LSE Growth Commission

INSTITUTE FOR GOVERNMENT

HOORAY FOR GDP!

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Abstract

Should raising the growth rate of GDP per capita be a policy goal of governments in general, and of the British government in particular? Many people would say no, for the following reasons: 1. GDP is hopelessly flawed as a measure of welfare; 2. Growing GDP is pointless since most people don't benefit; 3. Raising GDP per capita is pointless as it doesn't make people any happier; and 4. The planet is finite, so further growth of GDP (at least in rich countries) is not feasible anyway. I discuss and reject all four of these objections. I urge the LSE Growth Commission to focus its efforts on policies to increase the growth rate of GDP per capita in the medium and long run.

1. Introduction

The much-loved poet John Betjeman is reported to have said on his deathbed that the one thing he regretted in his life was not having had more sex. This reminds us (if we needed reminding) that there is more to life than just buying and consuming stuff. But this is what GDP is: output of (or viewed another way, expenditure on) stuff. Presumably the LSE Growth Commission wants to promote growth but growth of what? Should it be GDP or GDP per capita or something else entirely, such as happiness or well-being? Many people today would say that promoting the growth of GDP is undesirable or even irresponsible. Undesirable, because (at least in rich countries) it benefits only a few at the price of rising inequality. Irresponsible, because continued growth risks irremediable damage to the environment.

I want to argue that these criticisms of GDP are wrong and that continued growth of GDP per capita in a country like the UK would most likely be a good thing, and not just in the short term as a way to reduce the currently high level of unemployment (desirable though that would be). So I need to confront the commonest criticisms of GDP as a target of policy:

1. GDP is hopelessly flawed as a measure of welfare. It ignores leisure and women's work in the home. It takes no account of pollution and carbon emissions.
2. GDP ignores distribution. In the richest country in the world, the United States, the typical person or family has seen little or no benefit from economic growth since the 1970s. But over the same period inequality has risen sharply.
3. Happiness should be the grand aim of policy. But the evidence is that, above a certain level, a higher material standard of living does not make people any happier. So we should stop looking for policies to raise GDP and look instead for policies which promote happiness.
4. Even if higher GDP were a good idea on other grounds, it's not feasible because the environmental damage would be too great. The planet is finite, so if the truly poor in the third world are to be allowed to raise their standard of living by a modest amount, then consumers in the rich countries will have to accept a lower standard of living, i.e. lower not higher GDP per capita should be the aim for them.

In what follows I consider each of these arguments in turn.

2. "GDP is hopelessly flawed as a measure of welfare"

In response to this claim I would make three points:

1. GDP is and always was intended to be a measure of output, not of welfare. In current prices it measures the value of goods and services produced for final consumption, private and public, present and future; future consumption is covered since GDP includes output of investment goods. Converting to constant prices allows one to calculate growth of GDP over time (or differences between countries across space). The exclusion of home production and leisure is not due (I believe) to prejudice against women but to the desire on the part of national income accountants to avoid imputations wherever possible. However, it is not very difficult to include values for leisure and home production provided the necessary data on time use are available and provided one can decide on an appropriate wage rate to value time spent in non-market activities.
2. Though not a *measure* of welfare, GDP can be considered as a *component* of welfare. The volume of goods and services available to the average person clearly contributes to welfare in the wider sense, though of course it is far from being the only component. So one can imagine a social welfare function which has GDP as one of its components along with health, inequality, human rights, etc: see the comments below on the Stiglitz-Sen-Fitoussi Report.
3. GDP is also an *indicator* of welfare. In practice, in cross-country data GDP per capita is highly correlated with other factors which are important for human welfare. In particular it is positively correlated with life expectancy, negatively correlated with infant mortality, and negatively correlated with inequality. Infant mortality might be considered as an indicator of happiness, insofar as parents feel grief for lost children. Charts 1-3 illustrate these facts (actually these charts, from Oulton (2012), plot household consumption per capita rather than GDP per capita against each welfare measure, but the picture for GDP would be very similar), for some 126-146 countries in 2005. The simple correlations between these measures are in Table 1. In other words, richer countries tend to have greater life expectancy, lower infant mortality,

and lower inequality. Correlation is not necessarily causation, though one might certainly make the case that higher GDP per capita causes improved health (Fogel, 2004).

Table 1
Cross-country correlations between household consumption per capita and inequality, life expectancy and infant mortality in 2005

	Real HC per head	*Life expect-ancy*	*Infant mortality*	*Gini coeff-icient*
Real HC per head	1.00			
Life expectancy	0.71	1.00		
Infant mortality	-0.65	-0.92	1.00	
Gini coefficient	-0.55	-0.54	0.43	1.00

Source: Oulton (2012). Household consumption is at purchasing power parity. PPPs calculated by a multilateral EKS (Fisher) index. Number of countries varies: 146 for household consumption and infant mortality, 144 for life expectancy, and 126 for the Gini coefficient.

According to the Commission on the Measurement of Economic Performance, policy should be concerned with well-being and well-being is multi-dimensional (Stiglitz et al., 2009, page 15) :

"To define what well-being means a multidimensional definition has to be used. Based on academic research and a number of concrete initiatives developed around the world, the Commission has identified the following key dimension that should be taken into account. At least in principle, these dimensions should be considered simultaneously:

i. Material living standards (income, consumption and wealth);

ii. Health;

iii. Education;

iv. Personal activities including work

v. Political voice and governance;

vi. Social connections and relationships;

vii. Environment (present and future conditions);

viii. Insecurity, of an economic as well as a physical nature."

Both the OECD and within the UK the ONS now have programmes in hand to develop these improved measures. Originally branded as "Beyond GDP", this is now characterised as "GDP and beyond", a change in emphasis with which I would agree. The criticisms in the Stiglitz-Sen-Fitoussi Report of GDP (considered narrowly as a measure of output) as currently measured in many countries, though mostly of long standing, e.g. the measurement of government output, are well-taken.

Few will disagree that these dimensions of life are important for human welfare and no-one can object to improved measurement. In the British case my only doubt is whether the ONS is capable of taking on a potentially vast new programme when the basic economic statistics on which GDP rests are inadequate (Oulton, 2004). In my contribution to the now forgotten Allsopp Review of 2004 (it used to be on the main Treasury website but has now been moved to the "historic" section), I argued that the ONS should implement the OECD's recommendations on capital and productivity measurement: OECD (2001a) and (2001b). This has yet to be done. To give two examples:

- The ONS has yet to implement double deflation on the output side of the UK national accounts, despite this also being a Eurostat requirement. The effect is that the "real" side of the accounts lacks an important consistency check. Abstracting from taxes on expenditure, the growth of real output should equal the growth of real final expenditure. At the moment this consistency is enforced by a fudge: the growth of some industries, e.g. banking, is "adjusted", so that the two sides of the national accounts match to within a prescribed tolerance.
- The estimates of capital stocks are methodologically inconsistent with the estimates of capital services (which are currently suspended anyway). The balance sheet estimates are inconsistent with both.[1]

We can go a long way towards a measure of welfare by just using the apparatus of the national accounts. The concept known as Weitzman's Net National Product is the key one here (Weitzman, 1976 and 2003). It formalises and develops earlier work by Hicks and others. It is defined in real terms as consumption plus *net* investment, the latter valued in terms of consumption:

[1] The balance sheet estimates include "land and buildings", the capital stock estimates include only buildings. But you should not try to estimate the value of land by subtraction since the buildings part is estimated differently in the two series.

$$WNNP(t) = C(t) + \sum_{i=1}^{N} P_i(t)[I_i(t) - D_i(t)] / P_C(t)$$

Here C is the volume of consumption, P_i is the price of the i-th investment good, P_C is the price of consumption, I is gross investment and D is depreciation (both the latter in real terms). The two things to note are that depreciation is subtracted from the right hand side and that nominal net investment is deflated by the price index for consumption. Weitzman showed that his NNP could be thought of as the yield on society's wealth and was therefore equal to the maximum sustainable level of consumption. The present system of national accounts requires depreciation to be estimated (even if this is not done very well due to lack of information about asset lives) in order to calculate a different concept of NNP. So it is fairly simple to calculate WNNP from published national accounts.[2] In principle one would want to include the net addition to *all* assets that are relevant to human welfare, including environmental stocks. In practice of course we are a long way from achieving this. For example, the UK national accounts include mineral oil exploration as part of gross investment but depletion of oil and gas stocks by extraction is *not* included in depreciation and so NNP is overstated.

Weitzman's concept is not beyond criticism. It understates the level of sustainable consumption unless the growth rate of TFP is zero. Conceivably, if all assets such as R&D stocks were included, then TFP growth really would be zero. But the findings of those who have extended the concept of capital by adding intangible assets suggest otherwise: they still find a significant role for TFP (Corrado *et al*., 2009; Marrano *et al*., 2009). However the *growth rate* of sustainable consumption is still correctly measured by the growth rate of WNNP even when TFP growth is non-zero. Another criticism of WNNP is that it does not allow properly for leisure. This has led Basu *et al*. (2012) to suggest that TFP growth itself should be the way to measure welfare growth. If they are right about this then improving the national accounts merits even higher priority.

[2] In Oulton (2004b) I calculated WNNP for the US and compared its growth with that of GDP.

3. "Growing GDP is pointless since most people don't benefit"

This claim is most often made in relation to the United States. Many people assert that real household income levels there have stagnated since the 1970s, despite labour productivity and GDP per capita growing quite rapidly.[3] It is non-controversial that income inequality has been rising for decades in the U.S. but does this mean that the typical household has received no benefit from growth? A comprehensive examination of these issues has recently appeared in an article by Wolff *et al*. (2012). Their results reveal quite a different picture.

They define a number of income concepts which are superior to GDP as a measure of household welfare: Comprehensive Disposable Income (CDI), Post Fiscal Income (PFI), and their preferred measure, the Levy Institute Measure of Economic Well-Being (LIMEW). CDI is household income, including property income (on an annuitized basis), less taxes plus cash and non-cash benefits. PFI adds to this individual public consumption (e.g. publicly-provided health and education but not things like defence). Finally LIMEW adds the value of household production. These measures are all per household. For LIMEW they also report equivalent median income; "equivalent" means that corrections are made for changing household size and composition. They estimated each of these income measures over the period 1959-2007 and for various sub-periods. Since measuring economic welfare over time is the objective, they convert each measure to real terms using the CPI and consider the median household values.

The growth rates of these four concepts of household income appear in lines 1-4 of Table 2. Let's concentrate on the last column initially, which shows growth over the whole period 1959-2007. The big point to take away is that median LIMEW grew at 0.67%, and equivalent median LIMEW at 1.01% p.a. Furthermore if we look at the sub-periods in the table we can see that there is no sign of a slowdown, except perhaps in 2004-2007. The period 1959-1972, supposedly the golden age of economic growth, was actually a comparatively poor one for households. Far and away the best period for households was 1982-1989 which coincides

[3] There is considerable evidence that mean real wages, broken down by age, sex and educational level, have stagnated since the 1970s. But this does not quite establish that living standards have also stagnated since the composition of the labour force might have shifted to better-paying jobs. Also, property income, taxes and benefits have to be taken into account too.

roughly with the Reagan presidency if we are allowed to ignore 1980-1981, the Volcker deflation and recession.[4]

The second big point to take away from Table 2 is that all these measures grew much less rapidly than GDP per capita, shown in Line 9, which grew at 2.18% p.a. over this period. None of the household measures grew at anything like this rate, e.g. their preferred measure, median LIMEW, grew at only 0.67% p.a. What accounts for this huge gap? Wolff *et al*. don't discuss this much but here is my explanation:

- Household size and composition have been changing: there are fewer children and more single households (Gordon, 2009). Hence equivalent median LIMEW grew faster than median LIMEW by some 0.34% p.a. (the same household income is spread over a smaller number of people).
- If the distribution of income had stayed the same, then mean LIMEW would have grown at the same rate as the median. In fact, the mean grew faster than the median by 0.30% p.a. Equivalent mean LIMEW therefore grew (I estimate) at 1.31% p.a.
- LIMEW is deflated by the CPI while GDP is deflated by the GDP deflator (more precisely, each component of GDP is deflated by its own price index). It so happens that the consumption deflator grew more rapidly than the GDP deflator: the difference was 0.31% p.a.[5] Employing the GDP deflator rather than the consumption deflator raises the growth of median equivalent LIMEW to 1.62% p.a.
- Much of the remaining gap between this and GDP per capita can probably be explained by the fact that household production is included in LIMEW but not in GDP: household production grows slowly because by assumption there is zero technical progress. This may account for another 0.3% p.a. of the difference.

These remarks are not meant to suggest that GDP per capita is a better measure of welfare than (equivalent) median LIMEW, but rather to explain how there can be such a large difference between the growth rates of the two.

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[4] GDP per capita was 2.8% below its 1979 level in 1982 which helps to explain some of the rapid growth after 1982.

[5] This is probably because the prices of investment goods have been falling in relation to consumption goods, i.e. technical progress has been more rapid in investment goods. That GDP should grow faster than consumption is a likely consequence in such an economy: to keep the capital output-ratio constant in current price terms, investment has to growth faster than consumption in steady state (Oulton, 2007 and 2012).

The conclusion is that the median U.S. household has gained significantly from economic growth since 1959. This remains the case even though the median household would have gained more (to the extent of 0.30% p.a.) if inequality had not widened. However most of the gap between the growth of GDP per capita and of median LIMEW is not due to rising inequality but to the other factors detailed above. Furthermore, and contrary to the common view, there were large gains in the 1980s which continued, albeit at a slower rate, in the 1990s and even into the 2000s.

The little bit of analysis above is an attempt to show how one can move "beyond GDP" and to explain how household welfare relates to GDP. Of course it is only a statistical decomposition. It would be much harder to explain the differences in a fundamental sense. For that one would need amongst other things a theory of technical progress and also of divorce (to explain changing household composition), not to mention political economy models explaining changes in tax rates and benefits.

Table 2
Real income measures, per capita and per household, in the United States: annual percentage rates of growth, 1959-2007

	1959-1972	*1972-1982*	*1982-1989*	*1989-2000*	*2000-2004*	*2004-2007*	*1959-2007*
1. Median CDI	1.22	-0.29	2.16	0.88	0.62	0.16	0.85
2. Median PFI	1.55	-0.38	2.16	1.00	0.69	0.65	0.98
3. Median LIMEW	0.36	-0.68	2.82	0.93	0.96	0.22	0.67
4. Equivalent median LIMEW	0.94	-0.13	3.22	0.97	0.84	0.42	1.01
5. Mean LIMEW	0.53	-0.41	2.87	1.90	0.22	0.73	0.97
6. Equivalent mean LIMEW	1.11	0.14	3.27	1.94	0.10	0.93	1.31
7. PCE deflator less GDP deflator	0.32	0.35	0.25	0.32	0.35	0.33	0.31
8. Equivalent mean LIMEW deflated by GDP deflator	1.43	0.49	3.52	2.26	0.45	1.27	1.62
9. GDP per capita	2.73	1.34	3.37	2.03	1.26	1.58	2.18

Sources
Wolff *et al*. (2012), Tables 2 and 3, and own calculations. GDP per capita (chained 2005 dollars) is from the U.S. NIPA, Table 7.1, and the PCE and GDP deflators are from U.S. NIPA, Table 1.1.4; downloaded on 18/05/2012 from www.bea.gov. Lines 1-4 are from Table 2 of Wolff *et. al.* (2012). Line 5 is my calculation based on Table 3 of Wolff *et al*. (2012).
Notes
CDI: Comprehensive Disposable Income. CDI equals LIMEW less the value of household production and public consumption, per household.
PFI: Post Fiscal Income. PFI equals LIMEW less the value of household production, per household.
LIMEW: Levy Institute Measure of Economic Well-Being, which is income less taxes plus cash and non-cash benefits plus individual public consumption plus household production, with property income valued on an annuity basis, per household.
Equivalent median LIMEW: median LIMEW per equivalent household, i.e. after adjusting for household size and composition.
Equivalent mean LIMEW: calculated as growth of *equivalent median* LIMEW plus growth of *mean* LIMEW minus growth of *median* LIMEW.
CDI, PFI and LIMEW are deflated by the personal consumption deflator. GDP per capita is deflated by the GDP deflator.

4. Should GDP be adjusted for inequality?

There have been a number of suggestions for discarding GDP in favour of a measure which takes explicit account of inequality. One of the best-known is the measure based on the Atkinson index of inequality (Atkinson, 1970):

$$Z = \left(\sum_{i=1}^{N} y_i^{1-\varepsilon} \right)^{1/(1-\varepsilon)}, \ 0 \le \varepsilon < 1$$

where y_i is the income of the *i*-th person (or household) and ε is a parameter measuring "inequality aversion": if $\varepsilon = 0$ then society cares nothing for inequality. If there were no taxes and transfers, i.e. if all income were from work or property, and if there were no concern for inequality ($\varepsilon = 0$), then the Atkinson measure reduces to GDP per capita (or per household).

In the standard treatment of which the Atkinson index is an example, equality is *per se* bad, though people may differ in the extent to which they are inequality averse. Inequality aversion is captured by the ε parameter in the Atkinson index. I would argue that our moral intuitions about inequality are too complex to be wholly captured by this formulation. In particular the crucial issue of desert is omitted. If the Atkinson/Sen approach were the whole story, then social welfare would be raised by abolishing two institutions (amongst others): the national lottery and the Nobel prizes. Both increase inequality unambiguously. Indeed Nobel prizes must be the most unequally distributed of all forms of income: only a dozen or so individuals receive one each year out of a world population of seven billion. Nobel prizes could be justified on Rawlsian grounds: monetary incentives are needed to induce the effort required to make discoveries which benefit everyone, including the worst off. But suppose that it could be conclusively shown that the monetary rewards are not necessary, and that the prize winners (and their less successful colleagues) would have expended the same effort in exchange for just the honour and glory alone? I suspect that most people would still be quite happy to see the winners receive a monetary reward, even if it was not economically required. This is because they are perceived to deserve it. With the National Lottery a different form of desert comes into play. Some winners receive £20 million pounds and in one sense no-one is worth this amount. But anyone can buy a lottery ticket and so long as the lottery process is perceived as fair most people are quite happy with the outcome.

Desert is a complex issue and it may be that people's views are not entirely consistent. Who gets the money and for what may well make a difference. The large rewards paid to professional footballers are seen by most people as justified (as long as they are playing well) but not the similar-sized rewards paid to bankers, especially in the current conjuncture.

Then there is the issue of redistribution, particularly welfare payments. Here it is obvious that notions of desert play a major role in most people's thinking. Paying Disability Living Allowance to an injured former soldier may well be seen as one thing, paying it to a drug addict with consequential mental health problems may seem quite another. Whether what I take to be common moral perceptions can be justified philosophically is not the point here. The point is that they exist and in a democracy they should be taken into account.

My own view therefore is that the Commission should not endorse any particular measure of GDP adjusted for inequality. Inequality concerns are real but there is still a case in my view for separating questions of growth from questions of distribution.

5. "Raising GDP per capita is pointless as it doesn't make people any happier"

Surveys of well-being or happiness repeatedly show that within any given country at any point in time richer people report themselves to be happier than poorer people. But when the same survey is repeated in the same country over time there is no rise in the average level of happiness despite the fact that per capita income has gone up. Most of the time series evidence is for the U.S. and this result is known as the Easterlin paradox.[6]

The commonest explanation for the paradox and the one suggested by Easterlin himself, is that, at least above a certain level of income, people care more about their relative position in the income scale than they do about their absolute position. They are motivated by envy and ideas of "keeping up with the Joneses", and also by the satisfaction obtained by looking down on the less successful, more than by the pure desire for stuff. This explanation reconciles the

[6] The time series evidence has been disputed by Stevenson and Wolfers (2008).

cross-section and time series evidence. But it leaves the implication that stopping growth would have no effect on happiness. Also, more redistribution from rich to poor would raise overall happiness (provided it did not reduce GDP too much through adverse incentive effects).

I must admit that I am puzzled by these survey results, mainly because they are inconsistent with other facts about people's behaviour. First, one might ask, if people care mainly about their relative position, why has there been so much fuss about the financial crisis? After all, for most British people the drop in income has been (on this view) trivially small, no more than five per cent, and furthermore it fell disproportionately on the rich (at least initially). Second, if people care about their relative position, why does this have to be expressed in terms of annual income? After all, most workers today can work part time if they want to. So why can't A boast that his daily rate of pay is higher than B's even if B's *annual* earnings are higher because smart A works only 3 days a week while poor dumb B, a slave to the rat race, works five? Also surveys of part time workers regularly show that many would like to work longer hours if only they could. It is true that some leisure activities like skiing require a lot of complementary expenditure on stuff but many other activities such as watching TV, surfing the Internet, chatting with friends in pubs or cafés, or avoiding Betjemanian regret, do not.

In fact, people's leisure choices provide powerful evidence against the view that only relative position matters. The Classical economists argued that the amount of time people were prepared to work depended on the range of goods and services available for consumption. This was the basis for Adam Smith's "vent for surplus" theory of international trade, which was elaborated by John Stuart Mill (1871, Book III, chapter XVII):

> "A people may be in a quiescent, indolent, uncultivated state, with all their tastes either fully satisfied or entirely undeveloped, and they may fail to put forth the whole of their productive energies for want of any sufficient object of desire. The opening of a foreign trade, by making them acquainted with new objects, or tempting them by the easier acquisition of things which they had not previously thought attainable, sometimes works a sort of industrial revolution in a country whose resources were previously undeveloped for want of energy and ambition in the people: inducing those who were satisfied with scanty comforts and little work, to work harder for the gratification of their new tastes,

and even to save, and accumulate capital, for the still more complete satisfaction of those tastes at a future time."

Let's perform a simple thought experiment. Imagine that over the 220 or so years since the Industrial Revolution began in Britain *process* innovation has taken place at the historically observed rate but that there has been no *product* innovation in *consumer* goods (though I allow product innovation in *capital* goods). UK GDP per capita has risen by a factor of about 12 since 1800.[7] So people today would have potentially vastly higher incomes than they did then. But they can only spend these incomes on the consumer goods and services that were available in 1800. In those days most consumer expenditure was on food (at least 60% of the typical family budget), heat (wood or coal), lighting (candles) and clothing (mostly made from wool or leather). Luxuries like horse-drawn carriages were available to the rich and would now in this imaginary world be available to everyone. But there would be no cars, refrigerators, washing machines or dishwashers, no radio, cinema, TV or Internet, no rail or air travel, and no modern health care (e.g. no antibiotics or antiseptics). How many hours a week, how many weeks a year and how many years out of the expected lifetime would the average person be willing to work? My guess is that in this imaginary world people would work a lot less and take a lot more leisure than do real people today. After all, most consumer expenditure nowadays goes on products which were not available in 1800 and a lot on products not invented even by 1950.[8]

This insight is obscured in modern formulations of growth theory which assume that the representative consumer maximises the present value of a utility function whose arguments are consumption (good) and work (bad):

$$U_t = \int_0^\infty u[c(t), \ell(t)] e^{-(\rho - n)t} dt$$

Here u is utility, c is consumption per capita, ℓ is the proportion of time devoted to work, ρ is the discount rate and n is the population growth rate. It can then be shown that the only form of the utility function capable of yielding a constant proportion of time devoted to work in the steady state is the following (Barro and Sala-i-Martin, 1995, chapter 9):

$$u(c, \ell) = \frac{c^{1-\theta} \cdot \exp[(1-\theta) \cdot \omega(\ell)]}{1-\theta}, \ \theta > 0, \ \omega'(\ell) < 0, \ \omega''(\ell) \leq 0$$

[7] Source: spreadsheet accompanying Maddison (2003).

[8] Only about a tenth of the family budget goes on food nowadays and even within the food basket many items (such as the British national dish, microwave–ready chicken tikka marsala) were not available in 1800.

and this form is the one usually assumed, at least implicitly.[9] This matches the facts (roughly) as of course it is designed to do. But my argument is that the rough constancy of the labour/leisure choice is a bit of an accident, produced by a kind of battle between product and process innovation. There is no guarantee that this constancy will persist. If consumer product innovation falters then I would expect leisure to rise. Of course other factors are at work here too: increased longevity, itself probably a product of economic growth, is generating pressure for increased work effort.

In summary, people's choice between labour and leisure demonstrates that they value higher consumption in an absolute and not just a relative sense. So rising GDP per capita would be in accordance with people's desires and preferences. Philosophers and social critics may object that the average person's desires and preferences are trivial, ill-informed and misguided (an attitude which can be traced back at least as far as Plato's *Republic*), but I think the Growth Commission should take people as they are.

According to the World Happiness Report, page 67: " … [A] reasonable interim conclusion is as follows:

> 1. In a typical country, economic growth improves happiness, other things equal. But other things are not necessarily equal, so economic growth does not automatically go with increased happiness. Thus policy-makers should balance the argument for more rapid growth against the arguments for supporting other sources of happiness. This applies to countries at every level of development.
> 2. In developed countries in particular there is strong micro-level evidence of the importance of income comparisons, which has not been disproved by aggregate data. For this reason policies to raise average happiness must target much else besides economic growth."

There is more than a whiff of the philosopher king about the first of these points. After all, even the U.S. constitution only guarantees the right to *pursue* happiness not a right to happiness *per se*. Actually, it is not clear to me that policy-makers have to choose between policies to promote GDP and policies to promote happiness, assuming the latter could be

[9] Sometimes people just assume that leisure is constant, drop ℓ, and write the utility function simply as $u = c^{1-\theta}/1-\theta$.

reliably identified. This is not necessarily a guns or butter choice. Promoting faster growth may be a matter of smarter regulation (in principle either higher or lower but certainly different) which would not be resource intensive. Alternatively, the Commission might recommend more costly policies such as more expenditure on education and apprenticeship for the lower half of the ability distribution. But such policies might also help to reduce inequality and so arguably promote happiness too.

Again on page 92 the Report states: "The first lesson of happiness research is that GDP is a valuable goal but that other things also matter greatly. So GDP should not be pursued to the point where:

- economic stability is imperiled
- community cohesion is destroyed
- the weak lose their dignity or place in the economy
- ethical standards are sacrificed, or
- the environment, including the climate, is put at risk."

I did not find in their report any evidence that any of these risks (with the possible exception of the last one, on which see the next section) will materialise in a country like Britain if GDP continues to grow.

6. "The planet is finite, so ever-rising GDP is just not feasible"

The issues raised by this statement in the title of this section are obviously of huge importance and I do not claim to be an expert on them. But at the very least I think the Commission has a communication or PR problem which it needs to address. Many people including I suspect most natural scientists would agree with the statement.

Consider for example the recent report issued by the Royal Society entitled *People and the Planet* (Royal Society, 2012). The flavour of its conclusions can be gathered from the summary on the Royal Society website:

> "Rapid and widespread changes in the world's human population, coupled with unprecedented levels of consumption present profound challenges to human health and wellbeing, and the natural environment. This report gives an overview of how global population and consumption are linked, and the implications for a finite planet.

Key recommendations include:

1. The international community must **bring the 1.3 billion people living on less than $1.25 per day out of absolute poverty**, and reduce the inequality that persists in the world today. This will require focused efforts in key policy areas including economic development, education, family planning and health.
2. **The most developed and the emerging economies must stabilise and then reduce material consumption levels** through: dramatic improvements in resource use efficiency, including: reducing waste; investment in sustainable resources, technologies and infrastructures; and systematically decoupling economic activity from environmental impact."

Use of the phrase "material consumption" leaves a bit of wiggle room. It is possible that real consumption (as measured in the national accounts) could continue to rise while "material consumption" (of water, fish stocks, minerals, etc) was falling. This possibility is mentioned but not discussed in the Report. So it's fair to assume that a reduction in "material consumption" would entail a reduction of actual, national accounts consumption. It's often said that we live in a service economy but most of household consumption is of goods and public consumption like health and education requires large material inputs (buildings, energy, etc). In its preferred scenario GDP per capita is equalised across the world at $20,000 in 2005 PPP terms by 2050 (Report, page 81). The UK's GDP per capita was $31,580 in 2005 PPPs so this would imply a 37% cut.

When they think about economic growth natural scientists tend to think about biological processes, say the growth of bacteria in a Petri dish. Seed the dish with a few bacteria and what follows looks like exponential growth for a while. But eventually as the bacteria cover most of the dish growth slows down. When the dish is completely covered growth stops. End of story.

Well, not quite. To natural scientists it's a no-brainer that exponential growth is only a temporary phase, but it's not quite so obvious to economists. It's true that the solution to a standard growth theory model, which typically ignores the environment, is perpetual exponential growth. Without this property it wouldn't be a growth model! The reason for designing this into the models is that exponential growth is just what we have observed for the last 200 years, at least in the more fortunate parts of the world. But this doesn't mean that economists haven't though about the effect of environmental limits on growth.

First, adding a resource in fixed supply such as land to a standard growth model does not change anything much: growth can still be exponential forever provided that the population growth rate is not too high (Nordhaus *et al.*, 1992). Second, adding a fixed but depletable resource such as the stock of oil to a standard growth model does not change anything much either: growth can still be exponential forever provided that technical progress is sufficiently fast; the precise condition is that the growth rate of TFP must exceed the share of oil in the value of GDP times the real rate of interest, a fairly mild condition (Jones, 2002, chapter 9).

These models all treat the environment as a source for growth. The environment also serves as a *sink* for the by-products of economic activity. The Green Solow model of Brock and Taylor (2010) treats this case. In their model production generates emissions which add to the global stock of pollutants such as CO_2. Once this stock surpasses a certain level the costs are assumed to be so severe that disaster ensues. Emissions can be reduced by abatement activities which are costly. Also, there is technical progress in emissions: the quantity of pollutants emitted per unit of total input falls over time. Is perpetual exponential growth still possible while the total (not per capita) stock of pollutants is held constant at a sustainable level? The answer is again yes but now the condition is more demanding: technical progress in emissions reduction must be at a faster rate than the rate of technical progress in production plus the growth rate of population.

These models all have in common the result that perpetual exponential growth is possible provided that technical progress is sufficiently rapid. In one sense there is nothing new here. After all, even in growth models (whether exogenous or endogenous) which ignore the environment completely long run growth is only possible with technical progress; without it

(and absent some extreme assumptions), diminishing returns to ordinary physical capital will bring long run growth to a halt.

What is the evidence on all this? In 1980 Paul Ehrlich made a famous bet with Julian Simon that the price of a basket of minerals would rise by 1990. Ehrlich lost but the Royal Society Report notes that he would have won if the end date had been extended to the present. It is not clear to me that this uptick in minerals prices (also noted by Acemoglu, 2012) should be taken too seriously. The minerals in the basket were chromium, copper, nickel, tin and tungsten. So what are far and away the most important minerals economically, oil, gas and coal, were omitted. Many observers think we are about to enter a new age of carbon abundance: "tight oil" and "shale gas", extracted by fracking, will lead to a major increase in supply. Markets anyway have always been optimistic about future resource supplies. Weitzman (2003) argued that the prices of the major minerals imply that resource depletion is a minor concern. He compared the real world with an imaginary world in which a good fairy replaces every barrel of oil or every ton of minerals back in the ground after it has been extracted. The prices of oil, gas and 11 other important minerals imply that the imaginary world would be better off only to the extent of about 1.5% of global GDP in 1994. The interest of this calculation is that it is a market forecast, exploiting the fact that the price of a mineral is an asset price and so takes account of future as well as current scarcity. This calculation needs to be brought up to date. And I certainly would not want to argue in the wake of the financial crisis that markets always get it right. But Weitzman's result is still very suggestive.

On the impact of human activities on the environment in general we have the earlier work of Lomborg (2001) who found that on the whole most environmental indicators had improved in recent decades. Lomborg received a remarkable amount of personal vilification as a result of writing his book, and even physical assaults, but I am not aware that his work has been refuted. The Royal Society Report does not cite him though it does include citations to much work by natural scientists reaching more pessimistic conclusions.

The Growth Commission is not required to decide whether exponential growth is possible forever, but only whether it makes sense to advocate growth over the next 5, 10, 25, 50 or 100 years. The elephant in the room here is of course climate change due to CO_2 and other greenhouse gas emissions. I will have to leave it others more expert in this topic to decide

whether the UK can meet its carbon emission reduction targets while still enjoying growth in per capita GDP. One possibility which should be seriously considered is that the UK meets its targets but others do not, so that a serious deterioration in the global climate ensues. Then on more pessimistic scenarios maintaining UK living standards might not be feasible. But it seems to me that in this case the UK would need as much growth and innovation as possible in the run-up to this disaster in order to reduce the impact of the required abatement measures on living standards.

7. Conclusions

No-one disputes that raising the growth rate of GDP per capita from its current abysmal level would be a good idea in the short term, since unemployment is clearly above the NAIRU. But what about in the medium to long run, say the next 25, 50 or 100 years? This paper has considered a number of common objections to the desirability or feasibility of raising the growth rate and has seen reasons to reject them all. Having said that, it is possible that even if the Commission comes up with policies which increase physical and human capital accumulation and innovation, the growth rate may nevertheless fall. The reason is that people might choose to take their potentially higher incomes in the form of greater leisure. There is little sign of this occurring as yet. But if it did the Commission could still regard the outcome of its work as a success.

Chart 1

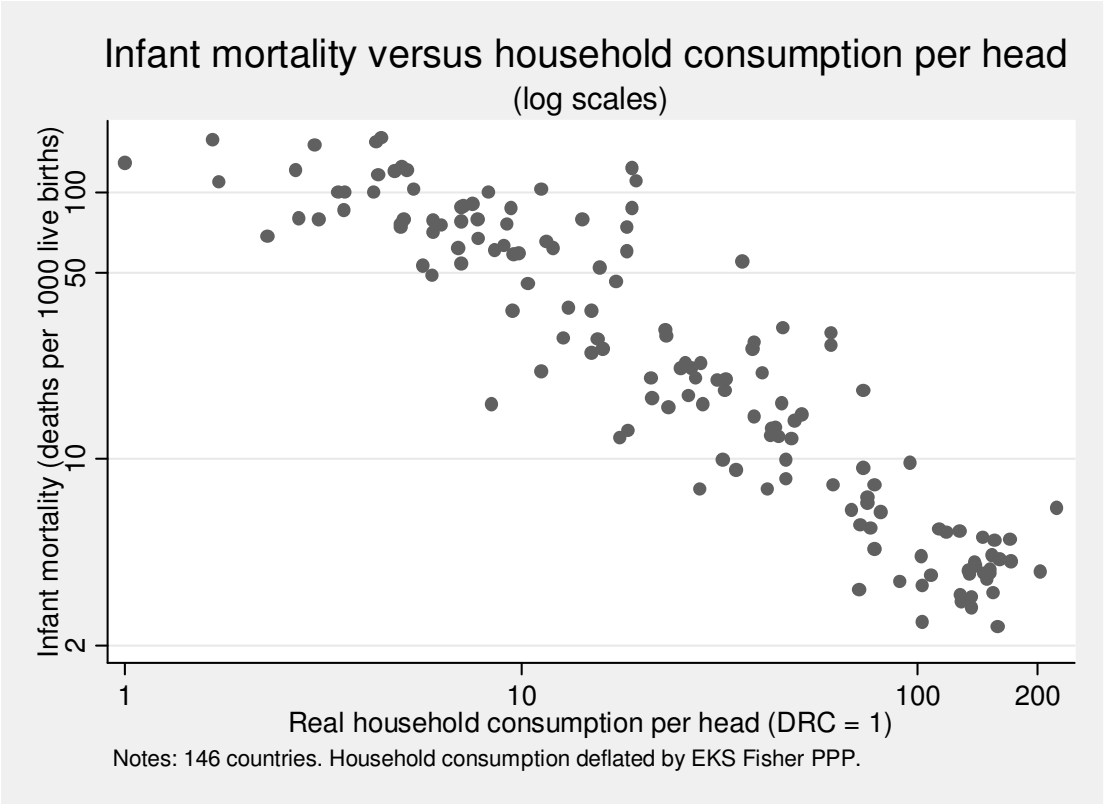

Infant mortality versus household consumption per head
(log scales)
Infant mortality (deaths per 1000 live births)
100
50
10
2
1
10
100
200
Real household consumption per head (DRC = 1)
Notes: 146 countries. Household consumption deflated by EKS Fisher PPP.

Chart 2

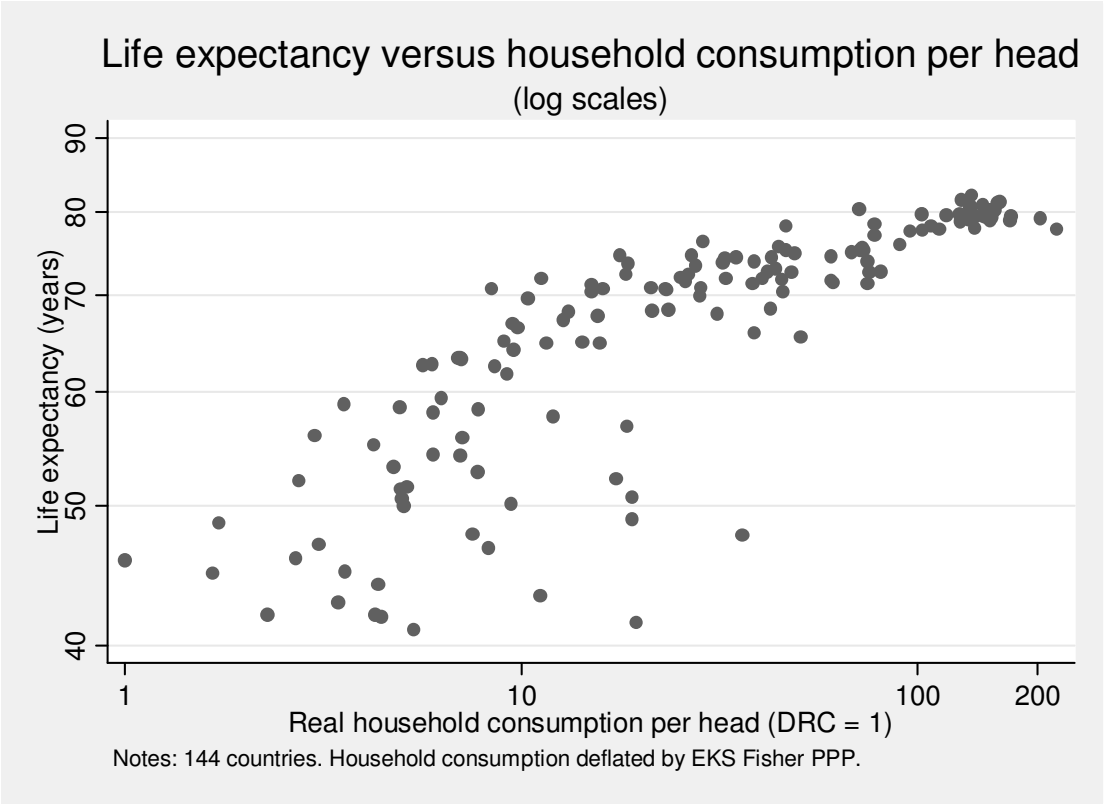
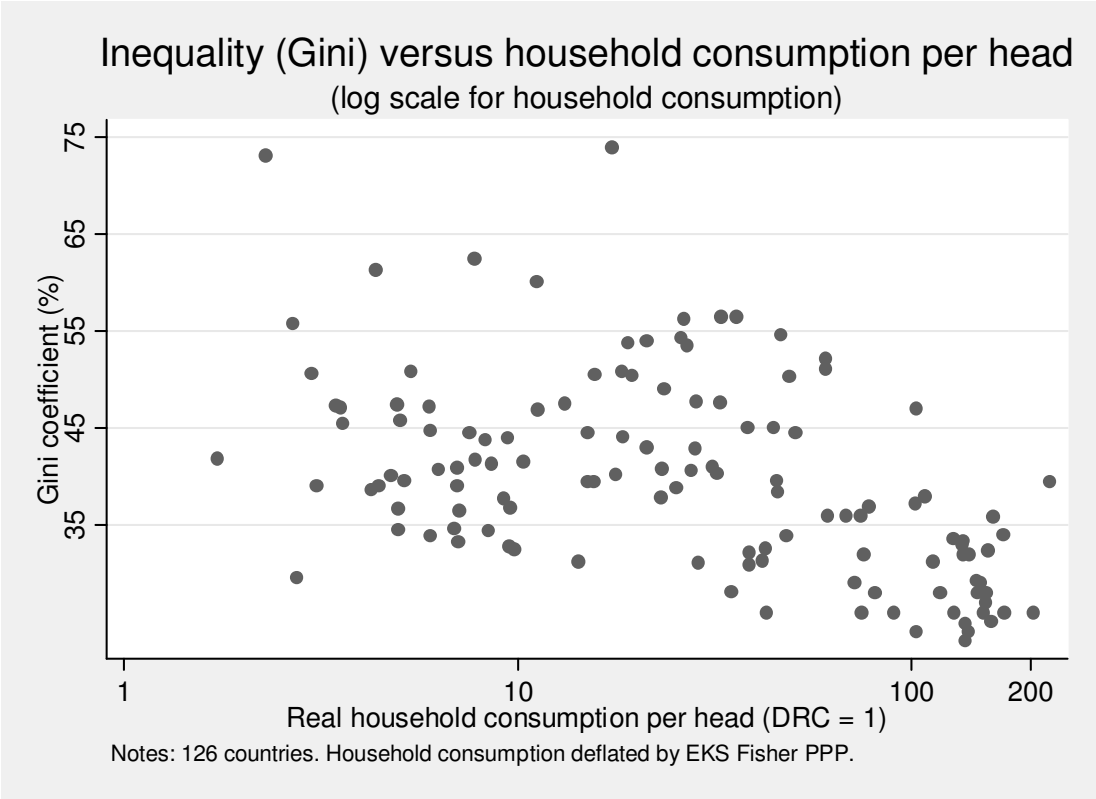

Life expectancy versus household consumption per head
(log scales)
Life expectancy (years)
90
80
70
60
50
40
1
10
100
200
Real household consumption per head (DRC = 1)
Notes: 144 countries. Household consumption deflated by EKS Fisher PPP.

Chart 3


Inequality (Gini) versus household consumption per head
(log scale for household consumption)
Gini coefficient (%)
75
65
55
45
35
1
10
100
200
Real household consumption per head (DRC = 1)
Notes: 126 countries. Household consumption deflated by EKS Fisher PPP.

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