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How much has the Internet Contributed to the UK Economy? Comments on the Boston Consulting Group "The Connected Kingdom" Report

Gordon (2000)¹ asked provocatively: would you rather have the internet or indoor plumbing? This sceptical view of the internet is not one that I share, but I do think the BCG report is not the right way to quantify the internet's most important impact and its strengths in the UK economy. In this short note I suggest (a) why I don't think it is the right way and (b) what an alternative approach suggests.

The main body of Chapter 2, "The Internet's Ripples" is interesting summary that quantifies some of the activity of the economy mediated by the internet. The measurement method tries to count "Internet GDP". How should we do this?

GDP is the value of production of goods and services in the economy. So one starting point is to ask how the internet has affected our ability to produce more GDP with less - productivity growth. How much has the internet made company communication and co-ordination cheaper for example and enabled companies to reformat business models (e.g. Amazon.com). This is a really hard problem so the author's main findings are based on a different method. They note that an alternative way to measure GDP is spending on the goods that are produced, which will equal final consumer spending, investment, government spending on goods (excluding transfers like benefits), and net exports. Thus the key finding, set out in exhibit 3, is that internet consumption, that is consumption mediated on the internet by e-commerce, is worth around £50bn in 2009 (note that total household consumption is about £900bn). The other elements measured here are the parts of investment and consumer computer spend (e.g. subscriptions to ISPs) that are due to the internet, which is very hard to do and government spending on the internet, estimated at 25bn, which is an even harder figure to pin down. This overall figure of £100bn is 7.2% of GDP. The figure of 7.2% of GDP is then used to point out that if the internet were an industry, it would be the 5th largest (behind real estate and business services, 23% of GDP manufacturing, 12%, retail/wholesale, 11% and financial services (9%, see exhibit 3).

There are two problems with this approach. First, to document which transactions to final consumers and investment are mediated via the internet does not tell us the role of the internet. The question really is: what would those transactions be if the internet did not exist? Before the internet, people still shopped at home, but via catalogues and the phone. So the question is whether the internet is just displaced these activities or added to them. If it just displaced them at the same prices then the contribution is

¹ Gordon, R., (2000) "Does the internet measure up to the innovations of the past?", NBER working paper 7833.

zero, not £100bn. One way that extra activity has been generated by the internet if prices are cheaper online. Studies find some are, but there is quite a lot of online dispersion. It seems the people still like to go physically shopping. At least this calculation needs to be done.²

The second problem is that the comparison of the “internet sector” with the shares of different industries in GDP is comparing apples and oranges. By this chosen measure, if a consumer buys online a £70 pair of shoes, the report’s method will allocate £70 to the internet economy. But, the share of GDP accounted for by shoe retailing is something different. Suppose the economy consists of shoe manufacturers and shoe retailers. The former sell the shoes to the retailers for £50 and the retailers to the final consumers for £70. GDP in this economy is *not* £130 i.e. it is not £50+£70. The reason is that this is double counting: one cannot count sales of the shoes twice in counting the value of the production of goods and services in the economy. Instead, GDP in this economy is £70, namely £50 in manufacturing and £20 of value added in services. If all the shoes are bought online then the internet economy is the largest “industry” sector, but that just says that computing GDP by final consumption correctly adds together the contributions of the chain of value added in the economy.³

Thus the much more interesting effect of the internet is the effect on productivity growth. Productivity in the UK economy grows usually at around 2.75% per year. A few years of that growth (compounded) is worth way more than the 7% of activity. And if that productivity growth is due to new ideas then we do not have to count a candidate driving force, e.g. the internet, against a counter-factual like catalogues.

So what do we know about the effect of the internet on productivity gains? Productivity growth means getting more out of the economy with less input. It comes from an increased flow of effective services from three main sources: capital, labour and ideas. As far as capital is concerned, the internet is of course a (gigantic) piece of capital equipment which lowers the costs of providing the capital services from communications via lower price phone calls, increased connectivity, cheaper and faster email etc. As far as ideas are concerned, the internet, with computers, enables new ideas to be communicated (search engines like Google are surely important here), lowering the price of R&D, and new forms of business model to emerge like online bookshops and banking. Thus what do we know about the empirical contributions of these factors?⁴

² An additional point is to measure the value of consumer utility from reduced prices, extra choice, convenience etc. This is typically not done since it is so hard, and so the value of a given stock of transactions is likely a lower bound on total value.

³ This point is acknowledged implicitly in the BCG Chapter 4 especially the box on page 20, which follows Barua et al. (1999, Measuring the Internet Economy, mimeo) who propose dividing the areas of the Internet Economy into four “layers:” (1) the internet infrastructure layer (mostly hardware manufacturing) , (2) the internet applications layer (mostly software), (3) the internet intermediary layer (B2B commerce, an intermediate), and (4) the internet commerce layer (selling to final consumers). This chapter measures the revenues of many companies involved in these layers and points out they are considerable: around £50bn, but as the text points out aren’t part of GDP since many of the products sold are sold from one firm to the next.

⁴ Litan and Rivlin, Projecting the Economic Impact of the Internet, American Economics Review, 91,2, May 2001, in an early paper estimated the contribution to be between 0.2 and 0.4% of GDP per year..

The capital services question is reviewed in an important paper by Corrado (2010, unpublished). She calculates that the omission of the internet means that current communication deflators understate actual the price falls in communication equipment by around 3-4 percentage points per year in 1995-07. With the new deflator, communications capital deepening accounts for 7 (0.19%pa/2.72%pa) of non-farm annual labour productivity growth over that period. That 7% is of course the figure in the BCG report of activity mediated over the internet. But this is 7% per year of 2.73% of growth per year. Being just from one piece of capital equipment it is a huge contribution and tells us how the internet's share of activity got to be so large.

Second, what is the effect of the internet on productivity via new ideas, new forms of business activity and the like? One contribution, not measured in the National Accounts relates to the role of the internet, and, one would suspect, Google in particular, in facilitating search. The innovation process itself has likely benefitted from the ability of share knowledge via the internet and search engines. Thus, one would suspect that the process of R&D has become more productive. We see some direct evidence of this in the increasing formation of (a) teams and (b) international teams in all forms of academic research (both scientific and non-scientific) just after the introduction of the internet.⁵ Corrado, Goodridge and Haskel (2010) estimate that the implied "price" of R&D has fallen very strongly as this communication has effectively made it much cheaper to "produce" new ideas. If one uses these new price deflators to capitalise R&D, it raises the implied contribution of R&D from 0.05%pa 1995-05 using a GDP deflator to 0.22%pa, which is from around 1.5% of labour productivity growth to 6.8% of labour productivity growth, an increase of 5.3% of annual labour productivity growth.

Finally, there is the internet's contribution to TFP growth, that is, the development of new business models and the like. TFP growth accounts for around 50% of labour productivity growth over this period. It has accelerated, both in the US and the UK, after 1995, which was the widespread introduction of the internet, suggesting that the internet must have had something to do with this. In the UK for example, the acceleration is of the order of 0.4%pa, which is around 7% of labour productivity growth.

All of these data are provisional and clearly more work is necessary to draw them together. But, a highly speculative conclusion on the contribution of the internet to productivity growth might be as follows. Suppose the internet has contributed (a) half of the post 2005 contribution of communication equipment, (b) all the additional contribution of R&D post 2005 over and above its pre-internet contribution and (c) the acceleration in TFP after 2005. This is then, all as percentages of annual labour productivity growth, $3.5\% + 5.3\% + 7\% = 15.8\%$ of labour productivity growth. If this is applied to the whole of the current £1,400bn of GDP (these are fractions of market sector GDP) then the addition to GDP from the internet each year is $15.8\% * 2.75\% * £1,400bn = £6bn$ per year which is about 0.4% of GDP. Set against the improvements in the number of goods available, freedom to access information and the like, this is almost certainly a lower bound.

⁵ Wuchty, S Jones, B., and Uzzi, B., "Teams in the Production of knowledge" Science, 18th May 2007, page 1036.