

Technologies series

Eat, be eaten, or die

Firms that do not handle technological change constructively will be toast

We are embarking on a major new research exercise, because

We at Llewellyn Consulting are embarking on a major new addition to our research offering. Building on our earlier, 22-page, *Technology Blue Book*,¹ we shall be looking in detail at a whole range of new technologies and their likely effects, both at the micro and at the macro level.²

... a raft of new technologies are set to change the world

Some of the new technologies are so-called 'enabling' technologies: those that, by their nature stand to find widespread application in a diverse range of activities – not least because they combine with other technologies. Key amongst these are artificial intelligence (better called 'machine learning'); blockchain ('distributed ledger'); and cloud, grid, and quantum computing.

In addition, there is a raft of new technologies that, while perhaps somewhat less broad and super-pervasive, nevertheless stand to have huge effects. Of these:

- Some are only in the early stage of scientific investigation and development, and so may take 20 years or more to find application; but
- A significant number – we shall focus on 30-odd of them – are closer (i.e. 10-20 years to application) and hence within a company's typical planning horizon). And in addition,
- Some – we shall focus on 16 or so of them – are practically ready for application.

The pressure is on

Firms will be affected well within current planning horizons

Decision-makers need not only to become fully familiar with the new technologies themselves, but also to see how associated policy and regulation is likely to evolve. Furthermore, they also need to consider the behaviour of competitors, particularly those at the technology 'frontier'.

'Frontier' firms³ have grown to dominate the new 'intangible' economy – Google, Apple, Microsoft, Amazon, Facebook and others have amassed huge cash balances, and are moving into ever more industries, partnering with incumbents, start-ups or going it alone. A wide performance gap has opened up between these companies and the rest (Figure 1). Concentration is increasing.

Only those which take good decisions are likely to prosper

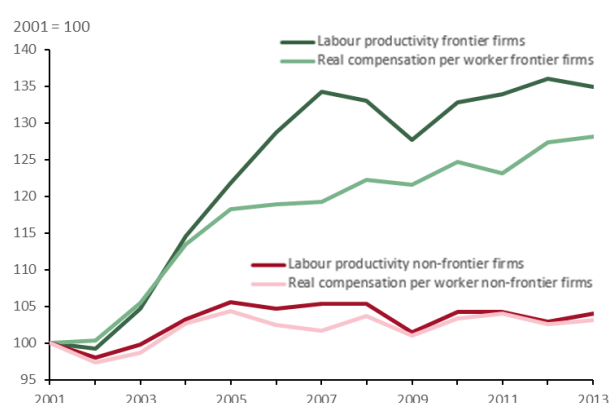
This combination of technology and strong international competition is putting firms under intense pressure. The turnover of large companies in the major indices is becoming increasingly rapid: top companies' lifespans in the S&P 500, for example, have shrunk from a 61-year tenure in 1958, to 25 years in 1980, and just 18 years in 2011.⁴

At the whole-economy level too, the rate of 'churn' is high. In the US, Germany, and the UK, for example, around 10% of all firms exit the market every year (Figure 2), while a similar number of new ones enter.

Next steps

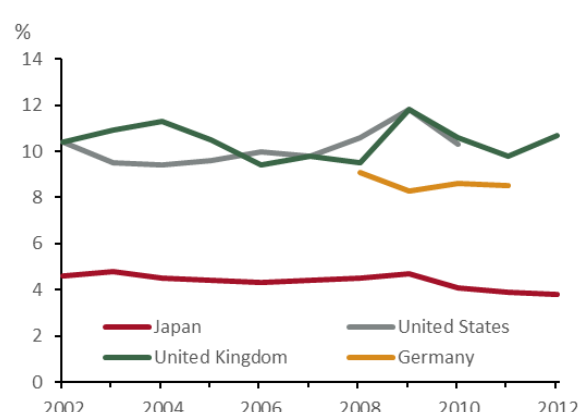
In this new series we are going to devote considerable attention to these challenges and opportunities. This includes drawing on a list of over 100 new technologies considered by scientists at Imperial College, MIT, and elsewhere to be of particular potential importance. ■

Figure 1: Labour productivity and real compensation by type of firm



Source: OECD Economic Outlook 2017 and Llewellyn Consulting

Figure 2: Firm exit rates, annual



Source: OECD Economic Survey Japan 2017

¹ The one-page summary of the 22-page *Technology Blue Book* is appended.

² We have in the past evaluated the comparative capability of various economies to benefit from the new technologies, and have displayed this in a heat-map, appended. For the full article in which it appeared, see Sepping, S., and Dharamsena, B., (2017). Science, technology, and innovation: a closer look. Llewellyn Consulting, September. Some of the results are surprising, in that some traditionally high-income OECD countries are revealed as not particularly well placed to benefit from the new technologies, while at the same time a number of non-OECD countries seem to be preparing themselves comparatively well. We shall update this heatmap in due course as part of this overall work on technology.

³ Frontier firms are defined for these purposes as the 5% of firms with the highest labour productivity by year and sector. Industries included are manufacturing and business services, excluding the financial sector, for firms with at least 20 employees.

⁴ Innosight, 2012. Creative Destruction Whips through Corporate America.

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Appendix

Theme: Technology – One-page summary

Proposition

Ubiquitous, bigger, and faster than the Industrial Revolution, the ICT revolution is entering a new, disruptive, phase. This will have profound consequences. One will be to widen disparities, both within and across firms and countries.

Reasoning

Technological progress, the fundamental driver of long-term economic performance,¹ intensified with the Information and Communications Technology (ICT) revolution² – digitisation, the internet, big data, and Artificial Intelligence (AI). Now it is entering a new ‘smart machine’ phase, not least by combining new and existing technologies.³

AI, an enabling cross-function set of technologies, is on the cusp of a breakthrough, driven by increasingly cheap, powerful, parallel computation;⁴ big data;⁵ and ever-improving ‘learning’ algorithms.⁶ The power of new machine-learning technologies is shown by the growing list of complex games in which smart machines have surpassed the world’s best human players.⁷ ‘Smart’ products and processes are set to proliferate.⁸

Expected economic outcomes

The revolution is transforming fundamentally what and where economies produce,⁹ – both in industry¹⁰ and in services,¹¹ with the distinction between the two becoming increasingly blurred. ICT-intensive sectors (including financial¹² and professional services) are currently at the forefront of the change.

Aggregate effects, on productivity and (dis)inflation are potentially significant,¹³ and probably mismeasured.¹⁴ However large improvements are not yet being seen, for a mixture of reasons, including costs of adjustment,¹⁵ weak investment,¹⁶ and slow adoption at the firm level.¹⁷

Even high IT investment would however probably not point to the ever-accelerating productivity (the so-called ‘singularity’) that some technologists envisage: economies do not run on processing information alone. Key to the potential impact is the degree of substitutability between information and other economic inputs.¹⁸

Labour market effects similarly stand to be substantial, but not necessarily overwhelming. Perhaps only around one-tenth of jobs are fully ‘automatable’: it is generally tasks within jobs that are automatable, and not all activities are equally at risk.¹⁹ Wage differentials do however seem likely to have a continuing tendency to widen,²⁰ at least pre-tax.

Performance gaps between companies will widen. It will be the ability to harness technological progress and, in particular, access to a range of digital skills,²¹ rather than the pace of technical progress itself, that will be the main differentiator of company performance and worker pay.²²

At the whole-economy level it is increasingly important that countries benefit from the productivity-enhancing effects of the new technologies.²³ Economies that fare best will be those with high tangible and intangible investment,²⁴ and the best innovation settings (science, readiness, and adoption in particular).²⁵ They will also have the best macroeconomic structural-policy settings, which determine how the economy as a whole adjusts to structural change.²⁶

Expected market outcomes

Market power seems likely to continue to concentrate in large, highly-profitable, cash-rich global companies. Those that own, and master the analysis of, big data may show spectacular gains. Intangible value will likely continue to rise relative to tangible value. Valuing companies will become yet more challenging. The major indexes will likely exhibit increasing company ‘churn’. The distinction between active and passive investing may blur increasingly.

Unless or until aggregate investment picks up substantially, equilibrium interest rates are likely to stay historically very low in the major (G7) economies.²⁷ However, modest increases in official rates are in prospect on the assumption that the business cycle continues to mature.

Watch for

- Divergence in performance between ‘frontier firms’ and workers with the ‘right’ skills vis-à-vis the rest.
- Differences across countries in policies that directly facilitate innovation, adoption, and structural adjustment.
- Smaller OECD economies (and regions and cities within countries) outperforming the advanced (G7) economies.
- Inequality increasing, provoking a growing backlash and perhaps reaching a tipping point.■

(A multi-page supporting document, that presents the argumentation, evidence, and references is available to clients).