

Date: 23rd April 2015

Monthly Bulletin Supplement: Analysis of Scottish GDP measures over time

Measuring Scottish GDP

GDP remains a key measure of economic success for most governments, whether it be the level of GDP, GDP per head of population (as a measure of the standard of living), or in terms of its growth rate (as a measure of its on-going success).

The Office for National Statistics (ONS) recently revised UK GDP, based on an internationally agreed, improved, new methodology. Scottish government statisticians have now also updated Scottish GDP to be based on the same methodology.⁽¹⁾

This allows for an updated comparison of Scottish data on a number of basis including: its overall size and its growth rate; in cash and real (inflation adjusted) terms; GDP per head of population; and relative to the UK as a whole and to other countries.

The remainder of this Briefing Note considers each of these in turn.

Comparisons of Scottish and UK GDP growth rates

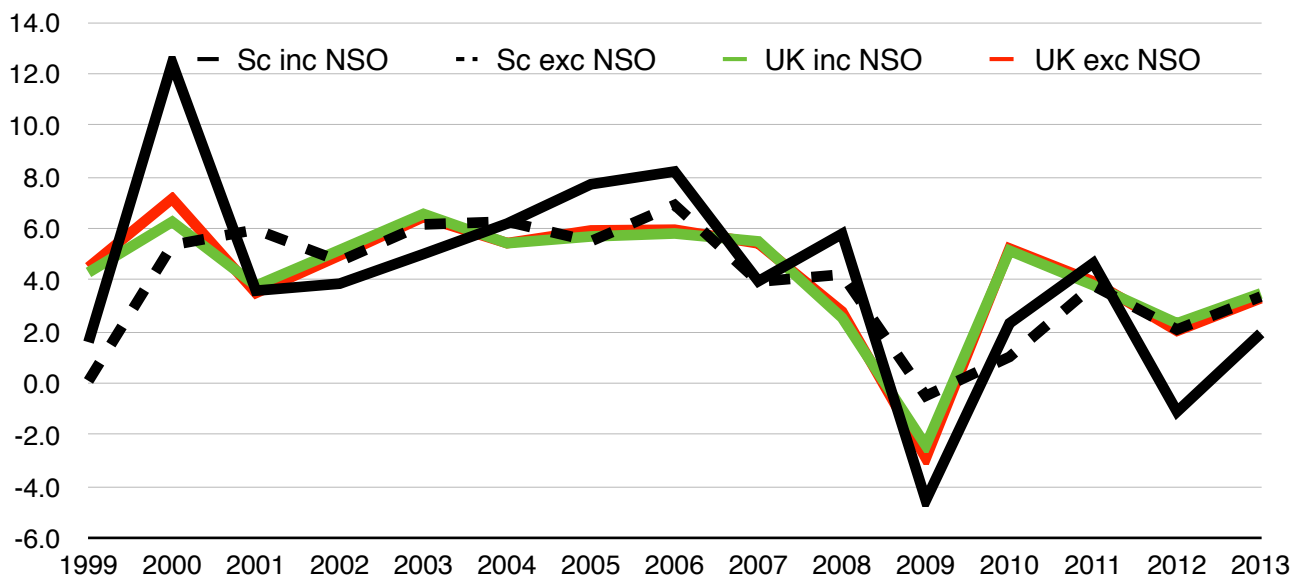
Cash terms

The new methodology used to calculate GDP has resulted in an increase in its level. For example, for 2013, Scottish GDP is now over 3% higher than it was under the previous methodology. The main reason for this increase is that certain economic activities have now been included in GDP, among them R&D and some 'illegal' activities such as prostitution and the sale of drugs.

In terms of growth, the most recent data shows that cash terms GDP growth for Scotland, when a geographic share of the North Sea is included, is much more volatile than for onshore GDP alone (see Chart 1). Onshore Scottish GDP growth is also much more in line with that seen for the UK, for which GDP growth rates are very similar regardless of whether the North Sea is included or not.

The data revisions have also affected the Scottish growth rate in certain years. For example, in 2009, the worst year of the recession, the old methodology saw GDP fall by 5.5%, while the revised methodology has tempered this to a fall of 4.5%. Over the period 1999 to 2013 the annual average growth rate for Scotland, including the North Sea, is unchanged at 4.1%, slightly below the UK's 4.2%. Excluding the North Sea, this falls to 3.9% for Scotland, while the UK's remains unchanged.

Chart 1 - Sc and UK GDP, cash terms (at market prices) annual growth, % change



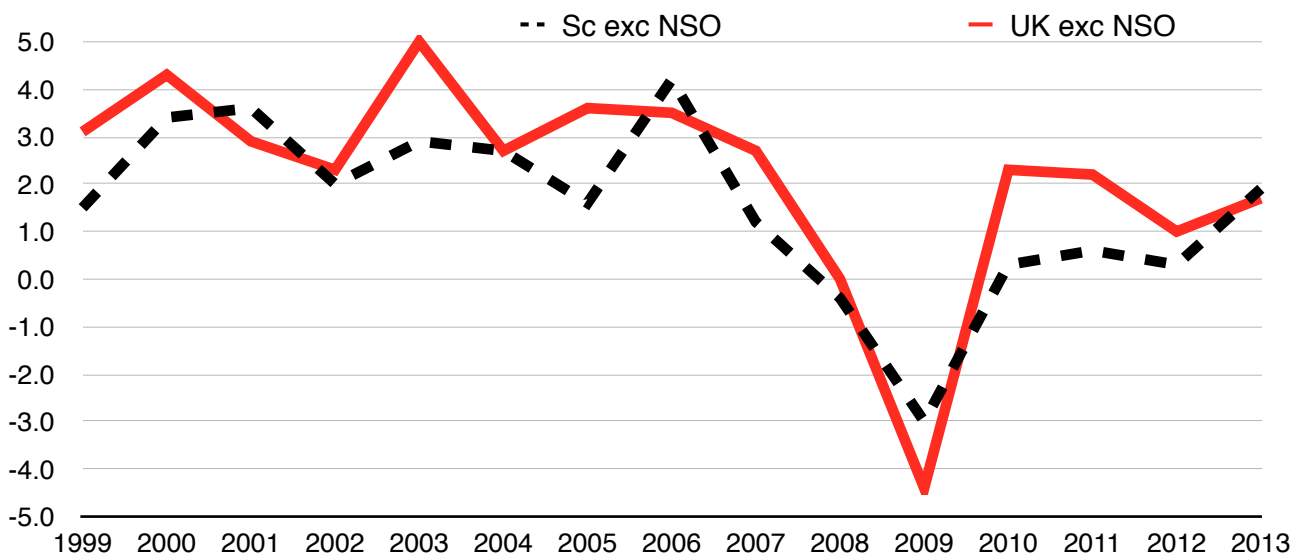
Source: Scottish government, ONS, Fiscal Affairs Scotland

Real (inflation adjusted) terms

Unfortunately, no data is available for real terms Scottish GDP including a geographic share of the North Sea. As a result only the revised real terms onshore GDP growth rates for Scotland and the UK can be compared. Chart 2 shows that, on average, the growth rates move in line with each other, although in some years, like 2003 and 2010, there are marked differences.

Over the period 1999 to 2013 the annual average real terms growth rate for Scotland was revised down from 1.7% to 1.5%. This is well below the UK's 2.2%.

Chart 2 - Scottish and UK GDP real terms (at basic prices) annual growth, % change



Source: Scottish government, ONS

Deflators

One of the interesting features of comparing the **onshore** cash and real terms growth rates of Scotland and the UK is that they do not always mirror each other. That is, the degree to which Scotland out (or under) grows the UK can be quite different whether measured in cash terms or in real, inflation adjusted, terms.

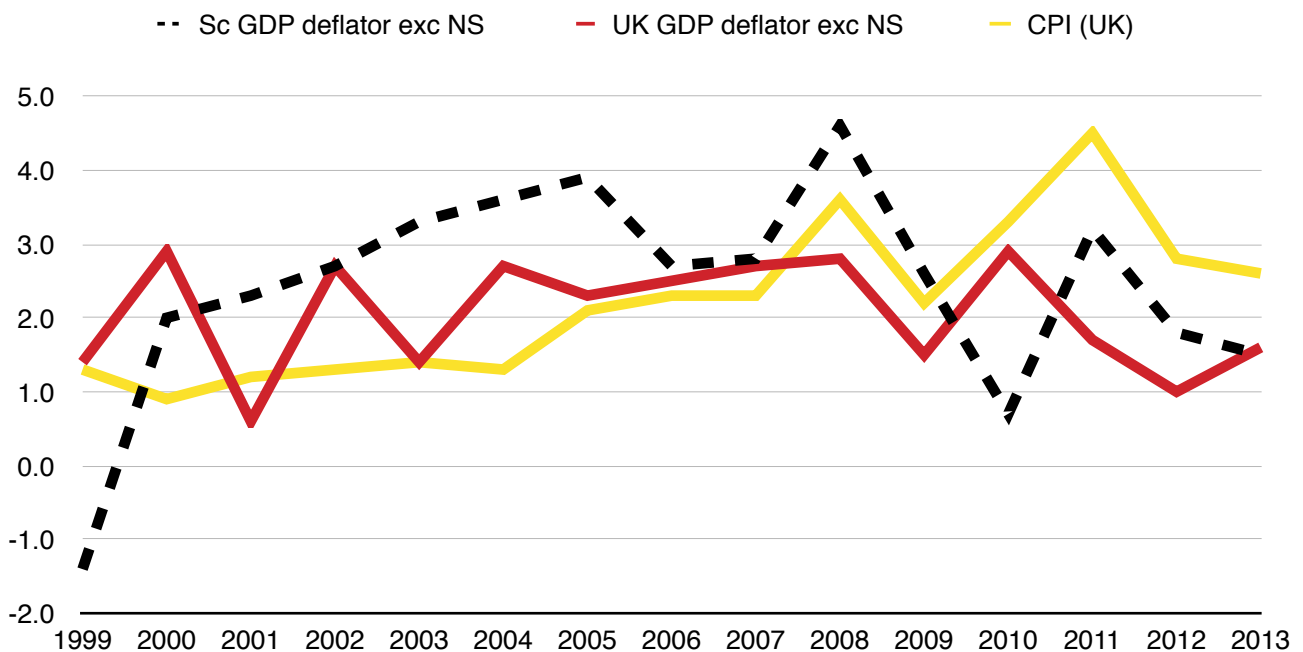
This means that the Scottish and UK implied GDP deflators are different. (2) To some extent that is to be expected, as the economies, while similar, are not exactly the same. However, the scale of the differences may imply even more fundamental differences exist, in terms of relative price shifts. That could mean that applying common Producer Price Indices (PPI) for elements of Scottish and UK GDP is inappropriate.

To take one example, in 1999 the Scottish deflator was negative, whereas the UK deflator was positive (see Chart 3) with the differential being almost 3 percentage points, while in 2002 the two deflators are identical. It seems unlikely that any significant change in relative industrial structures would have taken place in three years which could explain this. This suggests that different relative price changes may be at work, which reinforces the argument made in earlier reviews of Regional Accounts that such regional PPI's should be developed. (3)

Furthermore, as Chart 3 shows, the growth in the UK GDP deflator is, on average, closer to UK Consumer Price Inflation (CPI) than is growth in the Scottish GDP deflator. This observation means that a Scottish measure of CPI could also be different to the UK version and so be worth collecting separately.

Over the period 1999 to 2013 the annual average growth rate for the Scottish GDP deflator is 2.4%, as against 2.1% for the UK and 2.2% for UK CPI.

Chart 3 - Scottish and UK GDP growth rates, deflators, % change

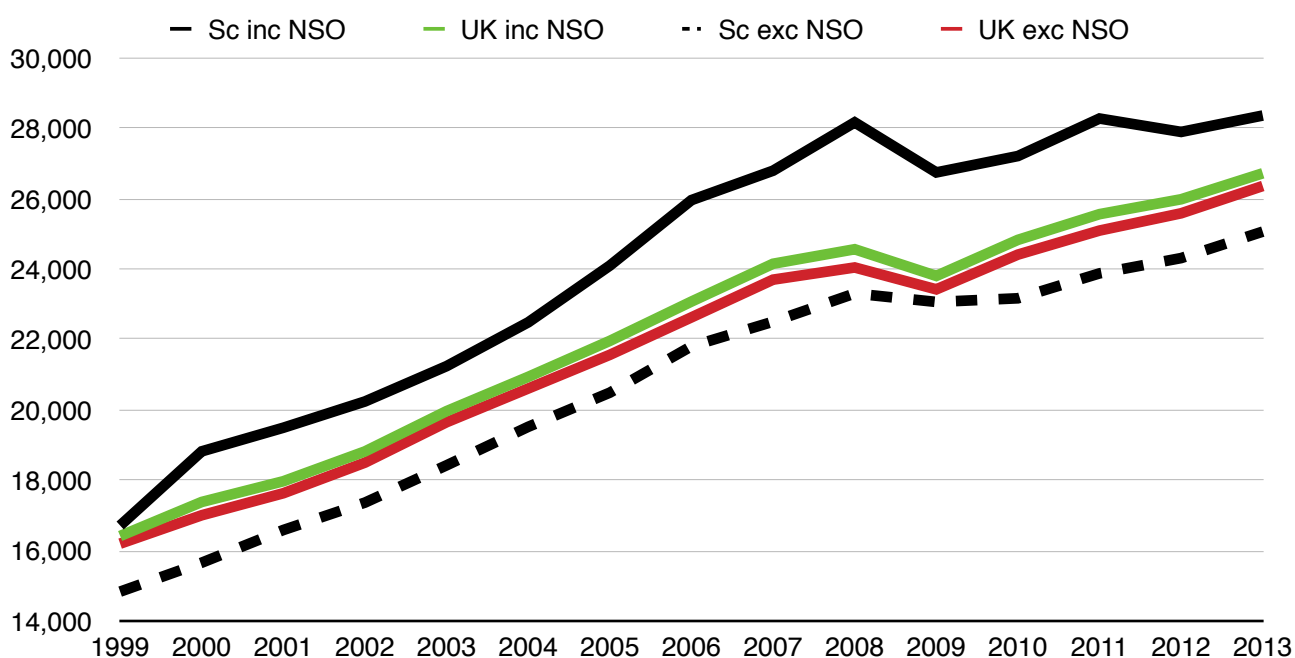


Source: ONS, Scottish deflator calculated by Fiscal Affairs Scotland

Comparisons of Scottish and UK GDP per head of population

Scottish GDP per head, including a geographic share of the North Sea, has been consistently higher than that seen for the UK, as Chart 4 illustrates. This is largely due to the fact that, on a geographic basis, Scotland is allocated around three-quarters of all North Sea related activity. In terms of the size of the Scottish economy this is a substantial boost.

Chart 4 - Scottish and UK GDP per head of population



Source: Scottish government, ONS, Fiscal Affairs Scotland

Based on the most recent annual data (2013), Scottish GDP per capita (including a geographic share of the North Sea) remains above that seen for the UK as a whole. However, the differential has fallen from 14.7% higher, in 2008, to 6.1% in 2013. The main cause of this fall has been the decline in North Sea related GDP, which fell in value by 30% over these five years.

The 2013 differential is equivalent to £1,642 per person. This figure is consistent with the £1600 figure used by Scottish Finance Minister John Swinney in a debate in the Scottish Parliament on the 1st April 2015.

However, for the reasons discussed in the next section, GDP per head is probably not a very good measure of Scotland's standard of living and either Gross National Income (or Net National Income) would be a more accurate one. An approximation of the impact that this can have is made in Table 2 below.

International Comparisons using GDP related measures

Such comparisons can be made in a number of ways. Below we look at:

- i) Gross Domestic Product (GDP) and Net National Product (NNI) per head of population, as two proxies for the level of standard of living;
- ii) Average annual growth rates since 1998, as a measure of recent relative success.

GDP per head

Table 1 shows that Scotland ranks 15th amongst OECD countries in terms of GDP per head, including a geographic share of North Sea activity. This is two places, and over \$2,300 per head, higher than the UK. (As most of the data is taken from the OECD database, the figures are shown in \$'s rather than in £'s.) Between 2012 and 2013 the UK's GDP per head rose by almost \$900 per head while Scotland's rose by almost \$500 per head.

Taking a longer term perspective, Scotland's relative international standing peaked in 2008, when it ranked 7th in terms of GDP per head. As above, the main cause of this fall in its ranking has been the decline in North Sea related GDP.

Table 1: Approximations of international standard of living (GDP per head), 2012 and 2013

Country	2012		2013		Change	
	\$,000	Ranking	\$	Ranking	\$	Ranking
Luxembourg	91,754	1st	90,724	1st	-1,030	-
Norway	66,358	2nd	65,635	2nd	-723	-
Switzerland	55,916	3rd	56,940	3rd	1,024	-
USA	51,435	4th	52,985	4th	1,550	-
Austria	44,892	7th	45,093	5th	-44,847	Up 2
Ireland	45,210	6th	45,642	6th	432	-
Denmark	43,565	8th	43,797	10th	232	Down 2
Germany	42,730	11th	43,108	11th	378	-
Iceland	40,464	15th	41,860	14th	1,396	Up 1
Scotland	40,138	(16th)	40,609	(15th)	471	Up 1
UK	37,383	17th	38,256	16th	873	Up 1
France	37,347	16th	37,556	17th	209	Down 1
Japan	35,601	18th	36,225	18th	624	-

Sources: OECD database; Scottish government, Fiscal Affairs Scotland

Notes: (1) data shown is in current prices, current purchasing power parity (PPP), terms. (2) Figures for the shift between 2012 and 2013 for the UK are different OECD vs ONS (and as shown in Chart 4), which is due to the use of different definitions of GDP and to exchange rate shifts. This also has an impact on the Scottish figures shown.

GDP per head vs Net National Income (NNI) per head

While GDP per head looks at what is produced in a country, it does not necessarily measure what income from production (comprising mainly wages and profits) stays in a country. To do that you need to adjust for flows of income out (to foreign owners and shareholders), as well as flows of income in (to UK citizens in relation to profits from investments made overseas). This gives you a much better measure of how the income of the citizens of a country has changed over time and is known as Gross National Income (GNI).

For most countries the difference between GDP per head and GNI per head is minor, but in some cases it is not. For example, Luxembourg has a far higher GDP per head than GNI per head as a large number of citizens from France, Belgium and Germany work there on a daily basis, and their income follows them back across the border. Equally, Ireland has a notably higher GDP than GNI as much of its manufacturing base is overseas owned (primarily by American companies) and so much of their profits are remitted back overseas.

This is also an issue for Scotland as a number of industries have a strong overseas ownership presence, for example: oil and gas, fisheries, energy and food and drink. Of these, the oil and gas sector is particularly important as it can account for up to 17% of total Scottish GDP. Unfortunately GNI figures for Scotland are not available on a regular basis.

The discussion below uses Net National Income (i.e. GNI less depreciation) rather than GNI as this is now the preferred measure used by the OECD, from where the comparator tables are drawn.

To get to an NNI figure for Scotland we use two approaches. The first is based on the one year (2010) for which an experimental GNI adjustment has been calculated by the Scottish government. This suggests an adjustment down for GDP of roughly 5% to get to GNI. (4) (5) With Scottish GDP per head being 6% higher than for the UK in 2013, this (5%) figure suggests an adjustment down to 1% higher for Scottish GNI, as well as for NNI. However, as this calculation involves a number of approximations, it should be treated as indicative rather than definitive.

While the 5% reduction is a substantial one, it is far less than seen in some other countries, e.g. Ireland where the difference is 15-20%. Furthermore, this estimate relies on what appear to be bullish assumptions with regards to the level of industry profits retained within Scotland, particularly with respect to North Sea profits. The analysis results in around two-thirds of all income from North Sea employment and North Sea gross profits being retained within Scotland; over £10 billion in 2010.

Around two-thirds of the companies operating in the North Sea are estimated to be international companies, which is at odds with the high share of profits retention used by the Scottish Government to calculate GNI. Furthermore, if such North Sea income is being retained within Scotland then this should be reflected in taxes paid on related profits and dividends. To date such implied higher tax revenues have not been reflected in the Scottish Government's 'Government Expenditure and Revenue in Scotland' (GERS) publication; for example, Scotland's share of income tax is below its population share.

So as can be seen, the use of this adjustment approximation is not ideal and its importance highlights the urgent need with which a more reliable measure of GNI/NNI needs to be calculated

on a regular basis. However, in the absence of any Scottish government alternative it has been retained here.

The second approach is based on an alternative measure of Scotland's income, that is, data for gross disposable household income (GDHI) per head. This measure suggests that the Scottish average GDHI is just below the UK average (97%). This lower than UK average value is supported by data from the UK Family Resource Survey, the Living Costs and Food Survey and the UK Wealth and Assets Survey. All show fewer households in Scotland are in the high income and wealth brackets compared to the UK (or GB) as a whole.

Table 2: Approximations of international standard of living, GDP vs NNI, 2013

Country	GDP per head		NNI per head		Change	
	\$,000	Ranking	\$,000	Ranking	\$,000	Ranking
Luxembourg	90,724	1st	46,559	3rd	44,165	Down 2
Norway	65,635	2nd	56,313	1st	9,322	Up 1
Switzerland	56,940	3rd	47,790	2nd	9,150	Up 1
United States	52,985	4th	46,062	4th	6,923	-
Netherlands	46,174	5th	38,471	6th	7,703	Down 1
Ireland	45,642	6th	32,654	15th	12,988	Down 9
Austria	45,093	7th	36,995	8th	8,099	Down 1
Sweden	44,646	8th	38,825	5th	5,821	Up 3
Australia	44,145	9th	36,375	10th	7,770	Down 1
Denmark	43,797	10th	37,517	7th	6,280	Up 3
Germany	43,108	11th	36,515	9th	6,593	Up 2
Canada	43,038	12th	35,076	11th	7,962	Up 1
Belgium	41,866	13th	33,167	13th	8,699	-
Iceland	41,860	14th	34,199	12th	7,661	Up 2
Scotland (i)	40,609	(15th)	33,204	(14th)	7,405	Down 1
Finland	39,869	15th	32,349	16th	7,520	Down 1
United Kingdom	38,256	16th	32,826	14th	5,430	Up 2
Scotland (ii)	-	-	31,841	(17th)	8,767	Down 2
France	37,556	17th	31,411	17th	6,145	-
Japan	36,225	18th	29,875	18th	6,350	-
Italy	34,836	19th	28,308	20th	6,528	Down 1
New Zealand	34,424	20th	28,759	19th	5,665	Up 1
Spain	33,112	21st	27,133	21st	5,979	-
Portugal	27,804	22nd	22,352	22nd	5,452	-
Greece	25,666	23rd	20,809	23rd	4,857	-

Sources: OECD database; Scottish government, Fiscal Affairs Scotland

Notes: Net National Income (NNI) is defined as GDP plus receipts from abroad less payments to abroad of wages and salaries and of property income plus net taxes and subsidies receivable from abroad, net of depreciation.

Table 2 shows that, in 2013, Scotland ranks somewhere between 14th and 17th amongst OECD countries in terms of NNI per head, depending on which approach to NNI is used. The UK is ranked 14th, excluding any ranking for Scotland.

Using the Scottish government estimate of NNI suggests that Scotland would still be ranked above the UK, but the gap would be narrower than for GDP (\$300 per head under NNI vs \$2300 per head under GDP).

Using the alternative, lower, measure, Scotland's NNI per head of population would be ranked below the UK's, at 17th, and \$1000 per head lower than the UK.

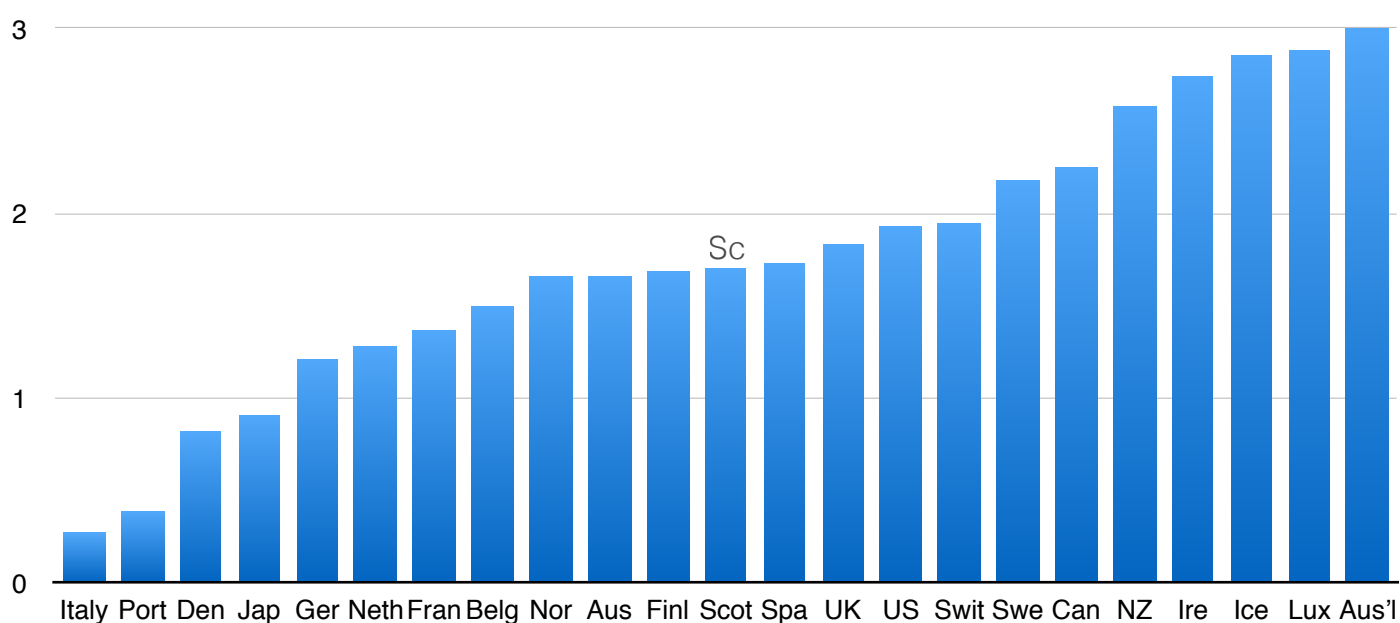
OECD GDP real terms growth rates since 1998

Data for the 15 year period from 1999 to 2013 shows that most countries experienced lower than typical growth, due to the impact of the recession. Chart 5 illustrates these growth rates and shows Scotland to be in the middle of the pack.

It is important to note that the measure used in Chart 5 is for Scotland excluding NSO, as the Scottish government do not publish data on Scottish real terms growth including a geographic share of NSO. In contrast the UK data includes NSO.

The average annual rate for Scotland **including** NSO will differ significantly to that shown in Chart 5, as North Sea production peaked in 1999 and now stands at around one third of that level. The adjustment would be notable and heavily downwards. However, this very low (or negative) real growth rate would be fairly meaningless for Scotland as the deflation of a natural commodity like oil is largely irrelevant. Declining real terms growth, caused by a largely foreign owned North Sea industry, would not affect most households income or, necessarily, government revenues. (6)

Chart 5 - annual average GDP growth rates across OECD countries, 1999 - 2013, %



Source: OECD database, Scottish government

Conclusions

This analysis illustrates how an interpretation of Scotland's economic performance, in both absolute and relative terms, is dependent on the measure of GDP being used.

However, the use of a simple 'real terms growth in GDP' measure, as used by most other countries to determine its economic health, is less appropriate for Scotland. This is for two main reasons. The first is due to the impact of high foreign ownership on what stays in the country. The second is due to the nature of North Sea production (or the production of any such natural commodity), where inflation is a good thing for a producer country rather than something that needs to be adjusted for to get to the true underlying position. (6)

While some countries have one of these features (e.g. Luxembourg and Ireland in relation to high foreign ownership and Norway in relation to the production of large quantities of a natural commodity), it is highly unusual, certainly across 'developed' economies, to have both. As a result there is no 'ideal' measure of Scottish GDP (growth). Instead different measures need to be used in different circumstances. For example, onshore real terms GDP is better for measuring changes in productivity, while total (including North Sea) cash terms GDP is better for gauging changes in the tax base.

These features impact not only on GDP measures themselves but also on other key fiscal and economic measures that use GDP, for example calculating a country's debt as a % of GDP and when attempting to ascertain the size of its future tax base.

The debate over the performance of the Scottish economy needs to take these complications fully into account. Unfortunately, at present, it is difficult to do so as key gaps in the data remain.

Despite these concerns there are some general conclusions that can be drawn from the analysis:

- Scotland's Standard of Living is on a par with that seen for the UK and in many of the richer OECD countries.
- Scotland's NNI is notably below its GDP, due to the influence of foreign ownership in key economic areas like North Sea oil and gas, energy and spirits production.
- Scotland's GDP is erratic due to the importance of the contribution of North Sea oil & gas, which has seen large changes, year on year, in both production and in price over recent years.

The analysis also highlights a number of areas where the availability of Scottish data could be improved, including:

- Initiating a measure of real GDP growth including a geographic share of North Sea activity;
- Initiating Scottish Producer Price Indices and a Scottish measure of CPI;
- Releasing regular figures for Scottish GNI and NNI.

The availability of these new data measures would significantly improve the breadth and quality of Scottish economic statistics. The work needed to be undertaken to do so would also result in much improved estimates of Scotland's current account, a key measure of a country's economic health.

Notes:

- (1) See the latest Scottish government Statistical Bulletins on Gross Domestic Product (4th Quarter 2014, published 15 April 2015) and Quarterly National Accounts (Quarter 3 2014, published 18 February 2015, see Table X).
- (2) The Scottish deflator used here is currently calculated using a mixture of market and basic price measures. This could have an impact in some years and so we need to await the next SNAP to get a fully accurate measure.
- (3) See the Allsop led 'Review of Statistics for Economic Policymaking', HMT, 2004 and the 'National Statistics Quality Review Series, Report No. 43: Review of Regional Accounts', ONS, 2005.
- (4) The adjustment refers to GNI rather than NNI, [although the two may not differ substantially in practice.] It also refers to a year when North Sea related profits were much higher and the distribution of those profits, between Scottish shareholders and non-Scottish shareholders, may have changed over time.
- (5) See 'Income Account and Gross National Income - Publication of Methodology and Initial Experimental Results', Scottish government, 2013.
- (6) This point is discussed in more detail in the paper 'Scotland's economic performance and the fiscal implications of moving to independence', McLaren & Armstrong, NIESR Economic Review, February 2014, Vol 227.

Contact details

John McLaren m: 07429 508 596
e: john.mclaren@btinternet.com

Jo Armstrong e: jo@jo-armstrong.co.uk

Charity details

Fiscal Affairs Scotland SCIO
SC044827

Website: fiscalaffairsscotland.co.uk