

0506733

# An investigation into relative income and happiness in the USA with special consideration of political affiliation

This study finds that political affiliation affects self-reported happiness and that this has implications for the relative income hypothesis. Republicans are found to be happier than Democrats, but independents are happiest. Self-reported happiness is found to be negatively affected by the increasing incomes of those within an individual's region. In addition, the incomes of those of a different political affiliation within a region are found to have a strong negative effect on self-reported happiness, whereas the incomes of those of the same political affiliation are found to have a positive effect. For each reference income, Democrats are less negatively affected by others' incomes than Republicans.

5397 words

22/04/2009

## *Contents*

I.	Introduction	3
II.	Concepts and literature	4
III.	Context, data and method	8
IV.	Empirical results	11
	a. Initial data analysis	11
	b. Political variables in the happiness equation	17
	c. Changing the comparison income to those of the same and the different political affiliation	21
	d. Political subgroup comparisons	23
V.	Concluding remarks	24
VI.	Evaluation and extensions	25
	 Bibliography	 27
	 Data sources	 28
	 Appendices	 29
	1) Democrat and Republican happiness profiles for all GSS survey years	30
	2) Summary statistics of main variables	31
	3) Definition and explanation of variables used in regressions	35
	4) Significant difference tests for the Republican and Democrat subsamples	37
	5) Structural change tests for the Republican and Democrat subsamples	38

*Acknowledgements: I am very grateful to Dr Maria Ruiz-Martos for providing encouragement and many helpful comments and suggestions throughout the course of this research, and Dr Gianna Boero for the extremely helpful initial lectures. I am also grateful to Professor Andrew Oswald for pointing me in the direction of a couple of enlightening papers. Any errors are mine.*

## *I. Introduction*

Marx argued that “our desires and pleasures spring from society; we measure them, therefore, by society, and not by the objects which serve for their satisfaction. Because they are of a social nature, they are of a relative nature”<sup>1</sup>. Mainstream utility theory posits that a person’s utility or happiness should only be affected by their *absolute* income. Higher incomes allow consumers to reach higher indifference curves which leads to greater levels of utility. However, numerous studies have empirically suggested<sup>2</sup> that a negative relationship exists between self-reported happiness and a person’s *relative* income. ‘Relative income’ is understood to mean a person’s level of income when compared to the income level of a particular reference group. This negative relationship is likely to arise from feelings of ‘relative deprivation’, which Runciman defines as:

A is relatively deprived of X if (i) he does not have X, (ii) he sees some person or persons, which may include himself at some previous or expected time, as having X, (iii) he wants X, and (iv) he sees it as feasible that he should have X.<sup>3</sup>

The rising incomes of a person’s ‘relevant others’ can be understood as imposing a negative externality on that person’s utility. ‘Relevant others’ refers to the reference group to who a person compares themselves. These externalities have implications for the design of economic policy. Layard argues that policy should be refocused to promote societal happiness rather than economic growth. Higher taxation which discourages work and encourages leisure is one idea which is justified by this approach.<sup>4</sup>

Three strands of investigation are examined in this study. Firstly, political variables such as party affiliation and regional political bias are explicitly considered as components of happiness as well as standard socioeconomic variables such as employment status. The inclusion of political variables is especially relevant to the USA which has a highly visible and

---

<sup>1</sup> Marx, K., 1849. *Wage labour and capital*, pp. 163

<sup>2</sup> See, for example, Luttmer (2005), McBride (2001), Ferrer-i-Carbonell (2005), Oswald and Blanchflower (2004).

<sup>3</sup> Runciman, W.G., 1966. *Relative Deprivation and Social Justice*, pp. 11

<sup>4</sup> Layard, R., 2005. *Happiness: Lessons from a New Science*

strongly dichotomous political culture. Secondly, the relationship between happiness and comparison income<sup>5</sup> is examined when the comparison income is limited to the incomes of those of the same or the different political affiliation. Finally, these relationships are tested across different political subgroups.

Section II surveys the literature and current state of thinking regarding relative utility theories and subjective wellbeing<sup>6</sup>. Section III describes and explains the data context and methodology, and section IV presents detailed results and analysis. Section V concludes and section VI provides suggestions for possible extensions.

## *II. Concepts and literature*

The idea of relative income as being of importance to people's utility or wellbeing has not been incorporated into traditional microeconomic theory. An increase in income is assumed to lead to an increase in welfare as an individual's rising income leads to an outward shift in their budget constraint. This allows the individual to increase consumption which leads to an increase in utility.<sup>7</sup> People should become happier as they become richer on an absolute level. However, Layard (1980) argues that riches only bring happiness, when one is relatively richer than other people.<sup>8</sup> Furthermore, Frank (1985) argues that concerns about relative standing are completely consistent with the rational pursuit of self interest, and so should be considered in the analysis of economic decisions.<sup>9</sup>

Easterlin (1974) presents the paradox that in the last half of the twentieth century, as real aggregate incomes in Western countries have increased, reported levels of aggregate happiness have remained static. His 1995 paper argues that wellbeing and happiness depend more on relative income than absolute income, and that subjective wellbeing is inversely related with the incomes of a person's reference group. Raising the incomes of all does not increase the subjective wellbeing of all as the individual positive effect on

---

<sup>5</sup> The terms 'comparison income' and 'reference income' are used interchangeably.

<sup>6</sup> The terms 'subjective wellbeing', 'wellbeing', and 'happiness' are used interchangeably.

<sup>7</sup> McBride (2001), pp. 253

<sup>8</sup> Layard (1980), pp. 737

<sup>9</sup> Frank (1985), pp. 103

happiness as the result of more income is offset by the rising level of income experienced by everyone. There is no positive change in utility because the relative frame of reference does not change. Easterlin argues that absolute income does matter up to a certain subsistence level, but once that level is reached relative income is more important to a person's wellbeing. The income of the reference group upon which people compare themselves ( $y^*$ ) can be considered in two ways. It can be evaluated against others; 'social comparison', or to oneself in the past; 'adaption' or 'habituation'.

This idea of relative income can be included in the standard utility function:

$$1. \quad U = f(y) + f(y^*) \quad \begin{array}{l} \text{Utility is increasing in own income } y \text{ and} \\ \text{decreasing in comparison income } y^*. \end{array}$$

(+)

(-)

Clark et al (2008) review the wellbeing literature and align Easterlin to a large empirical survey. Taking  $y^*$  to be the average income of a country, they find that two thirds of aggregate income has no effect on wellbeing because it is status-related. Status effects disappear due to the zero-sum nature of status (as only a fixed amount of status exists, one person's gain is another person's loss). 60% of the effect at the individual level evaporates within two years due to adaption. Overall, only 13% of the initial individual effect survives in the long run. This remaining positive effect on wellbeing is the result of changing consumption habits.

Blanchflower & Oswald (2004) define  $y^*$  as average income by American state and measure this over time using data from the General Social Survey. Their results are consistent with the Easterlin hypothesis and also show that some groups, such as blacks, have experienced increasing aggregate happiness whereas other groups, such as white women, have experienced decreasing aggregate happiness. McBride (2001) defines  $y^*$  average income of those within five years of age of the respondent. He finds micro-level evidence in support of the relative income hypothesis and suggests that relative income effects may be smaller at low income levels.

Luttmer (2005) provides further evidence that utility depends in part on relative position.  $Y^*$  is defined as average income by Public Use Microdata Areas (PUMAs), the average size of which is 150,000 inhabitants. He finds that higher levels of average income are associated with lower levels of happiness, controlling for income and other factors. An increase in neighbours' earnings and a similarly-sized decrease in own income are found to lead to a reduction in happiness of about the same magnitude. He finds that this association is not driven by selection or by changes in the way people define happiness. This addresses the concern that living in an affluent area might affect one's definition of happiness.

Akerlof & Kranton (2000) argue that 'identity' (a person's sense of self) affects individual behaviour and aspirations. Luttmer (2005) finds that the happiness of college-educated citizens is negatively affected by the incomes of college-educated neighbours but is not negatively affected by the incomes of non-college-educated neighbours, and vice-versa. This relates to the idea of 'relevant others' to who people compare themselves. Kingdon & Knight (2007) find that the incomes of close neighbours have a positive (rather than negative) effect on an individual's happiness, and that relative income is more important to happiness at higher levels of absolute income. However, they use smaller reference groups than Luttmer and find that as the comparison is extended to include strangers these positive spillovers are diluted. They consider a divided society by using South African data and propose that white and black households with the same income can differ in subjective wellbeing because they belong to different race-specific income quintiles.

Considering a 'divided society' of a political nature, Jost & Napier (2008) present evidence that, in both America and Europe, conservatives (right-wingers) report to be happier than liberals (left-wingers). This effect is stronger in countries where the overall quality of life is relatively lower. Furthermore, they report that as inequality in the USA has increased the happiness of 'liberals' has decreased. Alesina et al (2004) report a general tendency for people to report less happiness as economic inequality increases. This effect is stronger among Europeans than Americans.

There are some criticisms of the wellbeing literature. Clark et al (2008) note that most studies impose reference groups on their subjects. They argue that the generic problem

with constructed reference groups is that they might pick up effects other than social comparison, such as a geographic area's public good consumption. Knight & Song (2006) survey 9200 Chinese rural households and directly ask their subjects to identify with whom they compare themselves. 70% reported that their reference group was their own village. Their results show that living in a richer village has a positive effect on happiness and that relative income is twice as important as absolute income as a determinant of wellbeing.

Related to this, Green & Nelson (2007) argue that the happiness literature tends to ignore the positive return caused by living within a rich neighbourhood, such as greater public good provision. Furthermore, they argue that declining levels of social capital have had a negative effect on happiness, which could offset the happiness gains from rises in absolute income. Another criticism regards the endogeneity of some variables and spillovers between different aspects of a person's life. For example a happy person who is married may have better employment prospects.

The reliability of self-reported wellbeing data is also criticised, since people may not be able to provide an accurate assessment of their 'true' level of happiness. However, Frey and Stutzer (2002) provide ample psychological evidence which lends strong support to the reliability of self-reported wellbeing data. Furthermore, Dohmen et al (2008) present neurophysiological evidence for the importance of social comparisons on reward processing in the human brain. Their results show that there is a negative effect on those who receive less reward for the same performance under identical conditions.

Hence, there is much suggestive evidence of the importance of relative income to a person's happiness. I examine the USA, which is often characterised as a politically-divided society<sup>10</sup>, and for which there is an abundance of societal data.

---

<sup>10</sup> McKay (2005), pp. 127

### III. Context, data and method

The utility function basis of a happiness equation can be represented as:<sup>11</sup>

$$2. U = f(\text{own income, comparison income, socioeconomic controls})$$

Happiness equations use a log form for income variables, and a new term is introduced to represent socioeconomic controls. This can be written as:<sup>12</sup>

$$3. \text{happiness} = \beta_1 \ln(y) + \beta_2 \ln(y^*) + \gamma Z + \varepsilon$$

$y = \text{own income, } y^* = \text{comparison income, and } Z = \text{socioeconomic controls}$

Controls include age, sex, race, marital status, level of education, health status, and work status.<sup>13</sup> A squared age term is included to allow for the quadratic effect of age on happiness. In addition to these controls, I include three political variables: party affiliation, presidential vote, and whether the individual lives in a politically-bias region. The regression model used is:<sup>14</sup>

$$4. \text{happiness} = \alpha + \beta_1 \ln(y) + \beta_2 \ln(y^*) + \beta_3 \text{party} + \beta_4 \text{vote} + \beta_5 \text{region} + \beta_6 \text{age} + \beta_7 \text{age}^2 + \beta_8 \text{sex} + \beta_9 \text{race} + \beta_{10} \text{work} + \beta_{11} \text{marital} + \beta_{12} \text{education} + \beta_{13} \text{health} + \varepsilon$$

Data was sourced from the 2006 General Social Survey.<sup>15</sup> Due to the inherently ordered nature of the happiness variable, an ordered probit model was used. This model is frequently used in studies of happiness and has been confirmed as appropriate specifically for this happiness question in the GSS.<sup>16</sup>

<sup>11</sup> Based on Luttmer (2005), pp. 968

<sup>12</sup> Based on Clark et al (2008), pp. 100

<sup>13</sup> See Blanchflower & Oswald (2004)

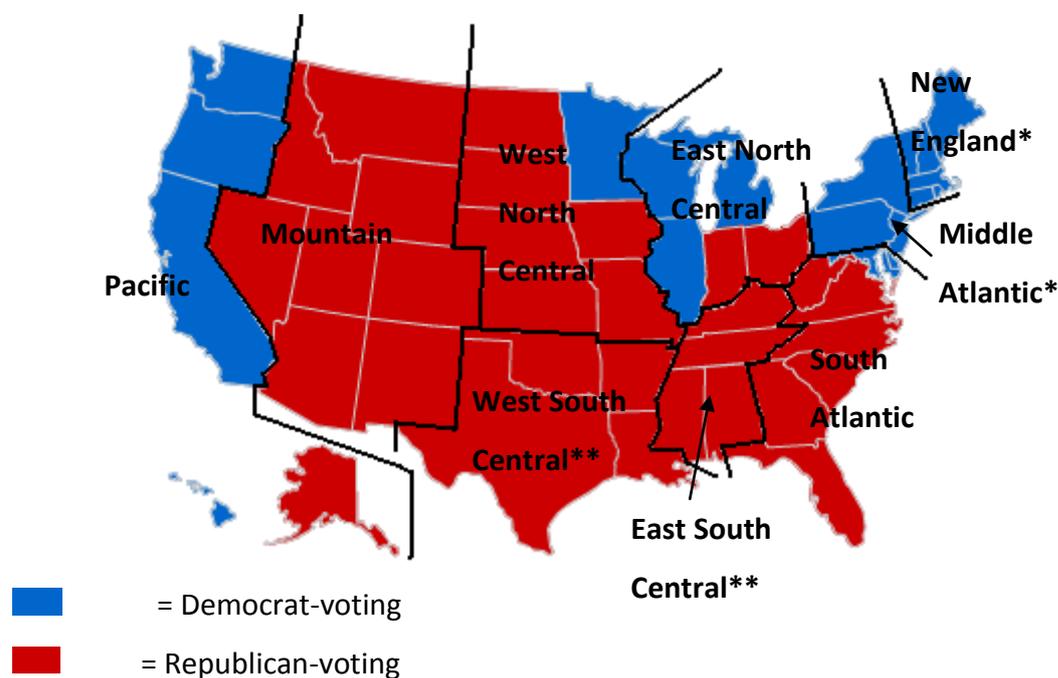
<sup>14</sup> Happiness acts as a proxy for utility as it is supposed that happiness scores provide information about utility. See Clark et al (2008).

<sup>15</sup> Most variables in the original data were ordered categories. These were manipulated to create dummies which allowed for more accurate analysis of specific socioeconomic circumstances. A complete description can be found in appendices 2 and 3.

<sup>16</sup> See McBride (2001) and Kingdon & Knight (2007), Hausman tests were used to confirm the ordered nature of this model.

Respondents were asked to identify in which of nine regions of the USA they are located. The regions, which are segmented by black lines, can be seen below. Respondents were also asked to identify their party affiliation and for whom they voted in the 2004 presidential election. The shading of states indicates the state's vote in the 2004 presidential election.

**Diagram 1 – map representing GSS regions and state vote in 2004 presidential election**



Data was limited to the 2006 survey year for a number of reasons. Firstly, the GSS state data was not publicly available. Data for average state income could have been acquired from other sources, but this was not done as there was no way to align this with the GSS political affiliation data. Due to the lack of GSS state data, analysis of the effect of living within a politically-homogenous region was therefore limited to the nine regions above. Some regions are formed of Democrat-voting states and Republican-voting states, meaning that they are politically-heterogeneous and inappropriate for analysis. However, in 2004 some regions are politically-homogenous in that all states within a region voted in the same way between the Democrat candidate (John Kerry) and the Republican candidate (George W. Bush). Cross referencing the GSS data (from 1973 onwards) with previous presidential

election data (from 1972 onwards)<sup>17</sup>, 2004 was the only year in which these politically-homogenous blocs were formed for both parties.<sup>18</sup> The Republican-voting region is therefore made up of the 'East South Central' and 'West South Central' regions, and the Democrat-voting region is made up of the 'New England' and 'Middle Atlantic' regions.<sup>19</sup>

This formation is flawed in that these regions are not perfectly homogenous; presidential vote is acting as a proxy for political homogeneity. The complex structure of the American political system lends itself to political heterogeneity with elections at county, state, and national level for different branches of government.<sup>20</sup> Despite these flaws, this formation is valid and appropriate as it is reflective of political biases and recent electoral trends for those states and regions.<sup>21</sup>

Secondly, by examining the happiness profile and means of Democrats and Republicans from all GSS years, a pattern emerged which was reflected in the 2006 data.<sup>22</sup> This pattern showed a high level of consistency across time in the aggregate happiness levels of the whole population and the Democrat and Republican subgroups. Therefore only the 2006 dataset was used as it is representative of previous surveys and obviated the need to adjust incomes for inflation.<sup>23</sup>

Observations for which there was no response for any of the variables under consideration were removed. This resulted in a total of 1103 observations from an initial 4510. Interestingly, the two questions which recorded the most non-responses were those regarding political party affiliation and presidential vote. Furthermore, analysis of previous surveys revealed an increasing reluctance amongst respondents to answer these questions

---

<sup>17</sup> Historical election data sourced from *realclearpolitics.com*

<sup>18</sup> Hence, 2006 was the only survey year for which politically-homogenous regional analysis could be undertaken.

<sup>19</sup> These regions are highlighted on diagram 1 with \* indicating the Democrat region and \*\* indicating the Republican region.

<sup>20</sup> McKay (2005), pp. 60

<sup>21</sup> The 'Mountain' region is also wholly Republican-voting in this example. However, three of the most populous states in this region (New Mexico, Colorado, Nevada) are considered to be 'swing' states and voted for the Democrat candidate in 2008. For these reasons this region was not included as part of the Republican-voting region.

<sup>22</sup> This pattern can be seen in appendix 1.

<sup>23</sup> The 2006 data set is by far the largest of all the GSS years which compensates for the loss of observations from other survey years.

when compared with earlier years. The GSS is not a panel survey so this could be due to different samples in each year, but it could also be reflective of the particularly partisan nature of the 2004 election or declining rates of political participation. As the sample size is very small compared with the whole population of the USA, the following results should be treated with a degree of caution.

## IV. Empirical results

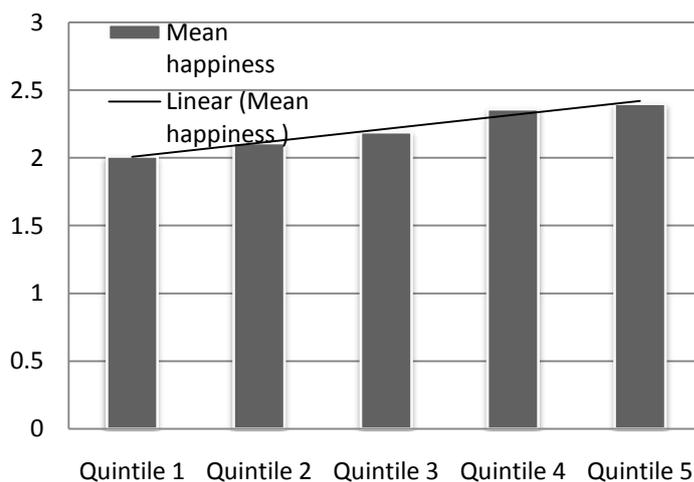
### a. Initial data analysis

The exact happiness question asked in the GSS was:

*Q157: Taken all together, how would you say things are these days – would you say that you are very happy, pretty happy, or not too happy?*<sup>24</sup>

Diagram 2 plots average reported happiness by income quintile and confirms the positive relationship between income and happiness.

**Diagram 2 – mean happiness by income quintile**



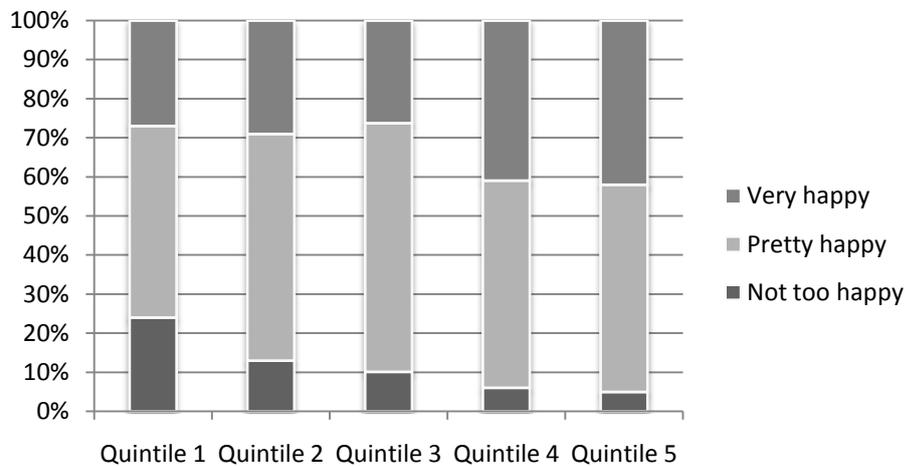
### *Happiness means*

- Quintile 1 = 2.01
- Quintile 2 = 2.11
- Quintile 3 = 2.19
- Quintile 4 = 2.36
- Quintile 5 = 2.40

<sup>24</sup> Respondents recorded a score of 1 for very happy, 2 for pretty happy, and 3 for not too happy. The ordering of this variable was switched so that a higher level of happiness related to a higher score, such that 1 equated to not too happy, 2 to pretty happy, and 3 to very happy.

Diagram 3 illustrates the ordered profile of these groups.

**Diagram 3 – ordered happiness profile for each income quintile**

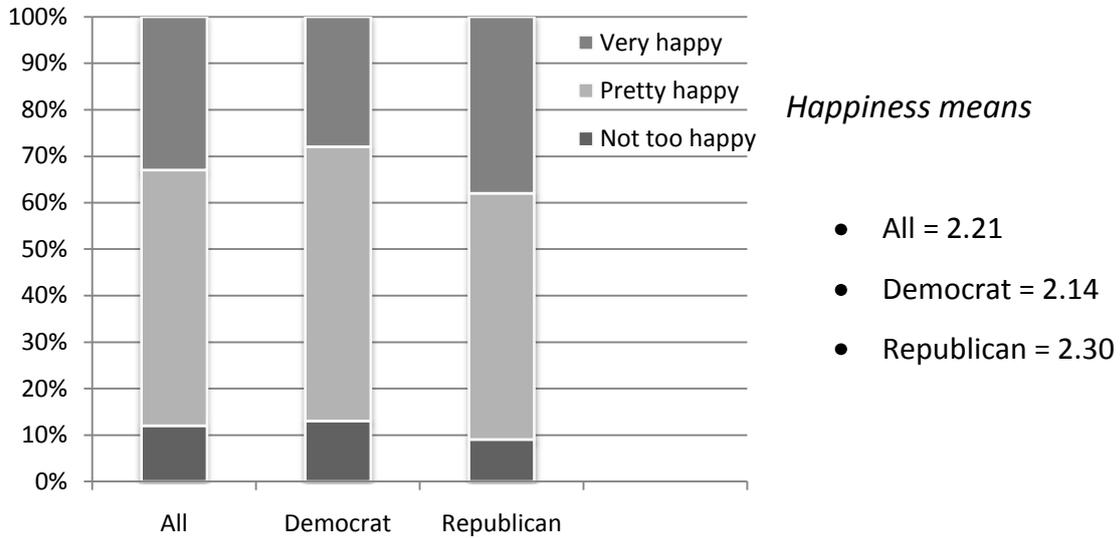


The highest proportion of very happy people and lowest proportion of not too happy people are found in the highest income quintile. Furthermore, the highest proportion of not too happy people is found in the lowest income quintile. The lowest proportion of very happy people and the largest proportion of pretty happy people occur in the middle income quintile. Relating this to Runciman's definition of relative deprivation and the idea of 'relevant' reference groups, this could be due to people in the middle of the income distribution having greater awareness of and aspirations to the level of wealth above them. This does not translate into a large proportion of not very happy people in the middle income quintile, which may be because these people are materially comfortable and not struggling with very low levels of income as those in the quintiles below them. This lends support to the importance of both absolute and relative income to a person's wellbeing.

Mean income is \$60291 with a standard deviation of \$41092. This is total family income. The limitation of this formulation of income is that it does not distinguish between the incomes of each family member. However, it is a reliable measure of a person's general level of wealth which is likely to affect their happiness and political affiliation. I have assumed that those under 18 are unlikely to be working to an extent which contributes significantly to family income. This simplification is tolerable as the minimum age of respondents is 18, which is also the minimum voting age. The mean income for Democrats is \$55477 and for Republicans it is \$65585.

Diagram 4 illustrates the profiles and mean happiness scores for all respondents and Democrat and Republican subgroups.

**Diagram 4 – ordered happiness profiles for all respondents, and Democrat and Republican subgroups**

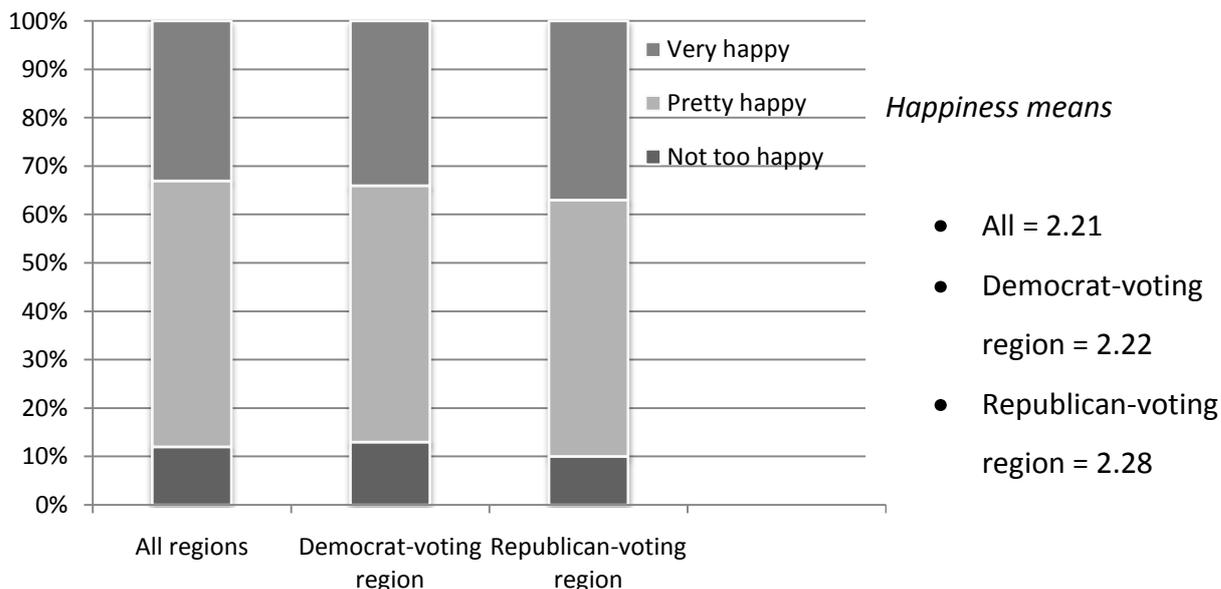


Republicans have a higher-than-average mean happiness and Democrats have a lower-than-average mean happiness. Furthermore, the proportion of very happy Republicans is greater than the sample average, and the proportion of not very happy Republicans is less than the sample average. Democrats demonstrate the opposite: there is a smaller-than-average proportion of very happy Democrats and a larger-than-average proportion of not very happy Democrats. Positive correlations exist between income and happiness, income and being Republican, and happiness and being Republican.

	<i>Income</i>	<i>Happiness</i>	<i>Democrat</i>	<i>Republican</i>
<i>Income</i>	1	0.226	-0.113	0.112
<i>Happiness</i>	0.226	1	-0.104	0.114
<i>Democrat</i>	-0.113	-0.104	1	0.105
<i>Republican</i>	0.112	0.114	0.105	1

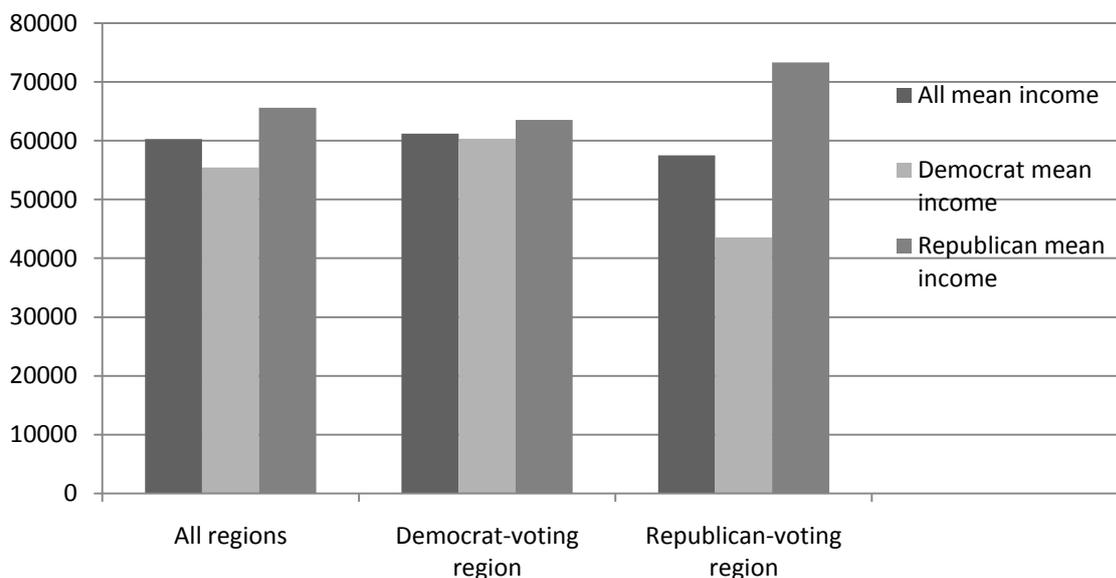
Diagram 5 illustrates the difference in reported levels of happiness between Democrat-voting and Republican-voting regions.

**Diagram 5 – ordered happiness profiles for all respondents and those living in the Democrat-voting and Republican-voting regions**



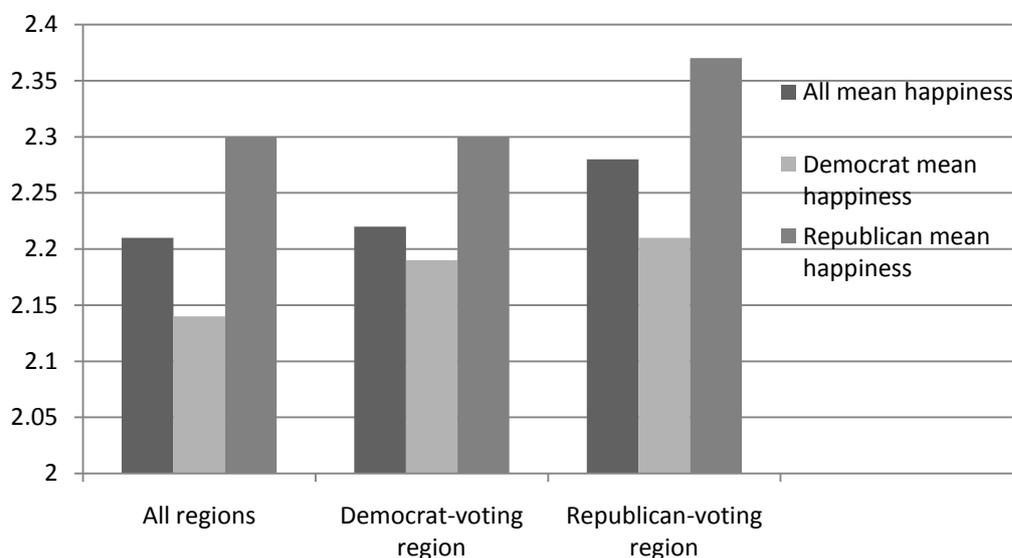
The happiness profile for each politically-homogenous region is very similar to the profile for the whole sample, although mean happiness scores are marginally higher for both. Diagram 6 plots mean incomes for the whole sample and Democrats and Republicans, over all regions and limited to Republican-voting and Democrat-voting regions.

**Diagram 6 – mean income for all respondents, and Democrat and Republican subgroups, over all regions and the Democrat-voting and Republican-voting regions**



There is much larger disparity between political affiliation and income level in the Republican-voting region than the Democrat-voting region, where mean incomes across political group are almost equal. Diagram 7 illustrates that greater income inequality in the Republican-voting region does not equate to lower levels of happiness. This contrasts with Alesina et al (2004) which suggests an inverse relationship between economic inequality and average happiness. My interpretation of economic inequality as inequality of average incomes between different political groups does not perfectly match Alesina et al's, who use a broader interpretation of economic inequality which is not defined by political affiliation. This means that my contradiction of their conclusion is suggestive at best. However, I believe it is valid and indicative of an interesting result in this data that greater income inequality in one region corresponds with greater happiness, especially compared with the lower levels of happiness reported in a less unequal region.

**Diagram 7 – mean happiness scores for all respondents, and Democrat and Republican subgroups, over the whole sample and the Democrat-voting and Republican-voting regions**



In both politically-homogenous regions, mean happiness is higher than the national average. The happiest and richest subgroup is Republicans living in the Republican-voting region. The happiness of Republicans is lower in the Democrat-voting region but is equal to the national Republican average. The happiness ordering between Republican groups closely corresponds with the ordering of Republican incomes. A higher-than-average Republican

income level in the Republican-voting region corresponds with a higher-than-average Republican happiness. A Republican income level in the Democrat-voting region which is extremely close to the national Republican average income corresponds with identical levels of average Republican happiness in the Democrat-voting region and nationally.

Democrats living within the Democrat-voting region are happier than Democrats nationally. When compared with the national average this reflects higher incomes for Democrats in that region. However, the happiest Democrats are found within the Republican region, even though they are on average much poorer than their Republican neighbours and other Democrats nationally. Although this group is poorer in absolute and relative<sup>25</sup> terms than Democrats in the Democrat-voting region, they express higher levels of happiness. This may be indicative of the relative unimportance of political affiliation on happiness (as the only discriminating factor between these groups is political affiliation, rather than another socioeconomic factor such as marital status).

This result also lends support to Kingdon & Knight's conclusion<sup>26</sup> that the reference group to which people compare themselves is smaller than some studies, such as Luttmer (2005), suggest. It is interesting that a subgroup with far lower absolute and relative average incomes when compared with both the national and regional levels displays a higher-than-average level of happiness. This higher level of happiness is especially striking when one considers that this difference holds when compared with the level of happiness of absolutely and relatively better off people of the same reference group (Democrats) living within a region which corresponds with their political alignment (Democrat-voting) rather than one which does not (Republican-voting).

There is a strong positive relationship between being Republican and voting Bush, and a similar positive relationship for being Democrat and voting Kerry.

---

<sup>25</sup> Relative compared to the region's average mean income for all residents.

<sup>26</sup> See Kingdon & Knight (2007)

	<i>Vote Kerry</i>	<i>Vote Bush</i>
<i>Democrat</i>	0.755	-0.755
<i>Republican</i>	-0.756	0.756

The imperfect nature of these correlations indicates two aspects of the data which are important to consider. Firstly, the two sets of variables do not describe the same thing. One describes party affiliation whereas the other describes the respondent's vote. Some Democrats voted for Bush and some Republicans voted for Kerry. Furthermore, 8.5% of respondents in the final sample were independents. It is important to include both sets of variables but also to be aware of the strong correlation between them. Assuming one as a proxy for another would ignore the subtleties of the profile of voters which includes independents and those who did not vote for their party's candidate.

*b. Political variables in the happiness equation*

The results of the primary regression are reported below. It includes standard socioeconomic controls and adds three political variables: party affiliation (*democrat* or *republican*), vote in the 2004 presidential election (*votebush*), and whether the respondent lives within a politically-homogenous region (*regiondem* or *regionrep*). Observations which had no response for any one of the variables were eliminated, meaning that every remaining respondent had voted for either Bush or Kerry. Respondents who had not voted could have been included, but it was impossible to be certain whether those who did not respond actually did not vote or were simply reluctant to specify their vote, which would lead to an unrepresentative sample. The profile of voting in the final sample (48.7% Kerry, 51.3% Bush) is very similar to the overall proportion for the 2004 election (48.3% Kerry, 50.7% Bush). A small proportion (1.4%) of respondents voted for a third candidate, Ralph Nader. However, this was larger than the actual proportion of the popular vote he received (0.38%). For that reason those observations were eliminated. Voting Kerry was chosen to be the base category.<sup>27</sup>

---

<sup>27</sup> The base category was a white male in full-time employment, never married, did not graduate from high school, was in good health, voted for Kerry, and is politically independent.

**Regression output**

Ordered probit regression  
 Log pseudolikelihood<sup>28</sup> = -929.8

n = 1103  
 Wald Chi<sup>2</sup>(30) = 206.78  
 Prob > Chi<sup>2</sup> = 0.000  
 Pseudo R<sup>2</sup> = 0.11

Dependent variable: happy

<i>Variable</i> <sup>29</sup>	<i>Coefficient</i>	<i>Standard Error</i>	<i>P &gt;  z </i>	<i>Marginal effect</i>
lninc	0.171	0.055	0.002	0.080
lnavinc	-0.109	0.649	0.867	-0.051
votebush	0.111	0.123	0.365	0.052
democrat	-0.115	0.140	0.410	-0.054
republican	-0.001	0.130	0.992	-0.001
regiondem	0.090	0.105	0.394	0.042
regionrep	0.202	0.111	0.068	0.095
age	0.000	0.014	0.986	0.000
agesq	0.000	0.000	0.860	0.000
wrkpt	-0.022	0.130	0.864	-0.010
wrktl	0.135	0.237	0.570	0.063
wrkun	-0.269	0.233	0.247	-0.126
wrkre	0.429	0.151	0.005	0.201
wrkst	0.162	0.252	0.520	0.076
wrkkh	0.120	0.145	0.408	0.056
wrko	-0.613	0.225	0.006	-0.288
mar	0.327	0.108	0.003	0.153
wid	-0.319	0.181	0.078	-0.150
div	-0.165	0.124	0.184	-0.077
sep	-0.254	0.265	0.338	-0.119
edhs	0.031	0.152	0.838	0.015
edjc	-0.109	0.193	0.572	-0.051
edba	0.201	0.167	0.229	0.094
edgr	0.064	0.189	0.734	0.030
fem	0.152	0.078	0.052	0.071
blk	0.192	0.122	0.117	0.090
raceo	0.224	0.150	0.136	0.105
hlthg	-0.467	0.087	0.000	-0.219
hlthf	-0.823	0.118	0.000	-0.386
hlthp	-1.132	0.202	0.000	-0.531
/cut 1	-0.788	7.188		
/cut 2	1.075	7.189		

<sup>28</sup> The regression was run with robust standard errors.

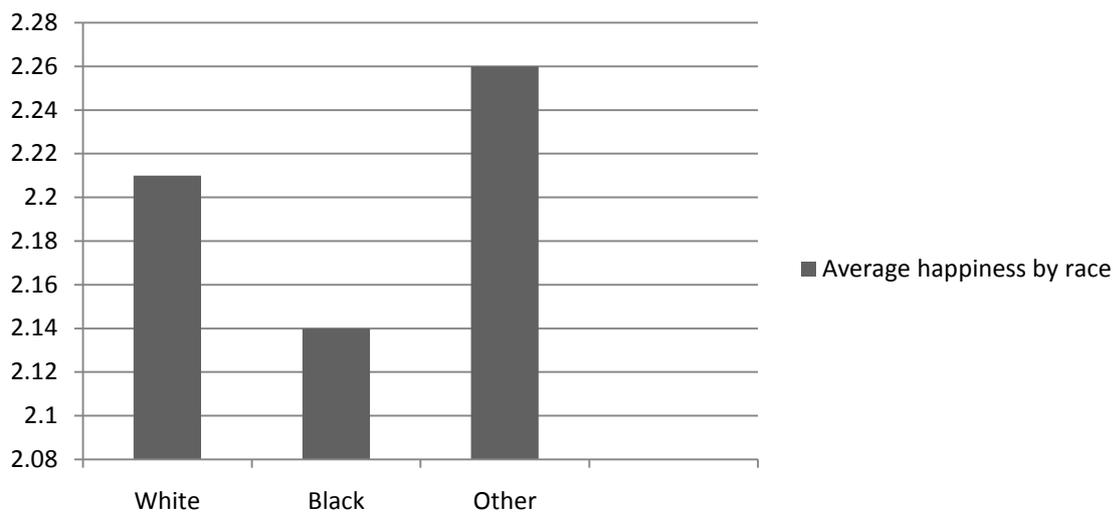
<sup>29</sup> Descriptions of all variables can be found in appendix 3.

The results indicate that happiness is increasing in own income and decreasing in others' income. The comparison income was taken to be regional average income, calculated from the GSS data. This indicates that, *ceteris paribus*, increasing incomes of people in the respondent's region are related to a decrease in the respondent's level of happiness. Marginal effects were calculated to provide a more exact interpretation of these results. Taking the example of *regionrep*, the marginal effect of 0.095 indicates that, *ceteris paribus*, living in the Republican-voting region corresponds to a 9.5% greater likelihood that the respondent is in a higher happiness category. The coefficient values are still useful in that they provide an indication of the direction and magnitude of each variable's effect on happiness.

Other results from previous studies are also confirmed. Being married has a large positive effect on happiness and being widowed has a large negative effect. Happiness decreases as a person becomes less healthy. These variables are all relatively large and significant. *Ceteris paribus*, being female and/or being black has a positive effect on happiness. This somewhat contradicts the result of Blanchflower & Oswald (2004), which showed that, on average, blacks are less happy than whites. This could be due to the inclusion of the political affiliation variables. There a positive correlation between being black and being Democrat, and a negative correlation between being black and being Republican.

	<i>Black</i>	<i>Other race</i>
<i>Democrat</i>	0.307	-0.117
<i>Republican</i>	-0.293	-0.104

The separate effect of being black is positive when compared with whites. However, due to the positive correlation between being black and being Democrat, most blacks are Democrats and this negatively affects their happiness, such that on average blacks are less happy than whites. This can be seen in diagram 8.

**Diagram 8 – mean happiness by race**

Generally, a greater level of education has a positive effect on happiness, although college graduates are happier than those who pursue graduate study. Interestingly, those attending a two-year 'junior college' are the least happy. This may be because of the transitory nature of junior colleges. Some students who attend junior college will progress to a four-year college and attain an undergraduate degree. The effect recorded here is the effect of those junior college students who do not go any further. The negative effect may be the result of seeing many of their peers progressing to four-year colleges and the benefits (such as better employment prospects) this entails. This can be related to Runciman's exposition of relative deprivation. Junior college students see what their peers who move on to four-year colleges have and their aspirations are adjusted. They have a higher level of education (are 'better off') than students who did not graduate from high school and high school graduates, but feel relatively more deprived and are less happy.

Voting Bush has a positive effect on happiness, meaning that those who voted for Bush tend to be happier than those who voted for Kerry, *ceteris paribus*. The effect of being Republican is very slightly negative, but there is a larger negative effect if the respondent is a Democrat. Taking political affiliation as the discriminating variable, one can see that independents are slightly happier than Republicans, who are much happier than Democrats. That Republicans are happier than Democrats is reinforced when one considers that most Republicans will also have voted for Bush. Living within either politically-homogenous region has a positive effect on happiness compared to those who do not live in those regions. The positive effect

on happiness of living in the Republican-voting region is larger than the effect of living in the Democrat-voting region.

Given that residents of the Republican-voting region are, on average, poorer than residents of the Democrat-voting region and the nation as a whole, this is extremely interesting. Compared with other variables such as marital status, this is indicative of the relative unimportance of regional political bias as a determinant of happiness. Political affiliation, and the resultant voting profile of regions, may be reflective of regional differences of other aspects of people's lives such as religiosity. This makes sense, in that political affiliation can be understood as the manifestation of social values. These are likely to be influenced by a person's circumstances and experiences, including prevailing social norms which may differ across regions and have a large influence on people's perceptions of a good or fulfilling life which leads to greater happiness.

*c. Changing the comparison income to those of the same and the different political affiliation*

Two new variables were formed to investigate whether happiness is affected differently by the incomes of different 'relevant others'. The comparison income was defined firstly as the average income of those of the same political affiliation and secondly as the average income of those of the different political affiliation.<sup>30</sup> The 'same affiliation income' and 'different affiliation income' variables were formed using the average income for each political affiliation within each region. This formulation makes the variable more robust since it corrects for possible disparity between income groups (for example if Republicans are always richer than Democrats) as both sets of comparisons<sup>31</sup> are included.

---

<sup>30</sup> The comparison income for independents remained the average income for all respondents in the region as those respondents did not have a political affiliation upon which to base a 'same'/'different' comparison.

<sup>31</sup> For the 'different' variable, the effects of Democrats comparing themselves with the incomes of Republicans, and Republicans comparing themselves with the incomes of Democrats, are both included. For the 'same' variable, the effects of Democrats comparing themselves with the incomes of other Democrats, and Republicans comparing themselves with the incomes of other Republicans, are both included. See appendix 3.

$\gamma^*$	<i>Regional mean income</i>	<i>Regional mean income of those of the same political affiliation</i>	<i>Regional mean income of those of the different political affiliation</i>
Coefficient on happiness	-0.109	+0.368	-0.192

These results suggest that a person's happiness is negatively affected by the incomes of those of the different political affiliation. This reflects the wider relative income hypothesis. In contrast, a person's happiness is positively affected by the incomes of those of the same political affiliation. The consistency of this result was confirmed in unreported regressions with slightly different specifications which yielded similar results. The effect on happiness of incomes of those of the same political affiliation was consistently positive whereas the effect on happiness of incomes of those of the different political affiliation was consistently negative.

This result has implications for the debate concerning who people compare themselves against, or 'relevant others'. Higher incomes of certain groups do *not* necessarily have a negative effect on a person's reported happiness. Runciman's exposition of relative deprivation implies that people are negatively affected by the rising incomes of those who share similar characteristics. The above result contradicts this and suggests that at some level similarity with the reference group can induce positive feelings about others' success. This result supports Kingdon & Knight's conclusion that the incomes of 'those with similar characteristics' can render a positive effect on happiness. The other side to this argument is that people are relatively more envious of those they perceive to be 'different'. This contradicts the conclusion in Luttmer (2005) which finds that college-educated citizens are negatively affected by the incomes of other college-educated citizens, but are not negatively affected by the incomes of non-college-educated citizens. In that example, people are more envious of those who are more similar. This difference may be due to the nature of political affiliation. It is a choice which is reflective of experiences, personal values and priorities, and, importantly, it is inherently contentious. A person's level of education is non-contentious and a function of ability and nurturing.

*d. Political subgroup comparisons*

Interactive dummies were used to compare the effect on happiness of different comparison incomes on the Democrat and Republican subgroups.

*Democrat / Republican*

$\gamma^*$	<i>Regional mean income</i>	<i>Regional mean income for those of the same political affiliation</i>	<i>Regional mean income for those of the different political affiliation</i>
Democrat / Republican coefficient on happiness	0.831 / -0.725	0.502 / 0.214	-0.397 / -1.448
Significant difference between subgroups? <sup>32</sup>	No	No	No
Structural change? <sup>33</sup>	No	No	No

With each comparison income, Democrats are less negatively affected than Republicans. Moreover, Democrats are positively affected by the overall average incomes in their region. For both groups, the positive effect on happiness of the incomes of those of the same political affiliation and the negative effect of those of the different political affiliation both hold, albeit with slight differences in magnitude. This may be related to social and political ideals, such as the higher priority Democrats place on public and welfare spending than Republicans. *Ceteris paribus*, one would expect public goods to be more abundant in a region with higher incomes and a larger relative tax base.<sup>34</sup> For Democrats, the negative effect of others' incomes on happiness would therefore be offset by the increase in happiness as the result of an increase in expenditure on programmes of which they are in favour.

<sup>32</sup> Significance measured at the 5% level, where the null hypothesis states that the different subgroup coefficients are equal. See appendix 4.

<sup>33</sup> Structural change tests were undertaken using log likelihood values for restricted (no interactive dummies) and unrestricted (interactive dummies for each subgroup) models, using the Chi<sup>2</sup> distribution table. Degrees of freedom were equal to the number of restrictions. See appendix 5.

<sup>34</sup> Assuming that higher incomes do not lead to a downward change in preferences for public goods, provision is determined by tax revenue such that higher incomes provide more provision.

Considering that Republicans are on average happier than Democrats, that they are more negatively affected by others' incomes is interesting. It confirms that relative income does affect happiness but that there are also other, perhaps more important, determinants of happiness such as health status, employment status and marital status. This is unsurprising given the wide-ranging implications on a person's quality of life of those three factors.

Jost & Napier (2008) argue that Republicans are happier than Democrats because their political philosophy presents a psychological 'barrier' to worries regarding inequality. However, the above result suggests that it is Republicans who are more affected by income inequality rather than Democrats. The difference between personal and social comparisons may explain this result. Democrats may be more likely to worry about perceived *social* inequality (as Jost & Napier suggest), but are less affected by *personal* relative differences. Republicans exhibit an opposite trend.

## V. *Concluding remarks*

Three strands of investigation were identified at the beginning of this paper. Firstly, the results of previous studies which show that happiness is increasing in own income and decreasing in the incomes of 'relevant others' are confirmed. With respect to political affiliation, Republicans are happier than Democrats, but independents are happiest. Political affiliation does have an effect on happiness, but its significance is less than other variables such as health status and marital status. The inclusion of political affiliation has also affected the understanding of other determinants of happiness. When political affiliation is considered, being black has a positive effect on happiness. This contradicts findings in other studies in which the effect on happiness of being black is negative.

Secondly, when people compare themselves to others of the same political affiliation, the relationship between happiness and the comparison income is positive. As person B's income increases, person A's happiness increases, *ceteris paribus*. Conversely, when people compare themselves against individuals of a different political affiliation the effect is negative. This negative effect with consideration of political affiliation is stronger than the

negative effect when comparison is made with the average income of all residents within a region regardless of political affiliation. This result adds to the debate concerning 'relevant others' to who people compare themselves in the relative income hypothesis, and suggests that different spheres of comparison have different effects on a person's evaluation of their relative socioeconomic position.

Finally, differences in relative income affect Democrats' happiness less than Republicans' happiness, whatever the reference group. This suggests that Democrats care less about interpersonal income inequality than Republicans. As Republicans are on average happier than Democrats, this suggests that other factors in Republicans' lives are causing their happiness to be greater. A likely candidate to explain this difference in happiness is religiosity, as on average Republicans express stronger religious affiliation and participation than Democrats.<sup>35</sup>

## VI. *Evaluation and extensions*

Information and identification are significant problems when considering social comparisons. This problem is particularly acute when two personal and imperfectly observable characteristics such as income level and political affiliation are considered. Are people actually able to make comparisons regarding differences in incomes? Are they able to identify those of the same or different political affiliation? To confirm whether political affiliation does affect how people compare themselves, an experiment could be conducted based on Oswald & Zizzo (2000). In this scenario, participants are aware of the incomes of the other participants and are able to "burn" others' wealth (to reduce income disparities). Participants could be asked to specify their political affiliation, and this information would be provided to all other participants. This would enable analysis of the willingness of different political groups to "burn" wealth and whether they choose to reduce the incomes of those of the same or the different political affiliation.

---

<sup>35</sup> See Jost & Napier (2008).

Another improvement would be the use of state data which would better allow for the investigation of the effect on happiness of living within politically-bias communities. State data would be a more robust and reliable measure of political homogeneity than regional data. In addition, state data would provide more detailed insight into the effect of different levels of economic inequality on wellbeing. A larger data set would also be desirable to test these conclusions against a wider population sample. Panel data analysis could be used to investigate the effect of changing incomes on political affiliation, specifically, whether people switch allegiance as their incomes change. Furthermore, panel analysis would allow for more specific investigation of the effect on people's happiness of changing levels of income and changes in other socioeconomic variables through the control of individual fixed effects. This could expose causal relationships and help to further explain the interplay between relative income, happiness, and political affiliation.

## Bibliography

- Alesina, A., di Tella, R., MacCulloch, R., 2004. *Inequality and happiness: are Europeans and Americans different?* Journal of Public Economics 88, 2009-2042.
- Akerlof, G., Kranton, R., 2000. *Economics and identity*. Quarterly Journal of Economics 115 (3), 715-753.
- Blanchflower, D., Oswald, A., 2004. *Well-being over time in Britain and the USA*. Journal of Public Economics 88, 1359-1386.
- Clark, A., Frijters, P., Shields, M., 2008. *Relative income, happiness, and utility: an explanation for the Easterlin paradox and other puzzles*. Journal of Economic Literature 46 (1), 95-144.
- Dohmen, T., Elger, C.E., Falk, A., Fleissbach, K., Sunde, U., Trautner, P., Weber, B., 2007. *Social comparison affects reward-related brain activity in the human ventral striatum*. Science 318, 1305-1308.
- Dougherty, C., 2007. *Introduction to Econometrics*. Oxford University Press, Oxford.
- Easterlin, R., 1974. *Does economic growth improve the human lot? Some empirical evidence*. In: David, P.A., Reder, M.W., (Eds.), Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz. Academic Press, New York and London, 89-125.
- Easterlin, R., 1995. *Will raising the incomes of all increase the happiness of all?* Journal of Economic Behavior and Organization 27, 35-47.
- Ferrer-i-Carbonell, A., 2005. *Income and well-being: an empirical analysis of the comparison income effect*. Journal of Public Economics 89, 997-1019.
- Frank, R.H., 1985. *The Demand for Unobservable and Other Nonpositional Goods*. American Economic Review 75 (1), 101-116.
- Frey, B., Stutzer, A., 2002. *Happiness and Economics: How the Economy and Institutions Affect Well-Being*. Princeton University Press.
- Greene, K., Nelson, P., 2007. *Is relative income of overriding importance for individuals?* International Journal of Social Economics 34 (11), 883-898.
- Jost, J., Napier, J., 2008. *Why are conservatives happier than liberals?* Psychological Science 19 (6), 565-572.
- Kingdon, G.G., Knight, J., 2007. *Community, comparisons and subjective well-being in a divided society*. Journal of Economic Behavior and Organization 64, 69-90.
- Knight, J., Song, L., 2006. *Subjective well-being and its determinants in rural China*. Unpublished.

- Layard, R., 1980. *Human Satisfactions and Public Policy*. Economic Journal 90 (360), 737-750.
- Layard, R., 2005. *Happiness: Lessons from a New Science*. Penguin, New York and London.
- Luttmer, E., 2005. *Neighbors as negatives: relative earnings and well-being*. Quarterly Journal of Economics 120 (3), 963-1002.
- Marx, K., 1849. *Wage labour and capital*. In: Marx, K., Engel, F. (Eds.), Selected Works, vol. 1, Progress Publishers, Moscow.
- McBride, M., 2001. *Relative-income effects on subjective well-being in the cross-section*. Journal of Economic Behavior and Organization 45, 251-278.
- McKay, D., 2005. *American Politics and Society*. Blackwell Publishing, Oxford.
- Oswald, A., 2006. *What is a happiness equation?*  
[www2.warwick.ac.uk/fac/soc/economics/staff/faculty/oswald/happinessformula06.pdf](http://www2.warwick.ac.uk/fac/soc/economics/staff/faculty/oswald/happinessformula06.pdf)
- Oswald, A., Zizzo, D.J., 2000. *Are people willing to pay to reduce others' incomes?* Working paper, TWERP #568.
- Runciman, W.G., 1966. *Relative Deprivation and Social Justice*. University of California Press, Berkeley.

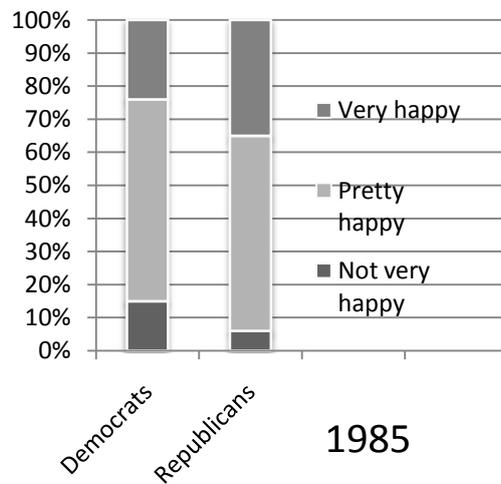
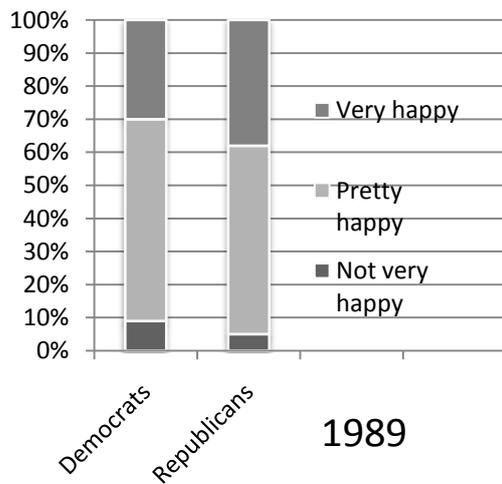
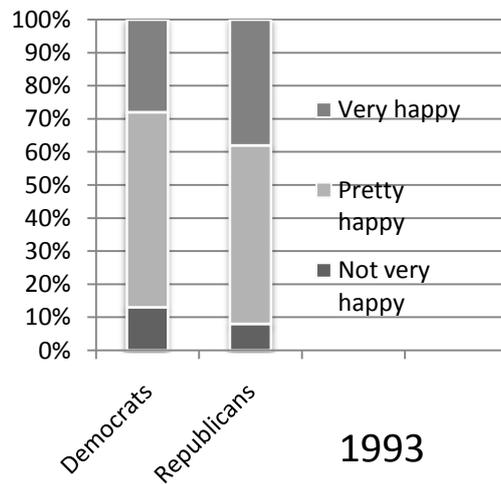
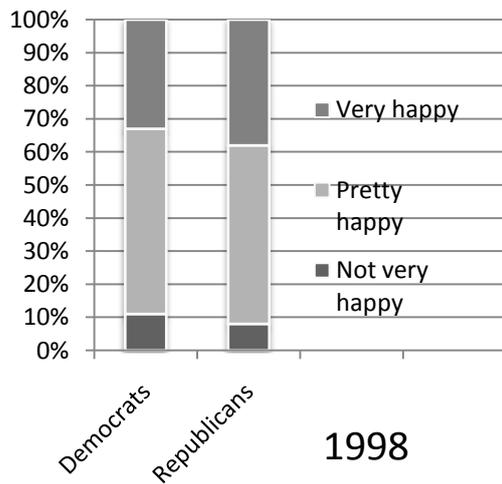
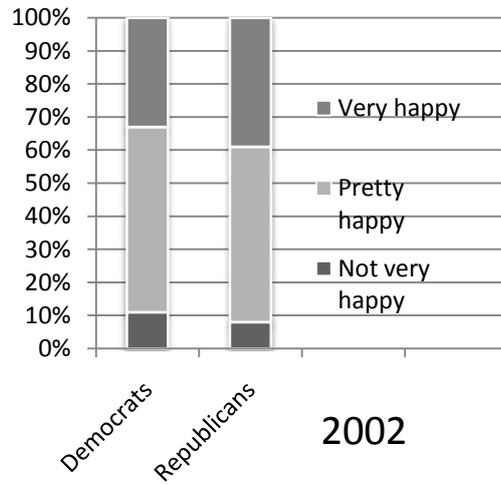
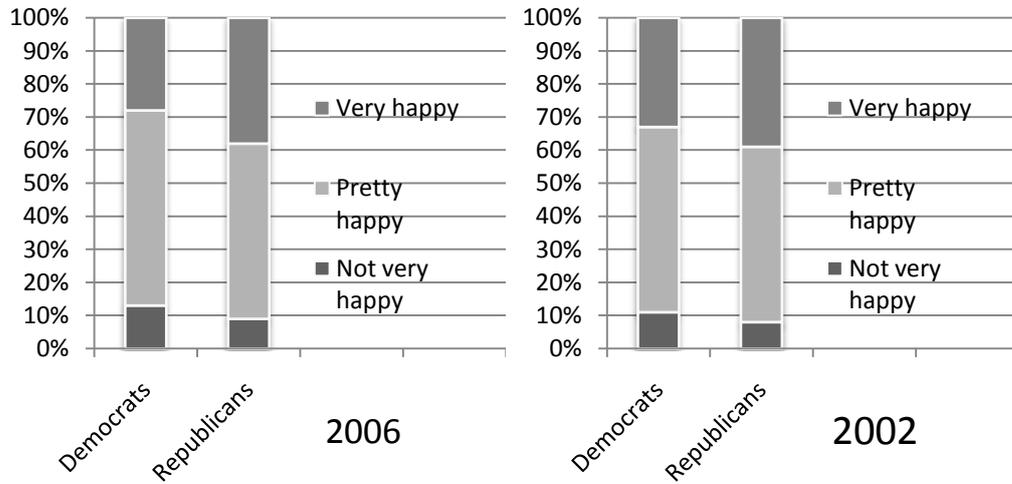
## Data sources

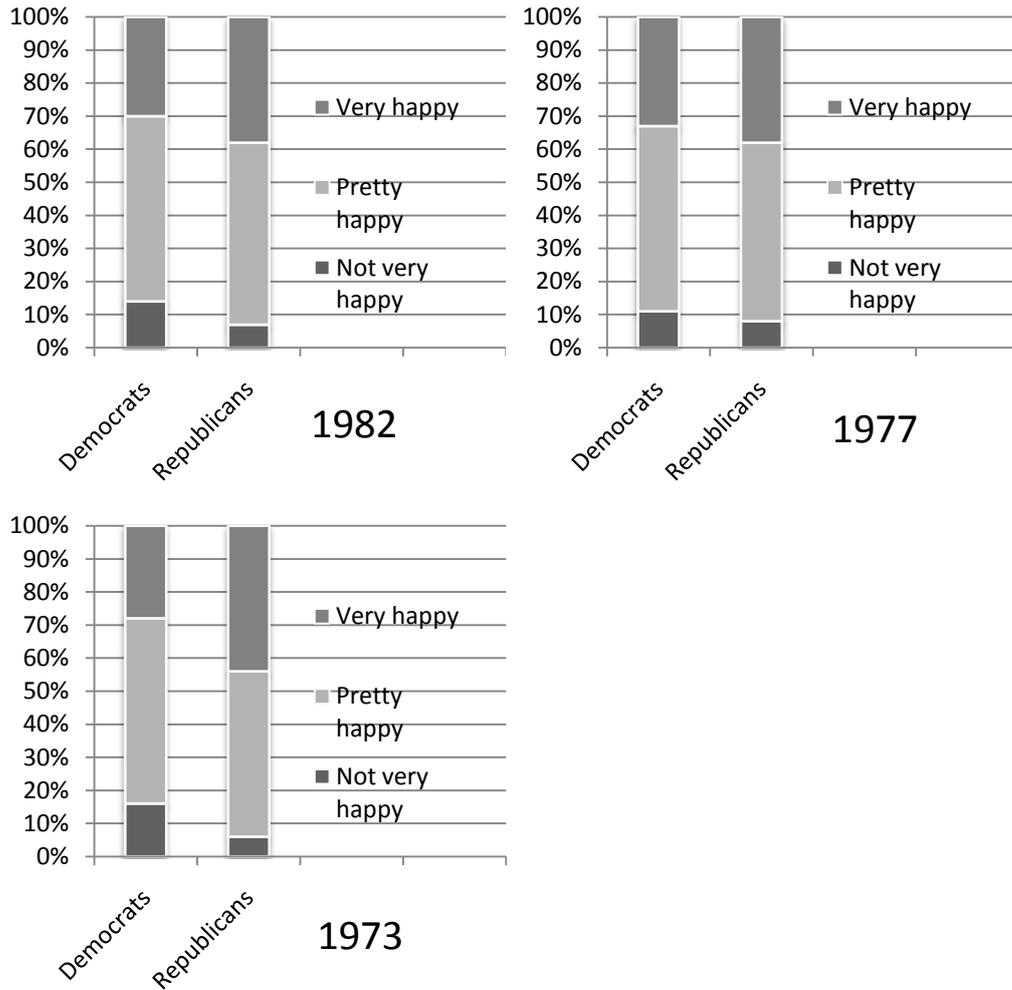
- General Social Survey (GSS). <http://www.norc.org/GSS+Website/>
- <http://www.realclearpolitics.com/>

# Appendices

**Appendix 1**

Democrat and Republican happiness profile for all GSS years.





**Appendix 2**

Summary statistics of main variables.

- Income variables

<i>Variable</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Minimum</i>	<i>Maximum</i>
<b>Income</b>	\$60291	\$41092	\$1000	\$150000
<b>Average regional income</b>	\$60290	\$3568	\$55206	\$66255
<b>Average regional income (same political affiliation)</b>	\$60350 <sup>36</sup>	\$8983	\$40400	\$74326
<b>Average regional income (different political affiliation)</b>	\$60500	\$9021	\$40400	\$74326

<sup>36</sup> Means and standard deviations for the final two comparison incomes are slightly different due to the difference in numbers of Republicans and Democrats, and the inclusion of independents.

- Happiness

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	Not too happy	130	11.79
2	Pretty happy	608	55.12
3	Very happy	365	33.09
	Total	1103	100

- Race

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	White	880	79.78
2	Black	154	13.96
3	Other	69	6.26
	Total	1103	100

- Sex

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	Male	468	42.43
2	Female	635	57.57
	Total	1103	100

- Marital status

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	Married	556	50.41
2	Widowed	106	9.61
3	Divorced	191	17.32
4	Separated	28	2.54
5	Never married	222	20.13
	Total	1103	100

- Work status

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	Working full time	593	53.76
2	Working part time	100	9.07
3	With a job, but on temporary leave	18	1.63
4	Unemployed	27	2.45
5	Retired	229	20.76
6	In school	29	2.63
7	Keeping house	86	7.80
8	Other	21	1.90
	Total	1103	100

- Level of education

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	Less than high school	73	6.62
2	High school	544	49.32
3	Junior college	110	9.97
4	Bachelor's	254	23.03
5	Graduate	122	11.06
	Total	1103	100

- Health status

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	Excellent	338	30.64
2	Good	516	46.78
3	Fair	196	17.77
4	Poor	53	4.81
	Total	1103	100

- Region

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	New England	41	3.72
2	Middle Atlantic	131	11.88
3	East North Central	208	18.86
4	West North Central	79	7.16
5	South Atlantic	225	20.40
6	East South Central	55	4.99
7	West South Central	105	9.52
8	Mountain	103	9.34
9	Pacific	156	14.14
	Total	1103	100

- Presidential vote

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	Kerry (Democrat)	536	48.59
2	Bush (Republican)	567	51.41
	Total	1103	100

- Party affiliation

<i>Value</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
1	Strong Democrat	200	18.13
2	Not strong Democrat	203	18.40
3	Independent near Democrat	130	11.79
4	Independent	94	8.52
5	Independent near Republican	78	7.07
6	Not strong Republican	226	20.49
7	Strong Republican	172	15.59
	Total	1103	100

### Appendix 3

Definition and explanation of variables used in regressions.

#### *Dependent variable*

- **happy** - respondents recorded a score of 1 for very happy, 2 for pretty happy, and 3 for not too happy. In my analysis I switched the ordering of this variable to allow for a positive relationship between happiness and ordering, such that 1 was equated to not too happy, 2 to pretty happy, and 3 to very happy.

#### *Hypothesis variables*

- **lninc** – natural log of family income recorded in the GSS. Respondents were asked to specify their total family income according to a range 1 to 25, where 1 corresponded to under \$1000 and 25 to \$150000 or over. Categories 2 to 24 expressed ranges. The income level attributed to respondents was manipulated to the middle of the value range. For example, a respondent who answered 19 was in the range \$50000 to \$59999, so the income attributed to that person was \$55000.
- **lnavinc** – natural log of mean income in a respondent's region.
- **lnavsinc** – natural log of mean income of those of the same political affiliation in a respondent's region.
- **lnavdinc** – natural log of mean income of those of the different political affiliation in a respondent's region. To form these variables, the average incomes for Democrats and Republicans within each region were taken. These average incomes were then allocated to the 'same average income' or 'different average income' columns in an Excel version of the data file. For example for Democrats, the average income of Democrats in a region was listed under 'same average income', and the average income for Republicans was listed under 'different average income'. The opposite allocation was made for Republicans. This formulation means that the comparison effect of both political groups is being measured in each variable, rather than comparison only being made with either the Democrat or the Republican average regional income. Independents were allocated the standard regional mean of all respondents.
- **votebush** – dummy variable which is 1 if the respondent voted for George W. Bush, 0 otherwise.

- **democrat** – dummy variable which is 1 if the respondent considers themselves to be a Democrat, 0 otherwise. Formed from party affiliation variable, Democrat if in categories 1, 2, or 3.
- **republican** – dummy variable which is 1 if the respondent considers themselves to be a Republican, 0 otherwise. Formed from party affiliation variable, Republican if in categories 4, 5, or 6.
- **regiondem** – dummy variable which is 1 if the respondent lives in a Democrat-voting region, 0 otherwise. Formed from region variable, Democrat region if in categories 1 or 2.
- **regionrep** – dummy variable which is 1 if the respondent lives in a Republican-voting region, 0 otherwise. Formed from region variable, Republican region if in categories 6 or 7.

#### *Control variables*

- **age** – age of respondent in years.
- **wrkpt** – dummy variable which is 1 if the respondent's working status is 'part-time', 0 otherwise.
- **wrktl** – dummy variable which is 1 if the respondent's working status is 'temporary leave', 0 otherwise.
- **wrkun** – dummy variable which is 1 if the respondent's working status is 'unemployed', 0 otherwise.
- **wrkre** – dummy variable which is 1 if the respondent's working status is 'retired', 0 otherwise.
- **wrkst** – dummy variable which is 1 if the respondent's working status is 'student', 0 otherwise.
- **wrkkh** – dummy variable which is 1 if the respondent's working status is 'keeping house', 0 otherwise.
- **wrko** – dummy variable which is 1 if the respondent's working status is 'other', 0 otherwise.
- **mar** – dummy variable which is 1 if the respondent's marital status is 'married', 0 otherwise.
- **wid** – dummy variable which is 1 if the respondent's marital status is 'widowed', 0 otherwise.
- **div** – dummy variable which is 1 if the respondent's marital status is 'divorced', 0 otherwise.
- **sep** – dummy variable which is 1 if the respondent's marital status is 'separated', 0 otherwise.
- **edhs** – dummy variable which is 1 if the respondent's level of education is 'high school graduate', 0 otherwise.

- **edjc** – dummy variable which is 1 if the respondent's level of education is 'junior college graduate', 0 otherwise.
- **edba** – dummy variable which is 1 if the respondent's level of education is 'college graduate', 0 otherwise.
- **edgr** – dummy variable which is 1 if the respondent's level of education is 'postgraduate degree', 0 otherwise.
- **fem** – dummy variable which is 1 if the respondent's sex is 'female', 0 otherwise.
- **blk** – dummy variable which is 1 if the respondent's race is 'black', 0 otherwise.
- **raceo** – dummy variable which is 1 if the respondent's race is 'other' (not black or white), 0 otherwise.
- **hlthg** - dummy variable which is 1 if the respondent's health status is 'good', 0 otherwise.
- **hlthf** – dummy variable which is 1 if the respondent's health status is 'fair', 0 otherwise.
- **hlthp** – dummy variable which is 1 if the respondent's health status is 'poor', 0 otherwise.

#### Appendix 4

Significant difference tests on happiness of the three comparison income variables for the Republican and Democrat subsamples. Tests were undertaken at the 5% significance level.

##### 1) *Regional mean income*

$$H_0: - [\text{happy}]d\lnavinc + [\text{happy}]r\lnavinc = 0$$

$$\text{Chi}^2(1) = 1.39$$

Prob > Chi<sup>2</sup> = 0.2384. Therefore do not reject the null hypothesis; the difference between coefficients is not significant.

##### 2) *Regional mean 'same' income*

$$H_0: - [\text{happy}]d\lnavsinc + [\text{happy}]r\lnavsinc = 0$$

$$\text{Chi}^2(1) = 0.12$$

Prob > Chi<sup>2</sup> = 0.7302. Therefore do not reject the null hypothesis; the difference between coefficients is not significant.

##### 3) *Regional mean 'different' income*

$$H_0: - [\text{happy}]d\lnavdinc + [\text{happy}]r\lnavdinc = 0$$

$$\text{Chi}^2(1) = 0.31$$

Prob > Chi<sup>2</sup> = 0.5761. Therefore do not reject the null hypothesis; the difference between coefficients is not significant.

### Appendix 5

Structural change tests for the three comparison income variables when interactive dummies for the Democrat and Republican subgroups were introduced. These were calculated by taking the log likelihood for the unrestricted (with interactive dummies) model and subtracting the log likelihood for the restricted (without interactive dummies) model and multiplying that answer by 2. This was then be distributed as Chi<sup>2</sup>(*g*), where *g* = number of restrictions. Tests were undertaken at the 5% significance level.

#### 1) *Regional mean income*

H<sub>0</sub>: No evidence of structural change.

$$(\text{Unrestricted} - \text{restricted}) \times 2 = (-907.77612 - (-) 929.79268) \times 2 = 44.03$$

$$\text{Chi}^2(40) = 55.76$$

44.03 < 55.76. Therefore do not reject the null hypothesis; there is no evidence of structural change.

#### 2) *Regional mean 'same' income*

H<sub>0</sub>: No evidence of structural change.

$$(\text{Unrestricted} - \text{restricted}) \times 2 = (-907.18308 - (-) 929.01107) \times 2 = 43.66$$

$$\text{Chi}^2(40) = 55.76$$

43.66 < 55.76. Therefore do not reject the null hypothesis; there is no evidence of structural change.

#### 3) *Regional mean 'different' income*

H<sub>0</sub>: No evidence of structural change.

$$(\text{Unrestricted} - \text{restricted}) \times 2 = (-910.39994 - (-) 929.59146) \times 2 = 38.38$$

$$\text{Chi}^2(40) = 55.76$$

38.38 < 55.76. Therefore do not reject the null hypothesis; there is no evidence of structural change.