Economic Growth: Onwards and Upwards?

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Abstract

This paper considers developments in UK growth performance and supply-side policies since the 1980s. It argues that economic reforms made in the Thatcher years and consolidated under subsequent governments delivered improved pre-crisis growth outcomes helped by the ICT revolution and stronger competition in product markets. The new growth economics provided useful insights for policymakers some of which were partly heeded. Recently, as productivity growth has stalled, there has been a turn to 'soft' industrial policy and a fear that the future is one of secular stagnation. The former has made little difference and the latter is unlikely.

Keywords: endogenous growth; ICT revolution; UK industrial policy; productivity puzzle; secular stagnation

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I. Introduction

Economic growth remains a major policy objective. Growth is central to achieving rising living standards whether directly by raising incomes or indirectly through facilitating a better quality of life. Sustained growth of labour productivity which is the key ingredient is driven by investment in various types of capital and by innovation. In the medium- and long-term, insofar as government can influence the growth rate, it is supply-side policies that matter. For guidance about the design of these policies, growth economics is the natural starting point.

Over the last 30 years, much has changed in terms both of the way economists think about economic growth and also the context in which the UK economy operates. The advent of endogenous-growth economics has focused attention on the micro-foundations of productivity performance. This not only means that the scope for policy to affect the long-run growth rate is made explicit but also that the range of relevant policies is wider than was recognized by the informal growth economics of the 1970s. Today's policymakers are working in an economy which has de-industrialized quite remarkably, participates in an era of much greater globalization, faces challenges from the rise of China and is deep into the ICT revolution. (Mutually incompatible) spectres such as secular stagnation and the mass computerization of employment seem to mount serious new challenges.

Against this background, I will review how ideas about and policies towards growth have evolved since the mid-1980s and I will draw some lessons from this experience. An important focal point will be the role of 'industrial policy' in its various guises ('selective', 'horizontal' and 'soft'). Then, unprofessionally for an economic historian, I will allow myself some speculations about the future.

II. Emerging Themes in the Mid-1980s

The most obvious feature of the mid-1980s was the growing realization of a 'new normal', namely, that growth had slowed down permanently in OECD countries following the Golden Age which had ended by the mid-1970s (Matthews, 1982). This 'new normal' is reflected in the difference in growth rates between the periods 1950-73 and 1973-95 which is reported in Table 1. A well-known growth accounting exercise by Maddison (1987) interpreted the post-1973 slowdown as largely explicable in terms of the end of a period of rapid catch-up growth which reduced the scope for productivity advance in Europe. However, neither Maddison nor Denison (1985) was able to account for the majority of the slowdown in the United States which represented the key 'productivity puzzle' of the period. This was made all the more mysterious by the 'Solow productivity paradox' that 'you can see the computer age everywhere except in the productivity statistics'.[1] So, in one important respect, there was some considerable uncertainty about the new normal in terms of the future contribution to productivity growth from technological progress in the leading economy.

If policymakers were discouraged by an environment in which growth would be slower, they could be encouraged by the advent of the 'new growth economics'.[2] Hitherto, formal growth theory had been dominated by the neoclassical growth model in which long-run productivity growth was a

[1] This famous quip was made by Robert Solow in July of 1987, see Triplett (1999).
[2] Or, in Gordon Brown's infamous phrase, they could be thrilled by 'post-neoclassical endogenous growth'.

result of exogenous technological change and changes in the investment rate only affected the level of output per person rather than its growth rate. The key feature of the endogenous growth models which appeared during the 1980s was that they made long-run growth rates a result of investment decisions (relating to a broad concept of capital) based on microeconomic foundations. Two different types of model were developed, namely, AK models of growth in which diminishing returns to (broad) capital accumulation were assumed away and endogenous innovation models in which the rate of technological progress is a result of profit-seeking investments. Two well-known variants of the former type were eventually published as Romer (1986), based on constant returns to physical capital, and Lucas (1988) where endogenous growth could be the result of human and physical capital accumulation combined, with the former generating externalities. Both these papers circulated for some years before publication. Two well-known variants of the latter type were the quality-ladders approach of Grossman and Helpman (1991) and the Schumpeterian growth model of Aghion and Howitt (1992) which was first drafted in 1987.

The relevance of both these types of models is that well-designed supply-side policy can have positive growth-rate effects, rather than just levels effects as in the neoclassical growth model. It should be noted, however, that growth rate effects might also result from adverse implications of uncertainty and volatility of demand for investment and the traditional assumption that trend growth was independent of business cycle fluctuations was not necessarily valid (Ramey and Ramey, 1995). In the mid-1980s, however, the policy implications of the new growth economics were still quite unclear.

Empirical analysis of economic growth was also changing in the 1980s as new data sets became available, notably an early version of what became very well-known estimates of long-run real income levels for OECD economies (Maddison, 1982) and a much improved version of the Penn World Tables (Summers and Heston, 1984). These permitted more sophisticated international comparisons of performance and underpinned a huge growth regressions literature. Notions such as 'conditional β-convergence' (Barro, 1991) and 'social capability' for catch-up and convergence (Abramovitz, 1986) were developed as attempts were made to examine the roles that institutions and policies had played in growth outcomes. In turn, this would provide a new framework in which to interpret British relative economic decline.

Relative economic decline was, of course, being addressed in the 1980s by the radical reforms of supply-side policies introduced by the Thatcher governments which had departed from the 'post-war consensus' on economic policy which had prevailed for the previous three decades. The new policies included de-regulation - notably in the financial sector, restructuring of taxation, privatization, reductions in benefits and subsidies, and reforms to industrial relations. Attempts to slow down de-industrialization were largely abandoned and efficiency was prioritized relative to equity. Crucially, the de-facto 'trade-union veto' on policy reform was ended. By the mid-1980s, it seemed possible that the Thatcher Experiment was delivering improved productivity performance but the economic rationale and effectiveness of the reforms were controversial (Crafts, 1988). Moreover, even in the early 1990s, it was unclear whether following the next election many of these policies would be reversed and whether they had delivered a levels effect or a growth rate effect (Crafts, 1991).

The 1980s saw the rejection of selective industrial policy as promulgated in the 1960s and 1970s through protectionism, nationalization, promotion of national champions which had deservedly got a bad name. Commentators who were by no means against government intervention in principle concluded that policy appeared to be "directed at helping old industries to survive rather than encouraging new products and new technology" (Silberston, 1981, p. 49) and that, although 'picking winners' may have been the aspiration, "it was losers like Rolls Royce, British Leyland and Alfred Herbert who picked Ministers" (Morris and Stout, 1985, p. 873). So, in the mid-1980s industrial policy was being downsized in a big way and moving to a mostly horizontal basis. Critics worried that the pendulum had swung too far and that the new policy stance would expose Britain to a dangerous unbalancing away from manufacturing (Krugman, 1987; House of Lords, 1991).

III. What did 1980s' Economists and Policymakers Get Right or Wrong?

As is reflected in Table 1, the mid-1980s' consensus view that the Golden Age of economic growth was over and that growth rates would no longer match those of the 1950s and 1960s was basically correct. That said, the medium-term outcome for the UK was relatively favourable in that labour productivity growth between 1973 and 2007 was not greatly reduced from the pre-1973 rate. Growth slowed down much more in France and Germany so there was a relative improvement in British performance which was not widely anticipated.

The productivity slowdown in the United States, which was at its most acute in the early 1980s, gave way to a strong burst of productivity growth around the turn of the century. The slowdown is still not well understood today but we can say that the Solow Paradox has been resolved and ICT has turned out to be a strong General Purpose Technology (GPT) in terms of its productivity impact, as is shown by the comparisons with the two most famous earlier GPTs in Table 2. To place the chronology in perspective, it is worth noting that James Watt's steam engine was patented in 1769, Thomas Edison first distributed electrical power to customers in New York in 1882, and the Intel 4004 microprocessor was introduced in 1971.

Table 2 reveals both that the impact of ICT has been relatively large and also that it has come through very quickly. This new GPT is unprecedented in its rate of technological progress, reflected in the speed and magnitude of the price falls in ICT equipment reported in Table 1. Faster price falls imply a larger and more rapid adoption of the ICT capital equipment in which the new technology is embodied which feeds through into the ICT-capital deepening component. Even so, the arithmetic of growth accounting immediately reveals that the initial effect of new general purpose technologies such as steam and ICT will be modest simply because β and η are very small in the early days. In the context of Solow Paradox, it is worth noting that by historical standards the growth contribution of ICT in the late 1980s was already quite stunning – the true paradox is why people apparently expected so much more.

The body of empirical evidence with which to assess the new growth economics is now massive compared with the mid-1980s. The detail of how supply-side policy affects the profitability of investment decisions with at least short-term growth effects is now much clearer and the basic predictions of the new growth economics find some support. For example, reforming taxation with a view to increasing the growth rate would generally entail reducing marginal direct tax rates and increasing indirect and property taxes and can have non-trivial effects over a 10 year period

(Johansson et al., 2008). Investment in public capital has positive effects on real GDP, where an output elasticity of about 0.2 is a reasonable assumption, and also 'crowds in' private capital in the medium term (Kamps, 2005a). This estimate underpins a calculation that to maintain the level of public capital to GDP at a growth-maximizing level, public investment of about 2.7 per cent of GDP per year given a reasonable estimate of potential growth in the UK (Kamps, 2005b).

It is now clear, however, that the implications of AK models are not consistent with the data, as has been emphasized in several major reviews of the literature (Acemoglu, 2009, ch. 11; Durlauf et al., 2005; Klenow and Rodriguez-Clare, 2005). The discrepancies include strong evidence in favour of β-convergence across the OECD countries, the post-1973 growth slowdown not being accompanied by significant declines in broad capital accumulation, the small coefficients on investment rates in growth regressions, the small size of estimated externalities to human capital accumulation, and the fact that TFP differences are far more important than factor inputs in accounting for cross-country variation in output per person.[3] Capital accumulation makes an important contribution to growth, as growth accounting underlines (cf. Table 4), but it is not the 'engine of growth' as envisaged by AK models.

Similarly, investigations of the impact of trade liberalization do not match the predictions of the AK model. For example, Badinger (2005) found that European economic integration has had a sizeable impact on the level of income but has not had a permanent effect on the rate of growth. This is in line with recent investigations of the impact of trade liberalizations using difference-in-differences approaches (Estevadeordal and Taylor, 2013) but goes against the hopeful predictions of some economists in the 1980s.[4]

With regard to endogenous-innovation growth models, the basic idea of endogenous innovation remains appealing but it is dubious whether the claim of fully endogenous growth can be sustained. One obvious piece of evidence against this proposition is the failure of OECD growth to accelerate despite large increases in R & D expenditure (Klenow and Rodriguez-Clare, 2005). The evidence is potentially consistent with an interpretation of American growth as being largely underpinned over the post World War II period by a succession of transitory effects resulting from increases in human-capital and research intensities (Fernald and Jones, 2014).

There is, however, plenty of evidence that innovative effort does respond to profit incentives and that the notion of endogenizing TFP growth is plausible. The ability to appropriate returns matters and is achieved by a variety of imperfections in competition (Granstrand, 2006), increased market size stimulates innovation as theory suggests (Acemoglu and Linn, 2004), and R & D responds to price signals as in the case of energy efficiency and energy prices (Popp, 2002). There is consensus in the literature that R and D has a strong impact on TFP growth (with an elasticity of perhaps 0.15).

[3] For example, a recent exercise found that real GDP per person in the EU27 + EFTA countries was 64.7 per cent of the USA level in 2005, compared with human capital intensity at 91.2 per cent, physical capital intensity at 114.1 per cent, labour inputs per person at 91.3 per cent and TFP at 67.8 per cent of the USA level (Duval and de la Maisonneuve, 2009).

[4] For example, Baldwin (1989) argued that the Cecchini Report could be massively underestimating the impact of the European Single Market because the static efficiency it expected would raise the output to capital ratio, and hence for any given savings rate the growth of the capital stock, and thus (in a constant-returns setting) the growth of GDP perhaps by as much as 0.9 percentage points per year. Sadly, this does not seem to have been the outcome.

Similarly, the diffusion of new technology is strongly influenced by absorptive capacity of firms and the profitability of adoption (Geroski, 2000).[5] Accordingly, the international evidence is that the diffusion of ICT has been significantly inhibited in countries which have lower educational attainment and which are heavily regulated (Cette and Lopez, 2012). Employment protection has been shown to deter investment in ICT equipment (Gust and Marquez, 2004) because it increases the costs of reorganizing working practices and upgrading the labour force, which are central to realizing the productivity potential of ICT (Brynjolfsson and Hitt, 2003).

Endogenous innovation models are ambivalent about the impact of competition on innovation. There is the classic 'Schumpeterian' argument was that ex-ante market power encourages innovation because it enhances the expected appropriability of profits. Against this is the 'Hicksian' possibility that market power allows management to be sleepy and the point that firms gain more from innovating in an industry which is competitive ex-ante if profits are perfectly appropriable ex-post. A combination of Hicks and Schumpeter might suggest that the relationship between market power and innovation has an inverted-U shape. A sophisticated variant of these arguments has proposed that entry threats encourage innovation by firms close to the technological frontier who can protect their rents but discourage innovation by firms far from the frontier who will succumb to entry whether or not they innovate (Aghion and Howitt, 1992). Econometric analysis found that in the 1970s and 1980s greater competition increased innovation in the UK (Blundell et al., 1999; Geroski, 1990). Good competition policy has had a strong impact on TFP growth in OECD countries (Buccirossi et al., 2013). There is also evidence of an inverted U-shape in the relationship between market power and patenting with the peak at a low price-cost margin (Aghion et al., 2005). Foreign-firm entry in the UK following trade liberalization has resulted in increased patenting and productivity growth but only in industries close to the technology frontier (Aghion et al., 2009).

The striking result here which was not well understood in the mid-1980s is that strengthening competition can promote growth. Substantial support for this proposition has accumulated since then but the rationale may be more general than that above. A powerful line of argument is that competition is an effective antidote to principal-agent problems within firms that involve managers whose interests are imperfectly aligned with owners with adverse effects on productivity. In this context, weak shareholders find competition helpful in devising contracts that incentivize managers while competition also raises the sensitivity of profits to managerial actions (Nickell, 1996). Additionally, product market competition reduces slack and acts as a disciplinary device fostering the adoption of new technology. In an endogenous growth setting this has growth rate effects (Aghion et al., 1997). Nickell et al. (1997) found that a fall of supernormal profits from 15 to 5 per cent of value added raised TFP growth by 1 percentage point in UK firms without a dominant external shareholder but had no significant effect where there was such a shareholding. Moreover, competition promotes good management practices which pay off in improved productivity outcomes (Bloom and van Reenen, 2007).

The hypothesis that volatility can harm growth has been somewhat controversial. One reason for this is that models were produced that had the opposite prediction, namely, that larger and more

[5] Absorptive capacity entails the ability to search for, evaluate, assimilate, and exploit knowledge. This is underpinned by education and skills but also by investments in intangible capital including crucially R&D (Griffith et al., 2004) but also economic competences including training, flexibility in use of business models, effective cooperation with research organizations, and organizational capabilities (Harris and Moffat, 2013).

frequent business-cycle fluctuations can raise growth, for example, since the opportunity cost of productivity enhancing activities falls in recessions (Aghion and Saint-Paul, 1998) and conflicting results have been found in empirical work (Lin and Kim, 2014). Nevertheless, the preponderance of evidence points fairly clearly to a negative effect on growth of unexpected volatility, uncertainty, or the variance of innovations to a forecasting equation for growth (Bloom, 2014; Rafferty, 2005; Ramey and Ramey, 1995) and this implies that a well-designed macroeconomic policy framework could be beneficial for long-run growth outcomes.

In sum, it is reasonable now to think that, despite its laughing-stock status in Punch-and-Judy politics, 'post-neoclassical endogenous growth theory' offers important insights into the way supply-side policy can be designed to promote productivity growth over the medium term. The main thrust is that growth depends on investment in tangible and intangible capital, in education and training, and on innovation. Decisions to invest and innovate respond to economic incentives such that well-designed policy which addresses market failures can raise the growth rate a bit. This implies that governments need to pay attention to making investments that complement private sector capital accumulation, for example in infrastructure, to supporting activities like education and research and development where social returns exceed private returns, to avoiding the imposition of high marginal direct tax rates, to recognising that regulations can undermine productivity, and to fostering competitive pressure on management to develop and adopt cost-effective innovations.

Table 3 reports modern evidence on British relative economic decline. This confirms the seriousness of growth underperformance during the 1950s through the 1970s but it also shows that this was no longer the case from the 1980s to the eve of the crisis in 2007. By that year, real GDP per person was about the same as in West Germany and ahead of France and it seemed reasonable to argue that relative economic decline vis-à-vis these countries had ended. The shortfall compared with France and Germany in capital deepening and TFP contributions to labour productivity growth largely disappeared (Table 4). A productivity-level gap still remained but this was offset by higher levels of employment and longer hours worked while labour productivity growth was noticeably stronger in the UK after the mid-1990s (cf. Table 1). It seems fair to say that this outcome was better than was generally expected in the mid-1980s.

The acceleration in American productivity growth after 1995 was underpinned by ICT. Since the main impact of ICT on economic growth comes through its use as a new form of capital equipment, the development of this new general purpose technology gave Europe a great opportunity to raise productivity growth but most countries have been less successful in responding than the United States. However, the UK did benefit more than most, as is reflected in Table 5. ICT has had considerable potential to improve productivity growth in some service sectors, especially finance and distribution, and relatively good UK productivity performance after 1995 was based on a strong contribution from market services.

The diffusion of ICT has been aided by complementary investments in intangible capital and in high-quality human capital and relatively light regulation of labour and product markets. Expansion of higher education helped the UK but especially notable is a strong volume of investment in intangible capital (including software, innovative property, economic competencies of businesses) which amounted to 10.5 per cent of market sector GDP in 2006 compared with 7.2 per cent in Germany

and 8.0 per cent in France (van Ark et al., 2009).[6] For the UK, the 1980s' de-regulation of services that are intensive in the use of ICT (notably finance and retailing), which reduced barriers to entry, and reform of industrial relations was important for its relatively successful response to the new technology. Investment in ICT is much more profitable and has a bigger productivity payoff if it is accompanied by organizational change in working and management practices (Crespi et al., 2007). This would not have happened with 1970s-style industrial relations in conditions of weak competition. For example, Prais (1981, pp. 198-199) noted the egregious example of the newspaper industry where these conditions precluded the introduction of electronic equipment in Fleet Street although an investment of £50 million could have reduced costs by £35 million per year.

Putting this recent experience into longer-run perspective, two points deserve to be made. First, Britain has been relatively good at the diffusion of ICT in market services whereas in the earlier postwar period it was relatively bad at the diffusion of Fordist techniques in manufacturing. This makes the point that relative social capability is not independent of the technological epoch. Second, success in ICT diffusion was an unintended and unexpected consequence of economic reforms in the Thatcher period.

Since the 1970s, government policy has moved in the general direction of substantially increasing competition in product markets, initially through abandoning protectionism, then through de-regulation and finally through strengthening competition policy. There is no doubt that this had a significant effect in improving productivity performance (Crafts, 2012).[7] The impact was felt at least partly through greater pressure on management to perform and through firm-worker bargains which raised effort and improved working practices. For example, increases in competition resulting from the European Single Market raised both the level and growth rate of TFP in plants which were part of multi-plant firms and thus most prone to agency problems (Griffith, 2001). Trade union membership and bargaining power were seriously eroded. This was prompted partly by high unemployment and anti-union legislation in the 1980s but also owed a good deal to increased competition (Brown et al., 2008). The 1980s saw a surge in productivity growth in unionized firms as organizational change took place under pressure of competition (Machin and Wadhwani, 1989) and de-recognition of unions in the context of increases in foreign competition had a strong effect on productivity growth in the late 1980s (Gregg et al., 1993). The productivity payoff was boosted by the interaction of reforms to industrial relations and product-market competition; this was another pleasant surprise.

Selective industrial policy stayed out of favour and spending on horizontal policies was greatly reduced by the removal of most investment and employment subsidies. This was partly because the 1970s experience led to disillusionment and partly because international treaties and, in particular, EU rules on state aids constrained policy. DTI expenditure on industrial policy measures was £421.4 million in 1997/8 (prior to devolution) of which £121.9 million was on science and technology

[6] Growth accounting techniques can be modified to include a contribution from intangible capital. This also entails modifying the definition of output and revising factor shares and means that residual TFP growth changes. If this is done, the post-1995 UK had notably higher productivity growth contributions than either France or Germany from each of ICT capital deepening, intangible capital deepening and TFP (van Ark et al., 2009).

[7] The impact of increased competition resulting from joining the European Economic Community was far greater than anyone foresaw ex ante (Crafts, 2015a).

schemes, £171.3 million for support for small firms, and £128.2 million on regional policy, almost all of which went on Regional Selective Assistance (RSA) (Wren, 2001). Whereas in 1981/6 state aids were 3.8 per cent of manufacturing GDP by 1994/6 this had fallen to 0.9 per cent. Virtually all (91%) of state aid in 2006 was for horizontal rather than selective policies (Buigues and Sekkat, 2011).

When Labour won a landslide victory in the 1997 election, it was possible to wonder whether in government it would revert to 'Old Labour' policies. The answer soon became apparent and was a resounding 'No'. 1970s-style policy was conspicuous by its absence: there was no nationalization programme, no move to subsidize manufacturing investment, no counterpart of the National Enterprise Board, no return to high marginal rates of direct tax, no attempt to resist de-industrialization by supporting declining industries, and no major reversal of industrial relations reform. Implicitly, the Thatcher supply-side reforms had been accepted. The changes that Labour made were to strengthen some aspects of horizontal industrial policies with a new emphasis on education, R & D, investing in public capital, and strengthening competition policy. This was further fine-tuning of reforms to make a 'liberal market economy' (Hall and Soskice, 2001) work better.

New Labour also emphasized the importance of stability based on a predictable policy framework as conducive to better growth performance and saw the delegation of monetary policy to the Bank of England and its fiscal rules as delivering this (HM Treasury, 2002). The 'Great Moderation' period was characterized by very significant reductions in macroeconomic uncertainty and this was probably favourable for pre-crisis growth performance. However, this seems to have owed more to good luck, in the shape of a more benign economic environment, than to good policy (Benati, 2008). Notably, a dog that didn't bark was a financial crisis although the financial liberalization of the 1980s and subsequent evolution of banking had considerably increased the economy's exposure to this risk (ICB, 2011).

IV. How Have Perceptions of the Issues Changed?

On the eve of the crisis, the growth performance of the UK economy was generally seen as quite satisfactory (Van Reenen, 2013). A long period of relative economic decline vis-à-vis other European economies seemed to have come to an end under the auspices of the supply-side policies initiated under the Thatcher government and continued in most respects by New Labour. Subsequent developments have come as a rude shock; in 2014 quarter 2, real GDP per person was still only at 98.2 per cent of the previous peak level in 2008 quarter 1 while real GDP per hour worked at the end of 2013 was about 16 per cent below what would have been expected on the basis of its pre-crisis trend (Barnett et al., 2014). This new 'productivity puzzle' raises questions about the continued viability of the 'post-Thatcher consensus'.

Several new issues have emerged since 2007. First, in the aftermath of the worst financial crisis since the 19th century, the 'productivity puzzle' surely reflects a permanent and sizeable adverse effect on the level of potential output but may provoke some scepticism as to whether pre-2007 trend growth is sustainable.[8] Second, the crisis has also reawakened 1980s' concerns about the structure of the UK economy as to whether the financial sector had become too big and

[8] It is generally agreed that serious financial crises reduce the level of potential output although by how much is debateable. There is no strong evidence that post-crisis trend growth is reduced but the transition period while the levels effect materializes may be quite long (IMF, 2009).

manufacturing too small so that 'rebalancing' of the economy should become a policy priority. Third, in the context of slow growth and an 'unbalanced' economy, a fundamental re-design of industrial policy started to be discussed for the first time in a generation. Fourth, it has become increasingly apparent that a new industrial policy will have to contend with a more globalized world economy and, in particular, the so-called '2nd Unbundling' which has resulted from the ICT revolution (Baldwin, 2012).

The estimates in Table 1 illustrate the 'productivity puzzle' with growth in real GDP per hour worked averaging -0.51 over the years 2007-13. Estimates by The Conference Board (2014) suggest that the key culprit in growth accounting terms was TFP growth which averaged -1.36 per cent per year but was partly offset by continued capital-deepening. This raises the question of the extent to which negative productivity growth over these recent years reflects a one-time adjustment to a lower level of potential output or a 'new normal' lower trend rate of growth of productivity. It is well-known that financial crises can have permanent adverse direct effects on the level and possibly also the trend growth rate of potential output. Thinking in terms of a production function or growth accounting, there may be direct adverse effects on capital inputs as investment is interrupted, on human capital if skills are lost or restructuring makes them redundant, on labour inputs through increases in equilibrium unemployment, and on TFP if R & D is cut back or innovative firms cannot get finance.

The orthodox view, embraced by OECD and the Office for Budget Responsibility (OBR) among others, is that there has been a big levels effect but no impact on future trend growth such that log labour productivity will maintain a trend path parallel to what would have been expected in 2007.[9] Thus OBR (2014a) believes that the future long run trend rate of growth of labour productivity will be 2.2 per cent per year while the current output gap is only about 1 per cent of GDP.[10] The estimates by Ollivaud and Turner (2014) reported in Table 6 show a levels effect on labour productivity of 9.1 per cent most of which comes from a fall in TFP of 7.4 per cent. At the same time, these authors estimate that the output gap is only 1.3 per cent of GDP so the adverse effect is expected to be permanent. It is striking that the estimated impact of the crisis on the level of TFP is much larger than that in other countries.

The costs of a banking crisis in terms of foregone output are now much more generally recognised to be very large. At least in retrospect, it seems clear that de-regulation in the financial sector went too far and that, subsequently, excessive leverage risked a banking crisis which could have a serious adverse effect on potential output. In particular, given market failures arising from asymmetric information and moral hazard, banks should have been required to have much higher ratios of loss-absorbing equity capital to reduce the risks of bank failures. This might well imply that capital would have been more expensive and real GDP a bit lower as a result. Nevertheless, since the output losses are so substantial, this is probably a price worth paying. For example, the benefit-cost analysis in Miles et al. (2013) suggests that optimal bank capital is close to 20% of risk-weighted assets at an annual cost of about 1.5 per cent of GDP.

[9] This would actually be quite similar to what analysis based on time-series econometrics suggests for the experience of the United States in the context of the massive financial crisis during the Great Depression (Ben-David et al., 2003).

[10] This projection implies that the sustainable trend rate of growth pre-crisis was a little below the end-point calculation of the growth rate between 1995 and 2007 reported in Table 1.

It is important to know whether the orthodox view that the 'productivity puzzle' basically reflects a large levels effect, resulting from the financial crisis and accruing primarily through a one-off decline in TFP, is correct. A more pessimistic interpretation would be that it is partly the result of a slowdown in trend labour productivity growth. A more optimistic interpretation would be that some of what is now counted as a permanent effect will actually be regained as the economy returns to normal. There is still considerable uncertainty about these issues, especially with regard to TFP. A recent overview suggested that as much as 6 percentage points (3/8ths) of the shortfall is currently unexplained (Barnett et al., 2014) but found quite strong evidence that the crisis had led to impairment of resource reallocation, and thus had decreased efficiency as well as holding back implementation of innovations, while also noting that there is little evidence of spare capacity and that labour hoarding seems unlikely still to be a strong factor. The decline in TFP seems quite large (by at least 4 percentage points) compared with what might be predicted on the basis of earlier financial crises (Oulton, 2013a) but the uncertainty engendered by the crisis has been very severe and this may well have undermined productivity performance (Bloom, 2014).

Thus, it still seems possible to fear that trend TFP growth will be weaker in future or to hope that as uncertainty among businesses recedes and normal patterns of entry and exit return there will be an increase in efficiency that will repair some of the damage. The economy probably had a small positive output gap in 2007 but not big enough seriously to distort perceptions of pre-crisis performance.[11] It can fairly be pointed out that a more heavily regulated and somewhat smaller financial services sector may well contribute less to productivity growth in future than in the pre-crisis years but it is not correct to see its pre-crisis contribution as a mirage.[12] There has been no dramatic change in supply-side policy of the kind that the UK experienced in the crisis of the 1930s which saw the abandonment of free trade and a serious weakening of competition in product markets that took decades fully to reverse and undermined productivity performance in the decades after World War II (Crafts, 2012). On the contrary, policy settings in areas such as competition and product market regulation which served the economy well prior to 2007 are still in place (Crafts 2015b). There is no obvious reason to suppose that future productivity growth should be much lower unless it is feared that technological progress at the frontier will become weaker.

By 2007, the share of manufacturing in UK employment had fallen to 10.1 per cent from 27.2 per cent in 1975 and 17.8 per cent in 1990. The crisis has re-opened the question of the desirability of this de-industrialization. For example, in many speeches in 2009 Peter Mandelson declared that there should be 'less financial engineering, more real engineering'. It is quite possible that, if the share of manufacturing in the economy were to rise, labour productivity growth would increase; in the pre-crisis period the growth rate of real output per hour worked in manufacturing exceeded that

[11] The output gap is always measured with difficulty but the best guess is that it was about 2 per cent in 2007 according to the detailed analysis in Murray (2014).

[12] It is sometimes claimed that mismeasurement of financial services output distorted the pre-crisis picture; Oulton (2013b) shows that any such effect is very small - at most 0.1 percent per year during 2000-2007. According to the EUKLEMS database, output per hour worked grew at 4.23 per cent per year between 1197 and 2007 and, weighted by the sector's value-added share, contributed 0.19 per cent per year to total labour productivity growth.

in market services by about 1 percentage point per year.[13] However, there is as yet no sign of an upturn in manufacturing's share of economic activity and it is difficult to think of a credible scenario in which it could occur (Foresight, 2013). Manufacturing was 9.5 per cent of GDP and 9.8 per cent of employment in the first three quarters of 2014. The idea that there is a route to significantly faster growth through re-industrialization any time soon seems far-fetched.

Nevertheless, there are good reasons to think that pre-crisis industrial policies could be significantly improved upon and the Coalition Government certainly thought so in *The Plan for Growth* (HMT and BIS, 2011). Seasoned observers know well that during the 'post-Thatcher consensus' there were persistent weaknesses in horizontal industrial policies relating to education, infrastructure, regulation, taxation and, especially, innovation policy all of which might extract a growth penalty according to new growth economics.

The quality of education is generally seen as important for growth and there is evidence that cognitive skills matter. As measured by international test scores, UK schooling has been flat-lining recently and is well below the top performers as measured by OECD's PISA scores. The average for maths and science in 2012 was 504 compared with 503 in 2009 and 505 in 2006. Hanushek and Woessmann (2012) estimate that increasing this score by 25 points – a bit less than half the difference between the UK and Singapore - would raise the long-run growth rate by about 0.3-0.4 percentage points. It remains to be seen whether the Gove reforms will improve matters.

There is consensus in the literature that R and D has a strong impact on TFP growth and has a very high social rate of return, on average 2 to 3 times as high as the median private rate of return of around 20 to 25 per cent (Frontier Economics, 2014). More generally, the process of innovation is exposed to market failures and there is a strong prima facie case for government intervention. This has long been recognised by UK governments yet the UK level of R and D (1.73 per cent of GDP of which business R and D comprised 1.10 per cent of GDP) is less than half that of the biggest spending OECD countries (OECD, 2014). Government support for R and D continues to be underfunded.

From a growth perspective, the UK has been investing too little in infrastructure. The UK net stock of public capital relative to GDP fell substantially between 1980 and 2010 (from 64% to 36%). To maintain the level of public capital to GDP at a growth-maximizing level, public investment of about 2.7 per cent of GDP per year would be needed but UK investment has fallen from 2.4 to 1.9 per cent of GDP since 2010 and during 2014/15 through 2018/19 this will fall to an average of 1.8 per cent (OBR, 2014b). This is an unhelpful policy development.

Reforming taxation with a view to increasing the growth rate would generally entail reducing marginal direct tax rates and a serious reform of corporate taxation while increasing indirect and property taxes (Mirrlees et al., 2011). Relatively low statutory UK corporate tax rates and increases in VAT seem to suggest this advice has been heeded. However, calculations of UK Effective Average and Effective Marginal Tax Rates (taking into account capital allowances) indicate that by 2015 the former will be 20.3 and the latter 18.9 per cent which would leave the UK as 29th among OECD economies (Bilicka and Devereux, 2012) while the VAT tax base remains very narrow.

[13] However, a smaller financial services sector might not help; it should be noted that labour productivity growth in financial services was appreciably higher than in manufacturing, 4.23 per cent per year compared with 3.48 per cent per year in the ten years to 2007 (EU KLEMS, 2011).

Not all UK regulation is productivity friendly. Recent research has emphasized that UK land-use planning reduce labour productivity significantly both by making land unduly expensive and by restricting city size which means that agglomeration economies are foregone and spatial adjustment is impeded – successful British cities are too small (Leunig and Overman, 2008). One of the implications of the planning rules is an implicit regulatory tax rate of around 300 per cent which makes office space in cities like Leeds and Manchester much more expensive than even New York and San Francisco (Cheshire and Hilber, 2008). Similarly, planning policy by making land for retailing very expensive and by constraining retailers to choose less productive sites has reduced the level of TFP in supermarkets by about 32 per cent in post-1996 compared with pre-1988 stores, thereby significantly reducing the rate of TFP growth in the sector (Cheshire et al., 2015). The National Planning Policy Framework introduced in 2012 addresses some of these issues by introducing a presumption in favour of development where there is no local plan but still retains the Green Belt and did not liberalize the rules for retailing. This represents only a timid step in a direction favourable to growth – a bit underwhelming compared with the rhetoric of *The Plan for Growth*.

The Plan for Growth (HMT and BIS, 2011) had four declared aims, namely, to create the most competitive tax system in the G20, to make the UK one of the best places in Europe to start, finance and grow a business, to encourage investment and exports as a route to a more balanced economy, and to create a more educated workforce that is the most flexible in Europe. This can largely be construed as continuity in terms of signalling an intention to improve horizontal industrial policies and this impression is strengthened by much of the detailed discussion in the document.

Nevertheless, the aspiration to achieve a 'more balanced economy' did mark something of a change in response to the shock of the financial crisis, clearly represented a desire to strengthen sectors which were deemed to central to these goals through an 'industrial strategy', and has entailed a move back towards more selective industrial policies albeit without the corporatist overtones of the 1970s or any grand ambition to make reforms that would develop a 'co-ordinated market economy' (Hall and Soskice, 2001).

The distinctive feature marking a modest break from the pre-crisis years is the 'industrial strategy' which aims to promote growth through boosting eleven selected sectors and to stimulate the advance and commercialization of eight selected technologies (Rhodes, 2014). The government is in the process of developing 'strategic partnerships' in key sectors with growth potential to address market failures, especially with regard to innovation, and to underpin investment (BIS, 2012). These entail a high-level forum, skills improvement initiatives, and public support for research centres. An interesting component of this approach is the funding of 'catapult centres' which aim to enhance business capabilities in the exploitation of new technologies. Industrial strategy expenditure is running at about £2 billion per year.

Although this is a return to 'selective industrial policy', it is not really 'back to the 1970s'. Back then, there is no doubt that such policies were a very expensive failure characterized by costly support for declining industries and vain attempts to compete with the United States in high-technology industries. The current approach is on a much smaller scale and is closer to 'soft industrial policy' with the government as a facilitator that seeks to address coordination failures rather than to 'pick winners' (Warwick, 2013). In particular, the aim is to address market failures associated with the so-called 'valley of death' in terms of the phase of technology platform research (which often entails

high risk, high cost and provision of public goods) that comes between basic research and applied R and D (Tassey, 2014).

It is difficult to believe that the industrial strategy really tackles the most important reasons for the business (and manufacturing) innovation shortfall which the Coalition wishes to remedy and in this respect it is no different from earlier governments. In particular, R and D is an activity which is vulnerable to short-termism and impatient capital where future returns are myopically discounted - a problem more likely to be found in a 'liberal market economy' than a 'co-ordinated market economy'. It has been regularly documented that UK equity markets are notably short-termist (Miles, 1993; Black and Fraser, 2000; Davies et al., 2014) and that this has adverse effects on long-term innovation related investment (Bond et al., 2003; Hughes, 2013). It may be that to address these issues quite significant institutional reform is required and that this is the next step in re-thinking supply-side policy.

A return to selective industrial policy has also to take account of the '2nd Unbundling' which is based on ICT and has been taking place in the last 25 years or so. This entails the development of complex supply chains with many production stages in different locations based on the reduction in coordination costs facilitated by the new technology (Baldwin, 2012). Manufactured products are produced but the fabrication of them does not necessarily contribute a high proportion of the value added which may actually accrue in service activities both pre-and post fabrication.[14] In this new phase of globalization manufacturing activity has been shifting from high income countries to developing countries, notably to China, and many jobs in countries like the UK have become vulnerable to offshoring (Blinder and Krueger, 2013). The value-added contribution of low and medium-skilled workers in advanced countries to global value chains in manufacturing fell sharply between 1995 and 2008 from 34.9 to 22.1 per cent (Table 7). The aim of 21st-century industrial policy will presumably be to try to anchor high value-added segments of the supply-chain in the UK, including activities conventionally taken to be, and perhaps measured as, services.

These developments have implications that change the optimal composition of industrial policies compared with the less globalized world in the earlier technological era of the 1970s (Baldwin and Evenett, 2012). First, with regard to selective policies, it may be necessary to re-think the notion of giving support to particular manufacturing sectors and think instead in terms of interventions that influence the location and co-location of economic activities. Second, the increased mobility of some factors of production means that it may be important not only to consider externalities but how far these will be internalized to the UK. This means, for example, that compared with earlier times, the weight of horizontal policies should tilt towards human capital rather than transferable technology. Third, corporate taxation has to be designed for a world in which there is greater tax competition which typically implies lower marginal rates than in a closed-economy setting.

Perhaps most important of all is to recognize the value of increasing the 'stickiness' of economic activity by making alternative locations less good substitutes. This results from advantages that cannot easily be replicated elsewhere. In particular, this suggests that policies to nurture successful agglomerations deserve a high priority. It may be appropriate for the British government to follow

[14] In the well-known example of the 2007 Nokia smart phone, 2% of the retail price came from final assembly and 33% from the cost of physical components with the rest accruing from a variety of service inputs (Ali-Yrkkö et al., 2011)

the lead of the Dutch (CPB, 2010) and consider what a successful portfolio of British cities would look like in future and how this can be underpinned. This calls for an approach different from that of traditional industrial policy with its emphasis on subsidies to physical investment or promoting particular manufacturing industries. Instead, it will be important to develop well-designed transport infrastructure and land-use planning policies. Unfortunately, these are areas in which British policies leave a lot to be desired.

V. Future Issues

A remarkable recent development is the revival of interest in the concept of 'secular stagnation', originally popularized by Hansen (1939). Hansen argued that the American economy faced a crisis of under investment and deficient aggregate demand since investment opportunities and significantly diminished in the face of the closing of the frontier, declining population growth and a slowdown in technological progress. It was as if the United States was faced with a lower natural rate of growth to which the rate of growth of the capital stock would adjust through a permanently lower rate of investment. According to pessimists, the problem that future generations now face is that the rate of technological progress will be much slower (Cowen, 2011). Once again, as in the 1980s, the prospect of a 'new normal' of lower growth is much discussed (Sentance, 2013).

Mainstream opinion among American economists rejects the secular stagnation thesis (Fernald, 2014). It is true that projections of growth rates over the next 10 to 15 years in the United States have been reduced somewhat since the Great Recession and it is generally accepted that employment growth and the rate of improvement of labour quality will be slow down. However, even Gordon (2014), often cited as a notorious pessimist, expects labour productivity growth at 1.3 percent per year based on TFP growth around the average of the last 40 years. Future technological progress is notoriously hard to predict – 1980s' pessimism was, of course, derailed by ICT - but there is quite possibly scope for a significant acceleration in TFP growth since a major legacy of the ICT revolution will be much higher productivity in undertaking R & D (Mokyr, 2014).

It seems quite likely that the impact of computerization will intensify in the near future. Frey and Osborne (2013) estimate that 47 per cent of 2010 employment in the United States has at least a 70 per cent chance of being computerized by 2035 with these probabilities being strongly negatively correlated with wages and educational attainment of workers. Job polarization has been a striking feature of employment patterns in advanced economies in the last 30 years or so with the percentages of high-skilled (professional, managerial etc.) and low-skilled (labourers, low-education service sector workers) employment rising while middle-skilled (clerical, blue-collar) employment has been falling. Estimates reported in Table 8 for an aggregate of 16 European countries show a fall of 9.27 percentage points in the share of their 'middling occupations' between 1993 and 2010 against rises for 'high-paying' and 'low-paying'. The model estimated by Goos et al. (2014) suggests that this has been almost entirely due to technological change rather than to offshoring with the occupations that have been shrinking being those which entail tasks which are routine and codifiable and have been most amenable to computerization (Autor, 2014).

Future advances will come in machine learning which will be applied in mobile robotics as hitherto non-routine tasks are turned into well-defined problems in particular using big data which will allow substitution of (much cheaper) robots for labour in a wide range of low-wage service occupations.

Tasks which will probably not be susceptible to computerization are those involving perception and manipulation, creative intelligence, or social intelligence. This suggests that the issue to be confronted is actually not so much an absence of technological change but its factor-saving bias which could entail major problems in the labour market.

If future productivity growth is undermined by a slowdown in technological progress, it becomes all the more important that supply-side policy is well-designed to take advantage of what opportunities there are and to reduce productivity gaps with other advanced economies. Market failures in finance and innovation are serious and need to be corrected by appropriate policy interventions, as experience since the 1980s has confirmed, but it is natural to worry about the effectiveness of government in addressing the issues (Mayhew, 2013). This is, of course, not a new worry but it gains additional purchase with the relative decline of the two major political parties. Government failure is likely to loom larger for the next generation.

In this vein, the LSE Growth Commission (2013) recently suggested that failures in the institutional architecture are at the roots of the persistent and serious failure in UK investment in public capital which has continued under the present government. (Vote-seeking politicians cannot be expected to make good policy or respect cost-benefit analysis). They propose a solution in terms of several new institutions with powers delegated by parliament with statutory responsibility for strategy, an infrastructure planning commission with responsibility for delivery and an infrastructure bank to provide finance.

Whether this solution is the best one or not, the diagnosis is surely correct and applies quite widely to supply-side policy.[15] Supply-side policy is exposed to government failure but this has not been addressed by institutional innovation in the UK. In other aspects of public policy, it is accepted that politicians cannot be trusted to deliver efficient outcomes. Recent examples include the delegation of monetary policy to an independent Bank of England, the establishment of NICE to consider the costs and benefits of new drugs, the de-politicization of competition policy by removing the ministerial prerogative to over-rule the competition authorities, and the Office of Budget Responsibility to evaluate macroeconomic forecasts and the implications of government policy for fiscal sustainability. With regard to the politics of protectionism, we long ago signed up to international treaties (GATT/WTO/EU) which remove political discretion and which have guarded against a repeat of the policy errors of the 1930s.

At a minimum, it may be necessary to develop serious surveillance of supply-side policy. An agency tasked with this function might be asked inter alia to require government departments to provide information for the public domain and to audit government policies for their effects on medium-term productivity performance. It might also be asked to benchmark supply-side policies against international best practice and be expected to provide a regular strategic assessment and evidence papers.[16] A reconsideration of the framework in which supply-side policy is generated is made all

[15] For example, with regard to investment in roads a more attractive solution may be to make the road network a regulated utility with statutory obligations, a regulatory asset base and a revenue stream, a proposal from which the government has backed away.

[16] An example of a somewhat similar remit is the Australian government's independent research and advisory body, the Australian Productivity Commission.

the more urgent by the return of selective industrial policy, the recent upsurge of populism, and the increased likelihood of indecisive elections.

VI. Conclusions

A claim that the message from the last 30 years is 'Onwards and upwards!' is surely over the top but nevertheless there has been some good news since the 1980s. Most obviously, economic growth is an area where economics has a lot more to offer than used to be the case. Despite entertaining some unpersuasive ideas, on balance, the endogenous-growth revolution has produced both richer empirics and important practical implications which can help the design of much more effective supply-side policy.

The most striking change in thinking about productivity performance is the widespread recognition that competition really matters and can be an antidote to problems such as incompetent management and dysfunctional industrial relations which seemed completely intractable 40 years ago. If there is to be a return to a much more pro-active industrial policy in the UK, it is important that adverse implications for competition are minimized.

In the 20 years before the financial crisis, the UK's economic growth performance was quite respectable by international standards and stronger than might have been generally expected in the 1980s. This period seemed to see the end of British relative economic decline and the economic reforms of the Thatcher years deserve some credit for this. The ICT revolution did deliver and, as a pleasant surprise, the UK turned out to be much better at exploiting its opportunities than had been the case with Fordist manufacturing. At the same time, supply-side policy in the late 20th and early 21st centuries has left a good deal to be desired with persistent weaknesses in education, infrastructure, and innovation policies. This would not be surprising to Thatcher's 1980s' critics.

More recently, however, there have been some dark clouds and the optimism of a decade ago has evaporated. The 'productivity puzzle' of the last few years remains a worrying conundrum and may yet herald a period of weaker trend growth. However, fears about long-term 'secular stagnation', based on the end of innovation as we have known it, seem overdone. The problem is much more likely to be the factor-saving bias of technological progress based on computerization of jobs than a drying-up of productivity growth.

The crisis has provoked renewed interest in industrial policy or, as the Coalition government would have it, 'industrial strategy'. This is understandable and perhaps desirable and is unlikely to take us back to the 1970s. Nevertheless, it remains somewhat unclear what the design of a new industrial policy should be in a world of global supply chains and mobile capital. Moreover, this is an area where it is right to fear 'government failure', especially in an era of populist politics. This suggests that the time is right to pay attention to a long overdue overhaul of the institutional architecture of supply-side policymaking.

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Table 1. Rates of Growth of Real GDP/Person and Real GDP/Hour Worked (% per year)

	Y/P	*Y/HW*
1950-1973		
France	4.02	5.02
Germany	5.02	5.85
UK	2.42	2.85
USA	2.45	2.56
1973-1995		
France	1.61	2.85
Germany	1.92	3.01
UK	1.75	2.76
USA	1.80	1.28
1995-2007		
France	1.64	1.67
Germany	1.55	1.78
UK	2.87	2.52
USA	2.18	2.12
2007-2013		
France	-0.46	0.23
Germany	0.94	0.30
UK	-0.87	-0.51
USA	0.14	1.22

Note: Germany is West Germany prior to 1995.

Source: The Conference Board (2014)

Table 2. GPTs: Contributions to Labour Productivity Growth (% per year)

	Capital-Deepening	*TFP*	*Total*
Steam (UK)			
1760-1830	0.011	0.003	0.014
1830-1870	0.18	0.12	0.30
1870-1910	0.15	0.16	0.31
Electricity (USA)			
1899-1919	0.34	0.06	0.40
1919-1929	0.23	0.05	0.28
ICT (USA)			
1974-1995	0.41	0.36	0.77
1995-2004	0.78	0.72	1.50
2004-2012	0.36	0.28	0.64

Memorandum Item: Real Price Falls (%)

Steam Horsepower	
1760-1830	39.1
1830-1870	60.8
1870-1910	50.0
Electric Motors (Sweden)	
1901-1925	38.5
ICT Equipment	
1970-1989	80.6
1989-2007	77.5

Notes:

Growth accounting estimates based on the following equation:

$$\Delta(Y/L)/(Y/L) = \alpha\Delta(K_O/L)/(K_O/L) + \beta\Delta(K_{GPT}/L)/(K_{GPT}/L) + \omega(\Delta A/A)_{GPT} + \phi(\Delta A/A)_O$$

This equation decomposes the sources of labour productivity growth into contributions from two types of capital, GPT capital and other capital each weighted by their income shares, β and α, and two types of TFP growth in the production of GPT equipment and in the rest of the economy, each weighted by their shares in gross output, ω and ϕ. Thus, the GPT is allowed to have impacts on labour productivity growth both through a capital-deepening effect and through own TFP growth.

Sources:

Growth accounting: Crafts (2002) (2004) and Byrne et al. (2013).

Price falls: Crafts (2004), Edquist (2010) and Oulton (2012).

Table 3. Real GDP/Head (UK = 100 in each year)

	USA	*West Germany*	*France*
1870	76.6	57.6	58.8
1913	107.7	74.1	70.8
1929	125.3	73.6	85.6
1950	137.8	61.7	74.7
1979	142.7	115.9	111.1
2007	124.3	101.9	87.4
2013	132.2	107.8	89.8

Notes: estimates refer to Germany from 1870 to 1937. Purchasing power parity estimates in $1990GK for 1870 through 1979 and in $2005EKS from Penn World Table for 2007 and 2013.

Sources: Maddison (2010) and The Conference Board (2014); West Germany in 2007 and 2013 calculated from Statistiches Bundesamt Deutschland 2014.

Table 4. Contributions to Growth in Market Sector, 1950-2007 (% per year).

	Education	*Capital per Hour Worked*	*TFP*	*Labour Productivity Growth*
France				
1950-1973	0.5	1.7	3.0	5.2
1973-1995	0.2	1.2	1.5	2.9
1995-2007	0.3	0.7	0.9	1.9
Germany				
1950-1973	0.4	2.3	2.5	5.2
1973-1995	0.3	1.1	1.3	2.7
1995-2007	0.0	1.0	0.7	1.7
UK				
1950-1973	0.5	1.5	1.4	3.4
1973-1995	0.4	0.9	1.3	2.6
1995-2007	0.4	1.2	1.0	2.6
United States				
1950-1973	0.3	0.9	1.5	2.7
1973-1995	0.3	0.5	0.4	1.2
1995-2007	0.3	1.2	1.1	2.6

Note: labour productivity is measured in terms of output per hour worked.

Sources: 1950-1995: O'Mahony (1999); 1995-2007: van Ark (2011). Education contributions from 1950-1995 are estimated based on years of schooling in Morrisson and Murtin (2009).

Table 5. Labour Productivity Growth in the Market Sector, 1995-2007 (% per year)

a) Growth Accounting

	Labour Quality	*ICTK/HW*	*Non-ICT K/HW*	*TFP*	*Labour Productivity Growth*
UK	0.4	0.8	0.4	1.0	2.6
France	0.3	0.3	0.4	0.9	1.9
Germany	0.0	0.5	0.5	0.7	1.7
USA	0.3	0.9	0.3	1.1	2.6

b) Sectoral Contributions

	ICT Production	*Goods Production*	*Market Services*	*Reallocation*	*Labour Productivity Growth*
UK	0.5	0.7	1.6	-0.2	2.6
France	0.4	0.8	0.7	0.0	1.9
Germany	0.5	0.9	0.4	-0.1	1.7
USA	0.8	0.3	1.8	-0.3	2.6

Source: van Ark (2011)

Table 6. Crisis Effect on Level of Potential Output in 2014 (% fall relative to pre-crisis level)

	Labour Productivity	***Due to Capital/Worker***	***Due to TFP***	***Employment***	***Total***
France	-0.2	-0.3	0.1	-0.9	-1.1
Germany	0.4	0.5	-0.1	-4.3	-3.9
UK	9.1	1.7	7.4	-0.5	8.6
United States	1.8	1.3	0.5	0.7	2.5

Note: Column (1) is based on output per worker.

Source: Ollivaud and Turner (2014)

Table 7. Factor Shares in Global Value Chains of Manufactures (%)

	1995	*2008*
High Income Countries	***73.8***	***56.0***
Capital	26.5	21.6
High-Skilled Labor	12.4	12.2
Medium-Skilled Labor	24.6	17.0
Low-Skilled Labor	10.3	5.1
Other Countries	***26.2***	***44.0***
Capital	14.4	25.7
High-Skilled Labor	1.4	3.1
Medium-Skilled Labor	4.1	7.5
Low-Skilled Labor	6.2	7.7

Source: Timmer et al. (2014)

Table 8. Levels and Changes in European Employment, 1993-2010

	Employment Share in 1993 (%)	***Change in Share, 1993-2010 (%pt.)***	***Routine Task Intensity (mean = 0)***	***Offshorability (mean = 0)***
High-Paying Occupations	31.67	5.62	-0.72	-0.12
Middling Occupations	46.75	-9.27	0.69	0.24
Low-Paying Occupations	21.56	3.65	0.08	0.84

Note: data are averages for 16 European countries.

Source: Goos et al. (2014)