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the Level and Distribution of Well-Being:
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**Abstract:** The impact of increased affluence on life satisfaction is a matter of some controversy. This paper examines the impact of the recent economic boom in Ireland upon the level and distribution of various domains of well-being. There is evidence of a substantial increase in life satisfaction in the domain of finance and of an improvement in mental well-being. There is a reduction in inequality and polarisation for virtually all domains of life satisfaction. A social welfare function which is increasing and concave in individual well-being would show an improvement in social welfare over the period.

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# The Impact of an Economic Boom on the Level and Distribution of Subjective Well-Being: Ireland, 1994-2001

**Introduction**

Recent interest in what has become known as the "economics of happiness" has led to much speculation over the link between economic affluence and fundamental measures of human well-being (for recent reviews see Wolfers and Stevenson, 2008a and Clark et al, 2008).[1]  In a recent book, *The Challenge of Affluence,* Avner Offer (2006) maintains that "The rise of incomes…has done little or nothing to improve the sense of well-being".  Offer provides sophisticated arguments to back up his claim, a claim that Oswald and Powdthavee (2007) appear to agree with in their detailed review of the book where they state that  "[Offer's thesis]..is largely correct."  In support of this they provide evidence that psychological distress (as measured by the GHQ-12) rose in the UK over the 1991-2004 period.  In contrast however, Stevenson and Wolfers (2008a) conclude that absolute income plays an important role in shaping happiness but that the role of relative income is less than previously thought.

This paper provides further evidence on the affluence-happiness link by examining changes in various measures of life satisfaction and psychological distress between 1994 and 2001 in Ireland.  This period is of particular interest as it incorporates the major part of Ireland's "Celtic Tiger" phase when unusually high rates of growth were recorded.  As can be seen from table 1, growth rates in this

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[1] In the course of this paper we will use the phrases "well-being", "subjective well-being", "happiness" and "life satisfaction" interchangeably.  While this may be regarded as somewhat sloppy in effect we are referring to any data where individuals give ordinal, subjective answers to a question concerning how "well" they feel or in general how "satisfied" they are with life or various domains of life.  We will make it obvious when we are referring to other specific measures such as the GHQ-12.

period were exceptional, with annual volume changes in GNP approaching and sometimes exceeding 10%, and annual changes in GNP per head not far behind. The period also witnessed a dramatic fall in unemployment (for a cross-country analysis of the effect of macroeconomic variables on happiness see Di Tella et al, 2003). Thus Ireland in this period offers a further useful test-case of the link between affluence and happiness, as it is rare to observe such a dramatic change in income per head over such a short period of time.

Our results, in terms of the level of subjective well-being, are somewhat ambiguous. Some dimensions of subjective well-being (such as satisfaction in the area of finance and psychological distress as measured by the GHQ) show clear improvements over the period under review. Others such as self-assessed health and leisure satisfaction show little trend. It is noteworthy though that none of the measures show any appreciable decline over the period which is consistent with the discussion in Fahey (2007).

One area which has received relatively less attention in the economics of happiness is the link between economic growth and the distribution of more fundamental measures of well-being within a country. There is a long and distinguished literature on the link between growth and inequality of incomes, with perhaps the most celebrated contribution by Kuznets (1955) and more recent contributions by, amongst others, Deiniger and Squire (1996), Aghion et al (1999) and Ravallion and Chen (2003). However, there is relatively little evidence on the link between economic growth and inequality of happiness or subjective well-being. This is probably because data on subjective well-being is typically ordinal rather than

cardinal and so it is more difficult to establish complete rankings using such data. In particular, unlike the case with cardinal data where there may be a range of inequality indices to choose from, until recently indices which are specific to ordinal data (and which do not involve an unappealing "cardinalisation" of the ordinal data) have been few and far between.

One exception to this gap in the literature is the recent contribution by Stevenson and Wolfers (2008b). They analyse the distribution of happiness in the US over approximately the 1972-2006 period. They find that inequality of happiness fell quite substantially over that period and that gaps in happiness by race and gender narrowed. However, gaps in happiness by education widened considerably, mirroring the changes in income distribution. Their approach differs from ours however, in one very important way. Rather than using inequality measures which are specifically designed to deal with ordinal, categorical data, they cardinalise their data via generalised ordered probit regressions, thus imposing a specific, parametric functional form on the data. Analysis of health inequality has shown that the choice between a median-based inequality index specifically designed to deal with ordinal categorical data and more "conventional" inequality indices on data which have been cardinalised is not trivial (Madden, 2010).

In this paper we use ordinal measures of inequality which were originally introduced to analyse health data to examine the evolution of inequality of well-being in Ireland during the 1994-2001 period. Thus we this approach as complementary to that of Stevenson and Wolfers. While we do not have as long a time-series of evidence as they had, we do have a wider range of measures of well-being, measures

which concentrate on specific domains of welfare. We also examine whether polarisation in well-being changed over the period. While polarisation is similar to inequality, it is not the same and can often move in different directions. As pointed out by Esteban and Ray (1994) we may wish to distinguish between "convergence" to a global mean and "clustering" around local means. While the former will reduce both inequality and polarisation, the latter will reduce inequality but *increase* polarisation. Once again, we apply recently developed techniques specifically designed for ordinal, categorical data to investigate the development of polarisation in well-being over the 1994-2001 period.

Clearly the experience of one particular country at a particular point in time does not necessarily prove or disprove a hypothesis. However we believe that the evidence we present concerning the evolution of subjective measures of well-being in a country which is experiencing an economic boom represent a useful addition to the literature on the link between affluence and life satisfaction. In particular the exploration of the link between growth and the distribution of well-being in terms of inequality and polarisation is a relatively innovative contribution. The results below will show that the economic boom has been accompanied by an improvement in some domains of well-being, while others have remained broadly unchanged. However clearer results are found with respect to the distribution of well-being, where all our measures of well-being show reduced inequality and polarisation over the period.

In the next section we briefly review the macroeconomic history of Ireland over the period under review and describe the measures of subjective well being which we analyse.

**I.  The Economic Boom in Ireland, 1994-2001 and Measures of Subjective Well-Being.**

Table 1 shows the evolution of overall GNP, GNP per head and the rate of unemployment for Ireland for the 1994-2001 period (we use GNP as opposed to GDP owing to the unusually high rate of net factor payments in Ireland).  The period up to 2001 shows exceptionally high growth rates of GNP, GNP per capita and also a dramatic decline in the rate of unemployment.  The precise reasons behind this performance have been discussed in more detail elsewhere (e.g. Honohan and Walsh, 2002) and they are not of concern to us in this paper.  What is important from our point of view is to confirm the very strong growth performance of the Irish economy over this period and establish that it warrants the term "economic boom".  As measured by GNP per capita, Irish living standards increased by nearly 70% between 1993 and 2001, which we argue is convincing evidence that over that period a boom was experienced.

Table 1 here

What measures of subjective well-being will we analyse over the same period? We take six possible measures of subjective well-being from our data source (which we describe in more detail in the next section).  Individuals are asked "How satisfied are you with your present situation in the following areas of your life?".  The four areas listed are: your work or main daily activity, your financial situation, your housing situation and the amount of leisure time you have.  There are six possible

responses: they range from "not satisfied at all" which can be indicated with a score of 1 up to "fully satisfied" which carries a score of 6.

The fifth measure of subjective well-being we use is self assessed health (SAH). Individuals answer the question: in general, how good would you say your health is? The possible answers are: very bad, bad, fair, good and very good. Evidence suggests that measures of this type appear to give a good indicator for overall health (Idler and Benyamini, 1997) which is clearly an important dimension of well-being.

The final measure of subjective well being we use is the GHQ-12. The General Health Questionnaire (GHQ) first introduced by Goldberg (1972) is one of the most commonly employed measures of mental health. The original development of the measure involved a 60 item version (GHQ-60) with the "best" 30, 20 and 12 of these items being identified for use when the respondent's time was at a premium (giving rise to the GHQ-30, GHQ-20 and GHQ-12 measures respectively). Items in the GHQ consist of questions asking whether the respondent has recently experienced a particular symptom or item of behaviour rated on a four-point scale. For example a respondent might be asked the question: have you recently been feeling reasonably happy, all things considered? The respondent then answers from one of the following four categories: more so than usual, same as usual, less than usual, or much less than usual. Answers to the GHQ can then be aggregated into an overall GHQ score which can range from 0 to 36 (the Likert scoring method) or 0 to 12 (the GHQ scoring method).

We believe that analysis of these six measures gives a reasonably comprehensive overview of subjective well-being. We do not aggregate the six measures together (the GHQ score already involves a degree of aggregation). Instead we examine each measure separately. However, as we will see, there is quite a strong similarity in the results.

Before describing our data and presenting our results it might be useful to conclude this section with a brief discussion as to the importance of the distribution (as opposed to the level) of well-being. While this paper is primarily an exercise in positive economics in the sense that we are trying to analyse the evolution of certain measures of subjective well-being, can we make any normative statements using this analysis?

When analysing the impact of public policies upon well-being economists typically employ the concept of a social welfare function. Such a function is usually expressed as a function of individual utility functions which in turn may be a function of individual incomes. Thus such a function may be expressed as $W = W[U_1(y_1),..U_i(y_i),...U_N(y_N)]$. It is generally assumed that individual utility functions are increasing and concave in income, while social welfare is increasing and concave in individual utility.[2] Arising from these two assumptions is the result that social welfare is increasing and concave in incomes and hence, all else equal, inequality of incomes tends to lower social welfare. Note that the concavity of social

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[2] Note that in general if $y=g(x)$ and $g$ is a concave function, then under reasonably general conditions it can be shown that the variance of $y$ is no greater than that of $x$. While the variance is not considered an ideal measure of inequality, the same result also applies to the coefficient of variation, an inequality measure which is Lorenz consistent. This suggests that if utility could be measured in cardinal units its level of inequality would be less than that of income. But of course this does not imply any general relationship between the *growth* of income and changes in a scale-invariant measure of inequality of utility. I am grateful to Denis Conniffe for discussion on this point.

welfare with respect to individual income arises from two sources: (i) the concavity of the utility of income function and (ii) the concavity of social welfare with respect to individual utility, the degree of which will depend upon the ethical preferences of society or the mythical "social planner".

While social welfare may be decreasing in inequality of income, what about the relationship between social welfare and the distribution of subjective well-being? Presumably subjective well-being is more fundamentally related to what economists mean by utility than is income but that is quite a long way from thinking in terms of a utility of subjective well-being function and making assumptions about whether it is linear, concave or convex. If we remain agnostic about the shape of the individual utility of subjective well-being function, then if the distribution of subjective well-being is to be important from a social welfare point of view it must be owing to source (ii) above, the ethical views of the social planner. Thus the distribution of subjective well-being is important from a normative viewpoint because society places more value upon an increase in subjective well-being for someone who is less happy than someone who is more happy. In this sense, all else being equal, greater equality of happiness is a good thing.

We now describe the data we use and present results.

## II.       Data and Results

The data we use comes from eight waves of the Living in Ireland Survey (LII), from 1994 to 2001.[3]  The LII survey is a nationally representative survey which was collected annually between 1994 and 2001 and which formed the Irish part of the European Community Household Panel Survey.  It has been used extensively in a variety of studies on (amongst other issues) poverty, deprivation and education.

One issue which inevitably arises with the use of panel data is attrition.  Attrition is the process whereby households who were interviewed in the first year of the study are unavailable (for a variety of reasons) for interview in subsequent waves.  Since attrition can occur on a year-by-year basis it is possible that a substantial proportion of the original sample may have been lost after a period of say, five or six years.  There are two principal problems associated with attrition.  The first is that if attrition happens on a non-random basis then the sample may gradually become unrepresentative.  Secondly, as the sample shrinks in size estimated coefficients from regression analysis may lose precision.

There is a detailed discussion of attrition in the LII survey in Nolan et al (2002). They conclude that there is some evidence that as well as giving rise to a loss of precision, attrition in the LII survey may have been non-random.  In particular, there may have been relatively higher attrition amongst households which changed address and which consisted primarily of young single adults.  In response to this a booster sample, with just over 1500 new households, was introduced in 2000 with a view to

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[3] For an overview of the Living in Ireland Survey, see Watson (2004).

alleviating the problems arising from attrition (see Watson, 2004). On this basis there is a temptation to merely use the 1994 and 2000 samples in our analysis but in the interests of obtaining a longer time-series of our variables we feel it is worth using all eight waves.[4] However the issue of attrition is important to bear in mind when interpreting our results. We can regard our data as repeated cross sections with differing sample sizes or as an unbalanced panel with a booster sample (though note we do not exploit the panel nature of the data).

The next issue we have to address is how we will compare these ordinal variables on a year-by-year basis. Clearly for each measure a certain fraction of the population will be in each category. If we were using standard comparisons of means and dispersion we would first have to decide upon a scale which assigns a numerical value to each category. One possibility would be what Allinson and Foster (2004) term the "linear" scale, where, for example, in the case of the first four measures discussed above values of 1-6 would be assigned to the six possible answers (where obviously a higher value corresponds to a greater degree of satisfaction). For the self-assessed measure of health values of 1-5 would be assigned, while for GHQ-12 the Likert Aggregation could be used with values of 0-3 for each question, giving an overall score from 0 to 36. These indices could then be re-scaled so that 1994=100.

Figure 1 shows how these indices have evolved over the period under review. There has been a clear increase in financial satisfaction and discernible increases in work satisfaction and GHQ (we have re-scaled the GHQ so that higher is "better", so

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[4] Madden (2007) analyses GHQ data for 1994 and 2000 and finds that mental stress fell over the period for a wide range of reasonable GHQ thresholds.

effectively what we see here is a reduction in psychological distress). Housing and leisure satisfaction and self-assessed health show little observable trend.

However the difficulty with this analysis is the choice of the linear scale (or indeed the choice of any specific scale). While the linear scale has a certain superficial attraction it is clearly arbitrary and an alternative (and equally plausible scale) could give quite different results (for a comprehensive discussion of this issue see Allinson and Foster, 2004).

The only circumstance where the choice of scale does not matter (i.e. the ranking of any two years would be the same regardless what scale was used as long as a higher value of the scale indicates a better outcome in terms of satisfaction) is where first-order stochastic dominance is observed. In this instance if year A stochastically dominates year B then the cumulative frequency for year B at each point on the ordinal scale (as we go from lower to higher) is always higher in B than in A.

Tables 2 to 7 provide a grid which shows where first-order stochastic dominance (indicated by F) between any two years may be observed. Entries for F which are above the main diagonal indicate a situation where the earlier year (the row year) dominates the later one (the column year), while entries below the diagonal indicate where the later year dominates the earlier one. Thus table 3, for finance, has many entries below the main diagonal, giving conclusive evidence that satisfaction in the area of finance was increasing over the period. There is evidence of improvements in health in the 1996-1999 period, but this seems to have been a peak with both 1998 and 1999 showing dominance over 2001. The same pattern is evident in GHQ. This

may reflect the fact that 1999 was the last year before the booster sample was added, in which case it is arguably the year most affected by attrition. If those with poor health (either self-assessed or mental health as indicated by GHQ) were most prone to leave the sample then the 1999 sample may be biased towards the more healthy in the population.

Tables 2-7 here

What about the distribution of these measures of life satisfaction over the period? Allinson and Foster (2004) show how distributions of ordinal variables may be ranked according to a dominance criterion not unlike the Lorenz criterion when ranking inequality with cardinal variables. Thus the distribution in year A will have more spread than that in year B if A can be obtained from B via a sequence of median-preserving spreads (hence the clear analogy with Lorenz dominance where A would be obtained from B via a sequence of mean preserving spreads). They show that the distribution for year A has greater spread than that for year B if (a) year A and year B both have the same median category, $m$ (b) for all categories below the median the cumulative frequency in A is at least as great as in B and (c) for all categories greater than or equal to the median the cumulative frequency in B is at least as great as that in A. This spread criterion, S, holds for any scale as long as a higher value of the scale indicates a better outcome in terms of satisfaction. Note however that, like the Lorenz criterion in conventional inequality analysis, the S criterion is only partial. It is possible that S dominance will not be found, in which case recourse has to be sought in more restrictive indices.

Tables 2 to 7 also indicate where S dominance is found. Once again, the pattern of dominance above and below the main diagonal is revealing. A high frequency of dominance above the main diagonal indicates that inequality is *decreasing* over time as it shows that earlier years had greater spread than later years. There is a clear indication of declining inequality in work, housing and leisure satisfaction, self-assessed health and GHQ stress over the period. There is less evidence for S dominance for finance except for the case of 1994 compared to the immediately following years.

In conventional inequality analysis with cardinal data Lorenz dominance provides only a partial ordering, and hence analysts frequently employ inequality indices such as the Gini coefficient or coefficient of variation which provide complete orderings. Abul Naga and Yalcin (2007) provide a corresponding parametric index for qualitative data.

Suppose we have an ordinal measure of subjective well-being with $n$ different categories which can be clearly ordered $1,…, n$. Let $m$ denote the median category and let $F_i$ denote the *cumulative* proportion of the population in category $i$, where $i=1, …, n$. The inequality index proposed by Abul Naga and Yalcin (2007) is then

$$I_{\alpha,\beta} = \frac{\sum_{i<m} F_i^{\alpha} - \sum_{i\geq m} F_i^{\beta} + (n+1-m)}{k + (n+1-m)}$$

where $k = (m-1)\left(\frac{1}{2}\right)^{\alpha} - [1 + (n-m)\left(\frac{1}{2}\right)^{\beta}]$ and $\alpha$ and $\beta$ are parameters chosen by the analyst and are ethical choices which essentially reflect the weight given to inequality above and below the median. For a given value of β, as $\alpha \rightarrow \infty$ less weight is given

to disparities below the median, while similarly for given values of α as $\beta \to \infty$ less weight is given to disparities above the median.  The case where $\alpha = \beta = 1$ is that where effectively equal weight is given to disparities above and below the median.

Table 8 provides values for $I_{1,1}$ for our different measures of subjective well-being for 1994 to 2001 and these are also represented in figure 2.  They are of interest in terms of comparing the degree of inequality for the different measures of well-being at any point in time and also in terms of the evolution over time.  Finance and leisure show the highest level of inequality but it is interesting to note that they tend to converge over the period under review while GHQ clearly has the lowest level of inequality.  There is also a clear downward trend for measures of subjective well-being, except perhaps in the case of self-assessed health.

Table 8 here

It is possible that inequality-averse policy-makers would be more concerned with inequality of well-being at the lower end of the distribution.  This would be reflected in a higher value for $\beta$.  Thus table 9 provides values for $I_{1,5}$.  The pattern is very similar over the period except that the fall in inequality in work and finance satisfaction is perhaps not quite as pronounced as in the $I_{1,1}$ case.  The convergence between finance and leisure inequality is not as noticeable as in the $I_{1,1}$ case, once again indicating that the lower inequality in finance satisfaction was relatively concentrated above the median.

Table 9 here

What about developments in polarisation? Apouey (2007) developed a parametric index of polarisation specifically designed to address categorical, ordinal data. Using the same notation as above the measure is

$$P = 1 - \frac{2^{\gamma}}{n-1} \sum_{i=1}^{n-1} \left| F_i - \frac{1}{2} \right|^{\gamma}$$

where $\gamma$ is a parameter reflecting the relative importance given to the median category. Following the suggested values of $\gamma$ in Apouey (2008) we choose a value of $\gamma$ of 0.6 for the first five measures of well-being and a higher value, 0.8, for GHQ. The higher value for GHQ reflects the recommendation in Apouey (2008) that in general, higher values be chosen when the number of categories is greater. However, in terms of the trend in the measure over time, the results are not sensitive to the choice of $\gamma$.

Table 10 shows the results for this measure and the movement over time is also illustrated in figure 3. Similar to the indices of inequality there is clear evidence of a decline in polarisation, with the greatest decline to be observed in the area of finance and the most modest decline in health and GHQ.

Table 10 here

Thus, overall, it seems fair to say that the results in tables 8-10 are consistent with those in tables 2 to 7. There is fairly clear evidence that inequality in most domains of subjective well-being has fallen over this period. When these results are combined with the evidence concerning the level of subjective well-being (where some areas show a clear rise and no area shows a fall of any consequence) then this provides a

fairly convincing argument that the economic boom in Ireland over the 1994-2001 period was accompanied by non-trivial improvements in domains of life satisfaction.

## III.    Conclusion

This paper has analysed the evolution of the level and distribution of various domains of life satisfaction in Ireland during the economic boom of the latter part of the 1990s.  Ireland witnessed dramatically high rates of economic growth and falling unemployment.  The data shows that some areas of life satisfaction registered clear improvements while others were broadly unchanged.  Using measures of inequality specifically aimed at ordinal data we find that inequality in virtually all domains of life satisfaction fell over the period.  Similar results were found with respect to polarisation. The combination of results on the level and distribution of life satisfaction suggests that a social welfare function which is increasing and concave in the level of individual well-being would show an increase in social welfare over the period.

Of course since 2007-2008 Ireland, like many countries, has experienced a sharp reversal in its economic fortunes, and the extent of this reversal has probably been greater than in other OECD countries.  Unfortunately, our dataset does not cover years after 2001 so it not possible to extend this analysis to more recent years.  But it would certainly represent a useful extension of this work if similar analysis could be applied to some measures of well-being for the post 2007 period.

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**Figure 1: Subjective Well-Being, Linear Scale, 1994=100**
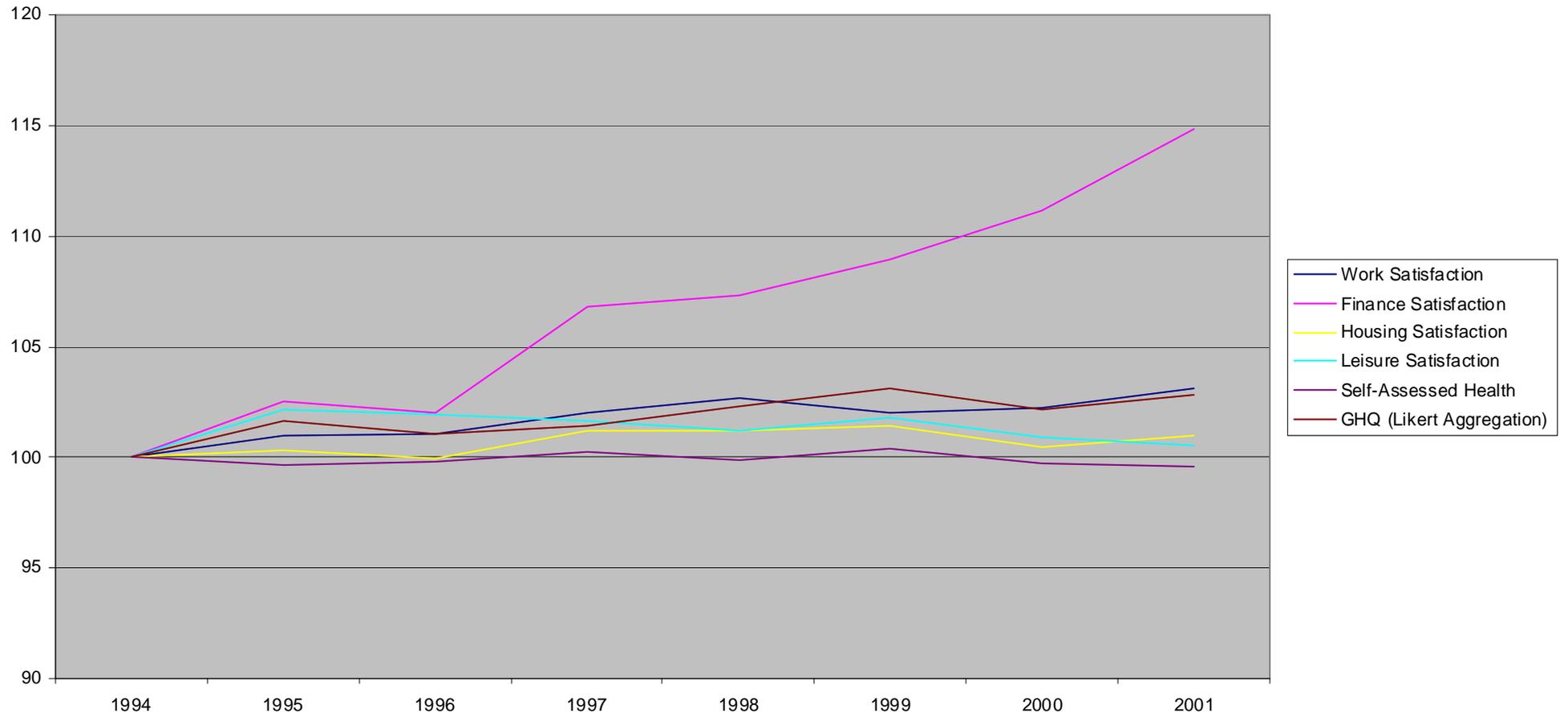
**Figure 2: Naga-Yalcin Index of Inequality of Subjective Well-Being**
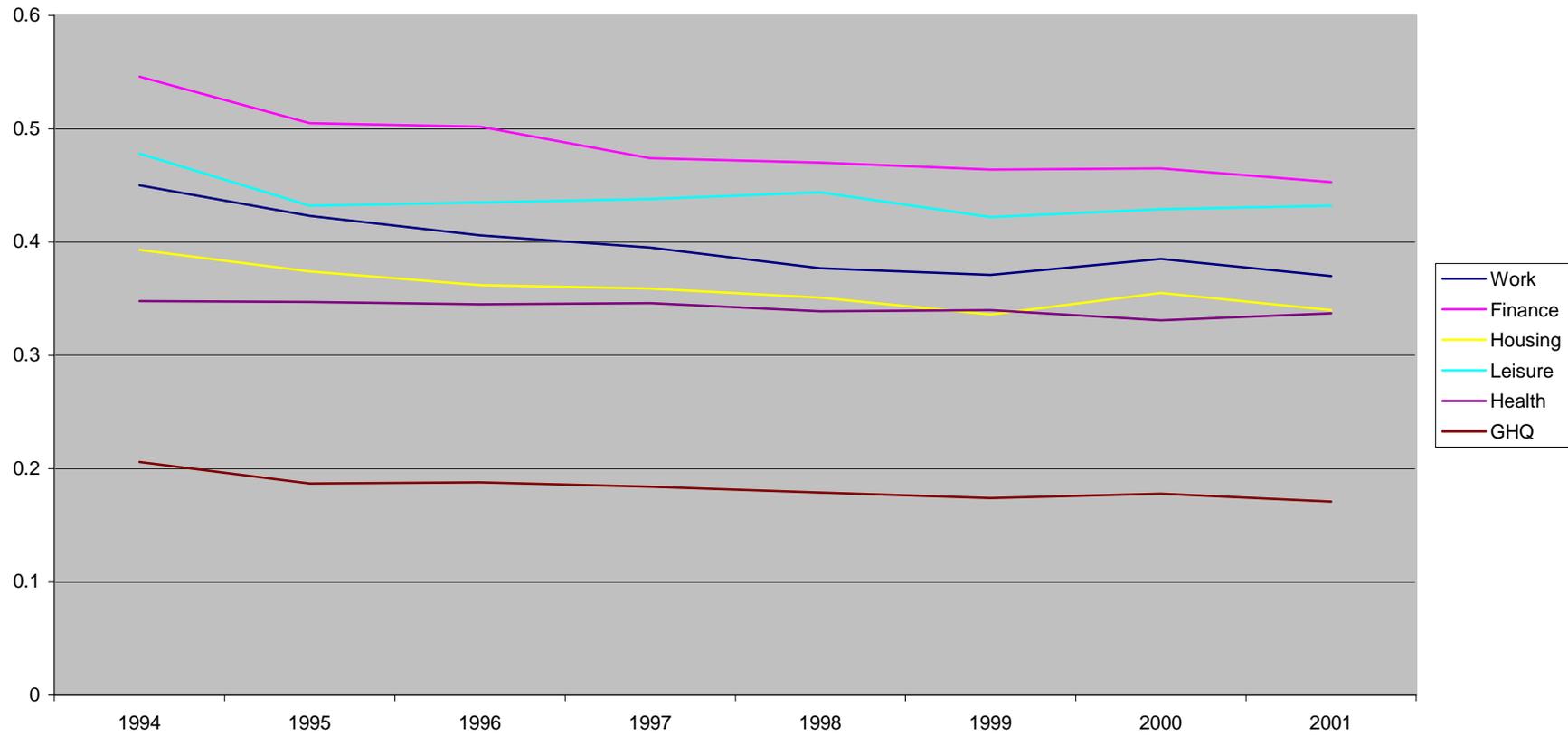
**Figure 3: Apouey Index of Polarisation of Subjective Well-Being**
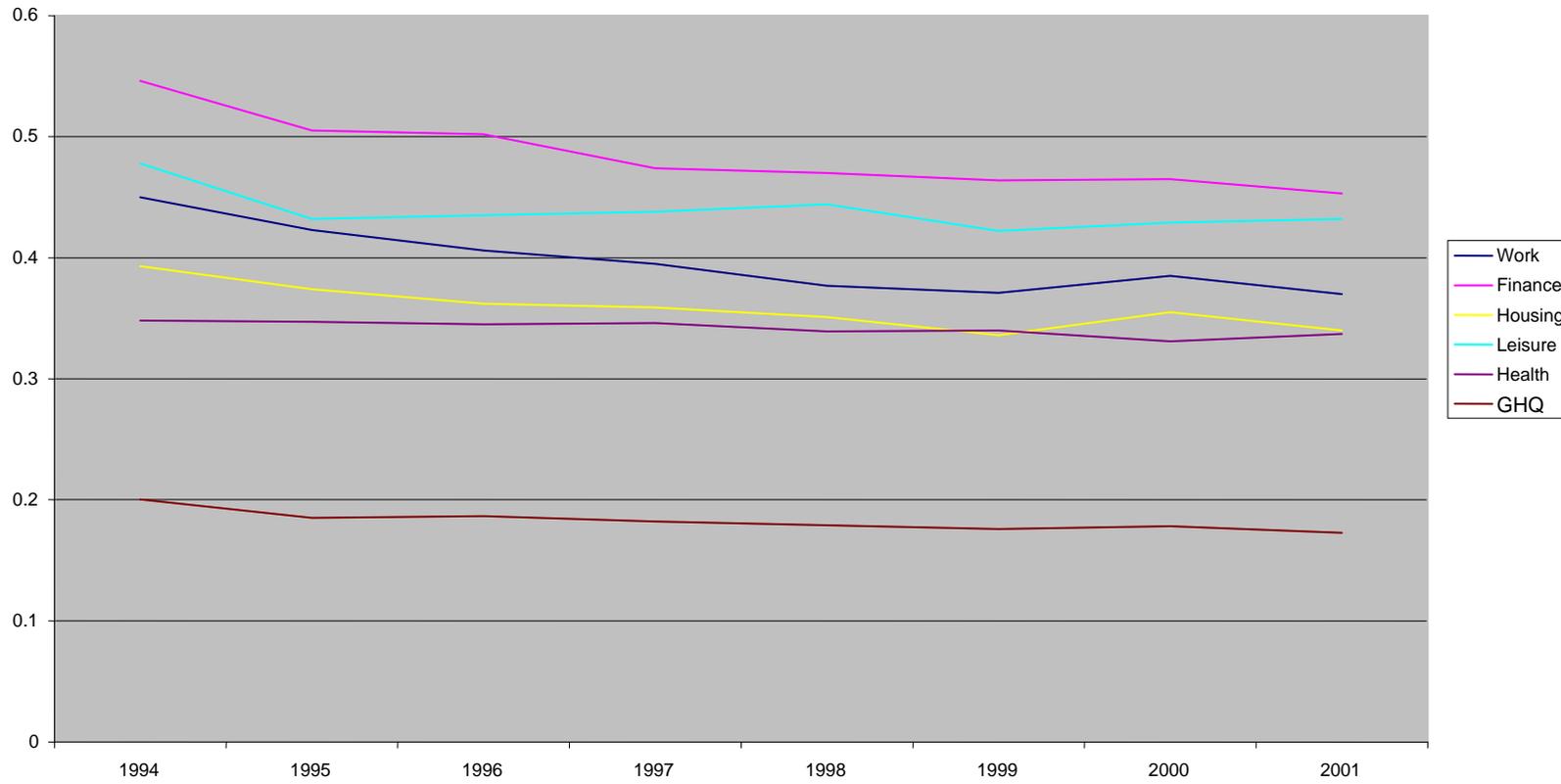
# Table 1: Ireland, Key Economic Indicators, 1994-2001

| Year | GNP<br>% Change | GNP Per Head<br>% Change | Unemployment<br>Rate (%) |
|---|---|---|---|
| **1994** | 6.5 | 6.1 | 14.7 |
| **1995** | 8.0 | 7.5 | 12.2 |
| **1996** | 7.8 | 7.0 | 11.9 |
| **1997** | 10.1 | 8.9 | 10.3 |
| **1998** | 7.7 | 6.5 | 7.6 |
| **1999** | 8.5 | 7.4 | 5.5 |
| **2000** | 9.4 | 8.0 | 4.3 |
| **2001** | 4.0 | 2.4 | 3.8 |

Source: Central Statistics Office "National Income and Expenditure" and Census 2006, Labour Force Survey, Quarterly National Household Survey.

# Table 2: Dominance, Work

|  | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|
| **1994** |  | S | S | S | S | S | S | S |
| **1995** |  |  | S | S | S | S | S | S |
| **1996** |  |  |  | S |  | S | S | S |
| **1997** |  |  | F |  | S | S | S | S |
| **1998** |  |  |  |  |  |  |  |  |
| **1999** |  |  |  |  |  |  |  |  |
| **2000** |  |  |  |  |  | S |  | S |
| **2001** |  |  |  |  |  | S | F |  |

# Table 3: Dominance, Finance

|  | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|
| **1994** |  | S | S | S | S | S |  |  |
| **1995** |  |  |  | S |  |  |  |  |
| **1996** |  |  |  |  |  |  |  |  |
| **1997** |  | F | F |  |  |  |  |  |
| **1998** | F | F | F |  |  |  |  |  |
| **1999** | F | F | F | F | F |  |  |  |
| **2000** | F | F | F | F | F | F |  |  |
| **2001** | F | F | F | F | F | F | F |  |

## Table 4: Dominance, Housing

|      | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|------|------|------|------|------|------|------|------|------|
| **1994** |  | S | S | S | S | S | S | S |
| **1995** |  |  | S |  | S | S | S | S |
| **1996** |  |  |  |  |  | S |  | S |
| **1997** |  | F |  |  | S | S |  | S |
| **1998** |  |  |  |  |  | S | F | S |
| **1999** |  |  | F |  |  |  | F |  |
| **2000** |  |  |  |  |  | S |  | F, S |
| **2001** |  |  |  |  |  |  |  |  |

## Table 5: Dominance, Leisure

|      | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|------|------|------|------|------|------|------|------|------|
| **1994** |  | S | S | S | S | S | S | S |
| **1995** |  |  |  |  |  | S | S | S |
| **1996** |  |  |  |  |  | S | S | S |
| **1997** |  |  |  |  |  | S | S | S |
| **1998** |  |  |  |  |  | S | S | S |
| **1999** |  |  |  |  |  |  | F |  |
| **2000** |  |  |  |  |  |  |  | F |
| **2001** |  |  |  |  |  |  |  |  |

## Table 6: Dominance, Health

|      | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|------|------|------|------|------|------|------|------|------|
| **1994** |  | F |  |  | S | S | S | S |
| **1995** |  |  | S |  | S |  | S | S |
| **1996** |  | F |  |  | S |  | S | S |
| **1997** |  | F | F |  | S | S | S | S |
| **1998** |  |  |  |  |  |  | S | F |
| **1999** |  | F | F |  | F, S |  | S | F |
| **2000** |  |  |  |  |  |  |  |  |
| **2001** |  |  |  |  |  |  | S |  |

## Table 7: Dominance, GHQ

|      | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|------|------|------|------|------|------|------|------|------|
| 1994 |      | S    | S    | S    | S    | S    | S    | S    |
| 1995 |      |      | F    |      | S    |      | S    | S    |
| 1996 |      |      |      | S    |      |      | S    | S    |
| 1997 |      |      |      |      |      |      |      |      |
| 1998 |      |      |      | F    |      |      | F    | S    |
| 1999 |      | F    | F    | F    | F    |      | F    | S    |
| 2000 |      |      |      | F    |      |      |      |      |
| 2001 |      |      |      | F    |      |      | F    |      |

## Table 8: Abul-Naga Index of Inequality (α=1, β=1).

|      | Work  | Finance | Housing | Leisure | Health | GHQ   |
|------|-------|---------|---------|---------|--------|-------|
| 1994 | 0.450 | 0.546   | 0.393   | 0.478   | 0.348  | 0.206 |
| 1995 | 0.423 | 0.505   | 0.374   | 0.432   | 0.347  | 0.187 |
| 1996 | 0.406 | 0.502   | 0.362   | 0.435   | 0.345  | 0.188 |
| 1997 | 0.395 | 0.474   | 0.359   | 0.438   | 0.346  | 0.184 |
| 1998 | 0.377 | 0.470   | 0.351   | 0.444   | 0.339  | 0.179 |
| 1999 | 0.371 | 0.464   | 0.336   | 0.422   | 0.340  | 0.174 |
| 2000 | 0.385 | 0.465   | 0.355   | 0.429   | 0.331  | 0.178 |
| 2001 | 0.370 | 0.453   | 0.340   | 0.432   | 0.337  | 0.171 |

## Table 9: Abul-Naga Index of Inequality (α=1, β=5).

|      | Work  | Finance | Housing | Leisure | Health | GHQ   |
|------|-------|---------|---------|---------|--------|-------|
| 1994 | 0.558 | 0.651   | 0.499   | 0.582   | 0.479  | 0.266 |
| 1995 | 0.534 | 0.616   | 0.486   | 0.544   | 0.480  | 0.252 |
| 1996 | 0.517 | 0.608   | 0.480   | 0.547   | 0.479  | 0.25  |
| 1997 | 0.509 | 0.600   | 0.472   | 0.549   | 0.477  | 0.246 |
| 1998 | 0.492 | 0.601   | 0.468   | 0.554   | 0.475  | 0.243 |
| 1999 | 0.483 | 0.600   | 0.457   | 0.535   | 0.473  | 0.241 |
| 2000 | 0.499 | 0.610   | 0.473   | 0.540   | 0.471  | 0.239 |
| 2001 | 0.487 | 0.602   | 0.461   | 0.543   | 0.475  | 0.231 |

## Table 10: Apouey Index of Polarisation (γ=0.6).

|      | Work  | Finance | Housing | Leisure | Health | GHQ (γ=0.8) |
|------|-------|---------|---------|---------|--------|-------------|
| 1994 | 0.345 | 0.446   | 0.309   | 0.370   | 0.306  | 0.200       |
| 1995 | 0.325 | 0.401   | 0.292   | 0.333   | 0.301  | 0.185       |
| 1996 | 0.313 | 0.399   | 0.278   | 0.335   | 0.300  | 0.186       |
| 1997 | 0.305 | 0.365   | 0.281   | 0.340   | 0.305  | 0.182       |
| 1998 | 0.291 | 0.362   | 0.274   | 0.348   | 0.294  | 0.179       |
| 1999 | 0.286 | 0.354   | 0.260   | 0.328   | 0.299  | 0.176       |
| 2000 | 0.291 | 0.354   | 0.273   | 0.335   | 0.285  | 0.178       |
| 2001 | 0.285 | 0.345   | 0.261   | 0.340   | 0.291  | 0.172       |