BOX A: SECTORAL PRODUCTIVITY AND CHANGES IN THE COMPOSITION OF EMPLOYMENT

Growth in labour productivity is the main driver of improvements in living standards over the long term. Economy-wide labour productivity growth can be usefully decomposed into two broad components. The first is sector-level productivity growth weighted by the sector shares in total output. At the sectoral level, productivity growth is driven by improved efficiency and capital deepening (i.e., increases in capital per worker). The second is shifts in the sectoral composition of employment. Shifts in the composition of employment towards relatively high productivity sectors will tend to increase aggregate labour productivity.

We can approximate these two effects using the following equation[1]:

$$\frac{d\rho}{\rho} = \sum_{i=1}^{m} \frac{Y_i}{Y} \frac{d\rho_i}{\rho_i} + \sum_{i=1}^{m} \frac{\rho_i}{\rho} ds_i$$

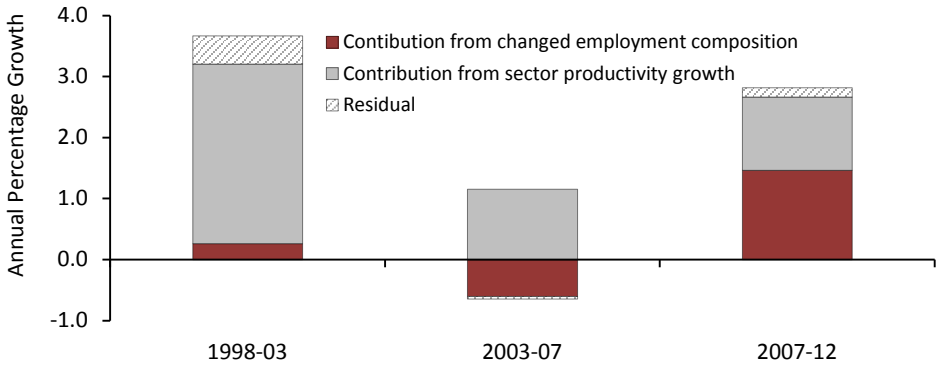
where ρ is productivity measured by output per employee, Y is output, and s is a sector's share of employment. An individual sector is indexed by i and the total number of sectors is m. Essentially, the growth in productivity is broken down into two components:

(i) the contribution to productivity growth purely from sector-level productivity growth; this is the sum of each sector's productivity growth weighted by its share of output;

(ii) the contribution from shifts between relatively productive and relatively unproductive sectors; this is the sum of the change in share of employment weighted by relative productivity.[2]

Figure A1 shows the economy-wide split over three periods; the late 1990s/early 2000s; the mid-2000s (which roughly translates to the housing bubble period); and the post-bubble period.[3]

FIGURE A1: ECONOMY-WIDE PRODUCTIVITY DECOMPOSED



Source: CSO and Internal Calculations
Note: A small residual results from the estimation of sector shares and the chain-linking process for measuring sectoral GVA.

We can see that at the tail-end of the Celtic Tiger (1998 to 2003), there is limited productivity growth from shifts in the sectoral composition of employment while productivity growth within sectors accounts for the vast majority of the economy-wide productivity growth over the period, which averaged three-and-a-half per cent *per annum*.

[1] The derivation of this formula and the decomposition can be found at www.fiscalcouncil.ie.

[2] The formula assumes that average and marginal productivity are equal.

[3] A similar split results from removing sectors dominated by the public sector where output is difficult to estimate.

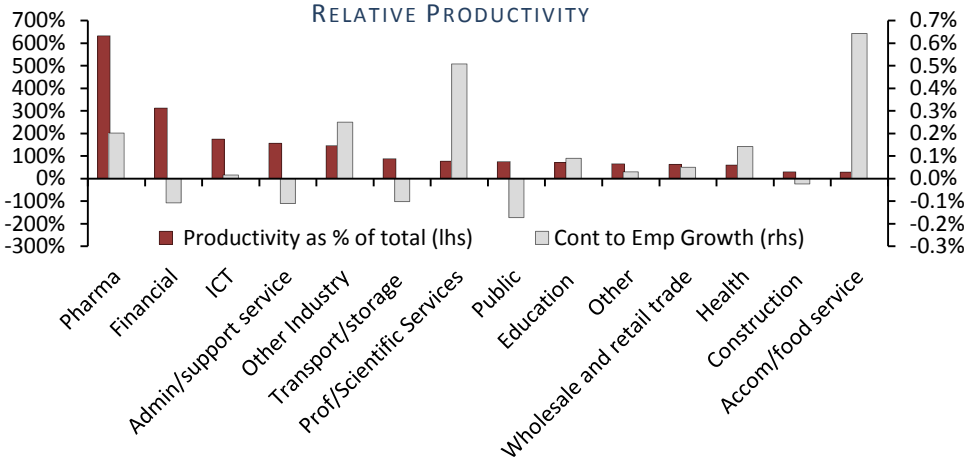
During the housing bubble period, aggregate productivity fell considerably, averaging just 0.5 per cent growth *per annum*. The contribution from shifting employment composition was negative, indicating that relatively unproductive sectors expanded their employment share. This is consistent with an environment in which employment in traditionally low productivity sectors is expanding rapidly. For instance, in the years 2003 to 2007, employment growth in Construction averaged 9.1 per cent *per annum*; similarly, Accommodation and Food Service activities grew at 4.2 per cent *per annum*. In contrast, higher productivity sectors such as ICT and pharma experienced employment growth of 1.1 per cent and 3.2 per cent *per annum*, respectively.

Productivity growth within sectors also fell considerably over the same period, from a 2.9 per cent annual contribution to just 1.2 per cent, possibly reflecting the maturing of the catch-up phase of Irish economic growth. One of the largest contributors to this source of productivity growth was the financial services sector (reflecting, in part, the unsustainable expansion of credit during the period).

Since the recession (2007-12), aggregate productivity growth has jumped back to 2.7 per cent *per annum*, close to rates seen prior to the housing boom. However, more than half of this has been due to shifts in the composition of employment as the bulk of job losses were concentrated in low-productivity sectors while the annual contribution from sectoral productivity growth did not fare much better than it had during the housing boom at c.1.2 per cent. If employment shares are held constant, then a repeat of the post-2003 productivity performance going forward would see productivity growth of slightly over 1 per cent *per annum*.

In the medium term, the outlook for Irish productivity depends, in part, on the nature of the recovery. A domestic demand-led recovery accompanied by strong growth in construction activity would imply relatively weak productivity growth.

FIGURE A2: CONTRIBUTION TO EMPLOYMENT GROWTH AND RELATIVE PRODUCTIVITY

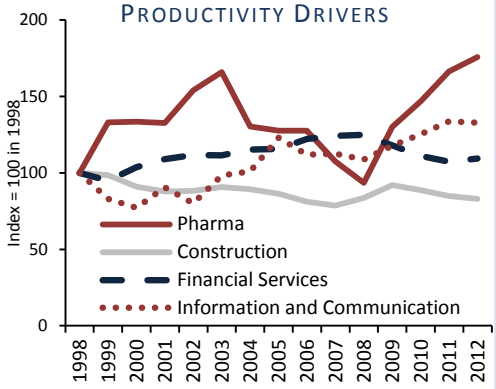


Source: CSO and internal calculations.

Measured productivity was actually negative in 2013. Part of this is explained by the pharmaceutical sector's 'patent cliff', but it may not be the whole story. It is difficult to draw firm conclusions regarding shifts in the composition of employment for 2013 due to CSO sampling issues regarding agriculture. Figure A2 shows the contribution of several non-agri sectors to employment growth in 2013 and their relative productivity in 2012. The largest

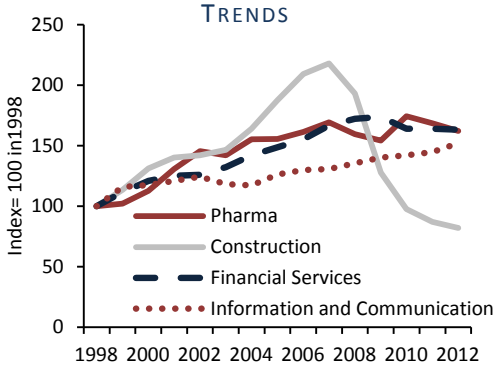
contributor to non-agri employment was the least productive sector in the economy, accommodation and food services. While the second largest contributor, professional, scientific and technical services, is considerably more productive, it is still less productive than the aggregate. Some of the more productive sectors saw their share of employment decline, and while the pharma sector did post jobs growth, its relative productivity fell substantially in 2013. There is considerable uncertainty regarding the future of pharmaceutical productivity in Ireland, but Van Egeraat (2014) projects that output losses resulting from patent expirations relevant to Ireland should be concentrated in the period 2012 to 2014.[4]

FIGURE A3 (a): TRENDS IN PRODUCTIVITY DRIVERS



Source: CSO.

FIGURE A3 (b): EMPLOYMENT TRENDS



Source: CSO.

Forecasting productivity at the sector level poses significant challenges. To get a sense of the trends, Figure A3 shows productivity trends indexed to 1998 for a number of key sectors. As noted above, pharma is likely to have weakened in 2013 with uncertain productivity prospects thereafter. The financial services sector has shown less volatility than pharma; however, due to its larger size and high productivity, movements in this sector can have a large impact on aggregate productivity. Continued employment reductions and improvements in interest margins should support a positive contribution from this sector. Construction productivity is at just over 80 per cent of its level in 1998, suggesting scope for productivity gains. Finally, ICT has shown consistent productivity growth since 2008 and has increased its share of employment. A continuation of this trend would support the aggregate productivity performance.

[4] See comment on forthcoming work, "CSO pharmaceutical industrial production figures – patent cliff or hill" by C. Van Egeraat (2014) available at: http://irelandafternama.wordpress.com/2012/11/07/cso-pharmaceutical-industrial-production-figures-patent-cliff-or-hill/