Natural Capital, Subjective Well-Being, and the New Welfare Economics of Sustainability: Some Evidence from Cross-Country Regressions

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ABSTRACT

The measurement of natural capital and its management during the economic development process are important aspects of the capital approach to sustainable development. This paper explores whether natural capital per capita is correlated with life satisfaction across fifty-eight developed and developing countries, using natural capital data from the World Bank's Millennium Capital Assessment. Bivariate regressions indicate that it is. When a multiple regression model is estimated that includes major macro-level determinants of life satisfaction (i.e. GNI per capita, social capital, income distribution, unemployment and inflation), the positive relationship between natural capital and life satisfaction remains. Adding regional dummy variables for ex-Soviet Union countries and Latin American countries produces somewhat weaker estimates for natural capital, unless data outliers are deleted. Use of alternative subjective well-being variables (i.e. 'happiness', and a combined life satisfaction and happiness index) does not change the nature of the results. The findings arguably strengthen the case for a 'new welfare economics of sustainability' that takes subjective well-being measures into account.

Keywords Life Satisfaction · Subjective Well-Being · Natural Capital · Sustainable Development · Welfare Economics · Cross-Country Analysis.

JEL: C31, D6, O13, Q56

1. INTRODUCTION

The capital approach to sustainable development aims to measure the comprehensive wealth of nations in order to make sure that future generations will at least have the same total wealth per capita available to them as the current generation (World Bank, 2006, Strange and Bayley, 2008). In that sense, total wealth per capita and changes in its value have been interpreted as measuring social welfare (World Bank, 2006, Ruta and Hamilton, 2007).

Engelbrecht (2008) explored bivariate macro-level wealth-happiness relationships across countries, focussing on total wealth and its three major sub-categories (i.e. natural, produced, and intangible capital) as measured in the Millennium Capital Assessment (World Bank, 2006). It was found that total wealth per capita is strongly correlated with Gross National Income (GNI) per capita, due mostly to produced capital, as well as with intangible capital. However, when the most natural capital intensive countries were deleted as outliers, natural capital was highly correlated with mean life satisfaction and similar measures of subjective well-being, especially in high income countries. On that basis it is argued that discussions of sustainable development and social welfare should incorporate subjective well-being measures. Showing the importance of natural capital for the subjective well-being of the current generation should make it easier for politicians to support policies aimed at preserving, if not enhancing, natural capital, thereby also benefiting future generations.

The current paper explores whether the bivariate macro-level relationship between subjective well-being and natural capital is robust to the inclusion of major macro-level determinants of subjective well-being established in the literature (i.e. GNI per capita, social capital, income distribution, unemployment and inflation), as well as to the inclusion of dummy variables capturing major regional effects. The regression estimates reported in this paper suggest that it is, especially when the issue of data outliers is carefully addressed. Moreover, using alternative subjective well-being variables instead of the preferred one (i.e. life satisfaction) does not change the nature of the results. The findings arguably strengthen the case for a 'new welfare economics of sustainability', to use Gowdy's (2005) term, that takes subjective well-being measures into account.

However, it should be noted at the outset that the aim of this paper is not to develop a comprehensive model of the causal relationships between subjective well-being and its major determinants, with NatCpc being one of them, although it will hopefully stimulate research on such a model. There might well be reverse causation, at least to a certain extent, between the 'dependent' and some of the 'explanatory' variables, as well as amongst the latter. Such effects can only be taken into account when additional data in the time dimension become available. Also, the paper does not comment on how to improve the still imperfect measurement of natural capital, how to maintain or increase natural capital, or to what extent there is substitutability between natural capital and other inputs in the production process (the issue of strong versus weak sustainability, see Ekins et al., 2003, Comolli, 2006).

The paper is organized as follows. Section 2 briefly introduces the vexed issue of how to define sustainable development, and reviews some prior literature that focuses on the link between subjective well-being and environmental variables. The general methodology is introduced in section 3. Section 4 reports the definition of variables and data sources. Bivariate and multiple regression results are reported in section 5. Section 6 contains concluding comments. The main data used are reported in Appendix A.

2. NATURAL CAPITAL, SUSTAINABLE DEVELOPMENT, SOCIAL WELFARE AND LIFE SATISFACTION

Natural capital is an important concept in the sustainable development literature and a key concept in environmental economics (Ekins et al., 2003, Barbier and Heal, 2006, Brand 2009). Numerous papers have been written about its measurement, its role in the development process and its relationship to social welfare. However, how social welfare should be measured is itself contested. In contrast to the World Bank (2006), some ecological economists have argued that the debate about sustainability has to go beyond the framework of traditional welfare economics and the capital approach to sustainability, which are focussed on Pareto efficiency, and sustainable consumption as a measure of social welfare (see, for example, Gowdy, 2005, Azqueta and Sotelsk, 2007). While, undoubtedly, the capital-based approach to sustainability is an improvement over income-based measures of sustainable development (see Mäler, 2007), it is arguably still too limited.

This issue should also be seen in the context of recent criticisms of concepts like genuine savings and change in total wealth per capita that are associated with the total capital approach to sustainability. The World Bank publishes these measures and interprets them as indicators of sustainability of a country's development path (World Bank, 2006). However, Pillarisetti's (2005) provides a rather critical appraisal of the genuine savings concept and argues that policy implications based on it are erroneous. He prefers to focus on natural capital without mixing it up with other forms of capital (such as physical and human capital). Also, Gnègnè (in press) tests whether genuine savings (and, by extension, change in total wealth per capita) can explain changes in welfare (measured by the infant mortality rate and the Human Development Index [HDI]). The author confirms such a link, but finds it to be weak. In short, so far the evidence regarding the usefulness of genuine savings and change in total wealth per capita as indicators of changes in social welfare seems rather mixed.

However, focussing on natural capital's impact on subjective wellbeing does not imply that measurement of this type of capital is assumed to be easy or uncontroversial. Its measurement in the Millennium Capital Assessment exercise relies on many assumptions, i.e. its components are measured with varying degrees of accuracy, and some important elements that ideally should be included are not. It is expected that measurement of natural capital will improve further over time, but progress will not be easy.

This is not the first paper to analyse the relationship between measures of subjective well-being and natural capital or other indicators of the quantity and quality of the natural environment. In recent years, there has been an increase in the number of studies, mostly by economists, that use what can be called a "life satisfaction approach to environmental welfare analysis".[1] They all find that there is a significant correlation between the two types of variables.

Welsch (2002) is probably the first to examine how subjective well-being (i.e. 'happiness') varies with material prosperity and environmental conditions across countries. Using macro-level data, he calculates the subjective monetary value of changes in pollution, focussing mostly on the pollutant nitrogen dioxide. Welsch (2007) extends the welfare analysis of his earlier study.

Brown and Kasser (2005) provide micro-level evidence from samples of U.S. adolescents and adults that subjective well-being and 'ecologically responsible behaviour' (like turning off the lights, re-using paper and plastic bags) are positively correlated due to psychological factors like intrinsic values and mindfulness. This suggests that a sustainable way of life might not require a happiness sacrifice. Instead, it might enhance both personal and collective well-being.

Ferrer-i-Carbonell and Gowdy (2007) use micro-level data from the British Household Panel Survey and find robust correlations between individuals' subjective well-being (i.e. 'life satisfaction') and their environmental awareness about ozone depletion and biodiversity loss. Importantly, they show that caring about positive environmental features (e.g. nature landscapes) has positive effects on subjective well-being, whereas the opposite is true about negative environmental features (e.g. pollution).

Zidanšek (2007), using macro-level data, explores bivariate relationships between three alternative indicators of happiness and two alternative environmental indexes (an Environmental Sustainability Index [ISI], and an environmental performance index) as well as some of their sub-components. He finds that happiness and sustainability go hand-in-hand, suggesting that sustainable development in the interest of future generations does not require a happiness sacrifice of the current generation.

Using a mix of micro- and macro-level data, Bonini (2008) explores the cross-country relationship between individuals' life satisfaction and a number of macro-level variables, while also controlling for several individual-level characteristics. The macro-level variables are GDP per capita, human development (measured by the HDI), environmental conditions (measured by an ESI) and region-specific effects. He finds that region-specific effects dominate and that ESI and HDI are not significantly better indicators of life satisfaction than GDP per capita. However, due to collinearity issues Bonini does not include GDP per capita, HDI and ESI side-by-side in the same regression. Rather, he tests his multi-level model by conducting separate regressions that alternatively include GDP per capita, HDI and ESI among the variables. Also, he does not seem to have conducted an analysis of outliers.

Brereton at al. (2008) present an interesting micro-level study characterized by the inclusion in happiness regressions of a number of novel spatial environmental and

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[1] An alternative approach to using 'standard' subjective well-being measures and exploring their relationship with environmental variables is to modify the subjective well-being measures so that they reflect the state of the environment. See, for example, Marks et al. (2006), Ng (2008).

climate variables derived from Geographical Information Systems (GIS). They are able to match GIS data with survey data for 1500 Irish men and women that contain information on subjective well-being as well as a large number of socio-economic and socio-demographic control variables. They conclude that geography and the environment have a much larger influence on subjective well-being than previously thought. Given the very disaggregated nature of the analysis, their approach might lend itself to more direct policy conclusions than more aggregate analysis.

The current paper is similar to Vemuri and Costanza (2006) and Abdallah et al. (2008). Vemuri and Costanza (2006) focus on how various types of capital (i.e. human, social, built and natural capital) contribute to life satisfaction across countries and find that, when a number of poor countries are deleted as outliers, they can explain 72% of the cross-country variation in life satisfaction. However, their data are less up-to-date, e.g. the life satisfaction data are from the 1990 and 1995 waves of the World Values Surveys (WVS) and, more importantly, they use proxy variables for the various types of capital. For example, the HDI is used as a proxy for built and human capital, and an index of the value of ecosystem services per km^2 is used as a proxy for natural capital. These are not proper capital stock data and very different from the natural capital data used in this paper. Moreover, Vemuri and Costanza do not find their proxy for social capital to be a statistically significant predictor of average subjective well-being and exclude it from their main regressions. Their social capital proxy is derived from the Freedom House press freedom ratings. It is not based, as is more common, on the response to the trust questions in the WVS. Also, Vemuri and Costanza do not include other major explanatory variables of subjective well-being suggested by the happiness literature.

However, we take Vemuri and Costanza (2006, p. 128) conclusion that "It appears that natural capital has a unique relationship with life satisfaction that is not compensated by any of the other variables" and that "a natural capital variable should be included more often in analyses of life satisfaction" seriously. Their findings apply in the context of their specific model. The current paper includes natural capital in a macro-level life satisfaction equation and provides further evidence that their conclusion applies more widely.

Building on Vemuri and Costanza's (2006) approach of accounting for life satisfaction in terms of objective data based on different types of capital, Abdallah et al. (2008) impute mean life satisfaction estimates for a much wider range of (especially poor) countries, resulting in data for all 178 countries covered by the HDI. Their regression analysis, however, uses data for only 79 countries. They employ the same proxy for natural capital as Vemuri and Costanza (2006). Using this and a number of other explanatory variables, they are able to explain up to 76% of the cross-country variation in life satisfaction. They find natural, human and socio-political variables to be strong predictors of life satisfaction. Somewhat oddly, given the focus in much of happiness research on the link (or lack thereof) between subjective well-being and the material standard of living, Abdallah et al. (2008) exclude a standard of living variable, like GDP per capita, because it is strongly correlated with the other variables. This raises the question whether their main explanatory variables really affect life satisfaction beyond any impact associated with GDP. In our analysis, therefore, we retain a general standard of living variable in all multiple regressions.

3. METHODOLOGY

The aim of this paper is to test whether any macro-level bivariate relationship between subjective well-being and natural capital per capita observed across countries is robust to the inclusion of major known country-level determinants of subjective well-being. Therefore, we include variables in our analysis that are likely to have high 'explanatory power', according to previous findings in the literature. However, before introducing these variables, we have to comment on the selection of our preferred subjective well-being variable.

Subjective well-being can be measured in a number of ways. It is common in the psychological and happiness literatures to distinguish between two major sub-categories: (1) Subjective well-being associated with often short-lived pleasant emotions, or feeling good ('hedonic well-being', 'affective well-being', or 'happiness' for short), and (2) contentment derived from leading a meaningful and fulfilling life, or living well ('eudaimonic well-being', or 'life satisfaction' for short)(see, for example, Ryan and Deci, 2001, Steger et al., 2008, Deci and Ryan, 2008). Life satisfaction is closer related to intrinsic goals and cognitive judgements than to emotions. Sometimes the distinction doesn't matter and the terms happiness and life satisfaction are used synonymously. Note, however, that Inglehart et al. (2008) find that a society's level of life satisfaction is more sensitive to economic conditions than is happiness. For example, in many ex-Soviet Union countries happiness seems to have rising more widely than life satisfaction (and, at least for a while, moved in opposite direction in some cases), with life satisfaction closer mirroring economic declines. Inglehart et al. (2008) argue that a subjective well-being index that combines both life satisfaction and happiness is a broader based and more reliable indicator of subjective well-being than either component by itself. They derive such a combined measure and simply call it their subjective well-being index.

It remains to be seen whether the three types of subjective well-being measures can be used interchangeably in our study. Vemuri and Costanza's (2006) argue, based on evidence provided by Diener at al. (1995), that national predictors of well-being more strongly influence life satisfaction rather than happiness. They therefore chose the former. Kroll (2008) uses similar reasoning for his preferential use of life satisfaction over happiness. Helliwell and Putnam (2004) also find the use of life satisfaction marginally preferable to the use of happiness. Given these prior findings, we use life satisfaction as our preferred subjective well-being variable but also test whether happiness, and a combination of the two as employed by Inglehart (2004) and Inglehart et al. (2008), produce similar results.

A major 'explanatory' variable is GNI per capita, which is a proxy for the general standard of living. This variable is included because it is known from numerous studies to be strongly correlated with subjective well-being in low and middle income countries (Diener and Suh, 1999, Frey and Stutzer, 2002, Kroll, 2008). The majority of countries in our sample fall into these categories. When country samples include mostly rich countries, the relationship is often found to be weak or non-robust to the inclusion of other explanatory variables (see, for example, Helliwell, 2003).

Social capital measured in various ways has often been found to have a strong impact on subjective well-being, working through many direct, indirect, and reverse channels (Diener and Suh, 1999, Helliwell, 2003, Helliwell and Putnam, 2004, Kroll, 2008, Tov and Diener, 2008). Kroll (2008), for example, finds that social capital in its major forms (i.e. 'cognitive social capital' proxied by a general trust variable, and 'structural social capital' proxied by the sum of memberships in different types of voluntary organizations) are more important determinants of life satisfaction in rich countries than are general standard of living variables and other economic variables like income inequality. Social capital seems less important in poorer countries, where the economic variables dominate. However, there is also evidence that social capital (i.e. trust) is correlated with higher per capita income (Knack and Keefer, 1997, Zak and Knack, 2001). It seems fair to say that it is not clear what the main mechanisms are that connect social capital, the general standard of living, and subjective well-being. Our country sample includes a mix of developed and developing countries. Therefore, we use both a general standard of living variable as well as a social capital variable among the 'explanatory' variables. Given limited data availability for structural social capital, a general trust variable is employed in this paper.

A number of studies have included income inequality (usually proxied by the Gini coefficient) in subjective well-being equations and, somewhat surprisingly, found either no or a positive correlation (Diener and Oishi, 2000, Schyns, 2002, Kroll, 2008). It is not yet clear whether this is a robust conclusion, or whether it is due to limitations in data coverage and outliers (Frey and Stutzer, 2002). We try to contribute to this discussion by including national Gini coefficients in our analysis.

Probably the most robust findings for economic variables determining subjective well-being in developed countries have been reported for unemployment and inflation. They have consistently strong negative impacts (see, for example, Frey and Stutzer, 2002, Di Tella et al., 2003, Kroll, 2008). The inflation and unemployment rates are therefore also included in our multipe regressions.

Last but not least, a recurring finding in the literature is the presence of strong region-specific effects. In particular, many Latin American countries seem to have higher levels of subjective well-being than suggested by their level of economic development. The opposite applies to ex-Soviet Union countries. This is found using both macro-level and micro-level data (see, for example, Inglehart et al., 2008, Bonini 2008). We therefore also include dummy variables for these two regions in some of our regressions.

This study uses nations as units of analysis. An advantage of this approach is that in this case, much of the unobserved heterogeneity at the individual level is likely to even out. Moreover, there is evidence that aggregate measures of subjective well-being are meaningful variables in the cross-country context. For example, Diener and Suh (1999) find that there is a high degree of homogeneity of subjective well-being within nations. Also see the discussion in Kroll (2008, chapter 5).

Our model specifications in general terms are as follows. The first model analyses the bivariate cross-country relationship between life satisfaction (LSF) and natural capital per capita (NatCpc):

LSF = f(NatCpc) (1)

The second model includes GNI per capita (GNIpc), a trust variable (Trust), the Gini coefficient (Gini), the unemployment rate (Un) and the inflation rate (Infl) as additional variables. It is similar to Kroll's basic model specification, except that we also include NatCpc.

LSF = f(GNIpc, NatCpc, Trust, Gini, Un, Infl) (2)

Next, we add the two regional variables as additional control variables (Ex-SovD, LatD):

LSF = f(GNIpc, NatCpc, Trust, Gini, Un, Infl, Ex-SovD, LatD) (3)

Finally, we also estimate models (2) and (3) with alternative subjective well-being variables.

4. VARIABLES AND DATA SOURCES

4.1 Subjective Well-Being Variables (LSF, HPY, SWB)

The subjective well-being variable preferred on a-priori grounds is (mean) life satisfaction (LSF). It is derived from participants' responses to question A170 of the WVS. The question asks participants "All things considered, how satisfied are you with your life as a whole these days?", and has ten possible responses (ranging from 1 'not at all satisfied' to 10 'very satisfied'). Another subjective well-being variable obtained from the WVS is happiness (HPY). Question A008 of the WVS asks "Taking all things together, would you say you are" 'very happy', 'rather happy, 'not very happy', or 'not at all happy'? The inverse of the mean values are used as the basis for deriving the HPY data used in this paper (i.e. so that larger means indicate higher levels of happiness). A third subjective well-being variable used is Inglehart's subjective well-being index (SWB) that combines both life satisfaction and happiness. Because in the WVS the life satisfaction and happiness questions have opposite polarity, and life satisfaction is measured on a 10-point scale whereas happiness is measured on a 4-point scale, SWB is calculated as 'life satisfaction – 2.5× happiness' (Inglehart et al., 2008).

The LSF, HPY and SWB data are sourced from the WVS website (http://www.worldvaluessurvey.org/), Inglehart (2004) and Inglehart et al. (2008). The later report data from the 2005 WVS wave. However, 2005 wave data are not provided for all countries in the sample used in this study. Data from the various sources have been combined to derive the data shown in Appendix Table A2. The aim is to us data as close as possible to the year 2000. Where data from before and after 2000 were available (e.g. for 1996 and 2007), simple interpolation is used to derive approximate values for 2000. For 46 of the 58 countries, values of the subjective well-being variables are for 2000 or later (2001 or 2002). For ten countries, only values for 1999 were available. For Georgia and the Dominican Republic, only 1996 data were available.

The three subjective well-being variables are highly correlated. For example, in the 58 country sample, the correlation between SWB and, respectively, HYP and LSF, is 0.92; and 0.72 between LSF and HYP). However, they do result in different country rankings. For example, Zimbabwe has the lowest life satisfaction (3.94), Colombia the highest (8.4). The unhappiest country in the sample is Indonesia (0.367), the happiest is Nigeria (0.704). For SWB, Indonesia again ranks lowest (-2.4), but Mexico ranks highest (4.34)(see Appendix Tables A1 and A2).

4.2 Gross National Income Per Capita (GNIpc)

We use GNIpc in US$ for the year 2000 as the proxy for the material standard of living. It is taken from World Bank (2006) and ranges from a low of US$ 297 in Nigeria to a high of US$ 37,879 in Japan.

4.3 Natural Capital Per Capita (NatCpc)

The data on natural capital per capita (NatCpc) are taken from the World Bank's Millennium Capital Assessment (World Bank, 2006). Natural capital is one of three major wealth subcategories, besides produced capital and intangible capital, which make up total wealth.[2] Natural capital is the smallest of the three, accounting for 26% (13%) of total wealth in low (middle) income countries. In high income countries, it accounts for only 2% (ibid., p. 4). In absolute terms, however, NatCpc increases with the level of economic development.

Measuring NatCpc is a work in progress, relying on data of various degrees of accuracy derived making many assumptions, and with new components being added over time as data become available or can be approximated. This makes it difficult to compare natural capital estimates over time. The data used here are for the year 2000 and take into account a large number non-renewable and renewable resources: Energy resources (oil, natural gas, hard coal, lignite), mineral resources (bauxite, copper gold, iron, lead, nickel, phosphate, silver, tin, zinc), timber and non-timber forest resources, cropland, pastureland and protected areas (see World Bank, 2006, Appendix 1, for further details). Notable omissions are subsoil water, diamonds and fisheries (ibid.) The value of NatCpc ranges from basically zero for Singapore to a high of US$ 54,828 for Norway (see Appendix Tables A1 and A2). The range of NatCpc is larger than that of GNIpc.

4.4 Social Capital (Trust)

The data for social capital are derived from participants' responses to question A165 of the WVS. The question asks participants "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" The percentage of people answering "Most people can be trusted" is used as the basis for deriving the values for Trust. The data are either for 2000 or earlier. Where possible, interpolation is used to approximate the value for 2000. For example, in the case of Moldava, survey responses to the question are available for

[2] Intangible capital, by far the largest component of wealth, is a measure of our ignorance, i.e. it is the difference between separately measured total wealth, and natural and produced capital (World Bank, 2006).

1996 (22.2%) and 2002 (14.7%). The value for 2000 is approximated using simple interpolation (resulting in 17.2%). Details of all approximations are available from the author.

4.5 Gini Coefficient (Gini)

The Gini coefficient is a measure of the degree of income inequality. A value of zero indicates perfect equality, a value of 100 indicates perfect inequality. The Gini data are taken from the World Development Indicators (WDI) database, accessed online on 28. October 2008. Gini coefficients for 2000 are available for 30 of the 58 countries in the sample. The actual year for which data are available is indicated in Appendix Table A2. Gini coefficients for China and India reported in WDI are for 2004. Instead, we use the Gini coefficient for China in 2000 reported by Chang (2002). The Gini coefficient for India in 1999-2000 is taken from Hong Kong (2004).

Denmark has the lowest coefficient (24.7), Brazil the highest (59.19). It is noticeable that 9 out of 10 Latin American countries have a Gini coefficient of around 50 or higher, indicating sizable income inequality. WDI also reports earlier Gini coefficients (not shown in Appendix Table A2), especially for countries in our sample with GNIpc below US$ 10,000. They were used in the sensitivity analysis. However, their limited availability was less than ideal.

4.6 Unemployment Rate (Un)

Unemployment rates (percentage of unemployed in total labour force) are sourced from WDI. They are mostly available for 2000, with the exception of Singapore, Brazil, El Salvador, Zimbabwe (1999) and Albania, Algeria, Jordan (2001). Iran's unemployment rate is for 1999 (CIA, 2002). An outlier is the unemployment rate for Nigeria. It is for 2005 (CIA, 2006). The lowest unemployment rate is reported for Mexico (2.2%), the highest for Algeria (27.3%), followed by South Africa (26.7%) (see Appendix Tables A1 and A2). Data for earlier years, mostly for 1996, were available for all countries except Nigeria and Albania. They were used in the sensitivity analysis (details are available upon request).

4.7 Inflation Rate (Infl)

The inflation rate used is the annual consumer price inflation in percent. Data for all countries in 2000 were available from WDI. They range from a low of -0.94 for Argentina to a high of 55.86 in Zimbabwe (see Appendix Tables A1 and A2). As part of the sensitivity analysis, 1996 inflation rates from the same source were also employed (they are not shown in Appendix Table A2).

4.8 Regional Dummy Variables (Ex-SovD, LatD)

Two dummy variables are used to account for well-known region-specific subjective well-being features. Ex-SovD has a value of 1 for ex-Soviet Union countries and zero otherwise. Similarly, LatD has a value of 1 for Latin American countries and zero otherwise. See Appendix Table A2 for details of which countries are included in each region. A dummy variable for high-income countries (i.e. those with GNIpc above

US$ 10,000) was initially included in the multiple regressions. However, it was dropped because it was highly correlated with GNIpc and not statistically significant.

5. ANALYSIS AND DISCUSSION

5.1 Bivariate Relationships

Before estimating our models, we plot the bivariate relationship between LSF and GNIpc, as well as that between LSF and NatCpc. Figure 1 shows the by now well-known non-linear relationship between a subjective well-being variable and a standard material standard of living variable. For poor countries, increases in the material standard of living tend to be associated with strong increases in LSF. This effect peters out considerable for the group of rich countries (i.e. countries with GNIpc above US$ 10,000), although it remains positive. For countries with GNIpc above US$ 12,000 it seems close to zero. Reader should also note the high ‘explanatory power’ of GNIpc. It alone is able to account for half of the variation in LSF across countries.

[Insert Figure 1 about here]

By contrast, the scatter diagram between LSF and NatCpc (Figure 2) has a different and somewhat odd shape that suggests outliers might be important in determining the relationship (similar odd shapes emerge if SWB or HYP are used instead of LSF). In particular, countries with very high levels of NatCpc seem to form a different pattern compared to the rest. Visual inspection suggests that such high NatCpc countries like Australia, Venezuela, Canada, New Zealand and Norway, but also Russia, might be unusual, distorting the overall pattern. Also note that the R^2 is highest when a linear trend line is fitted to the data, but it is still very small.

[Insert Figure 2 about here]

Table 1 shows the standardized coefficient estimates for model (1), using the full 58 country sample (regression 1.1), as well as for a number of smaller samples. In all cases, the coefficient estimate for NatCpc is highly statistically significant. The adjusted R^2 increases when outliers are deleted. Statistical analysis (using DFBETAS and DFFITS) identifies three outliers (i.e. Norway, Russia and Zimbabwe). Deleting these countries results in relatively minor changes (regression 1.2). The adjusted R^2 only increases to 0.2 when the visually identified highly NatCpc-intensive countries Norway, New Zealand, Canada, Venezuela, Australia and Russia are deleted (regression 1.3). A further substantial rise in the adjusted R^2 to about one third occurs when the nine most natural capital intensive countries are deleted from the sample. These are the top 16% of countries in terms of NatCpc, with NatCpc above US$ 13,000)(regression 1.4). The deleted countries are Norway, New Zealand, Canada, Venezuela, Australia, Russia, US, Iran and Algeria. However, the Durbin Watson (DW) statistic, here interpreted as a general test of model (mis)specification, is too low for regressions (1.1) to (1.4), indicating that the regressions results might not be reliable.

[Insert Table 1 about here]

Model (1) is also estimated for the sample of high-income countries. When all twenty-four countries are included, the parameter estimate for NatCpc remains highly statistically significant, but the adjusted R^2 is reduced to 0.106 (Table 1, regression 1.5). However, when, as in Engelbrecht (2008), the visual outliers Norway, New Zealand, Canada and Australia are deleted from this sample, the adjusted R^2 increases greatly to 0.43 (regression 1.6). When the US is also deleted as a natural resource intensive outlier, the standardised coefficient estimate rises to 0.746, with an adjusted R^2 of 0.531! Moreover, the DW statistics for rich country regressions do not indicate any model specification problems. The findings for high-income countries are similar to those reported in Engelbrecht (2008) and reconfirm the high correlation between subjective well-being variables and NatCpc in high-income countries that are not themselves among the top natural capital intensive countries. It is worth remembering that in these countries, natural capital accounts for a very small proportion of total wealth.

5.2 Multiple Regression Analysis: The Main Life Satisfaction Regressions And Some Sensitivity Analysis

The main question addressed in this paper is whether the positive bivariate relationship between LSF and NatCpc survives when NatCpc is incorporated in macro-level regressions that include major variables that have been found to 'explain' a large proportion of subjective well-being at the country level (models 2 and 3). The mixed availability and quality of data for the additional variables discussed in section 4 above suggests that the issue of outliers is likely to be even more important than in the context of the bivariate relationship. As a first step, we test for functional form. Box-Cox regressions indicate that it is preferable to enter all variables in log form, except for the inflation rate (because it has some negative values). Therefore, all regressions reported in Table 2 are in that form. The detailed Box-Cox regression estimates are not reported but they are available from the author.

The estimates for regression (1.1) in Table 2 indicate that in the full sample, NatCpc remains statistically significant when the other variables are included. GNIpc has the highest p value, followed by Gini. While the estimates for Un and Infl are statistically significant and have the expected signs, the positive estimate for Gini is somewhat surprising, as is the statistically insignificant estimate for Trust. The adjusted R^2s is quite high, even before any outliers are deleted (and increases to almost 0.9 for some of the reported regressions). In contrast to the bivariate regressions, the value of the DW statistic for regression (1.1) is inconclusive.

[Insert Table 2 about here]

We again calculate DFBETAS and DFFITS statistics. The DBETAS indicate that the largest of all outliers by far, and the only one for NatCpc, is Singapore. When it is deleted, the elasticity of NatCpc with respect to LSF more than doubles (to 0.033) and the coefficient estimate is statistically significant (p-value of 0.039)(not shown in Table 2). Further, the analysis suggests there are outliers for other variables. When all outliers suggested by the DFFITS statistics are deleted (Nigeria, Zimbabwe, Indonesia, Romania, Russia, Colombia, Turkey and Singapore), the number of observations is reduced to 50. The estimate for NatCpc remains statistically significant at the 5% level, the adjusted R^2 increases appreciably, and the DW statistic indicates no model specification issues (Table 2, regression 1.2). However, the unexpected results for Trust and Gini are unchanged, and the estimate for Infl becomes statistically insignificant.

Next, regional dummy variables are added (Table 2, regression 1.3) to estimate model 3. In that case, the coefficient on NatCpc has a p value of 0.055. The parameter estimate for Trust is still statistically insignificant, but so is now the estimate for the Gini coefficient. The regional dummy variables are highly statistically significant and have the expected signs. When Singapore is deleted (Table 2, regression 1.4), the coefficient estimate for NatCpc has a p value of 0.008. When further outliers are deleted (i.e. all outliers indicated by a DFFITS analysis: Nigeria, Zimbabwe, Indonesia, Philippines, Romania, Colombia and Singapore), the coefficient estimate for NatCpc is only statistically significant at the 10% level. However, the estimate for Trust comes closer to prior expectation by having a p value of 0.069 (Table 2, regression 1.5). The estimates for the regional dummy variables, UN and Infl are little affected by the deletion of outliers. The estimate for the Gini coefficient remains statistically insignificant. Given that the Latin American countries have relatively high levels of LSF as well as relatively high income inequality, it might be that LatD captures most of the impact of Gini. Therefore, regressions that exclude Gini were also estimated. However, the parameter estimates were similar to those reported in Table 2, regressions (1.3) to (1.5). The values of the DW statistics for regressions (1.3) to (1.5) are inconclusive.

We also explored the impact of using lagged observations (lagged five years or less) for Trust, Gini, Un and Infl. All of the observations for Infl are available for 1996 (from WDI). For Un, all but two observations are lagged (also using WDI data for 1996). However, for Gini and Trust, less than half of the observations are lagged. Re-running the regressions with these fully or partially lagged variables does not change the substance of our earlier results. However, the lagged Trust variable becomes close to being statistically significant at the 5% level in the lagged regression equivalent to regression (1.5) in Table 2.

Finally, we tried to run separate LSF regressions for the group of high-income countries. However, because of the small number of observations, almost all coefficient estimates are statistically insignificant. This is unfortunate, because the strongest bivariate regression results were obtained for this group of countries. The issue can only be remedied when more data for high-income countries become available.

5.3 Multiple Regression Analysis With Alternative Subjective Well-Being Variables

In order to explore to what extent our multiple regression results are sensitive to the subjective well-being variable chosen, regressions are also estimated with SWB and HPY as dependent variables (see Table 3). Box-Cox regressions indicate that in SWB regressions, GNIpc, NatCpc, Trust, Gini and Un should be entered in log form, whereas HPY regressions should be in linear form.

The results obtained for the SWB regressions using all 58 observations (Table 3, regressions 1.1 &1.2) are very similar to those for the LSF regressions (Table 2, regressions 1.1 & 1.3), except that the DW statistics obtained for model 2 now clearly rejects model misspecification. When seven outliers (as indicated by their DFFITS) are deleted (Table 3, regression 1.3), the estimates are improved compared to those obtained for regression 1.5, Table 2. In particular, the parameter estimate for NatCpc is now statistically significant at a conventional level, and the estimate for Trust is statistically significant and has the expected sign! Moreover, the value of the DW statistic now clearly rejects model misspecification and the adjusted R^2 is the highest for any of the regressions, i.e. almost 90%.

[Insert Table 3 about here]

By contrast, the results obtained for HYP regressions (Table 3, regressions 1.4 to 1.7) seem somewhat worse compared to those for LSF and SWB regressions. The adjusted R^2s are lower, parameter estimates for Trust are never statistically significant or of the expected sign, and estimates for Un, Infl and LatD are statistically insignificant in regressions (1.6) and (1.7). However, the regression estimates do not provide insights into whether NatCpc matters more for life satisfaction or for (hedonic) happiness: When outliers indicated by their DFFITS are deleted, the estimate for NatCpc has a higher p value than in the comparable LSF equation (compare regression 1.7, Table 3 with regression 1.5, Table 2).

6. CONCLUDING COMMENTS

The aim of this paper is to explore whether the bivariate macro-level relationship between subjective well-being and natural capital is robust to the inclusion of major determinants of subjective well-being. The results obtain suggest that it is, despite being the smallest of the wealth categories making up total wealth in the Millennium Capital Assessment. Moreover, the 'explanatory power' of the regressions is high, rising to almost 90% when outliers are deleted. The differences in results between life satisfaction and SWB regressions are not found to be especially large, although, like suggested by Inglehart et al. (2008), the use of SWB seems preferable. It leads to parameter estimates more in line with prior expectations (especially for the social capital variable). Estimates for HPY regressions seem less satisfactory. They have lower explanatory power and they are the only model (3) regressions for which parameter estimates of Un and Infl are statistically insignificant.

The findings support the view of those, like Chiesura and de Groot (2003), who argue that natural capital provides immaterial and often intangible functions that are nevertheless important for the quality of human life, i.e. 'socio-cultural functions', but that are usually excluded from the valuation of natural capital. They also provide support for Kahneman and Sugden's (2005) advocacy of the use of subjective well-being measures for policy evaluation in environmental economics. In short, the findings in this paper further strengthen the argument that discussions of sustainable development, natural capital and social welfare should incorporate subjective well-being measures. They are arguably an important element of a new welfare economics of sustainability.

In should be noted that the relationship between subjective well-being and natural capital is likely to be important in assessing the effects of climate change. Heal (2008) comments that climate change will deplete natural capital and reduce the flow of ecosystem services. He argues that we need to better understand this impact and how, in turn, it affects human welfare. We argue that subjective well-being research can and must contribute to solving this task.

The data underlying the analysis presented in this paper are limited and unsatisfactory in many ways, leaving plenty of scope for extending the analysis in future. Data limitations prevented separate multiple regression analysis for the group of high income countries. Some evidence from bivariate regressions suggests natural capital might have the largest impact on subjective well-being in these countries, especially when the top natural capital intensive countries are excluded as outliers.

Larger macro-level data sets might become available in the near future for, especially, social capital variables. This should enable researcher to exploit the full sample of 120 countries for which wealth data are provided by the World Bank (World Bank, 2006). Also, should comparable natural capital data become available for different time periods, it would be possible to explore the causal relationships between the main 'explanatory' variables in some detail.

Last but not least, future research could try to disaggregate natural capital in order to determine whether some of its components contribute a lot more to subjective well-being than others. Azqueta and Sotelsk (2007) suggest that some components might constitute a core set of natural capital that cannot be substituted (i.e. where strong sustainability applies). Earlier, Ekins et al. (2003) called these components 'critical natural capital'. Natural capital's impact on subjective well-being is an aspect of its 'criticality' that has often been overlooked. Subjective well-being research can potentially provide an additional and complementary approach to identifying a subset of core or critical natural capital.

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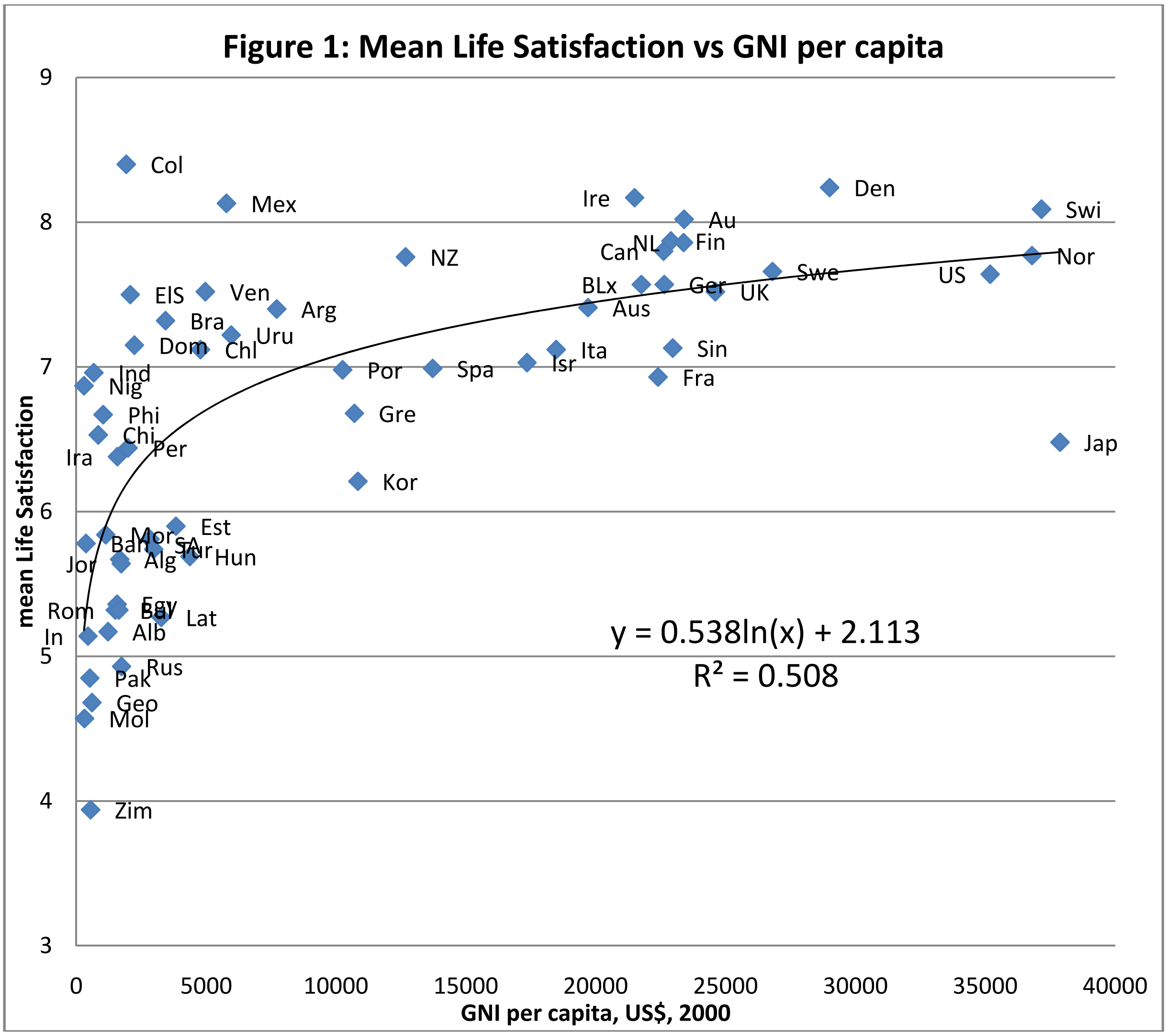
Figure 1: Mean Life Satisfaction vs GNI per capita
mean Life Satisfaction
GNI per capita, US$, 2000
y = 0.538ln(x) + 2.113
R² = 0.508
Col
Mex
Ire
Den
Swi
Au
NL
Fin
Can
NZ
Swe
Nor
US
BLx
Ger
UK
Aus
ElS
Ven
Arg
Bra
Uru
Dom
Chl
Ind
Nig
Por
Spa
Isr
Ita
Sin
Fra
Phi
Gre
Chi
Per
Ira
Jap
Kor
Est
Mor
Ban
SA
Tur
Hun
Jor
Alg
Egy
Bel
Rom
Lat
In
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Pak
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9
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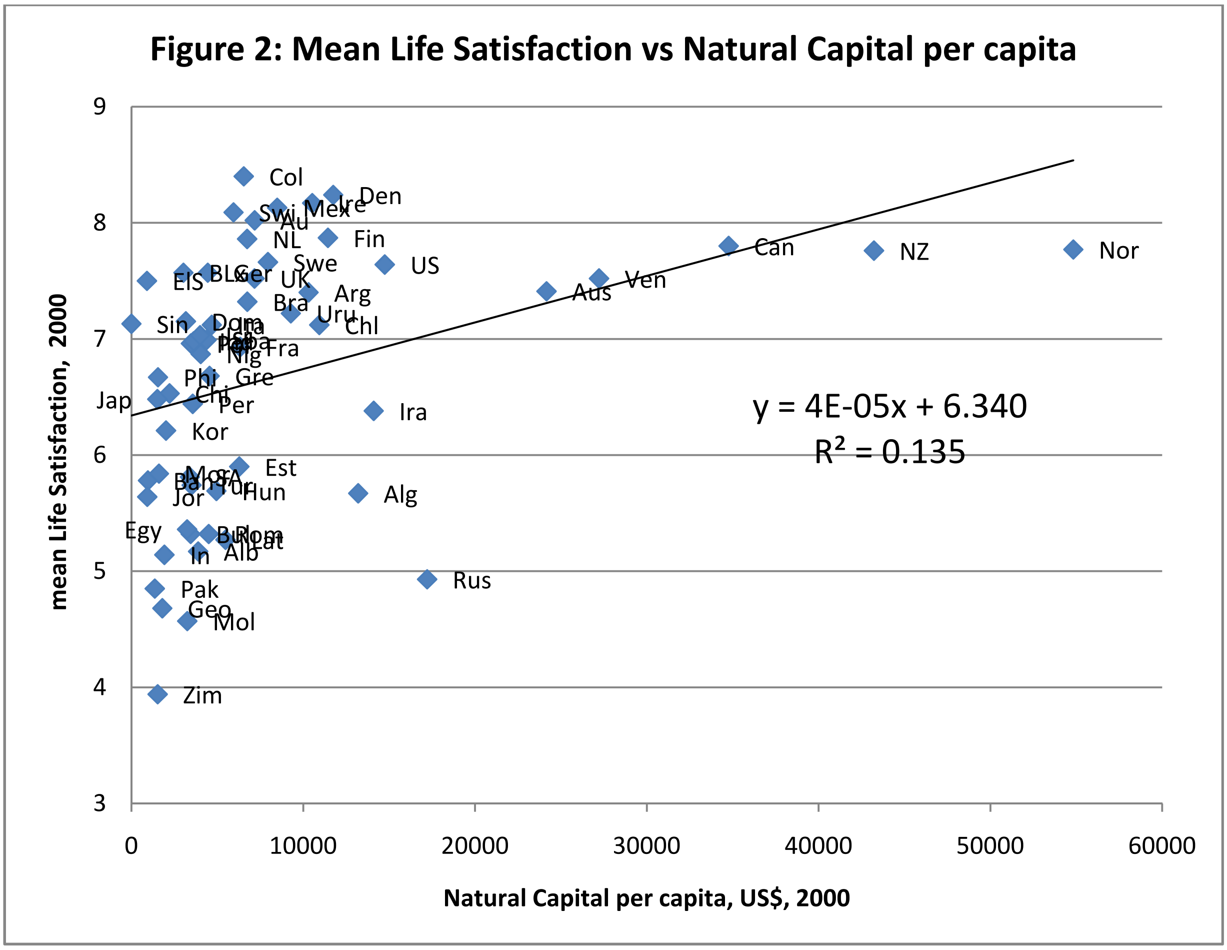

Figure 2: Mean Life Satisfaction vs Natural Capital per capita
mean Life Satisfaction, 2000
Natural Capital per capita, US$, 2000
y = 4E-05x + 6.340
R² = 0.135
9
8
7
6
5
4
3
0
10000
20000
30000
40000
50000
60000
Col
Den
Ire
Mex
Swi
Au
NL
Fin
US
Can
NZ
Nor
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Table 1: Bivariate relationship - Life satisfaction and natural capital per capita

Regression No.	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)
NatCpc	0.368	0.409	0.468	0.592	0.380	0.679
	(4.363)	(4.414)	(3.451)	(5.873)	(3.026)	(3.630)
Constant	6.340	6.345	5.869	5.581	7.264	6.745
	(37.64)	(37.99)	(23.32)	(21.88)	(52.18)	(33.07)
DW	1.083	1.034	1.0	1.235	1.464#	2.063#
Adjusted R^2	0.121	0.152	0.204	0.337	0.106	0.430
N	58	55	52	49	24	20

Notes: The dependent variable is LFS. Ordinary least squares with White's correction for unknown heteroscedasticity. Coefficients estimates are standardized. T-ratios are shown in brackets. All coefficient estimates are statistically significant ($p<0.01$). DW= Durbin-Watson statistic. N=Number of countries (i.e. observations). The DW statistics for regressions (1.1) to (1.4) indicate model specification problems. # no evidence of model misspecification.

Table 2: Main results - Life satisfaction regressions

Regression No.	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)
GNIpc	0.079**	0.084**	0.066**	0.052**	0.074**
	(7.610)	(8.551)	(5.921)	(3.954)	(7.026)
NatCpc	0.014**	0.024*	0.009	0.038**	0.021
	(3.571)	(2.015)	(1.967)	(2.772)	(1.698)
Trust	0.022	0.022	0.023	0.009	0.031
	(0.987)	(1.160)	(1.120)	(0.424)	(1.865)
Gini	0.299**	0.303**	0.069	0.022	0.065
	(4.330)	(5.215)	(0.898)	(0.298)	(1.070)
Un	-0.064**	-0.062**	-0.049**	-0.051**	-0.042**
	(-3.176)	(-3.877)	(-2.729)	(-3.001)	(-3.492)
Infl	-0.300**	-0.077	-0.214*	-0.232*	-0.077**
	(-2.803)	(-0.003)	(-2.021)	(-2.270)	(-3.094)
Ex-SovD			-0.101**	-0.121**	-0.103**
			(-2.837)	(-3.321)	(-3.988)
LatD			0.140**	0.136**	0.134**
			(3.579)	(3.480)	(4.938)
Constant	0.111	-0.062	1.034**	1.129**	0.827**
	(0.331)	(-0.226)	(2.981)	(3.357)	(2.884)
DW	2.300$	1.832#	1.785$	1.875$	1.800$
Adj. R^2	0.683	0.793	0.756	0.773	0.875
N	58	50	58	57	51

Notes: The dependent variable is LFS. Ordinary least squares with White's correction for unknown heteroscedasticity. All variables, except Infl and the regional dummy variables, are in logs, and only the coefficient estimate for Infl is standardized. T-ratios are shown in brackets. **p<0.01, *p<0.05. DW= Durbin-Watson statistic. # no evidence of model misspecification, $ inconclusive evidence. N=Number of countries.

Table 3: Subjective well-being and happiness regressions

Regr. No. Dependent Variable	(1.1) SWB	(1.2) SWB	(1.3) SWB	(1.4) HPY	(1.5) HPY	(1.6) HPY	(1.7) HPY
GNIpc	0.842**	0.716**	0.626**	0.568**	0.518**	0.464**	0.451**
	(7.548)	(5.572)	(8.921)	(3.975)	(5.295)	(2.966)	(5.826)
NatCpc	0.111**	0.084	0.268*	0.154	0.155**	0.174*	0.211**
	(3.345)	(1.888)	(2.025)	(1.620)	(3.148)	(2.035)	(4.028)
Trust	0.124	0.061	0.305*	-0.056	0.190	-0.138	-0.051
	(0.539)	(0.259)	(2.492)	(-0.433)	(1.495)	(-1.081)	(-0.499)
Gini	3.618**	1.661*	0.837	0.527**	0.582**	0.311*	0.159
	(5.615)	(2.062)	(1.821)	(5.653)	(5.569)	(2.122)	(1.360)
Un	-0.823**	-0.653**	-0.590**	-0.223*	-0.296**	-0.182	-0.152
	(-3.427)	(-2.930)	(-5.936)	(-2.099)	(-3.055)	(-1.768)	(-1.850)
Infl	-0.248**	-0.174*	-0.066**	-0.213*	-0.280**	-0.152	-.049
	(-3.278)	(-2.355)	(-2.995)	(-2.261)	(-5.387)	(-1.762)	(-1.035)
Ex-SovD		-1.179**	-1.209**			-0.063**	-0.077**
		(-3.575)	(-7.640)			(-3.684)	(-6.597)
LatD		0.946*	1.132**			0.015	0.198
		(2.069)	(3.464)			(0.498)	(1.503)
Constant	-17.833**	-9.676**	-8.597**	0.335**	0.328**	0.427**	0.462**
	(-5.862)	(-2.845)	(-4.215)	(9.308)	(8.212)	(8.386)	(10.87)
DW	2.043#	1.866$	1.942#	1.749$	2.006#	1.765$	2.282$
Adj. R^2	0.693	0.747	0.891	0.491	0.726	0.530	0.698
N	58	58	51	58	49	58	54

Notes: Ordinary least squares with White's correction for unknown heteroscedasticity. T-ratios are shown in brackets. **p<0.01, *p<0.05. In regressions (1.1) to (1.3), GNIpc, NatCpc, Trust and Gini are in logs. The coefficient estimate for Infl is the standardized estimate. Regressions (1.4) to (1.7) are estimated in linear form and standardized coefficients are reported. DW= Durbin-Watson statistic. # no evidence of model misspecification, $ inconclusive evidence.
The following countries are deleted as outliers:
Regression (1.3): Nigeria, Zimbabwe, Indonesia, The Philippines, Russia, Colombia and Singapore. Regression (1.5): Nigeria, Indonesia, China, Algeria, Russia, El Salvador, Turkey, Venezuela, Norway. Regression (1.7): Nigeria, Zimbabwe, Indonesia, Norway.

Appendix A

Table A1: Summary statistics

	Mean	St. Dev.	Min.	Max.
LFS	6.668	1.110	3.940	8.400
SWB	1.750	1.820	-2.400	4.340
HPY	0.521	0.082	0.267	0.704
GNIpc	10730	11480	297	37879
NatCpc	8175	10215	0.01	54828
Trust	29.402	16.163	2.800	66.500
Gini	38.290	9.1933	24.700	59.190
Un	9.093	5.719	2.200	27.300
Infl	7.134	11.907	-0.940	55.860

Table A2: Data

Country	Abb.	LFS	SWB	HPY	*GNIpc*	*NatCpc*	*Trust*	*Gini*	*Gini year*	*Un*	*Infl*
Nigeria	Nig	6.87	3.32	1.42	297	4040	25.6	46.5	1996	2.9	6.93
Moldova*	Mol	4.57	-1.61	2.47	316	3260	17.2	39.09	1998	8.5	31.29
Bangladesh	Ban	5.78	0.54	2.1	373	961	22.6	33.42	2000	3.3	2.21
India	In	5.14	0.03	2.05	446	1928	40.5	32.5	99-00	4.3	4.01
Pakistan	Pak	4.85	-0.3	2.06	517	1368	28.3	33.02	1999	7.2	4.37
Zimbabwe	Zim	3.94	-1.88	2.33	550	1531	11.9	50.1	1995	6	55.86
Georgia*	Geo	4.68	-1.11	2.32	601	1799	18.7	38.85	2000	10.8	4.06
Indonesia	Ind	6.96	-2.4	3.74	675	3472	51.6	30.33	2000	6.1	3.72
China	Chi	6.53	1.2	2.13	844	2223	54.1	45.8	2000	3.1	0.26
Philippines	Phi	6.67	2.32	1.74	1033	1549	7.8	46.09	2000	10.1	3.95
Morocco	Mor	5.84	0.74	2.04	1131	1604	23.9	39.5	1998	13.6	1.89
Albania*	Alb	5.17	-0.86	2.61	1220	3892	25.7	29.12	1997	22.7	0.05
Bulgaria*	Bul	5.32	-1.05	2.56	1504	3448	26.9	26.38	1997	17.1	10.32
Egypt	Egy	5.36	0.52	1.94	1569	3249	37.9	34.42	2000	9	2.68
Iran	Ira	6.38	0.93	2.18	1580	14105	65.3	44.1	1998	14	14.48
Romania*	Rom	5.32	-1.14	2.58	1639	4508	10.1	30.25	2000	7.1	45.67
Algeria	Alg	5.67	0.57	2.04	1670	13200	11.2	35.3	1995	27.3	0.34
Jordan	Jor	5.64	0.39	2.1	1727	931	27.7	36.42	1997	15.8	0.67
Russian Fed.*	Rus	4.93	-1.29	2.5	1738	17217	23.7	45.62	2000	9.8	20.78
Colombia#	Col	8.4	4.18	1.69	1926	6547	11.2	57.5	2000	20.5	9.22
Peru#	Per	6.44	1.32	2.05	1991	3575	9.6	49.82	2000	7.3	3.76
El Salvador#	ElS	7.5	3.67	1.53	2075	912	14.6	51.92	2000	6.8	2.27
Dominican Republic#	Dom	7.15	2.25	1.96	2234	3176	26.6	52.11	2000	13.9	7.72

South Africa	SA	5.81	1.11	1.88	2837	3400	13.1	57.78	2000	26.7	5.34
Turkey	Tur	5.74	0.76	1.99	2980	3504	16	40.03	2000	6.5	54.92
Latvia*	Lat	5.27	-0.7	2.39	3271	5485	17.1	33.62	1998	14	2.65
Brazil#	Bra	7.32	2.57	1.9	3432	6752	2.8	59.19	1999	9.6	7.04
Estonia*	Est	5.9	0.18	2.3	3836	6283	22.8	37	2000	12.7	4.03
Hungary*	Hun	5.69	0.23	2.19	4370	4947	21.8	27.32	2000	6.4	9.8
Chile#	Chl	7.12	2.53	1.84	4779	10944	22.8	55.36	2000	8.3	3.84
Venezuela#	Ven	7.52	3.58	1.58	4970	27227	15.9	49.53	1998	13.9	16.21
Mexico#	Mex	8.13	4.34	1.52	5783	8493	21.3	51.87	2000	2.2	9.5
Uruguay#	Uru	7.22	2.35	1.95	5962	9279	22.1	44.56	2000	13.6	4.76
Argentina#	Arg	7.4	2.74	1.86	7718	10312	15.4	49.84	1998	14.7	-0.94
Portugal	Por	6.98	2.01	2	10256	3629	10	38.45	1997	3.9	2.85
Greece	Gre	6.68	1.45	2.09	10706	4554	23.8	34.27	2000	11.1	3.17
Korea, Rep of	Kor	6.21	1.12	2.04	10843	2020	27.9	31.59	1998	4.4	2.27
New Zealand	NZ	7.76	3.53	1.69	12679	43226	49.2	36.17	1997	5.9	2.62
Spain	Spa	6.99	2.16	1.94	13723	4374	36	34.66	2000	13.9	3.43
Israel	Isr	7.03	2.08	1.98	17354	3999	23.5	39.2	2001	8.8	1.12
Italy	Ita	7.12	2.06	2.03	18478	4678	32.6	36.03	2000	10.5	2.54
Australia	Aus	7.41	3.21	1.68	19703	24167	39.9	35.19	1994	6.3	4.48
Ireland	Ire	8.17	4.12	1.62	21495	10534	35.9	34.28	2000	4.3	5.56
Belgium-Luxembourg	BLx	7.57	3.24	1.73	21756	3030	30.5	32.88	2000	6.4	2.57
France	Fra	6.93	2.49	1.78	22399	6335	22.2	32.74	1995	10	1.69
Canada	Can	7.8	3.78	1.61	22612	34771	38.8	32.56	2000	6.8	2.72
Germany	Ger	7.57	2.68	1.96	22641	4445	34.5	28.31	2000	7.7	1.47
Finland	Fin	7.87	3.2	1.87	22893	11445	58	26.88	2000	9.8	3.37
Singapore	Sin	7.13	3	1.65	22968	0.01	16.9	42.48	1998	4.6	1.36
Netherlands	NL	7.86	3.86	1.6	23382	6739	59.8	30.9	1999	2.9	2.52
Austria	Au	8.02	3.68	1.75	23403	7174	33.9	29.15	2000	3.6	2.35
United Kingdom	UK	7.52	3.28	1.74	24606	7167	30.1	35.97	1999	5.5	2.93
Sweden	Swe	7.66	3.42	1.7	26809	7950	66.3	25	2000	5.8	0.9
Denmark	Den	8.24	4.24	1.61	29009	11746	66.5	24.7	1997	4.5	2.92
United States	US	7.64	3.48	1.67	35188	14752	35.8	40.81	2000	4	3.38
Norway	Nor	7.77	3.44	1.73	36800	54828	65.3	25.79	2000	3.4	3.09
Switzerland	Swi	8.09	3.97	1.65	37165	5943	41	33.68	2000	2.7	1.54
Japan	Jap	6.48	1.96	1.83	37879	1513	43.1	24.85	1993	4.8	-0.71

Notes: * Ex-Soviet Union country; # Latin American country; data sources are discussed in section 4.