

**GDP and the System of National Accounts:  
Past, Present and Future**

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## 1. Introduction<sup>1</sup>

“China became the world’s largest economy in 2014.” “UK GDP grew by 0.1% in the first quarter of 2018.” “In the Eurozone, inflation as measured by the Harmonised Index of Consumer Prices was up 1.4% in March 2018 compared to the previous March.” Any scanner of websites that cover business news can read statements like these on any day of the week. Each statement relies on modern economic statistics using the System of National Accounts (SNA) as their basis. This chapter briefly outlines how the SNA came to have such a powerful (if background) role. Further, it discusses some of the many criticisms levelled at the SNA, and particularly at Gross Domestic Product (GDP), its centerpiece. These criticisms fall into two groups. The first group raises doubts about how accurately GDP is measured. The second is more about the relevance of GDP (and the SNA) as a guide to policy. Even if GDP is measured accurately, is it measuring anything which thoughtful people should be interested in?

## 2. GDP and the SNA: A brief history<sup>2</sup>

Simon Kuznets was one of the founders of national income accounting (he was awarded the Nobel Prize in Economics in 1971). In 1959, he published a study that revealed perhaps the most important empirical finding in the whole of economics (Kuznets 1959).<sup>3</sup> His discovery was that economic growth, i.e. the growth rate of GDP per capita, was much higher after the industrial revolution than it had been at any earlier time. So the countries fortunate enough to have passed through the industrial revolution experienced a dramatic acceleration in economic growth and (eventually) in living standards. The industrial revolution therefore marks a new epoch in human history. To non-economists, the industrial revolution is usually characterized by the great inventions accompanying it, such as steam power and railways. But the advent of great inventions does not necessarily lead to faster growth of per capita GDP on a sustained basis. For a counter-example, consider the 15th and 16th centuries in Europe, which saw the invention of printing and improvements in shipbuilding and navigation such as the magnetic compass, which in turn led to the conquest and settlement of

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<sup>1</sup> This paper has appeared as a chapter in the Credit Suisse Research Institute report “The future of GDP”, May 2018, edited by Michael O’Sullivan. I am grateful to the Credit Suisse Research Institute for financial support.

<sup>2</sup> See Diane Coyle (2014) and (2018) for a more in-depth treatment.

<sup>3</sup> He developed the argument further in Kuznets (1966).

the Americas. But we now know that these great discoveries did not lead to an appreciable increase in the European growth rate.

How did Kuznets reach his dramatic conclusion? After all, in 1959, he only had data for 19 countries and these data only stretched back in most cases for about 80 years. He had no data for any country before the industrial revolution. The answer is that he employed a thought experiment. He took the growth rates of GDP per capita, which he had measured in his sample of countries (mostly in the range of 1%–2 % per year), and then asked the question: suppose these growth rates had prevailed in earlier centuries, how low would the standard of living have been 200 or 500 years ago? He calculated that the standard of living would have been so low that no-one could have survived. But if they could not have survived, then we would not be around to do these calculations today. Therefore, growth rates must have been lower before the industrial revolution than after it. One can easily convince oneself of Kuznets' point by calculating what sum would grow to say USD 1,000 (roughly equal to the World Bank's global poverty standard for annual income today) if compounded at 1% over 200 years. The answer is USD 135, less than a dollar a day. Compounding over 500 years, the answer is less than seven dollars a year. Clearly, these income levels are impossible. Kuznets' conclusions have subsequently been amply confirmed by direct estimates of income levels and growth rates in pre-modern economies e.g. Broadberry et al (2016) for Britain.

### *Uses of GDP*

During World War II, pioneering estimates of GDP were used by the UK and US governments for planning the war. Estimates of GDP in current prices sufficed for this purpose since the main question was how much could be spent on the armed forces without reducing household expenditure to an unacceptable level. After the end of World War II, the national income accounting revolution spread rapidly across the world. The United Nations, under the guidance of other pioneers like Richard Stone (awarded the Nobel Prize in Economics in 1984), took up the challenge of producing an internationally accepted System of National Accounts. The first version, all of 48 pages long, appeared in 1953. Subsequent versions have appeared in 1968, 1993 and 2008, and further updates are planned. The latest version (European Commission et al. 2009) has grown to 662 pages. For a time, the Soviet Union employed and enforced a rival system on its satellites, the Material Product System

(MPS), based on Marxist principles. The disappearance of the Soviet Union has meant the disappearance of the MPS too, even in countries run by communist parties like China.

The post-war development of the SNA met the needs of Keynesian macroeconomic management, support for which was spreading rapidly. For this purpose, GDP is necessary in constant as well as current prices. Quarterly as well as annual estimates of GDP started to appear. Keynesian notions of macroeconomic management are now less popular than they once were, but central banks with a remit to target inflation are just as keen to receive high quality and frequent estimates of GDP and its main components such as consumption and investment.

In parallel with the needs of monetary and fiscal policy, a new market for GDP and the SNA has arisen due to increasing interest in the problems of long-run growth and development, both in developing and developed countries. And this has sparked innovations in official statistics too, such as the capital and productivity manuals of the Organisation for Economic Cooperation and Development (OECD, 2001 and 2009, respectively). The first of these manuals on measuring capital enshrined the fundamental distinction between capital stocks and capital services, originally introduced by Jorgenson (1989), and showed how it could be incorporated into the SNA. Building on the pioneering contributions of Jorgenson and Griliches (1967) and Jorgenson et al. (1987), the second manual on productivity employed the concept of capital services to show how theoretically consistent measures of total factor productivity growth could be derived within the framework of the SNA.

With the rise of major new economic powers like China and more recently India, there has also been increasing interest in international comparisons of the size of different economies (GDP) and their relative standards of living (GDP per capita). The crucial institution here is the International Comparison Program (ICP) run by the World Bank in conjunction with the OECD. The 2005 round of the ICP included 146 countries, covering 95% of the world's population (World Bank 2008). The latest round in 2011 included 199 countries, virtually all the countries in the world, though full results are available for only 177 (World Bank 2015). Just as national statistical agencies (NSAs) track prices over time for their domestic price programs such as the Consumer Price Index, so the ICP tracks prices across countries at a given moment in time, e.g. mid-2011, via a collaborative and coordinated network of NSAs. The prices of the individual products and the overall averages for aggregates like household

consumption or GDP, all measured relative to US dollar prices in the USA, are known as Purchasing Power Parities (PPPs). In both the national and international programs, broadly the same methodology is used: “matched models” under which the agencies try to track the prices of identical models either over time or across space. The results can be controversial in some cases. China (and Asia generally) turned out to be considerably poorer under the 2005 comparison than many observers had expected. Following methodological changes, China’s and Asia’s ranking rose substantially in the 2011 ICP (Deaton and Aten 2017).

### **3. How accurately is GDP measured?**

At least in countries with well-developed statistical systems, GDP in current prices (nominal GDP) is considered to be measured reasonably well (it may be a different matter in poor countries (Jerven 2013)). There is much more concern about GDP in volume terms, i.e. real GDP, because moving from nominal to real GDP requires deflating each component by an appropriate price index. There are two major issues with price indices. First, they may not make adequate allowance for quality change and for new goods. Second, for some components of GDP, price indices often do not exist and are thus replaced by proxies or conventions.

#### *Bias in price indices*

There has long been concern that price indices may understate quality change and not make adequate allowance for the appearance of new goods, thus leading to an overstatement of inflation and an understatement of real economic growth (very few researchers have advocated the opposite position, though it may be true for individual products<sup>4</sup>). Most of this evidence is for the USA, but there is no reason to think that other developed countries are any better. Perhaps the strongest advocate of this view is Robert Gordon. His earlier work uncovered a huge underestimate of quality change in durable goods prices in the USA in the 19th and 20th centuries up until the early 1980s (Gordon 1990). For example, over the period

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<sup>4</sup> For example, when the US Bureau of Labor Statistics introduced hedonic methods to measure commercial rents, it found that the new index rose more rapidly than the “matched models” index it was replacing. The reason was that the old method used “matched apartments” to measure rents. But, over time, the apartments being matched were getting older and less desirable, and this was reflected in the market by declining rents. So the old index was understating inflation in commercial rents and hence overstating growth in the real volume of housing services (Wasshausen and Moulton 2006).

from 1947 to 1983, he found that the rate of growth of the official producers' durable equipment deflator was 3% per annum too high and the official deflator for consumer's durable expenditure was 1.5% per annum too high. He reached this result by replicating the methods used by the US Bureau of Labor Statistics (BLS), but using extensive non-official data, mostly successive issues of the Sears mail order catalogues. These gave prices together with descriptions of items like lawnmowers, sometimes accompanied by photographs, so he was able to apply the "matched models" method of statistical agencies. The "matched models" method involves tracking the price of the *same* model over time, thus holding quality constant.

In his more recent book (Gordon 2016), he has argued strongly that growth in the US standard of living since the Civil War and up to the 1970s is severely understated by official statistics because of the revolutionary new products that became available to the typical family over these decades (flush toilets, cars, radio, films, TV, air travel, etc.) are not given full credit in the national accounts.

The Advisory Commission to Study the Consumer Price Index (1996), commonly known as the Boskin Commission (of which Gordon was a member), argued that the Consumer Price Index (CPI) had been overstating US inflation by over 1% per year for the years leading up to 1996 due to a combination of factors including inadequate allowance for new goods and quality change. Other factors were substitution bias, outlet bias and formula effects.

There are two problems with incorporating the effect of new goods on inflation. First, by virtue of its newness, it may be some time before it is introduced into the price index. Second, even when it has been introduced into the index, its effect on the standard of living will be understated since only price changes after its introduction will affect the index. Everyone may agree that the new goods represent a significant increase in welfare, but this is not captured in the price index and so does not lead to an impact on real income. The first problem is an administrative and budgetary one. The second is more conceptual.

In fact, economic theory has long known how to cope with new goods (or vanished old goods) in calculating a price index. In the case of a new consumer good (or a new input), we should treat it as if it had always existed, but at a price where demand for it is reduced to zero, i.e. its reservation price, also called its virtual price. More precisely, the reservation

price is the minimum price at which there is zero demand for the specific good. Prior to its appearance, the new good's reservation price should be included in the price index, and the good's actual price should be included after its appearance (Hicks 1940). This makes it clear why ignoring new goods leads to an overestimation of price rises and a consequent underestimation of real growth. For the price of the new good has in fact fallen from its reservation level to its observed level, which is necessarily lower.

The problem is how to estimate the reservation price. Researchers have done this for individual products, most notably Hausman (1997) for a new brand of breakfast cereal (Apple Cinnamon Cheerios), see also Hausman (2003), but the results are controversial since they are dependent on particular assumptions about demand and on econometric methods (Groshen et al. 2017). A more easily implementable approach, based on a Constant Elasticity of Substitution (CES) demand system (Feenstra 1994; Redding and Weinstein 2016), may be appropriate in some contexts, but also suffers from restrictive assumptions about the pattern of demand and has the unpalatable property that the reservation price is infinite. More to the point, no statistical agency currently uses the reservation price approach to measure the impact of new goods. So the problem has been parked and we must wait for further research to see whether a practical method can be developed (here “practical” means, in part, “within the budget that governments are willing to allot to statistical agencies”). How much difference improved methods would make is hard to judge, though ballpark figures like an additional 0.5% per annum on GDP are sometimes mentioned. It is probably no coincidence that there has been renewed interest recently in possible understatement of GDP growth since GDP and productivity growth seem to have slowed down at least since the Great Recession began at the end of 2007 (or perhaps earlier). But there seems little reason to ascribe the slowdown to mismeasurement since the latter was at least as great a problem prior to the appearance of a slowdown (Byrne et al. 2016; Syverson 2017).

Statistical agencies will no doubt implement improved methods as time goes on and research delivers new solutions.<sup>5</sup> But a point to bear in mind is that price indices are almost never revised. So the shortcomings of earlier methods will remain in the historical record, even if the most recent years are better measured.

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<sup>5</sup> See Bean (2016) for a comprehensive set of recommendations tailored to the British case for improving economic statistics.

### *Missing or inappropriate price indices*

Real GDP can be measured either from the expenditure side, GDP(E), or from the output side, GDP(O). Consistency requires that the two measures should be equal. On the expenditure side, we have the familiar formula,  $GDP(E) = C + I + G + X - M$ . Private consumption (C) typically accounts for 60%–65% of GDP and here we can rely on the prices gathered for the Consumer Price Index. The CPI program is the largest and best-funded of all price-gathering programs. Gross fixed investment (I) accounts for another 20% or so of GDP. Here we have to rely on the much less well-funded Producer Price Index program. Exports (X) and imports (M) account for a large fraction of GDP (in some small countries a multiple of GDP), but what matters for GDP is the balance, typically a small proportion of GDP (plus or minus 1%–3%). Since rich countries these days tend to trade mainly with each other and the goods imported and exported are similar, any errors in export and import price indices will tend to cancel out.

That leaves government consumption (G) – defense and public administration, education, and health – as the remaining major component of GDP(E) and here there is a serious deficiency. Until recently, most countries measured real government output by real government input (essentially hours worked adjusted for the composition of the labor force), which left very little room for productivity improvement and allowed for no improvements in quality. Nowadays, some countries try to do better by using a collection of output measures weighted together by costs. For example, the output of the education sector can be measured by a weighted average of the numbers passing through each stage of the school system, weighted by the costs of providing each stage. This is better than measuring education output by hours worked in this sector, but hardly addresses the quality issue. The quality issue is perhaps greatest in health, where there have been large improvements in health outcomes, sometimes achieved at low cost; for example, the incidence of heart attacks and strokes has been greatly reduced by statins and aspirin. It is clear that these improvements are not reflected in the price indices for health output and expenditure. Improving these indices is an active area of research (Groshen et al. 2017).

On the output side, GDP is the sum of value added across industries. Here the appropriate price indices are Producer Price Indices and (where they exist) Service Producer Price Indices (ideally, inputs need to be deflated separately from outputs, but this is not always the case). In

practice, statistical agencies tend to put much more weight on the expenditure side for estimates of real GDP. The reason is that the bulk of GDP(E) is private consumption, where price indices are comparatively well measured, So (for example), the UK's Office for National Statistics adjusts the annual estimates of the growth of real GDP(O) so that they conform to the growth of real GDP(E) to within 0.1% per annum (Lee 2011). They do this by adjusting the growth rates of private service industries. The reason, no doubt, why the adjustment falls on private services is that this is where price indices are either inadequate or missing, so that they have to be replaced by proxies like the CPI. A large fraction of the output of a modern economy (often larger than the proportion accounted for by manufacturing) is made up of industries supplying mainly intermediate services to business, such as finance and business services of all kinds (accountancy, advertising, contract cleaning, design, legal, management consultancy, computer and software services, etc.). Here price indices are often of low quality or missing altogether (Timmer et al. 2010, pages 90–94). To the extent that we care just about GDP, this does not matter since these problems are largely absent on the expenditure side: business services are an intermediate product so drop out of GDP(E). But, if we also care about what is happening in individual industries, say because we want to trace the origins and impact of the Great Recession, then we will also need better price indices for important industries like finance and business services.

#### *Cross-country comparisons of price and income levels*

Although it has attracted far less attention than possible deficiencies in consumer and producer price indices, the accuracy of PPPs is just as pressing an issue. There are conceptual problems that are yet to be fully resolved. To take one example, the relative income levels yielded by successive rounds of the ICP are not consistent with extrapolating from one round to the next using the national accounts of the countries studied. Whether this should be treated as a fact of life or adjusted for in some way is still a matter of debate. One extreme is to largely ignore national accounts and base international comparisons solely on successive PPPs. The other extreme is to pick the “best” single set of PPPs and ignore the others; this approach makes maximal use of national accounts. The debate continues here and also in regard to finding some alternative compromise (Oulton 2015).

## *GDP and globalization*

In 2016 Ireland's Central Statistical Office announced that Irish real GDP rose by 26.3% in 2015, quite possibly a world record for a single year's growth and certainly putting China in the shade. This astonishing figure did not result from any revisions to underlying data nor from methodological changes but instead was due to application of the existing rules as approved by Eurostat. GDP measures output generated by residents (persons and corporations) of a given economic territory. But globalization has made residence a somewhat slippery concept. And this has been compounded by the rising importance of income accruing to intellectual property, e.g. royalties and fees for the use of technology and brands. Often these payments are made between subsidiaries of a multinational company. So where the subsidiary receiving these income flows is located can make a big difference to GDP, particularly if it is located in a small country. And it is no secret that location is mainly determined by tax considerations.

What seems to have happened in the Irish case is that one or more large multinationals moved the subsidiary which licenses technology and brands to the rest of the group to Ireland, causing the large jump in Irish GDP in 2015. Of course, this made little or no difference to the Irish standard of living. (Real household disposable income in Ireland rose by 4.6% in 2015, due to continuing recovery from the global financial crisis). And from a planetary point of view it was just a redistribution of, rather than an increase in, global output. Nevertheless it makes the interpretation of Ireland's GDP, and that of any other country in the future subject to such shifts of residence, problematic. It may well be the case that the Irish subsidiaries generating these huge income flows are not just located in but managed from Ireland. But it is also very likely that the intangible assets generating these flows were not created in Ireland but elsewhere, probably mostly in the United States. Future versions of the SNA will no doubt try to find a more realistic basis for the definition of residence.<sup>6</sup>

#### **4. Should we still care about GDP?**

The commonest criticisms of GDP as a target of policy are the following:

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<sup>6</sup> See OECD (2016) for a discussion of the Irish case.

1. GDP is hopelessly flawed as a measure of welfare. It ignores leisure and women's work in the home.
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 that promote happiness.
4. Even if higher GDP were a good idea on other grounds, it is 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.

I consider the first three criticisms in turn. Space precludes a discussion of the fourth.

*"GDP is hopelessly flawed as a measure of welfare"*

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.

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 that has GDP as one of its components along with health, inequality, human rights, etc. (see comments below on the Stiglitz-Sen-Fitoussi Report).

GDP is also an *indicator* of welfare. In practice, in cross-country data, GDP per capita is highly correlated with other factors that are important for human welfare. In particular, it is positively correlated with life expectancy, negatively correlated with infant mortality, and negatively correlated with inequality. Figures 1–3 illustrate these facts for some 126–146 countries in 2005 (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). In other words, richer countries tend to have greater life expectancy, lower infant mortality, and lower inequality (although this last relationship is not a linear one: some middle-income countries have high inequality, but nonetheless the richest countries are also the most equal ones). Correlation is not necessarily causation, though one might certainly make the case that higher GDP per capita causes improved health (Fogel, 2004; Deaton 2013).

Life expectancy rose steadily throughout the 20th century and is still rising on average in the 21st century. This means that people have more years in which to enjoy the higher consumption they now receive, an aspect of welfare which is not captured just by the GDP statistics. But, recently, the USA has seen a rise in mortality among less-educated, middle-aged whites due it seems to self-harming behavior – drug and alcohol dependency, accidents and suicide (Case and Deaton 2017). Whether this is a specifically American phenomenon, related perhaps to deficiencies in the US social safety net (Edin and Shaefer 2015), or whether the same phenomenon will appear in other developed countries remains to be seen.

According to the Commission on the Measurement of Economic Performance (the Stiglitz-Sen-Fitoussi Commission), 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.”

Few will disagree that these dimensions of life are important for human welfare and no-one can object to improved measurement. There is clearly a role for government in measuring and tracking these dimensions. To what extent, however, a dimension like “social connections and relationships” should be objects of government policy is open to question. It is doubtful that effective policy levers exist. And, even if they did, the scope for a vast extension of the reach of government is worrying.

If one sticks to measurement and is somewhat less ambitious than the Stiglitz-Sen-Fitoussi Report, then further progress is possible. Jones and Klenow (2016) use an expected utility framework to combine measures of life expectancy, inequality and consumption to construct what they call a consumption-equivalent welfare measure for a large sample of countries. Their measure turns out to be highly correlated with GDP per capita.

*“Growing GDP is pointless since most people don’t benefit”*

This claim is most often made in relation to the USA. Many people assert that real household income levels there have stagnated since the 1970s, despite labor productivity and GDP per capita growing quite rapidly.<sup>7</sup> It is non-controversial that income inequality has been rising for decades in the USA, but does this mean that the typical household has received no benefit from growth? A comprehensive examination of these issues appears in an article by Wolff *et al.* (2012). Their results reveal quite a different picture.

They define a number of income concepts that 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

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<sup>7</sup> There is considerable evidence that mean real wages, analyzed by age, gender 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 labor force might have shifted to better-paying jobs. And property income, taxes and benefits have to be taken into account too.

health and education, but not things like defense). 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 1, with the last column showing growth over the whole 1959–2007 period. The main 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. Interestingly, 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 roughly with the Reagan presidency if we are allowed to ignore 1980–1981, the Volcker deflation and recession.<sup>8</sup>

The second take-away from Table 1 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. as mentioned before. What accounts for this huge gap? Wolff *et al.* do not 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. According to my estimates, equivalent mean LIMEW (line 6) therefore grew by 1.31% p.a.

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<sup>8</sup> GDP per capita was 2.8% below its 1979 level in 1982, which helps to explain some of the rapid growth after 1982. GDP per capita grew at 2.43% p.a. over 1980–88, still faster than any sub-period except 1959–72.

- 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 CPI grew more rapidly than the GDP deflator: the difference was 0.45% p.a. over 1959–2007 (line 10). Employing the GDP deflator rather than the CPI raises the growth of equivalent mean LIMEW to 1.76% p.a. (line 7). Arguably it would be better to use the price index for personal consumption expenditure (PCE) from the US National Income and Product Accounts (NIPA) as a deflator. Methodologically, the PCE is superior to the CPI since it is an annually chained Fisher index, while the CPI is a bi-annually chained Laspeyres.<sup>9</sup> Line 8 shows that the result would then have been much the same as deflating by the GDP deflator.
- Much of the remaining gap between median LIMEW and GDP per capita can probably be explained by two factors. First, investment has grown faster than consumption over this period, pulling up GDP in relation to consumption.<sup>10</sup> Second, household production is included in LIMEW, but not in GDP: household production grows slowly because, by assumption, there is zero technical progress. These factors may account for the remaining 0.42% p.a. of the difference between the growth rates of median LIMEW and GDP per capita over the 1959–2007 period.

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.

The conclusion is that the median US 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 in GDP per capita and in 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.

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<sup>9</sup> McCully et al. (2007) show that from Q1 2002 to Q2 2007, almost half of the 0.4 percentage point difference between the two deflators in annual growth rates was explained by the formula effect; most of the rest was explained by differences in relative weights due to the use of different surveys.

<sup>10</sup> 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. To keep the capital output ratio constant in current price terms, investment has to grow faster than consumption in steady state.

The above analysis is an attempt to show how, while still making use of the SNA, one can move “beyond GDP” to explain how household welfare relates to GDP. The main point is that rising inequality has certainly reduced the gains from higher productivity that would otherwise have accrued to the typical US household, but has not eliminated these gains completely.

The analysis stops in 2007, the last year of the boom. The median household has certainly done worse during the Great Recession and its aftermath, mainly because of lower productivity growth and declining labor force participation. Whether these adverse headwinds will continue to operate is an important question. On the one hand there are techno-optimists like Brynjolfsson and McAfee (2014) who argue that developments in AI are about to open a cornucopia of productivity growth. On the other hand there are techno-pessimists like Gordon (2016) who argue the opposite: the great innovations are all in the past and the impact of developments in AI and IT will be much more limited in the future. Gordon’s pessimism finds support in Fernald’s work on the growth of total factor productivity (TFP) in the US. He finds that TFP growth started to slow down after 2003, four years before the onset of the Great Recession. But elsewhere I have argued that this pessimism is overdone (Oulton, 2018). Much of the slowdown in both labor productivity and TFP since 2007, particularly in Europe, is due to the Great Recession itself. So when the Western economies are fully recovered productivity growth can be expected to revive as well.

*Should GDP be adjusted for inequality?*

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

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

where  $y_i$  is the income of the  $i$ -th person (or household),  $N$  is the number of people (or households) and  $\varepsilon$  is a parameter measuring “inequality aversion.” If  $\varepsilon = 0$  then society cares nothing for inequality, in which case the Atkinson measure reduces to GDP per capita (or per household).

In the standard treatment, of which the Atkinson index is an example, inequality is bad *per se*, though people may differ in the extent to which they are inequality averse. 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 merit or desert is omitted. If the Atkinson/Sen approach were the whole story, then social welfare would be raised by abolishing two institutions (among others): the national lotteries run in many countries 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 some 7.5 billion. Nobel prizes could be justified on Rawlsian grounds: monetary incentives are needed to induce the effort required to make discoveries that 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 honor 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 national lotteries, a different form of desert comes into play. In the UK version, some winners receive GBP 20 million or more and, in one sense, no-one is worth this amount. But anyone can buy a lottery ticket and, as long as the lottery process is perceived as fair, most people are quite happy with the outcome.

Merit or 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 after the global financial crisis.

Then there is the issue of redistribution, particularly welfare payments. Here it is obvious that notions of merit or desert play a major role in most people's thinking. Paying welfare benefits to a former soldier with post-traumatic stress disorder may well be seen as one thing, paying the same amount to a drug addict with addiction-induced mental health problems may seem quite another. Whether justified philosophically or not, the point is that moral perceptions such as these exist and, in a democracy, they should be taken into account.

In summary, it is not clear that the Atkinson index would meet with universal approval, even setting aside the issue of varying “taste” for inequality (the parameter  $\epsilon$ ). There is certainly a case for developing an index that takes explicit account of inequality as does the Atkinson index. But, fortunately, we do not need to choose between GDP and the Atkinson index (or any similar one). We are free to use and argue for both.

*“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 USA. and this result is known as the Easterlin paradox.<sup>11</sup>

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 of those more successful than themselves and also by the satisfaction obtained by looking down on the less successful, rather than by the pure desire for material goods. This explanation reconciles the 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, given that the rich are less numerous than the poor. At least this would follow if we take a utilitarian view and provided that redistribution 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 behavior. 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 people in most countries, the drop in income has been (on this view) trivially small, no more than 5%, 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. Consider two workers, A and B. A has a higher daily rate of pay but chooses to work only

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<sup>11</sup> Easterlin (1973). The time series evidence has been disputed by Stevenson and Wolfers (2008).

three days a week. B, a slave to the rat race, earns less per day but chooses to work 5 days a week, so his annual income is higher than A's. So why can't A boast that his daily rate of pay is higher than B's even if his *annual* earnings are lower? That way he can satisfy his desire to lord it over B while still enjoying a leisurely lifestyle. In other words a concern for relative position does not necessarily force people to work harder or longer than they would otherwise wish to do. But perhaps B-types are commoner than A-types. Surveys of part-time workers regularly show that many would like to work longer hours if only they could.

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 us imagine that over the roughly 220 years since the beginning of the Industrial Revolution in Britain, *process* innovation has taken place at the historically observed rate, but there has been no *product* innovation in *consumer* goods (though I allow product innovation in *capital* goods). The UK's GDP per capita has risen by a factor of about 12 since 1800.<sup>12</sup> 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

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<sup>12</sup> Source: spreadsheet accompanying Maddison (2003).

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, dishwashers or smartphones, 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 his/her 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 time than people do today. After all, most consumer expenditure nowadays goes on products that were not available in 1800 and a lot on products not invented even by 1950.<sup>13</sup>

Overall, the proportion of time devoted to market work has not changed much in the last century, though this masks differences between women whose contribution has been rising, while that of men has been falling. But the rough constancy of the labor/leisure choice may be somewhat of an accident, produced by a 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 labor 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 policy should take people as they are, not as others would have them.

### **Conclusion: Not fade away?**

The thought experiment just discussed suggests another one. Assume that technical progress continues to raise labor productivity over the next century at something like the rate experienced in the last 100 years. Will the typical consumer in Western societies take the

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<sup>13</sup> Only about a tenth of the family budget goes on food nowadays and, even within the food basket, many items were not available in 1800.

benefits in the form of ever-increasing leisure? If so, consumers would be increasingly satiated with the goods and services that GDP measures. So, in this era of material abundance, GDP might come to be viewed as not wrong, but increasingly irrelevant. Such societies would probably have their share of problems due to the uses to which some people might put their ever-more-abundant leisure. But the analysis of such problems would not be helped much by the GDP statistics.

This second thought experiment envisages the same scenario as the first: no new consumer goods or services. We know that the two centuries since 1800 have seen an enormous variety of new consumer goods invented and made available on the market. It seems to me very unlikely that this inventiveness will simply come to a dead halt in the foreseeable future. So I expect new consumer goods to appear in a steady stream. On this count alone, GDP and the SNA will continue to be useful. Also much of the rest of the world outside the magic circle of Western societies remains poor. Today's poorer countries will likely retain an interest in GDP for many decades to come.

Throughout its more than 60-year official life, the SNA has expanded to address new concerns. The "core" SNA is now buttressed by satellite accounts covering interactions between the economy and the environment and household activities. I expect this process to continue and deepen as international discussions proceed toward agreeing on a successor to the 2008 SNA.

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**Table 1**  
**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
<i>Deflated by CPI-U</i>							
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
<i>Deflated by GDP or PCE deflator</i>							
7. Equivalent mean LIMEW (deflated by GDP deflator)	1.02	1.26	3.64	2.74	0.25	0.94	1.76
8. Equivalent mean LIMEW (deflated by PCE deflator)	1.35	1.16	3.25	2.55	0.47	1.29	1.77
9. GDP per capita	2.73	1.34	3.37	2.03	1.26	1.58	2.18
<i>Memo items</i>							
10. CPI-U deflator less GDP deflator	-0.09	1.12	0.37	0.80	0.14	0.00	0.45
11. PCE deflator less GDP deflator	-0.32	0.10	0.39	0.19	-0.22	-0.36	-0.01
12. CPI-U deflator less PCE deflator	0.23	1.02	-0.02	0.61	0.37	0.36	0.46

## Table 1, continued

### Sources

Wolff *et al.* (2012), Tables 2 and 3, and own calculations. 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). Line 9, GDP per capita (chained 2005 dollars), is from the U.S. NIPA, Table 7.1, and the PCE and GDP deflators are from the U.S. NIPA, Table 1.1.4; downloaded on 18/05/2012 from [www.bea.gov](http://www.bea.gov). The CPI-U (line 12), the Consumer Price Index for Urban Consumers, is from the U.S. Bureau of Labor Statistics, downloaded from [www.bls.gov](http://www.bls.gov) on 12/07/2012.

### Notes

CDI: Comprehensive Disposable Income. CDI equals LIMEW less the value of household production and public individual consumption, per household.

PFI: Post Fiscal Income. PFI equals LIMEW less the value of household production, per household.

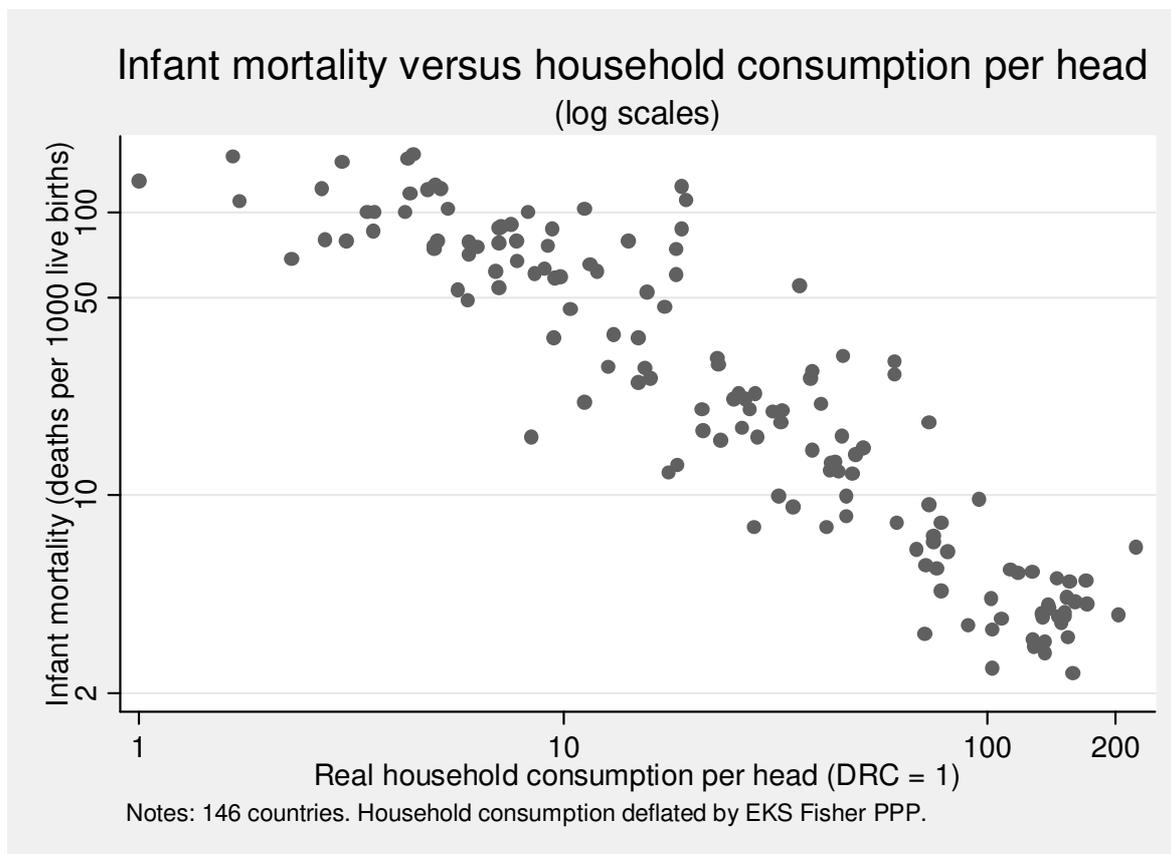
LIMEW: Levy Institute Measure of Economic Well-Being, which is income less taxes plus cash and non-cash benefits plus individual public consumption plus household production, with property income valued on an annuity basis, per household.

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.

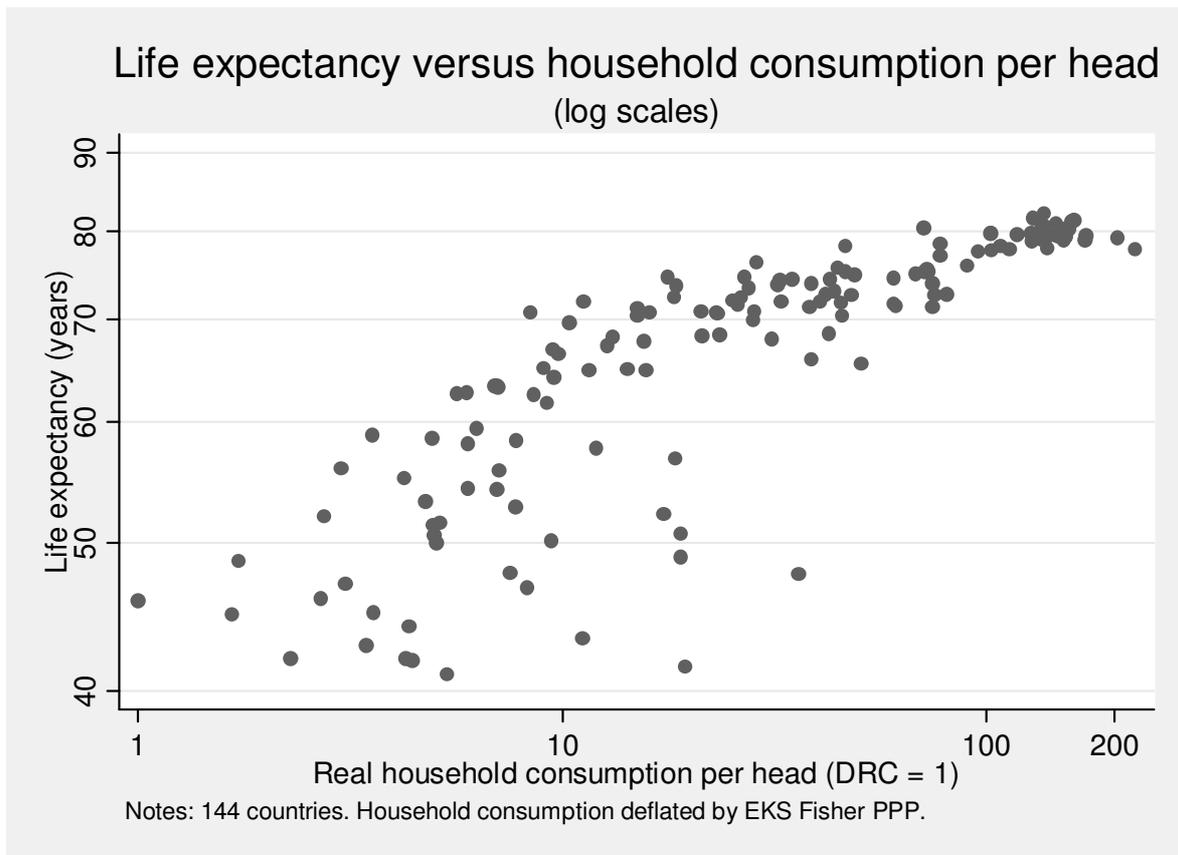
In lines 1-6, the deflator is the CPI-U. GDP per capita (line 9) is deflated by the GDP deflator.

Chart 1



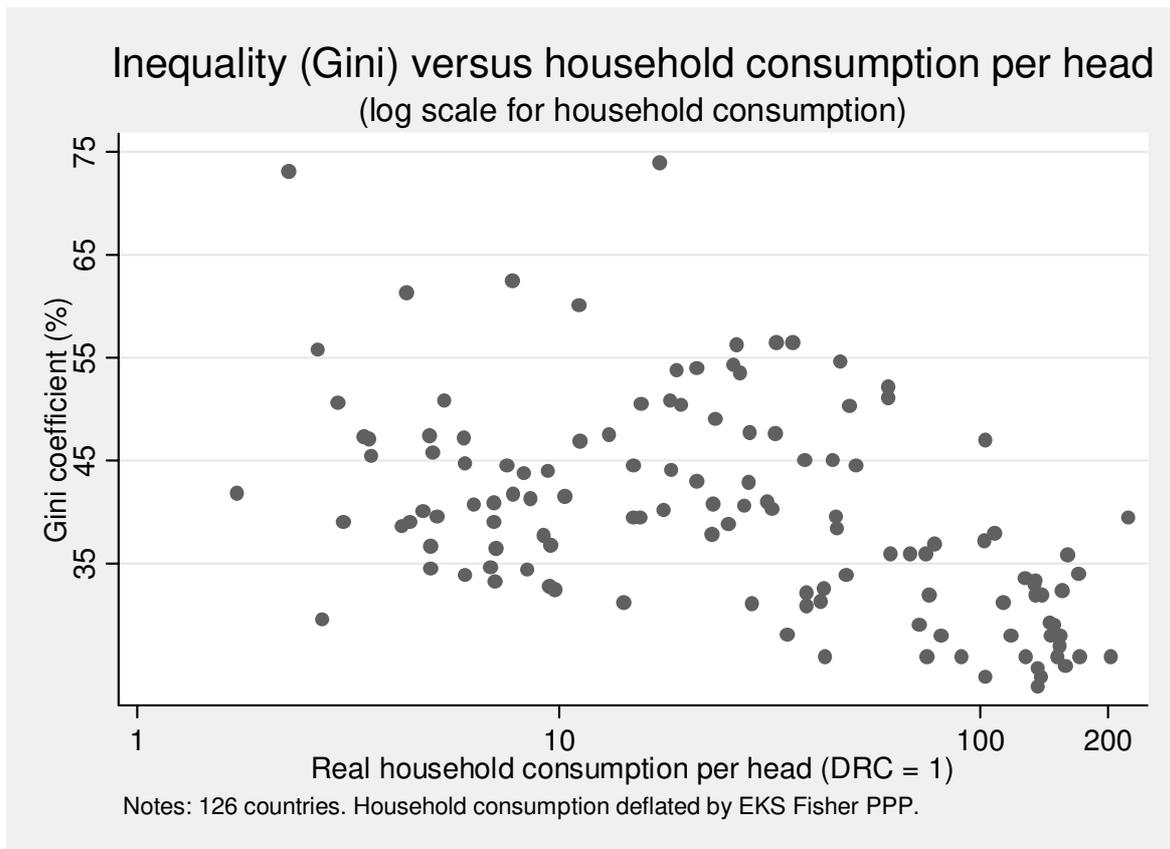
Source: Oulton (2012).

Chart 2



Source: Oulton (2012).

Chart 3



Source: Oulton (2012).