Summary of workshop

Workshop on Development of KETs for industrial modernization, their regional dimension and their link to emerging technologies

Brussels 8th June 2016

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Introductory session

This Workshop was part of the KeyTEC project diffusion activities. One main objective was presenting recent results and future analytical plans to relevant colleagues in DG-GROW, DG-RTD, DG-ECFIN and other JRC Units and receiving feedback on its relevance to support policy making in related areas (e.g. support to key enabling technologies development and uptaking in Europe, in relation to the industrial modernisation agenda and more broadly to the jobs, growth and investment priority). In addition, Key-TEC results and plans have been confronted and put into context of related analysis made by external experts.

The meeting started with a brief introduction of the KeyTEC project by Fernando Hervás, who explained the research and policy contexts of this activity. The objective of the KeyTEC project, a spin-off of the larger IRIMA project focusing on the monitoring and analysis of top corporate R&D investors, is to look at the capabilities of EU main industrial players to develop KETS and emerging technologies and its competitive position vis a vis main world industrial players. The project started analysing patent portfolios of top R&D investors and preceeded with 1) the analysis of specific KETs which are crucial for the development of certain AMTs value chains; 2) the analysis of the technological knowledge base, but without confining the scope to the top corporate R&D investors of the world.

Session 1 Development of KETs for industrial modernization

In the first session the position of the EU in the global production of specific KETs-based components or products which are incorporated in Advanced Manufacturing Technologies in order to assess upcoming challenges for the EU's competitiveness was discussed.

Moreover, the international landscape of AMT related technology development, flows of knowledge across geographical areas, and the combination of different KETs solutions was addressed. In this framework the specialization of regions in KETs becomes a relevant dimension to be considered in developing regional policies and RIS3 strategies, both for more advanced and lagging regions.

Rehinilde Veugelers (KU Leuven) presented the challenges the EU is facing in its effort to boost an innovation-based growth. She presented evidence hinting that the Europe's failure to follow its main competitors in this regard is largely due to a number of structural factors including its failing capacity for "creative destruction" (firm's dynamics) allowing a proper shift towards more knowledge-intensive activities and Europe's fragmented science, research and innovation system which among other hinders the emergence of "European value chains". More specifically she argued that one of the main reasons explaining the EU's R&D investment gap comes from its failure to specialise in so-called "innovation-based growth sectors"[1] and to the small number of successful "yollies"[2] operating

[1] Defined as sectors which (i) have an R&D intensity above average, (ii) an R&D growth rate above average and/or (iii) an above average share of young companies among its leading innovators.
[2] Defined as companies founded after 1975 and as of 2015 have grown to be among the world top R&D investors

in such sectors (this is particularly acute in ICT sectors: lack of European young digital innovators). Even in less R&D intensive sectors the number of EU based yollies is almost half the number of the US based ones. Evidence shows that by shifting European "yollies" towards the "innovation-based growth sectors" would close the size of the R&D gap by 55%.

In her words, the policy making focus should move to yollies and the conditions (regulatory, financial, labour, etc.) that can facilitate their development and growth. The impact of regulation frameworks, access to finance (and possible financial constraints) and labour market regulations were discussed in more detail and their relative impact in the growth of highly innovative firms were analysed. The importance of private vs public R&D expenditure was also highlighted. According to the evidence presented public R&D expenditure is not the most influential factor determining the growth of yollies and regulatory constraints are particularly important in certain sectors. The main differences between EU and US are related to the fragmentation of the EU market and to the financial instruments which make access to finance easier in the US.

The second presentation, by Els Van de Velde (Idea Consulting), covered main results obtained from the study performed for DG-JRC in the context of the KeyTEC project. The work focused on the competitiveness of EU companies in developing KETs which are crucial for the development of specific AMTs and on the assessment of future threats for Europe. Given the enabling nature of these KETs and their key role in the development of AMTs the study decomposes and analyses the whole value chain taking an application point of view approach. A detailed analysis of three specific value chains has been conducted to assess the innovation capability of EU companies in developing Advanced Manufacturing Technologies. The in-depth analysis of particular value chains provides a better understanding of the specific critical competitive forces faced by EU companies. The three selected value chains are emerging and have not yet reached the maturity stage. Among them additive manufacturing is seen as a key enabler for accelerating engineering processes and is considered to be of high strategic relevance for the European industry and especially for the aerospace sector which is of paramount importance for the EU.

An important and policy relevant conclusion of this study is that the EU should create the conditions allowing SMEs and mid-cap innovative companies involved in the development of these new technologies to grow so that they are able to deploy and exploit the returns from such technologies without being acquired by larger players/competitors based in other world regions. Not only facilitating the growth of companies is important, embedding them in local ecosystems is equally important. Well-functioning ecosystems are often characterized by a mix of large, medium and small players that ensure the interplay of R&D capability, innovative character, production volumes and global marketing channels. A targeted smart specialisation strategy can facilitate the formation of this type of ecosystems which in turn will reinforce the deployment of these technologies and hence stimulate the growth of companies.

In the final presentation of the first session Petros Gkotsis (DG-JRC) presented the main findings of a technical report that has been recently prepared by the JRC-IPTS. The study makes use of patent analysis in order to assess the capacity of the World top R&D Investors to develop advanced manufacturing technologies with a special emphasis on AMT related patents which pertain to at least one of the remaining five core KETs technological fields as well. The study focuses on the localisation of the AMT related research activities of the world top R&D investors, the resulting

knowledge flows between world regions and countries, and the identification of patents with special patterns and clusters between AMT related technological fields and the remaining five core KETs and the companies behind the development of this type of patents.

Evidence shows that the development and patenting of AMT related technologies is really important for firms in the *Aerospace & defence,* the *Industrials*, the *Automotive & parts* and the *Electronics & electrical equipment* sectors. EU firms in key sectors like the Aerospace & defence and the Automobile & parts sectors are particularly strong in developing AMT related technologies. In addition a large majority of the inventive activity from firms in other sectors takes place in the EU.

Session 2- Key Enabling & Emerging Technologies: Global trends and Regional dimension

In the second session the link of key enabling technologies with emerging technologies was discussed. Firms and research centres are constantly targeting new growth areas to push forward the technological frontier and increase their competitiveness. In this context identifying the development of emerging technologies, which are expected to transform the economy and the society, is crucial for the academic, business and policy communities.

Neil Lee (London School of Economics – LSE) opened this session with a presentation on the economic impacts of technological changes and the importance of location. Economists have long considered the impact of technological change on the labour market: skills biased technological change (SBTC). Yet economic geographers and spatial economists have not considered how different technologies will lead to a place biased technological change. Instead the focus is on the 'nuance' while analysis of the significance of place is considered too complicated. But skills are also complicated, and simplification / formalisation can help address this important question. This is equally important for researchers trying to explain regional decline and for policy makers interested in the medium-long term implications of adopting certain technologies. A very preliminary sketch of the evidence on how past technological changes affected places, along with a framework for thinking about how future technological change may influence places and possible application of this framework to future technological change was presented.

Cities shape and are shaped by technological change. This is based to a large extent on a long tradition of speculative work on changing technology and economic geography, but little work attempting to systematically consider how changing technologies influence 'place' has been produced. From a policy making perspective the emphasis should be on adaptation, rather than trying to swim against tide.

The second presentation, by Antonio Vezzani (DG-JRC), focused on KeyTEC ongoing activities on a new area of research which is related to the emergence of new technologies. The study is based on the analysis of patents filed at USPTO over the last 40 years (1973-2012). The work focuses on the combinations of different technological fields (represented by the International Patent Classification

- IPC scheme) within the patent documents. The aim is to investigate how different technological solutions emerge, diffuse, grow and decline over time. Indeed, although the work focuses on technological diffusion by monitoring the number of connections between different technologies, the growth dimension in terms of patent filings is also considered. The analysis of network data reveals similar behaviours for different technological fields, and highlights a restricted number of technologies that will reach maturity (from a technological development viewpoint) in the upcoming years.

The analysis of the diffusion patterns provides new evidence on the technological development process showing an increased complexity in the development of new technological applications and possibly of new technological knowledge. This increased complexity poses new challenges on creating (the right) high qualified jobs profiles and calls for the design of educational policies that will enable people to adapt to the upcoming technological paradigm(s). The methodological framework proposed is based on the diffusion of technologies in the knowledge production realm and is directly linked to their enabling character. The approach is in line with the concept leading to the definition of KETs and allows for updates, it could therefore represent a complementary tool to KETS. In this view, the methodology can represent a useful tool to support policy making by focusing on a selected group of technologies that are expected to become central in the technological development in the next years. The identification of a narrow set of promising technologies which is in turn of particular interest for policy making and can allow the design of a targeted and effective Research and Innovation (as well as Industrial) policies.

The final presentation, by Heidi Moens (DG-GROW), focused on the support of KETs in EU Regions. KETs contribution to the GDP growth of regions is significant and the contribution to job creation reached 11% of all employment depending on manufacturing. Regions with a high specialisation in KETs are found across the whole Europe but in particular in Austria, Belgium, Southern France, Germany, the Netherlands, Portugal, Spain and some regions in Finland, Greece, Italy and Poland. Evidence shows that specialisation in KETs is positively linked to the innovation performance of regions. Less innovative regions have become more specialized in KETs, thereby laying the foundation of possible innovation performance increases in the future. However, the uptake of KETs (and especially AMT) from SMEs across Europe is low and is further decelerating. Thus it is important from a policy making point of view to develop tools to assess the adoption of KETs at the regional-national level and for regions to develop Smart specialization strategies on KETs. A more integrated approach at the European level is also needed in order to boost European technology infrastructures to support industry and further strengthen KETs pilot lines and demonstration activities.

New instruments at the EU level (IPCEI, EFSI) are necessary in order to unleash significant investment into manufacturing. Finally regional smart specialisation strategies should be escalated to a European level. The Commission's platform for the industry modernisation also aims at supporting important projects of common European interest and new investment platforms under the investment plan. Development of new or sharing of existing infrastructures (testing facilities, pilot

lines, data centres…) is also essential for ensuring SMEs have easy access across borders to state-of-the-art technology services in KETs.

Final discussion and conclusions

This last part of the Workshop was animated by Colin Wolfe, Head of Unit in DG REGIO (Competence Centre Smart and Sustainable Growth) who asked participants to provide their views and main conclusions (based mainly on what was presented during the workshop) on a number of key related questions:

1. *What are crucial elements for the success of KETs strategies within territories?*

   The capacity of the public sector to facilitate their development and uptake ("be more nimble"; be more flexible"; "provide space"…) emerged as a crucial element.

2. *What are crucial elements for success for linking KETs between territories?*

More work is still needed to understand how supply and value chains emerged and are developing. This would provide evidence on how a right positioning in the value chain could be supported by the national member states and at the coordinated EU level. In particular, more emphasis on the link with the EU-13 (which everyone agreed is "catching-up") should be put. Nordics and Baltic States (FI-EE; SE- LT/LV; SE-PL etc), as well as the Danube Basin (Baden-W/Bavaria/Austria to HU/RO/BG etc) were highlighted as successful examples to explore further.

3. *What are the opportunities and dangers in pursuing this from a public policy perspective?*

Hunches are not enough, and – more seriously – responses have to be contextualised. Each region has its specificities, and the research or ex-ante evaluation has to be carried out to determine the base on which the partners (triple helix) should engage (in entrepreneurial discovery process or whatever).

Finally, it was emphasised the current phase of the overall S3 work was making implementation succeed, inter alia to guarantee the future of the concept. Conceptualisation, legislation and programming phases had been successfully completed in this cycle, and would come again – but the emphasis currently had to be on making things work.

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AGENDA

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Venue: Rue d'Egmont 11, Brussels

09:15-09:30
Welcome and Registration

09:30 – 09:45
Fernando Hervás – IRITEC project: aims and objectives

09:45 – 11:00
Session 1 – Development of KETs for industrial modernization

Rehinilde Veuglers (KULeuven)
EU's challenges for innovation-based growth

Els Van de Velde (IDEA Consult)
Assessing innovation capability of EU companies in developing advanced manufacturing technologies

Petros Gkotsis (DG-JRC, IRITEC)
Advanced Manufacturing Activities of Top R&D investors: specialization and location

11:00 – 11:30 Coffee Break

11:30 – 12:45
Session 2 – Key Enabling & Emerging Technologies: Global trends and Regional dimension

Neil Lee (London School of Economics)
Place-biased technological change? Linking innovation types with local economic outcomes

Antonio Vezzani (DG-JRC, IRITEC)
Patterns of technological diffusion: evidence from patent data

Heidi Moens (DG-GROW)
Supporting KETs in the regions

12:45 – 13:15
Discussion and Conclusions (Moderator Colin Wolfe Head of Competence Centre Smart & Sustainable Growth)