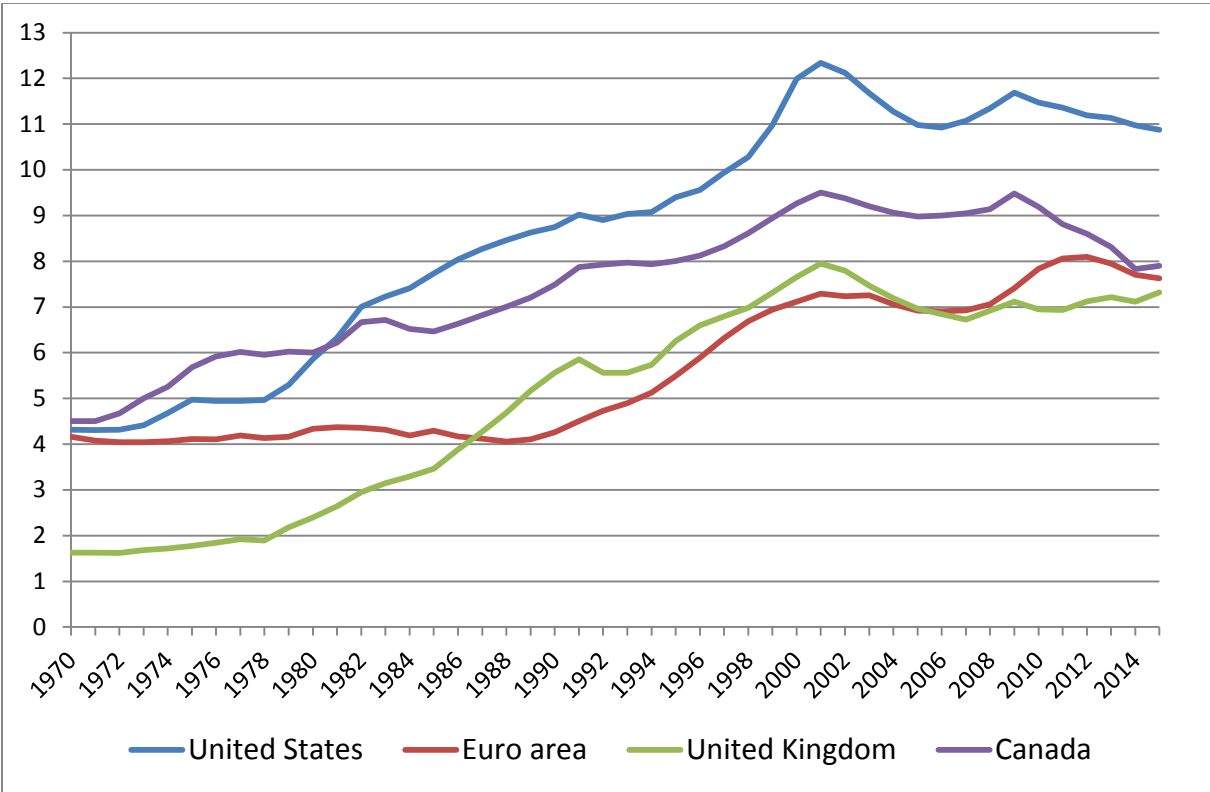


Have the growth gains from ICT been exhausted?

By [Gilbert Cette](#) and Ombeline Jullien de Pommerol

The diffusion of information and communication technology (ICT) and the associated benefits in terms of growth appear to have petered out at the start of the 2000s in advanced countries. This suggests we are experiencing a pause in the third industrial revolution, ahead of the incipient shock linked to the digital economy.

Chart 1 – Stabilisation of the nominal ICT capital coefficient since 2000



Note: Nominal ICT capital coefficient = nominal ICT capital divided by nominal GDP, economy as a whole, in %.

Source: authors' calculations using ICT investment data from the OECD.

The low GDP growth observed in the main advanced countries since the start of the 21st century can principally be attributed to sharp falls in productivity gains – in some cases to an all-time low (see [Bergeaud, Cette and Lecat, 2017](#)). Can these trends be linked to developments in ICT diffusion (see [Cette and Jullien de Pommerol, 2018](#))?

ICT diffusion has stabilised since the start of the 2000s

The diffusion of ICT to productive activity is captured here using the nominal ICT capital coefficient, which is nominal ICT capital divided by nominal GDP. In the United States, the euro area, the United Kingdom and Canada, this ICT capital coefficient increased steadily over the three decades from the start of the 1970s to the early 2000s (see Chart 1). It subsequently stabilised, as various studies have highlighted (e.g. [Cette, Clerc and Bresson, 2015](#)). ICT investment now consists in replacing previous ICT assets at constant value, although with steady gains in performance as ICT prices are still falling, albeit at a slower pace.

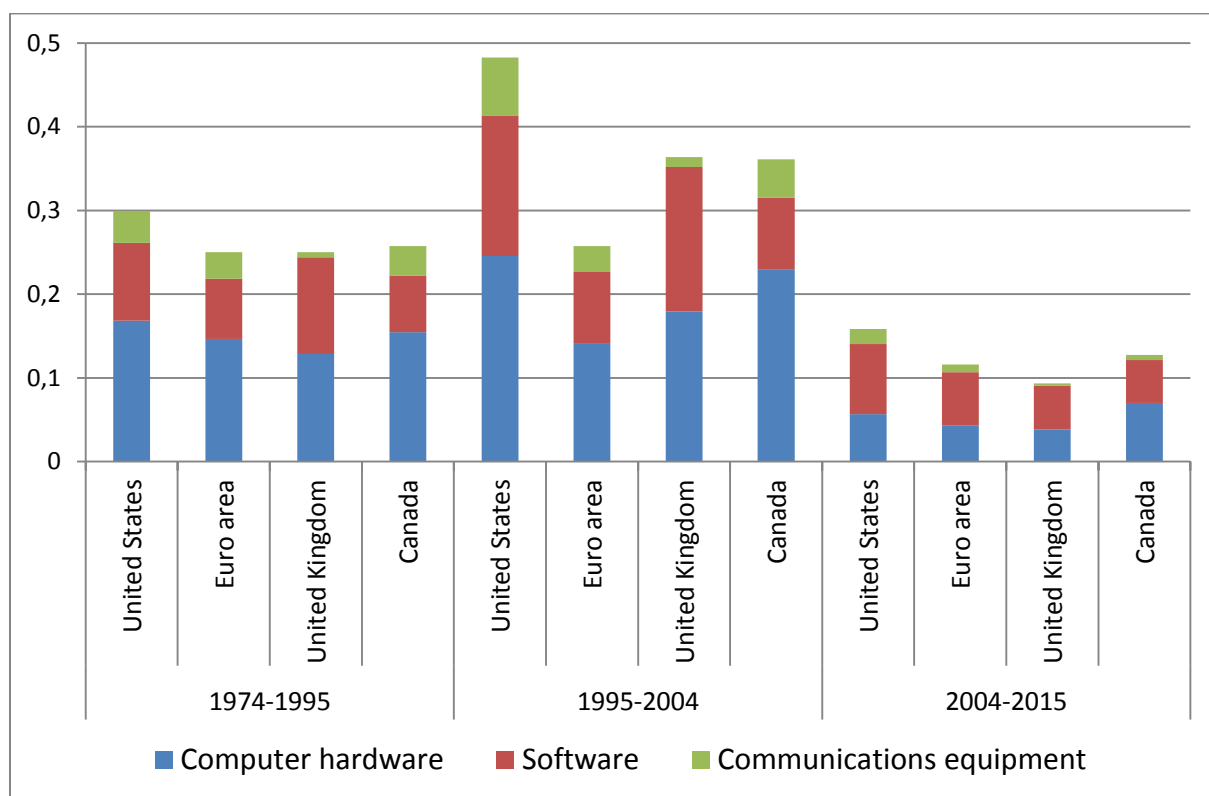
ICT diffusion has stabilised at very different levels (see, for example, [Van Ark et al., 2008](#), [Timmer et al., 2011](#), [Cette and Lopez, 2012](#)). The divergences are quite marked: at the end of the period, the United States' nominal ICT capital coefficient was more than 30% higher than in the three other economic areas under consideration.

Numerous studies have provided empirical explanations for these variations, such as differences in the average educational attainment of the working-age population, and the existence of rigidities in product and labour markets (see, for example, [Aghion et al., 2009](#), [Guerrieri et al., 2011](#), [Cette and Lopez, 2012](#)). In order to harvest the full potential of ICT, average skill levels need to be higher than for other forms of technology, and companies need to restructure, which can be difficult when labour market regulations are too strict. Certain product market regulations can also reduce competitive pressures, which can in turn lower the incentives for using better technology.

The contribution of ICT to growth has fallen

ICT can boost labour productivity via a number of channels. We focus on one of these, which is arguably the most important: the substitution of labour with ICT capital. We measure the contribution of ICT to growth in labour productivity via the increase in ICT capital intensity in productive apparatus. The period when ICT makes the strongest contribution to growth in hourly labour productivity is from 1995 to 2004. In the United States, where the contribution is highest, ICT adds an average of 0.5 percentage point to growth per year in 1995-2004, compared with 0.3 percentage point in the previous decade. This then falls back to 0.15 percentage point between 2004 and 2015. A similar, albeit more limited wave can be observed in the other countries included in our study (see Chart 2).

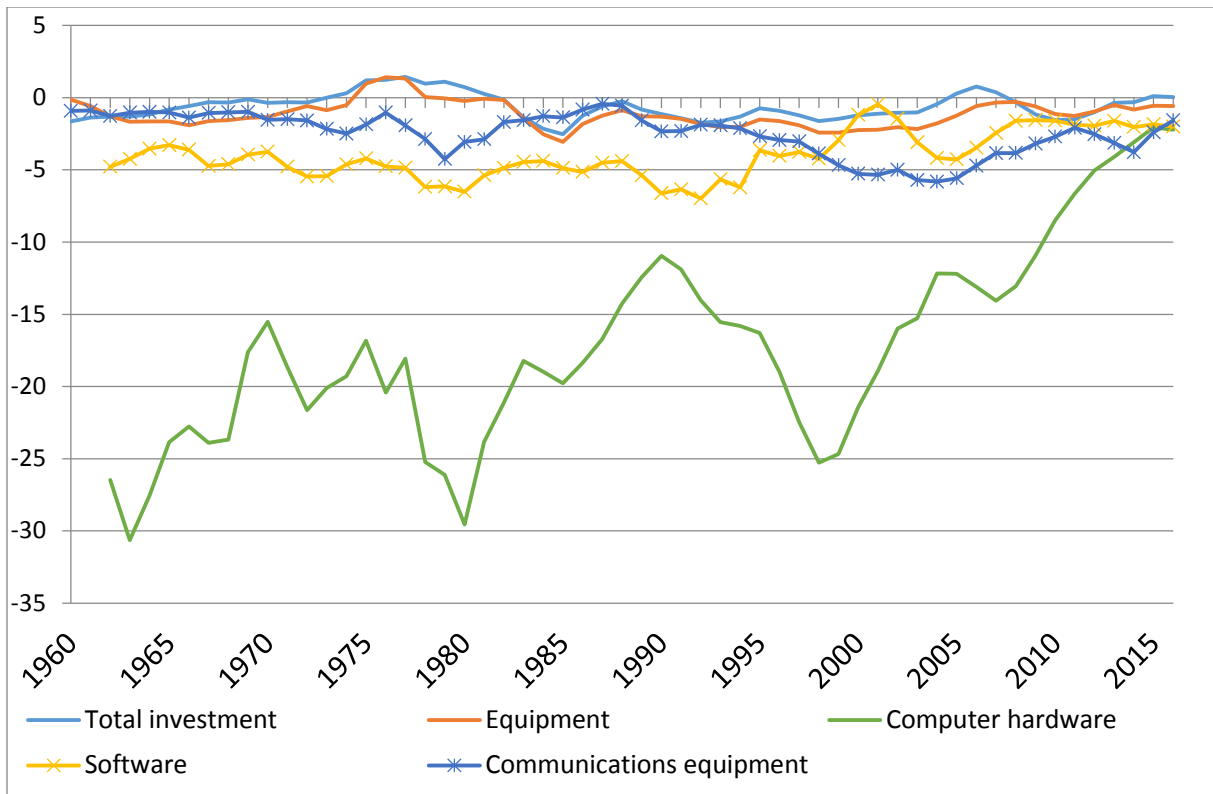
Chart 2 - Since 2004, ICT capital intensity has made a diminishing contribution to growth



Note: Contribution of ICT capital intensity to growth in hourly labour productivity. Economy as a whole - percentage points per year. Source: Authors' calculations.

The sharp rise in the contribution of ICT to labour productivity growth as of 1995 is linked to the acceleration in real ICT capital growth, which is in turn linked to the fall in the price of ICT relative to the GDP deflator. Conversely, the decline in the contribution of ICT over 2004-15 can be attributed to a slowdown in real ICT capital growth, which is in turn linked to smaller falls in the relative price of ICT, reflecting a slowdown in technological progress (see Chart 3).

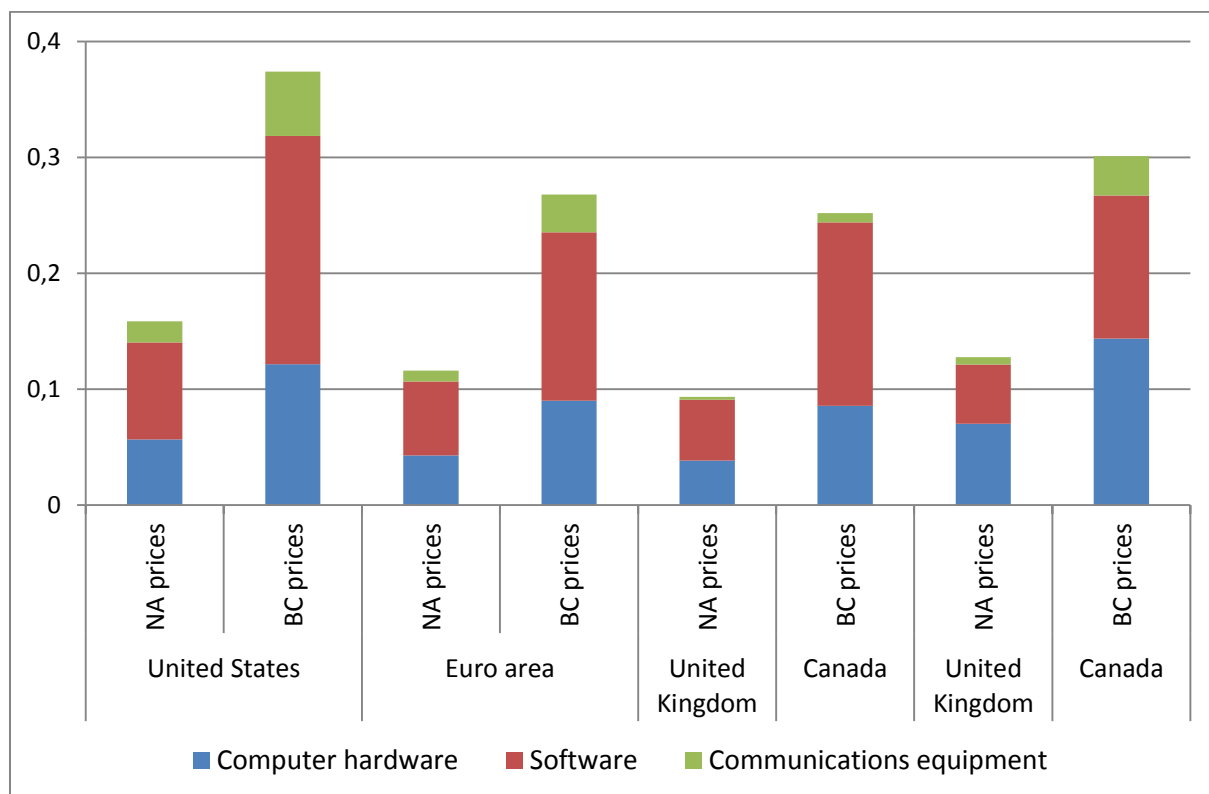
Chart 3 - The decline in the relative price of ICT has slowed in the past two decades



*Note: Annual % change in the relative price of various components of investment in the United States. Growth rates have been smoothed using a 3-yr moving average.
Source: Bureau of Economic Analysis (BEA).*

The apparent reduction in the contribution of ICT over 2004-15 can be explained in part by an underestimation of the fall in ICT prices in the US national accounts. Chart 4 shows the contribution measured using alternative ICT price indices proposed by [Byrne and Corrado \(2016\)](#). These suggest that, in the recent period, gains in technological performance have been higher than captured in the national accounts. Using these alternative price indices, the contribution of ICT to growth in the period 2004-15 is closer to that observed between 1974 and 1995. However, it is still well below levels for the period 1995-2004. This appears to confirm that the contribution of ICT to growth has declined since the start of the 2000s.

Chart 4 – Gains in ICT performance are stronger in the period 2004-15 using alternative price indices



*Note: Contribution of ICT capital intensity to hourly labour productivity in the period 2004-15 using different measurements of ICT prices. Percentage points per year.
 NA prices: ICT price indices used in US national accounts (source: BEA).
 BC prices: ICT price indices proposed by [Byrne and Corrado \(2016\)](#).
 Source: Authors' calculations.*

The digital revolution is on the horizon

The findings thus appear to confirm that ICT diffusion and its positive effects for growth have tapered off in the past two decades. If this were to become a lasting phenomenon, it would also mean that the third industrial revolution has run its course, and that the boost to economic performance has been shorter and more limited in scope than in previous technological revolutions. Nonetheless, we are already seeing signs of a vast new wave of performance growth. This is linked to the emergence and expansion of the digital economy which is a core part of the third industrial revolution. As [Van Ark \(2016\)](#) argues, the current lull in the productivity gains stemming from the third industrial revolution could in fact represent a period of transition between the creation and installation of new technologies and their full deployment.