

Preface

The way we work and the way organisations divide up the necessary tasks between technological artefacts and people is constantly evolving with the continuous technological development. This technological development is also continuously modifying the structures that emerges for holding and combining the distributed diversity of useful technical expertise, specialised capital equipment with its co-specialised relationships, processes, systems, information and knowledge (of which a large amount is tacit and therefore difficult to acquire) all of which contribute to higher efficiency, effectiveness as well as increased productivity of both the labour and capital that make use of it.

The result of what is a combination of skill-biased technological change, routine-biased technological change and capital-biased technological change is a dramatic change in both the internal structure of the institutions that make up an economy as well as in their interaction that forms the workings of the economy.

This increasingly rapid technological development risk substituting scarce, costly and demanding labour with cheap and abundant capital (initially in the form of ICT enabled productivity improving capital) creating a capital-biased technological progress¹ and an increasingly wealthy society on the aggregate level. The downside is that those members of society that only have labour as their income generating asset may not be able to make an adequate living requiring society to find new ways of distributing the wealth generated – something that most societies seem to have failed in doing so far. If this is not addressed this new abundance, which presently is taking the form of an increased wealth concentration for the few and an income reduction for the many, will threaten the fabric of society. There are then two worrisome trends that are observed: the first being the increasingly uneven income distribution, the second being the simultaneous decline in employment, income and availability of low skilled workers.

Over the coming decades this rate of change will accelerate exponentially, leading to fundamental challenges for individuals, organisations and society. This development is leading to an increasing mismatch between the skills existing in the workforce and the skills needed for the work opportunities of the future. One of the clear trends is the elimination of the “middle skilled part” of the workforce (known as polarisation) simultaneous with increasing productivity and insufficient supply at the high skilled end of the workforce resulting in increased real incomes at the high end. At the low-skilled end of the workforce we will see some increase in demand but there will still be oversupply combined with an increasingly global labour market resulting in a remuneration “race to the bottom” as illustrated by the behaviour in the emerging platform economy, as well as low productivity improvements at large parts of this low-end resulting in decreasing real incomes at this part of the low end. The largest medium-term change in impact will be for the professional service industry, an industry traditionally spared this type of productivity improvement driven reduction in number of jobs. Other industries, like manufacturing and agriculture will also be impacted but the change will be lower due to a tradition of high technology enabled productivity improvements in these sectors and hence society has an expectation and acceptance of these types of changes as relates to these sectors. Spath (2013) finds that within a few decades there will no longer be any jobs in Germany for low-skilled workers in industrial production. Against this background, it can be noted that Dirzus, representing the Association of German Engineers (VDI), stated in *Süddeutsche Zeitung* (2014, p.23) that as the use of virtual reality and other intelligent assistive technologies increase, the consequence is that “less educated people can do skilled work” – known as deskilling.

In some specific industries, e.g. thermal coal and parts of the agricultural value chain, there will be further job losses due to a combination of technology obsolescence, changing consumer preferences and regulatory changes resulting in stranded assets with a very high negative impact on both firm value and firm cash generation, putting further jobs in the impacted industries at risk.

The required skills for the future labour market will centre around interpersonal skills, creative problem solving and deep domain expertise. The challenge here is that the development of the knowledge domains that underpin this required domain expertise will be so fast that there is a need for continuous learning to stay relevant and employable (and in some domains, the speed of knowledge development may over time outpace human ability to learn making it imperative to complement the individual with artificial intelligence systems). The responsibility to ensure employability through relevance

rests equally on the individual, the employer and government. Michaels et al., (2014) found, in their study of 11 countries, evidence for ICT-based skills polarisation i.e. that industries with faster ICT growth shifted demand from middle-educated workers to highly educated workers. This requirement of relevant skills is equally if not more critical on the managerial level in firms.

The findings that there is a polarisation of the labour market is widespread². In a study of the Swedish economy Heyman et al. (2016) found that between 1996 and 2013, the share of low wage jobs with high risk of automation and low risk of being offshored and the share of high wage jobs with a low risk of automation and a high risk of being offshored had both increased their share of the economy. The empirical data also showed that manufacturing firms with a higher average risk of automation among their employees have achieved higher productivity improvement whereas this did not hold for service firms. The productivity improvements were also higher in firms with a lower average level of education among their employees illustrating the effect of deploying technology enabled productivity enhancing tools. Fölster (2015) found that the Swedish employment level has remained relatively stable and articulates two reasons for this: firstly, digitalisation and increases in income have led to increased demand for labour; secondly, labour market reforms, primarily geared towards young people, have had a major impact. Fölster (2015) argues that the positive employment effects are due to: A greater need for labour producing, operating and maintaining the digital technology; A greater need for labour selling digitalised services and products; Increases in income and lower prices of goods and services are increasing demand in the economy. Sweden is an interesting case since Sweden has the highest rate of technological restructuring among OECD countries and Swedish adults have the highest digital proficiency among OECD countries (OECD, 2013b). Tracking the positive and negative developments and the causalities between policy decisions and outcomes for Sweden is hence of great interest.

The lower the economic complexity of the country or region the larger these challenges will be due to these changes resulting in a combination of lower prosperity generation potential and higher societal cost.

Organisations are responding to this by developing ways to manage internal (full- and part-time) staff simultaneously with orchestrating relationships with external actors to guarantee access to the right capability at the right time whilst simultaneously aiming for lower risk exposure and lower cost in an increasingly dynamic and unpredictable operating environment by making labour a variable cost which is changing the contractual relationships between employers and the providers of labour (individuals or organisations).

This is resulting in a drastic increase in part-time and temporary work and consequently many low-wage earners become dependent on government assistance to sustain an acceptable standard of living. It is also normal that low hourly wages go hand in hand with insecure working models.

In order to be able to well manage the relationship with non-standard workers, organisations use four approaches in some combination (George & Chattopadhyay, 2015): Carefully designing jobs that are amenable for non-standard workers (e.g. jobs that have a lower level of complexity, jobs that demands fewer or lower levels of skills; jobs with which the non-standard worker is familiar, jobs that can be done independent of the rest of the organisation, jobs that are not core to the organisation, jobs that do not involve valuable and proprietary knowledge or technology); Ensuring fair or appropriate terms of exchange (accepting and understanding that there is heterogeneity in what non-standard workers want and that the social exchange is affected by the labour market at that point in time); Managing the nature of the non-standard worker's relationships with people in the workplace (this means developing processes that facilitate good horizontal and vertical interpersonal relationships); Understanding the core of non-standard workers' identities (and their related motivations) and engaging with them in a way that can help these workers realise, maintain or enhance these identities.

High and sustained levels of inequality, especially inequality of opportunity can entail large social costs. If this inequality rests on rents and hence does not generate appropriate incentives it can result in unproductive behaviour with the resulting adverse social and economic consequences, including a loss of confidence in institutions, eroding social cohesion and confidence in the future – examples of this behaviour can be observed in recent elections and referendums in countries as geographically distant as the UK, the US, Italy and Australia. The IMF has found that income inequality negatively affects both growth and the sustainability of growth. Again, increasing economic complexity, on average, goes hand in hand with decreasing income inequality.

In addition to the skills issue there is a volume issue. The generation of new jobs seem to decline with the advancement of ICT based technologies. Berger & Frey (2015b) find that the new ICT technology enabled industries that have emerged during the last 15 years have had very small impact on the volume of the workforce employing less than 0.5% of the US workforce (the ICT sector employ 3% of the US workforce), and those jobs created being primarily of a high STEM skilled nature. This number, given the way it is defined, excludes the, mostly, low paid jobs created and enabled by the new ICT technology enabled industries in the platform economy, many of

which are invisible to both the public and policy makers (e.g. data processing, search result judging, tweet sorting and classification, algorithm training data generation, etc.).

It is especially noteworthy that the present interpretation of the free market economy that is applying a neoclassical approach to markets have resulted in a decline of the middle class, the presence of which is necessary for any well-functioning modern economy. In addition, the number of people that are part of what Guy Standing calls the precariat³ is growing rapidly. According to Standing (2011a) members of the Precariat lack labour market security (defined as adequate income-earning opportunities), employment security (defined as protection against arbitrary dismissal), job security (defined as ability and opportunity to retain a niche in employment), work security (defined as protection against accidents and illness at work, through health and safety regulations), skill reproduction security (defined as opportunity to gain skills), income security (defined as assurance of an adequate stable income), and representation security (defined as a collective voice in the labour market).

At least the educated youth component of the precariat have the potential to be part of the part-time platform enabled economy and hence earn some income whereas the part that is neither educated nor enlightened does not have this potential opportunity and, since they are both unable and unprepared to develop the necessary skills for this participation will instead, due to their anger, sense of hopelessness and their part in the growing social unrest, easily fall prey to fear-mongering and conspiracy theory sprouting aspiring politicians resulting in ill-informed perceptions around globalisation, free trade, immigration and how societies generate prosperity for all. leading at worst to bad and self-harming decisions – good example of which is the Brexit referendum in the UK.

The outcome of the deployment of technology enabled productivity improvements on our lives is a function of the choices made by economic and political institutions since technology itself does not dictate a given outcome. So far it is safe to say that these institutions have not been up to the task given the increasing unequal distribution of wealth, meaningful work and opportunity in our societies.

The development discussed above requires changes by individuals, organisations and government to ensure a positive outcome for society. Economic growth, increased prosperity, reduced environmental and resource footprint, increased societal cohesion and inclusion must become complementary, not contradictory, goals for meaningful economic development.

On the national level a policy aiming at increased economic complexity combined with policies to address the skills mismatch in the present and future workforce, as well as a policy for providing dignity to those that will be left behind through smart social programs (some of which are already operating in select countries) including redistribution of some share of the net wealth created on the aggregate national level.

On the firm level, there must be an increased focus on productivity improvement (both defined as more for less and defined as higher perceived value outputs achieved in smarter ways) and on achieving a position of non-price based competition. Firms must also change the way they manage, or more likely orchestrate, their activities in a world with a different balance between employees, contracted in employees of others, contracted out employees to others, and self-employed service providers, or other non-standard work arrangements, on a scale going from full time to part time and from on-going via recurring to one-off relationships. In addition, the implementation of ICT enabled productivity improving tools will lead to higher decentralisation in decision and planning processes simultaneously with the need for higher process integration and cross functional perspectives resulting in a further reduction of hierarchical levels and less demand for central management capacities (Hirsch-Kreinsen, 2014).

Firms must also change their business model to reap the potential benefits inherent in smart deployment of digital technologies and in being part of ecosystems that also contain platform based enterprises and individuals capable of product and service provisioning.

On the individual level, there must be a substantially increased focus on, and responsibility for, continuous competence development as well as a high flexibility and acceptance of change. The deployment of technology enabled productivity enhancing tools will reduce the need for automation prone (a rapidly increasing group) low- and medium-skill tasks at the same time as it will increase the demand for high-skill tasks and existing or new tasks (on any skill level) that cannot presently be automated, including those that entail operating and maintaining tools that are the embodiment of the continuously and rapidly developing technology.

There will be a high need for research to address these emerging issues to provide input to policy decisions on the political level and input to strategic decisions on the firm level.

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ENDNOTES

- ¹ As supported by the data in Karabarbounis & Neiman, 2014 who found that 42 out of 57 countries examined had experienced a fall in their labour share of income, and OECD, 2012b reports that the median OECD country has seen a decrease in the labour share of about 5 percentage points since the early 1990s.

- ² e.g. Wright & Dwyer, 2003; Autor et al., 2006; Goos et al., 2009; Kal-leberg, 2011; Korpi & Tåhlin, 2011; Fernández-Marcías et al., 2012; Autor & Dorn, 2013; Beaudry et al., 2013; Dwyer, 2013; Nedelkoska, 2013; Åberg, 2013; Goos et al., 2014; Adermon & Gustavsson, 2015; Fonseca et al., 2015; Roy & Consoli, 2015; Åberg, 2015; Cortes & Salvatori, 2016; Harrigan et al., 2016; Heyman, 2016; Pekkala Kerr et al., 2016; Sparreboom & Tarvid, 2016.
- ³ “a multitude of insecure people, living bits-and-pieces lives, in and out of short-term jobs, without a narrative of occupational development, including millions of frustrated educated youth who do not like what they see before them, millions of women abused in oppressive labour, growing numbers of criminalised tagged for life, millions being categorised as ‘disabled’ and migrants in their hundreds of millions around the world” (Standing, 2011b).