	82%	5550	8%
Iraq	12	14%	3.7	21%	0.59	63%	4380	6%
Lithuania	9	11%	4.1	23%	0.82	87%	11620	16%
Portugal	8	9%	4.9	28%	0.82	87%	21870	30%
Egypt	0	0%	2.6	15%	0.66	71%	2550	3%
Romania	-10	-12%	3.7	21%	0.79	84%	8010	11%
Lebanon	-12.5	-15%	4.7	27%	0.75	79%	8360	11%

Appendix 2: Countries and Associated Data Listed by Cluster

Country	Happiness	CO2 per capita	HDI	GNI per capita	CLUSTER
Fiji	85	1.499937	0.702	3670	1
Nigeria	84	0.494091	0.471	1240	1
Colombia	73	1.629452	0.719	5460	1
Ghana	72	0.370888	0.558	1260	1
Philippines	69	0.873148	0.654	2060	1
Uzbekistan	62	3.656678	0.654	1300	1
Peru	59.5	1.967658	0.741	4720	1
Ecuador	58.5	2.175598	0.724	4330	1
Armenia	53	1.424236	0.729	3330	1
India	40.5	1.666209	0.554	1290	1
Mozambique	39	0.120258	0.327	430	1
Cameroon	36	0.350799	0.495	1130	1
Kenya	32.5	0.303782	0.519	800	1
Vietnam	30.5	1.728118	0.617	1270	1
Tunisia	29.5	2.453102	0.712	4150	1

Moldova	28	1.363005	0.66	1820	1
Pakistan	28	0.932118	0.515	1060	1
Georgia	25	1.401643	0.745	2680	1
Morocco	24	1.599383	0.591	2880	1
Iraq	12	3.703433	0.59	4380	1
Egypt	0	2.622791	0.662	2550	1
Brazil	68.5	2.150268	0.73	9520	2
Malaysia	68	7.667467	0.769	8150	2
Azerbaijan	60	5.050749	0.734	5370	2
Bosnia and Herzegovina	39.5	8.093102	0.735	4640	2
Macedonia	35.5	5.171997	0.74	4580	2
South Africa	35	9.204085	0.629	6100	2
Russian Federation	31.5	12.2255	0.788	10000	2
Bulgaria	29.5	5.930052	0.782	6320	2
Ukraine	29	6.644867	0.74	2990	2
China	27	6.194858	0.699	4240	2
Turkey	24.5	4.131031	0.722	9980	2
Poland	18	8.308632	0.821	12400	2
Serbia	14.5	6.303584	0.769	5550	2
Lithuania	9	4.12574	0.818	11620	2
Romania	-10	3.673158	0.786	8010	2
Lebanon	-12.5	4.700013	0.745	8360	2
Netherlands	77	10.95836	0.921	48530	3
Finland	69	11.53084	0.892	47140	3
Germany	52.5	9.114842	0.92	43300	3
Singapore	50	2.663192	0.895	42530	3
Japan	49	9.185651	0.912	42190	3
Canada	47.5	16.22	0.911	43250	3
Belgium	44	9.999147	0.897	45840	3
Australia	39	16.90802	0.938	46310	3
United States	33.5	17.56416	0.937	48960	3
Ireland	18	8.939753	0.916	42810	3
Switzerland	69.5	4.952968	0.913	73680	4
Denmark	64	8.346405	0.901	59590	4
Iceland	63.5	6.168529	0.906	33900	4
Spain	55	5.853466	0.885	31420	4
Austria	51	7.973648	0.895	47060	4
Sweden	50	5.599744	0.916	50860	4
France	38	5.555374	0.893	42280	4
Hong Kong	27.5	5.16623	0.906	33630	4
United Kingdom	27	7.925093	0.875	38690	4
Italy	23	6.717667	0.881	35520	4

Saudi Arabia	66	17.03991	0.782	19360	5
Korea, Rep (South)	43.5	11.48689	0.909	19720	5
Czech Republic	24.5	10.62301	0.873	18370	5