



**7th IRIMA WORKSHOP
INDUSTRIAL RESEARCH AND INNOVATION
MONITORING AND ANALYSIS
Innovation and Employment
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SUMMARY REPORT

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Objective of the workshop

The main aims of the 7th IRIMA workshop were:

- To get a better understanding of the relation between innovation and job creation on firm and sector level.
- To provide insights on the growth patterns of young firms in Europe and see to what extent there is a problem with the post-entry growth of innovative firms.
- To identify relevant messages from the available empirical evidence presented to inform EU policy making agendas dealing with innovation, industrial policy and employment.

Session 1

In this session, Marco Vivarelli (Catholic University of Milan, IT) presented the project "A reappraisal of the impact of Corporate R&D and Innovation on Employment", starting from a literature overview on the macro-economic impact of innovation on job creation and then moving to micro-economic tests. The results of this project were thereafter discussed by Bernhard Dachs and Iulia Siedschlag. The session ended with presentations of Dominique Guellec (OECD) and Jordi Jaumandreu (Boston University, US).

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² The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission

The main takeaways from this session are:

On the overall impact of technological change on employment

- From a historical point of view, technological change has not led to a massive destruction of jobs mainly due to compensation mechanisms operating over time: higher productivity increases income while output prices decrease. Higher wages and higher profits lead to a higher demand.
- The indirect effects of innovation on unemployment tend to be overlooked in the micro-economic literature. In addition, there are methodological limitations: need for longitudinal datasets. However, labour saving technological change has three indirect effects on labour demand:
 - o Job loss due to displacement,
 - o Job creation due to the compensation effect through decreasing marginal costs
 - o Substitution of jobs

The net balance of these effects can lead to job creation but this is not necessarily the case and the labour-friendly impact of innovation is neither per se confirmed.

- Lately, there has been much fear that things might be different given the nature, scale and the speed of current technological change – mainly the advances in Artificial Intelligence and Machine Learning, opening unprecedented possibilities for robotisation and tasks automatisation – might lead to job loss; not only for lower skilled jobs but also for "white collar" jobs.
- However, recent studies predicting high levels of job losses, mainly because of automatisation of routine tasks, fail to introduce dynamic changes/compensation mechanisms and the fact that the above mentioned indirect effects (in particular substitution of jobs) may emerge in fields totally unknown today. History has shown us that these effects indeed occur. In addition, it is expected that these changes will occur gradually.

On the impact by type of innovation

- Micro-economic literature of the last 15-20 years provides evidence for a positive relationship between product innovation and employment, but a negative or neutral relationship between process innovation and employment.
- Embodied Technological Change – for example in newly acquired machines – is a crucial innovation identifier of process innovation, but is very difficult to measure and therefore absent in many studies. In the micro-economic tests performed by Vivarelli et al, it shows that ETC leads to either a labour-saving effect or a labour-neutral effect.

- An important note for further research is to also include the impact of non-technological innovation and the complementarities between different types of innovation.

Sectoral differences of innovation impact

- A positive impact of innovation on employment is mainly seen in high-tech sectors, while for low-tech sectors there is no significant positive or negative impact measured. In order to maximize the job creation, innovation policies should be targeted at the high-tech firms.
- The effects of a decrease in ICT costs (as a proxy for technological development/diffusion) initiates a reallocation of jobs across sectors:
 - o a decline in jobs in manufacturing, business services, trade and agriculture;
 - o an increase in jobs in construction, care and culture/recreation/other services.

Evidence from recent studies (V. Spezia at the OECD and F. Biagi from the JRC) show that there is no negative impact on jobs from the increase of ICT use – at least in the medium run of 6-7 years.

- Many studies focus on the effects of innovation on employment in the manufacturing sector only. However, the employment share of manufacturing sector within the total economy is shrinking and its importance in terms of GDP is decreasing. There is a need to extend the studies to the service sector (Iulia Siedschlag presented a novel analysis in this respect).

Location and framework conditions

- The above described compensation mechanisms determining the relation between innovation and employment are very much affected by location specific framework conditions, such as product and labour market regulations.
- There is a need for more studies allowing cross-country comparisons. However, access to adequate and representative company datasets remains a challenge.
- Market conditions and in particular level of demand is an important explanatory factor of the link between innovation and employment (via product innovation). This is something usually missing in micro innovation studies – the paper presented by Jordi Jaumandreu accounts for this.

Skills and inequality

- There is a need to bring the crucial issue of skills into the microeconomic analysis of the impact of innovation on employment. It is not just about the numbers of employment created or destroyed but also about the kind of employment (qualitative aspect – skills versus unskilled workers).

- To the already well known phenomenon of skill biased technological change (shift towards high skilled workers to the detriment of low skills), the new ongoing wave of technological change and increasing automatisisation of routine tasks seem to lead to so-called "routine biased technological change" and to job polarisation (hollowing-out of medium-skilled jobs).
- These phenomena lead to new policy challenges related to increasing inequalities in the wage distribution, aggravated by the "winners take all" nature of some of the new business models emerging from the digitalisation of the economy.
- These are relevant issues which are starting to be analysed at the JRC (new Unit dealing with human capital and employment – referred to by Federico Biagi during his presentation – and new research activities related to inequality and fairness).

Session 2

In this session, the growth pattern of young innovative firms was the central point of attention. It has been widely argued that the EU has a scale-up problem, where young innovative firms stop growing after a certain threshold and remaining small or medium in size, in contrast with US firms. Presentations were provided by Fabiano Schivardi (Bocconi University, IT), Erik Stam (Utrecht School of Economics, NL) and Federico Biagi (European Commission).

The main messages from this session allow putting this issue into perspective, providing more evidence on the impact that young innovative firms have on employment and economic growth at the macro level.

Growth paths of young firms

- Growth of young firms in general is rare (69% of young firms never grow) and largely random. Moreover, high-growth is exceptional and continued growth is highly exceptional.
- Even more so: the probability of continuous high growth of firms is very low and a year of high growth is almost certainly followed by a setback. A very high growth in one year is often caused by exceptional market circumstances.
- Therefore it is legitimate to doubt whether the focus on growth of young firms (or the new emphasis on scale-ups) is to be considered as the golden bullet for policy makers to tackle the problem of employment creation. Company growth depends on a variety of factors of which some might be hard to address via policy intervention.

Characteristics

- EU start-ups show less ambition to grow than US start-ups, but within the EU there is also a difference between countries. The ambition effect is an important determinant of future growth.
- Preliminary analysis from Fabiano Schivardi show that company size is an important factor explaining late and lesser degrees of ICT adoption – as shown in the cases of Italy and Spain for example – which in turn determine lower levels of firm productivity and employment growth. However, the analysis shows that family ownership is also a strong explanatory factor of limited innovation adoption and limited growth, either due to limitations in managerial capabilities and the (lack of) injection of risk capital.
- The EU is a very heterogeneous region and growth policies need to be targeted according to countries' differences. The size of the internal market, the regulatory framework (there is evidence that tax and labour rules in some Member States operate as incentives for companies to remain small) and the efficiency of the judiciary system have been mentioned as factors to be considered.
- But the US has a similar problem: since the 2000s there has been a decline of number of young high-growth firms in the US and within the US there are big differences between states.
- The presence and the role of large innovative firms / market leaders have been mentioned as an important factor to sustain the emergence and growth of new young innovative companies (importance of local innovation ecosystems).

Data

- One of the main problems of measuring the impact of young firms on employment is the lack of micro-data that manage to capture these firms.
- A promising database was presented – ESSLAIT – that has disaggregated panel data available for 14 EU countries.
- The strength of this database is that it connects data on separate surveys with national business registers and offers the possibility to connect these databases later on. The importance of such databases was underlined by the participants of the workshop.
- By a first exploration of these data, it was shown that the diffusion of ICT has a significant positive impact on employment – for gazelles even more than classical technological innovations.

Round table discussion

During the round table discussion, the main topics were touched upon by Jordi Jaumandreu, Arie van der Zwan, Bernhard Dachs, Dominique Guellec, Mark Nicklas and Erik Stam. The discussion was led by Koen Jonkers.

Skills and inequality

- Technological change – especially AI and ML – will have a profound impact on education policy. Is there too much focus on higher education, while there are already signs of over-education of the population? There is a need for implementing a new skills agenda that puts emphasis on skills such as interdisciplinarity, creativity, entrepreneurial attitudes etc.
- Current studies are afraid of increasing inequality due to technological change, where people with automatable jobs would get behind.
- However, history here proves that inequality has been decreasing due to technological change. We do not know tomorrow's jobs yet. In addition, technological change and innovation have had an important (positive) impact on inequality via cost and price reductions and mass customisation of many traditional and new products.

Young Innovative Companies

- YICs might not be the golden bullet of job creation as often hoped for.
- Their impact in terms of employment is too small and dependant on external factors, such as ambition and macro-economic shocks. Besides, the growth process seems to be quite random.
- Keeping young firms in the market artificially (e.g. via subsidies) can lead to unwanted effects, since it impedes resource reallocation to successful ventures. Some countries have started to stop supporting directly young firms. In this respect the policy shift to scale-ups might make more sense.
- Young and small firms seem to be disadvantaged by overregulation with respect to initial public offers (IPOs) and by capital market structures and functioning (e.g. increasing importance of exchange trade funds and electronic trading) that favour big caps against small caps.

Importance of new emerging markets and product differentiation

- The largest company success stories have occurred in completely new markets/industries (e.g. internet) and show the importance of being ready to jump on the next opportunities, which emphasises the importance of investments in technological development and key emerging technologies.

- Innovation and firm growth cycles are different depending on the sector and the technologies. Each case requires particular characteristics of the underlying innovation ecosystem and different timeframes (e.g. ICT very different from Pharma or Automobiles) and policy should take account of these differences. Coupling start-up policy with large firms can be important (the example of the Emerge initiative in the Netherlands has been mentioned, where start-ups present themselves to large firms, potential investors and the public sector).
- Product differentiation (product innovation) is a crucial factor for many companies to grow (in many cases more than cost efficiency / reduction). Policy should therefore pay attention to the importance of product innovation (where investments in both technological and non-technological intangible assets are important) and market demand.

Macro vs micro

- Throughout the workshop, the importance of complementing macro and micro analyses has been mentioned. It is difficult to grasp macro-economic effects with micro-economic studies, even when looking at higher aggregation levels such as the sector-level (e.g. compensation and indirect effects of innovation on employment, via job displacements, business stealing and jobs substitution).
- There is a role for macro-economic models to capture these effects with ex-post evaluation – although it was questioned whether these models could capture these effects, due to the very micro-economic nature of the effects and large heterogeneity of firms and location factors. Therefore these models need to be complementary to the micro-economic studies.
- There was a strong call for counterfactual evaluation by trying different policies, such as stricter vs less strict labour-market policies in order to have better insight in their direct effects.