European Commission

JRC TECHNICAL REPORTS

Innovation and industrial dynamics: challenges for the next decade

6th European Conference on Corporate R&D and Innovation CONCORDi 2017

Background Note

Pietro Moncada-Paternò-Castello, Nicola Grassano and Antonio Vezzani

September 2017

JRC Science Hub
https://ec.europa.eu/jrc

JRC107903

Seville: Publications Office of the European Union, 2017

How to cite this report: Pietro Moncada-Paternò-Castello, Nicola Grassano and Antonio Vezzani (2017) Innovation and industrial dynamics: challenges for the next decade - 6th European Conference on Corporate R&D and Innovation - CONCORDi 2017. Background Note. Publications Office of the European Union, Seville, 2017, JRC107903.

European Commission
Joint Research Centre – Directorate for Growth and Innovation

in collaboration with

OECD
BETTER POLICIES FOR BETTER LIVES

CONCORDi 2017

6th European Conference on Corporate R&D and Innovation

27-29 September 2017 – Seville (Spain) [1]

INNOVATION AND INDUSTRIAL DYNAMICS: CHALLENGES FOR THE NEXT DECADE

Background Note

Pietro Moncada-Paternò-Castello, Nicola Grassano and Antonio Vezzani [2]

I. Introduction

Corporate R&D, innovation and technological development are crucial drivers for industry, competitiveness, job creation and welfare, as well as for sustainable territorial development in the EU. Since its 1st edition in 2007, CONCORDi has established itself as a forum where researchers working on themes related to corporate R&D and innovation present recent developments in the field and meet policy makers to exchange views and discuss possible implications for EU policy.

On the occasion of its 10th anniversary, the key objective of CONCORDi 2017 is to focus on the issues arising from recent developments in the world economy and attempt to identify research and policy challenges in the area for the next decade. What are the main challenges and opportunities that EU industry will face? Answering this compelling question is not an easy task and requires us to consider different dimensions of analysis in parallel. Indeed, technological change, sectoral dynamics and industrial transformation are inherently related to research and innovation, which in turn affects firm productivity, employment and competitiveness. However, the way these linkages work changes over time and continual monitoring is vital to identify needs and effectively support industrial research and innovation policies.

We are grateful to Sara Amoroso, Mafini Dosso, Hectór Hernandez, Fernando Hervás and Lesley Potters (European Commission, JRC) for the inputs and comments provided. The views expressed are purely those of the author and may not in any circumstances be regarded as stating an official position of the European Commission.

[1] CONCORDi 2017 website: http://iri.jrc.ec.europa.eu/concord/2017/index.html.

[2] All authors are from the European Commission, Joint Research Centre.

In a context of increasing global competition, where different socio-economic models coexist, it also crucial for the EU to understand how to best support the emergence and establishment of key innovative industries to face societal challenges such as digital revolution, the circular economy, health and energy. Of course, policy design also requires understanding the right level of intervention and therefore how to articulate regional, national and European policies. The ambition is to contribute to the EU industrial research and innovation policy agenda as well as to shape future international research on the subject.

In the tradition of CONCORDi, this year's conference will also address the role of scientific analysis in the design and implementation of EU industrial policy in a "transversal manner". The use of scientific evidence to support policy is a topic of high policy relevance in the context of the "EU better regulation agenda", which calls for the best evidence to support policy design, implementation and evaluation[3].

The Conference will take place from 27th to 29th September and will result in suggestions on how the EU can tackle challenges in the area of industrial research and innovation. It will be organised around four main thematic areas discussed along blocks of parallel sessions:

Industrial Dynamics

Towards greener economies (A2) – The industrial transformation (A3) – Digital innovation dynamics (B3) – ICT, Analytics and innovation systems (C3) – Dynamics in aerospace and in pharmaceuticals (E1)

Competitiveness, Growth and Employment

Innovation persistence and firm survival (A1) – Lessons from the crisis (B1) – Employment in innovation (E2) – Growth (F2) – Innovation and productivity (G1)

R&D support, Intellectual property and Innovation strategies

Supporting R&D - 1 (C1) – Intellectual property strategies -1 (C2) – Supporting R&D - 2 (D1) – Intellectual property strategies - 2 (D2) – Investing in intangibles (D3) – Simulation and innovation strategies (E3)

Internationalisation, Globalisation and other Territorial dimensions

Global value chains (B2) – Industry-university cooperation (F1) – The regional dimension of innovation (F3) – Innovation and Internationalisation (G2) – Knowledge spillovers and collaborative innovation (G3)

Luis Delgado *(Acting Director, Directorate for Growth and Innovation - Joint Research Centre of the European Commission)* and Dirk Pilat *(Deputy Director - Directorate for Science, Technology and Innovation of the OECD)* will open the conference in the afternoon of 27th September.

Patricia Reilly *(Cabinet of Commissioner Navracsics - European Commission)*, Uwe Cantner *(Friedrich Schiller University Jena, DE)*, Scott Stern *(Massachusetts Institute of*

[3] European Commission (2015). Better regulation for better results – An EU agenda. Communication from the Commission, Brussels, 19.5.2015, COM (2015) 215 final (link).

Technology, USA) and Luc Soete *(coordinator of Research, Innovation and Science Policy Experts – RISE - of the European Commission – UNU-MERIT, NL)* will provide their views at the plenary sessions of the conference.

Mariagrazia Squicciarini *(OECD)*, Alex Coad *(Pontificia Universidad Católica del Perú, PE)*, Jackie Krafft *(Centre National de la Recherche Scientifique, FR)* and Bronwyn H. Hall *(University of California at Berkeley, USA)* will summarize the scientific evidence coming from the papers presented and highlight major policy recommendations. A policy panel composed of high-level policy practitioners from the European Commission and other international organisations will close the conference.

In the following sections the four broad thematic areas of the conference are introduced and the contents of the papers are summarised. The subjects covered by the invited speakers and the policy-stakeholders panels are then presented. We finally close the document by proposing some open research and policy questions that CONCORDi 2017 may be able to address.

2. Industrial dynamics & Innovation: Challenges for the next decade

Innovation and technological development are at the core of the economic growth process and of the evolution of the industrial structure of countries (Dosi and Nelson, 2010)[4]. Indeed, the latter is mainly the result of the accumulation of knowledge and the diffusion of innovation throughout the economy, which leads to the development of (new) capabilities across firms and may displace previous knowledge. However, at the same time, the rate and the direction of technological change is determined by the specific characteristics of the industrial and economic structure of the system at each point in time and by their changes (Antonelli, 2014)[5]. The idea that changes in dominant technological systems influence the behaviour of the entire economy (and *vice versa*) was introduced by Perez (1985, 2003, 2009)[6] through the concept of 'techno-economic paradigms' and is connected to Schumpeterian 'creative destruction'[7].

Considering the thematic focus of the selected papers, some of the challenges that the EU is expected to face over the coming decades are considered below.

Challenge 1: Digital transformation. Recent years have seen a transformation towards the digital economy progressing at an increasing pace. The widespread use of digital technologies in most aspects of our daily lives has evolved to a degree where its effects are visible at all levels of society. Information and data flows are basically instantaneous and digital information can be infinitely replicated, making the exploitation of knowledge a key factor for economic competitiveness. In the knowledge economy, changes at the local level may quickly have global implications, whether intentional or not. As we

[4] Dosi, G., & Nelson, R. R. (2010). Technical change and industrial dynamics as evolutionary processes. Handbook of the Economics of Innovation, 1, 51-127

[5] Antonelli, C. (2014). The economics of innovation, new technologies and structural change. Routledge.

[6] Perez, C. (1985). Microelectronics, long waves and world structural change: New perspectives for developing countries. World development, 13(3), 441-463; Perez, C. (2003). Technological revolutions and financial capital. Edward Elgar Publishing.; Perez, C. (2009). The double bubble at the turn of the century: technological roots and Structural implications. Cambridge Journal of Economics, 33(4), 779-805.

[7] Schumpeter, J. (1942). Creative destruction. *Capitalism, socialism and democracy*, *825*.

become more and more aware of opportunities and challenges of the digital economy, there is need to better understand how the landscape of these technologies and products are forged, their specificities compared to other sectors and their potential effects on current and future technological and industrial trajectories.

This trend of automation and data exchange in manufacturing technologies is known as Industry 4.0[8] and is rapidly becoming a high priority for countries around the world. However, EU competitiveness is still based on an industrial structure largely oriented towards medium-high technological industrial sectors, with few European companies listed among the ICT giants. Thus, the EU is facing two simultaneous challenges: on the one hand, more should be done to support European ICT champions; while on the other, it is vital to ensure that more traditional sectors also benefit from the adoption of ICTs. The latter task is one of the pillars of the process of industrial modernisation which could bring about an "Industrial Renaissance"(European Commission, 2014)[9] based on a strong EU industrial base.

Challenge 2: Dynamics of sectoral innovation and the socio-economic objectives. In this process of industrial upgrading, we should not focus exclusively on ICT-technologies. While there are traditional sectors which present great innovation and competitiveness potential in the upcoming years – like the Aerospace and the Pharmaceuticals, the EU is still lagging behind some competitors to create and grow new knowledge-intensive sectors. In this process, the importance of entrepreneurship and the key role of new technology-based firms should be streamlined and prioritised. The EU presents relative advantages in a number of technologies and industries fundamental to address the Societal Grand Challenges[10] we are facing, including the move towards greener economies for sustainable growth. For example, the development of green technologies, which display strong accumulation patterns and where the EU has a strong position, may represent a cornerstone to build on.

Challenge 3: Innovation and employment. The creation via innovation investment, of more and better jobs all over the EU is one of the key priorities on the EU agenda. Nevertheless, recent evidence suggests that the innovation-employment link is not straightforward[11] and that the quality of new jobs remains an issue at stake for the design of labour-friendly innovation and industrial policy interventions. This is particularly true when considering that this link may vary across sectors and firms of different size. Similarly, the so called "jobless recovery" points to the importance of understanding what other lessons can be learned from the last financial crisis. The reallocation of market shares in manufacturing industries and their link with productivity and trade patterns can provide insights on the long term impact of the crisis.

[8] The Fourth Industrial Revolution aims to leverage differences between the physical, digital, and biological sphere. It integrates cyber-physical systems and the Internet of Things, big data and cloud computing, robotics, artificial-intelligence based systems and additive manufacturing. Compared to previous industrial revolutions, the fourth one is evolving at an exponential rather than at a linear pace (https://ec.europa.eu/digital-single-market/en/fourth-industrial-revolution)

[9] European Commission (2014). For a European Industrial Renaissance. COM(2014) 14 (link).

[10] Societal challenges in Horizon 2020 reflect European policy priorities addressing major concerns shared by citizens in Europe and elsewhere.

[11] Vivarelli, M. (2014). Innovation, Employment and Skills in Advanced and Developing Countries: A Survey of Economic Literature. Journal of Economic Issues, 48 (1), 123-54.

Challenge 4: Intangibles and firm productivity. The non-negligible contribution of intangible assets to firm productivity and competitiveness is a well acknowledged fact in the economic literature. However, the nature of firms' intangibles assets and the impact of the resulting knowledge-based investments on firm productivity deserve further scrutiny, before any intervention could be prioritised in this area. In fact, several conceptual and methodological challenges still exist to further advance our understanding of the complex but crucial relationship between innovation and productivity. In particular, while R&D is one of the more observable component of firms' overall innovative efforts, many firms undertake both process and product innovation without formally reporting R&D spending. There is also still scope to improve methods to measure productivity frameworks (e.g. capital stock as a proxy for the flow of capital services). From a conceptual point of view, open questions exist around the diffusion process of technological gains – those which enhance productivity - across firms.

Challenge 5: Intellectual Property Rights and innovation. A pivotal innovation strategy is the protection of a firm's intangible assets, central in favouring the transition towards a knowledge economy. Companies adopt mixed IP protection strategies with different mechanisms that seem to prevail depending on the innovation' type. Moreover, product life-cycles in markets for innovative products are shortening, which in turn affects Intellectual Property Rights (IPR) and firms' innovation strategies. The increasing complexity and speed of innovation development offer opportunities and pose challenges to innovation actors at all stages of the technological development. Moreover, as shown by the upsurge of legal disputes that seriously damage the effectiveness of the patenting system, there seems to be ongoing patent portfolio races. These behaviours favour the increase of R&D and innovation costs without necessarily generating more valuable patented inventions. New policy instruments targeting innovation outputs (patents or profit deriving from patents) rather than inputs (R&D) may further exacerbate this trend. At the same time while patent boxes may induce positive cross-border externalities within multinationals, they also seem to generate negative spillovers on average patent quality.

Challenge 6: Interaction between innovation ecosystems. In the global economy, international knowledge spillovers are essential to grasp new technological opportunities in a context where innovation ecosystem can be increasingly dispersed. How to ensure that they work in a sustainable and effective manner? How to favour collaborative innovations for increasingly complex breakthroughs? Input-output relationships in knowledge creation are still not fully understood and may provide important insights to inform policies targeting knowledge transfer and exchanges within and across territories and companies.

Challenge 7: Linking public with private research. While recent cuts in public research may have unforeseen perverse effects in the long term, we should still understand how to maximize the returns from public research investments. Indeed, different forms of public research seem to be related to innovation radicalness in different ways, which should be further analysed. On the other hand, we still know little about the phenomenon of corporate science (corporates involvement in publication activities), but we know that

building university-business cooperation is not always easy given the differences in institutional contexts and priorities between businesses and universities. Rather than making universities more similar to business corporations, it seems more compelling to understand how to solve this 'two-worlds' paradox.

Challenge 8: Integrate sector innovation specificities into tailored policies. This challenge relates, among other aspects, to the organisation of production, technology development, the condition of technological appropriability, accumulation, opportunities and sources of technological changes – technological *regimes* – as well as specific institutional and regulatory and competitive environments. In fact, sectors present persistent differences in the recourse to different type of assets (e.g. tangibles or intangibles) and the way technological development and production is organised. Therefore better understanding of these specificities appears crucial to design more tailored/effective policies."

Challenge 9: Bringing national and regional policymaking agendas together. Evidence suggests that regionalised support that is more sensitive to local context than nationally defined interventions, may have a greater effect in fostering firm innovativeness. Furthermore, recent studies suggest that public support to R&D have a higher impact in less favourable environments, implying regional policies have an important role in favouring innovation and guaranteeing further cohesion within the EU. In sum, both regional and national policies are needed and the EU needs to find the relevant balance.

3. The Conference papers

It is expected that the sixty-three papers that will be presented and discussed during the next CONCORDi 2017[12] will help to reinforce the research based evidence needed to address the fundamental issues presented in the previous section ([13]):

Industrial Dynamics

Towards greener economies (A2) Chair: Nicola Grassano (European Commission, ES)	Wednesday, 27 / 14:45-16:00

» **Transition Towards a Green Economy in Europe: Innovation and Knowledge Integration in the Renewable Energy Sector** (C. Conti, M.L. Mancusi, F. Sanna-Randaccio, R. Sestini, E., and E. Verdolini)

This paper investigates the fragmentation of the EU innovation system in the field of renewable energy sources (RES) by estimating the intensity and direction of knowledge spillovers over the years 1985-2010. We show that EU RES inventors have increasingly built "on the shoulders of the other EU giants" and that the EU strengthened its position as source of RES knowledge for the US. Finally, we show that this pattern is peculiar to RES.

» **How interdisciplinary is research in the bioeconomy? Analysing collaborative networks in an emerging field** (L. Borge and S. Bröring)

Interdisciplinary research is the key source for the development of novel technology platforms and innovation as such. This paper draws upon patent data to ascertain the collaborative network in the bioeconomy and to provide a visualization of collaborations between bioeconomy-related disciplines and between academics and industry. Moreover, it contributes to better understanding which area of science is more dominant and is penetrating the other areas in the emerging bioeconomy.

[12] In parenthesis the code of the parallel session in the Conference's programme
[13] The full programme of the Conference is available here: (link)

» **The Carrot or the Stick? Directed Technical Change and Nonlinearities of Policy Effectiveness in Energy Innovation** (L. Nesta, E. Verdolini and F. Vona)

The Paris Agreement on climate change introduces flexibility in policy responses rather than prescribing a common approach. This paper is a first attempt to shed light on the fundamental issue of the choice of the appropriate policy instrument for countries at different stage of technological development. Using data on patents and environmental policies, we test whether the effectiveness of different policy instruments exhibits strong nonlinearities depending on the country's existing technological know-how.

The industrial transformation (A3)

Wednesday, 27 / 14:45-16:00

Chair: Mary O'Sullivan (Université de Genève, CH)

» **Industry 4.0 and digital innovation in manufacturing: state of the art and future prospects in the Italian mechanical engineering** (L. Beltrametti, A. Gasparre and L. Persico)

Beyond the rhetoric of the "forth industrial revolution", a reliable and comprehensive picture of Industry 4.0 actual diffusion and realistic industrial potential is still missing. Our analysis focuses on the Italian mechanical engineering industry to investigate the scope and determinants of the adoption of Industry 4.0 technologies.

» **Bringing it all back home? Back-shoring of manufacturing activities and the diffusion of Industry 4.0** (B. Dachs S. Kinkel and A. Jäger)

The paper investigates the relationship between backshoring of production activities and investments in digital manufacturing technologies also known as Industry 4.0 (I4.0).We argue that I4.0 will have disruptive effects on global value chains and may support backshoring of manufacturing activities to Western Europe and the US. The empirical test is based on a large dataset of more than 2,000 manufacturing firms from Austria, Germany and Switzerland.

» **Manufacturing the future: is the manufacturing sector a driver of R&D, exports and productivity growth?** (A. Vezzani and A. Coad)

Many industrialized countries in Europe and North America have experienced a steady decline in the manufacturing sector over the last few decades. Amid growing concerns that outsourcing and offshoring have destabilized European economies, policymakers have suggested that a large manufacturing sector can: i) boost R&D, ii) encourage exporting, and iii) raise productivity. We examine these claims.

Digital innovation dynamics (B3)

Wednesday, 27 / 16:30-17:45

Chair: Katarzyna Śledziewska (Warsaw University, PL)

» **Technological innovation as a disruptor: the case of the cinema value chain at the digital age** (E. Salvador, J.-P. Simon and P.-J. Benghozi)

Cultural and creative industries are based on regular capacity for innovations. This article investigates how disruptive technologies are challenging the organization and the value chain of the cinema industry. These transformations are supported by a multilayer evolution driven by technological middlemen, industrial partnerships and IT infrastructure, and translates into a reconfiguration of the traditional business ecosystem and value chain that puts in question the role of public intervention.

» **7 ways to boost digital innovation and entrepreneurship in Europe**
(D. Nepelski, M. Bogdanowicz, F. Biagi, P. Desruelle, G. De Prato, G. Gabison, G. Piroli, A. Pesole, N. Thumm and V. Van Roy (European Commission, ES)

Because digital technologies facilitate the modernization of firms and economies, digital innovation and entrepreneurship requires a comprehensive policy response. Leveraging in a survey of over 30 studies, evidence indicates seven policy challenges: (1) Skills and capabilities; (2) Manage digital disruption while mitigate social and economic effects; (3) Address the ecosystem heterogeneity of digital innovation and entrepreneurship; (4) Facilitate collaboration, knowledge flow and spillovers; (5) Availability of funding for scaling-up of digital enterprises; (6) Coordination between players to guarantee technological interoperability and create technology-related network effects; (7) Balance between provision of incentives to create new products & the stimulation of knowledge dissemination.

» **Labor Services At Will Regulation of Dismissal and Investment in Industrial Robots** (G. Presidente)

Using data on shipments of industrial robots, this paper finds that employment protection legislation (EPL) positively affects investment in automation. EPL acts a constraint on the ability of adjusting employment in response to shocks, so firms have the incentive to substitute human labour with machines, which provide production services more flexibly. This paper sheds light on why robots increase productivity: rather than being better or faster than humans, they improve allocative efficiency.

ICT, analytics and innovation systems (C3)
Chair: Katarzyna Śledziewska (Warsaw University, PL)

Wednesday, 27 / 18:00-19:15

» **R&D, ICT and productivity**
(P. Mohnen, M. Polder and G. van Leeuwen)

Some scholars argue that the slow adoption of the ICT technology is one reason why European countries have a lower productivity growth than the US. Progress in digital technology can increase total factor productivity by boosting the effect of research on productivity, testing this hypothesis is the prime objective of this paper. We conduct the analysis at two levels of aggregation: at the micro-level using firm panel data for the Netherlands and at the macro level using sector panel data from 9 EU countries.

» **BIG Data - BIG Gains? Understanding the Link Between Big Data Analytics and Firm** Performance (F. Rasel, S. Viete and Th. Niebel)

In this paper, we provide first empirical evidence at the firm-level on the role of Big Data Analytics for firm performance in terms of firm innovation activities. We analyse the contribution of Big Data to firms' innovation performance within the widely used knowledge production function framework introduced by Grilliches (1979) to contribute better understanding this relationship across industries and help to assess the potential benefits of Big Data.

» **International ICT Trade Dynamics 2004-2014: An Explorative Network Analysis**
(R. Righi, S. Samoili, M. López-Cobo and G. De Prato)

The current study investigates countries' interconnections in terms of trade of ICT products and services worldwide. Based on a newly formed dataset, a directed, weighted, multi-layered and temporal network is introduced. This unbiased approach allows the development of an initial exploratory network analysis. This assessment reveals, over the period 2004-2014, that, due to the intensity of their international trade exchanges, the three main important nodes are China, the EU28, and the US.

Dynamics in aerospace and in pharmaceuticals (E1)
Chair: Antonio Vezzani (European Commission, ES)

Thursday, 28 / 11:45-13:00

» **Dynamic performance evaluation of aerospace industry actors in Belgium**
(P. Khoshnevis and P. Teirlinck)

Both managers in the space industry and policy makers are under increasing pressure to justify an efficient allocation of resources. This paper investigates the relation between multiple inputs and multiple outputs in the sector. Outputs include also innovation performance and spillovers of space activities to other sectors. Particular attention is paid to the role of cluster formation and different forms of proximity in regional economies for an efficient conversion of inputs into outputs.

» **Open Innovation in the Pharmaceutical Industry: a Study Using Social Network Analysis in Patents** (F. G. Basso, S. Kannebley Júnior, G. S. Porto)

The aim of this article is to analyse the collaboration networks of Novartis and Roche using Social Network Analysis. Patents filed between 1997 and 2016 were used to build a network based on information related to INPADOC and assignee. The adoption of open innovation was verified through the internalization of external knowledge to create new technologies protected by patents, as well as the acquisition of companies that have developed research together with both organizations.

» **Challenges for the Development of Technology-Based Firms in Aeronautics**
(A. Reis , J. Mendonça and L. Urbina)

In specific sectors such as aeronautics, with stratified and hierarchical supply chains, the trend has been for manufacturers to outsource the development and production of several important aircraft modules. In this paper, we look at the role of technology-based firms (TBFs) in the development of industrial capacity in aeronautics, by addressing the question: how can TBF address the changing nature of industrial production to move towards high value-added activities?

Competitiveness, Growth and Employment

Innovation persistence and firm survival (A1)

Wednesday, 27 / 14:45-16:00

Chair: Heli Koski (Aalto University, FI)

» **Persistent heterogeneity of R&D intensities within sectors: Evidence and policy implications**
(A. Coad)

Do firms in the same sector converge towards the same R&D intensities? Previous research has often assumed this to be true. A closer examination, using microdata from the EU Industrial R&D Investment Scoreboard for the years 2000-2015, shows a large amount of heterogeneity in R&D intensities among firms in the same sector, and that this heterogeneity persists over time. Firms with R&D intensity below the industry average show no tendency to catch up with the leaders. Policy implications are discussed.

» **Competition and innovation persistence in France**
(B. Mulkay)

This paper investigates how persistent is the relationship between competition and innovation at the firm level. We study how different concentration measures have an effect on the persistence of innovations at the firm level by using a new datasets for France coming from the annual surveys on R&D, covering the period 1999-2013.

» **Good Times, Bad Times: Innovation and Survival over the Business Cycle**
(E. Cefis and O. Marsili)

This study responds to the call made by management scholars and economists for understanding the implications of the global financial crisis from a micro economic perspective. In the study we consider innovation as a resource and capability that helps firms to adapt to change and survive. This is particularly true when a financial shock raises the intensity of market selection and transforms interfirm heterogeneity of resources and capabilities configurations into even greater performance differentials.

Lessons from the crisis (B1)

Wednesday, 27 / 16:30-17:45

Chair: Giovanni Dosi (Scuola Superiore Sant'Anna, IT)

» **Exploring ways to estimate endogenous productivity**
(Ch. Guillard, J. Jaumandreu and J. Olivari)

This paper explores ways to estimate endogenous productivity using firm data from the Spanish ESEE database (1990-2012). We compare our results with two traditional approaches that treat inputs and productivity as exogenous: Solow residual and Multilateral index. Our approach produces better production function estimates and more discriminating productivity measurements. We then discuss ways to apply the model when firm-level prices are not available.

» **The Compositional Nature of Productivity Slowdown**
(U. Cantner, H. Graf, E. Prytkova, and S. Vannuccini)

A growing number of studies identify a generalized slowdown in labour productivity growth. In this paper we take a Neo-Schumpeterian standpoint and we posit that the composition of aggregate productivity matters, thus addressing questions usually related to the macroeconomic side of the debate while at the same time shifting the focus at the slightly more granular `meso' level of industries.

» **Assessing Measurement Errors in the CDM Research-Innovation-Productivity Relationships**
(J. Mairesse and S. Robin)

The Crepon-Duguet-Mairesse 1998 article (CDM) introduced an econometric framework to analyse the relationships among research, innovation and productivity in cross-sectional survey-type data. Some implementations suggested that such data can give imprecise measures of innovation output and input (R&D). These 'measurement errors' may result in attenuation biases of the estimated R&D and innovation impact elasticities. Using a panel of three waves of the French Community Innovation Survey (CIS), we assess these biases and the magnitude of the underlying measurement errors.

Employment in innovation (E2)
Chair: Bernhard Dachs (Austrian Institute of Technology, AT)
Thursday, 28 / 11:45-13:00

» **Innovation and employment dynamics in the UK**
(T. Ciarli, A. Marzucchi, E. Salgado, M. Savona)

In the EU policy arena, the link between innovation and employment has been at the centre of the attention since the definition of the Europe 2020 Strategy. In this paper we investigate the effect of firms' R&D investment on the occupational choice of individuals working in the same local labour market (Travel-To-Work-Area, TTWA) and we consider the effect of R&D on the dynamics of employment, unemployment and self-employment.

» **Innovation and job creation in (high-growth) new firms**
(P. Santoleri)

This article examines the innovation-employment nexus for start-ups by using the Kauffman Firm Survey (KFS), a longitudinal dataset tracking the cohort of US firms founded in 2004. Results based on fixed effects panel quantile regressions indicate an overall positive, but heterogeneous effect of innovation on the conditional employment growth distribution. We consider both R&D and a firm intellectual property stock to explore this heterogeneity across the firm distribution and sectors.

» **Gender diversity, R&D teams and patents: An application to Spanish firms**
(M. Teruel and A. Segarra-Blasco)

We analyse if gender diversity affects the research productivity of Spanish innovative firms measured in terms of their stock of patents. We first test if the presence of female researchers in the R&D staff affects the patent capacity of the innovative firms and then we analyse if the evolution of the gender diversity index, during 2004-2014, affect the capacity of the innovative firm. Finally, we analyse if EC proposals to promote female research in private firms are getting the expected results.

Growth (F2)
Chair: Jacque Mairesse (Maastricht University, NL)
Thursday, 28 / 14:00-15:15

» **Financing constraints and growth ambitions of innovative European firms**
(A. Santos and M. Cincera)

The present paper aims to assess which factors in the financial market have a higher impact on firms' likelihood to be financially constrained when they have growth ambitions and need external finance. The results show that innovative firms have a higher probability of being financially constrained. For financially constrained firms, the main limiting factors are the non-availability of finance and the lack of collateral. Tax incentives for financially constrained firms are revealed to be the least important factor for innovative-firms, and a non-significant factor for non-innovative ones.

» **Endogenous growth with endogenous liquidity**
(Ch.-M. Chevalier)

Innovation policies associate more and more programs targeted to financial constraints in addition to incentives fostering R&D spending. This paper develops a Schumpeterian growth model with cash flow risk and asymmetric information between managers and investors, the tractability of the model allows for experiments shedding light on growth and liquidity for various industrial contexts.

» **Productivity, market selection and corporate growth: Comparative evidence from BRIC nations** (G. Dosi, I. Luna, N. Mathew, E. Youssef, H. Netto, , I. Savin, and X. Yu)

This paper presents a broad set of empirical regularities on firm-specific productivity improvement and market shares reallocation in manufacturing industries of Brazil, Russia, India and China (BRIC). The effect of a firm's relative efficiency upon its growth rate is at the centre of many models of industrial dynamics, both neoclassical and evolutionary. However, previous studies could not find a strong evidence for this link.

Innovation and productivity (G1)
Chair: Sara Amoroso (European Commission, ES)
Thursday, 28 / 15:45-17:00

» **Innovation and productivity in Spanish service firms: the impact of the 2008 economic crisis** (J.C. Alarcón, R. Aguilar Caro and J.L. Galán)

The aim of the paper is to analyse the evolution of the determinants of innovation outputs and productivity in Spanish services firms during the period 2003-2012. In the empirical application we use the PITEC microdata, a panel data based on the Spanish version of the Community Innovation Survey (CIS). Following the empirical literature of the last two decades we use an analytical model of two equations, based on the one formulated by Crépon, Duguet, and Mairesse in 1998 (CDM model).

» **Banking crises, R&D investments and slow recoveries** (O. Peja)

This paper studies the effect of banking crises on the composition of investment. It builds a partial equilibrium growth model with a banking sector and two types of investment: a low return one and an innovative, high productivity one. Industries that depend more on external finance, in more bank-based economies, invest disproportionally less in R&D following episodes of banking distress. These industries also have a relatively lower share of R&D, suggesting a shift in the composition of investment.

» **Trade, productivity, and employment growth during the Great Recession: evidence from French manufacturing firms** (G. Domini and D. Moschella)

The paper aims to investigate the micro-dynamics of productivity and reallocation among firms during the Great Recession, and their interplay with the firms' export activity. Based on a panel of French manufacturing firms, the paper focuses on the contribution of productivity and export activity to employment growth and firm survival over the period 2002-2013. It also investigates the potential role of other firm characteristics, notably including firms' innovative activities, as proxied by patents.

R&D support, Intellectual property and Innovation strategies

Supporting R&D - 1 (C1)
Chair: Raquel Ortega-Argilés (University of Birmingham, UK)
Wednesday, 27 / 18:00-19:15

» **Do selected firms show higher performance? The case of Portugal's innovation incentive** (A. Santos)

Based on a case study of the Portuguese Innovation Incentive System (SI Innovation), the objectives of the paper are: i) to assess the effect of public support for innovation on the economic performance of subsidized firms; ii) to measure eventual deviation between the financial statement foreseen in applications and the one actually achieved. The results show that subsidized firms invest more and create more new jobs than non-subsidized-firms.

» **The effectiveness of regional, national and EU support for innovation in the UK and Spain** (B. Becker, S. Roper and J.H. Love)

This paper uses data from the national innovation panel surveys in the UK and Spain over the 2004-12 period to explore the effectiveness of regional, national and EU innovation support in promoting the extent of innovation activity, its novelty, and market success. Results suggest that regionalised support is most influential in increasing the probability of undertaking process and organisational innovations.

» **Structure and funding of business R&D: Descriptive evidence from micro-aggregated cross data** (S. Appelt, M. Bajgar, C. Criscuolo and F. Galindo-Rueda)

This paper presents novel descriptive evidence on the structure, concentration and funding of research and development (R&D) performance by businesses. The analysis is based on statistical moments calculated in a harmonised way from nationally representative microeconomic data for 13 OECD countries.

Intellectual property strategies -1 (C2)	Wednesday, 27 / 18:00-19:15
Chair: Bruno van Pottelsberghe de la Potterie (Université Libre de Bruxelles, BE)	

» **Fasten Your Seatbelts! Can The Patent Prosecution Highway Take Your Application Down The Fast Lane?** (V. Behrens , D. Czarnitzk , and A. Toole)

This study empirically assesses the effectiveness of the Patent Prosecution Highway (PPH) with econometric methods by drawing upon two frequently used patent databases (PatStat and Public Pair) with the aid of a new merging technique. Results of this paper suggest that the PPH reduces the processing time of patent applications by around 25% - 43%, comparable to a reduction in pendency by 211 - 404 days.

» **Protecting intellectual property: complementarities and trade-offs among different strategies** (G. Capponi, A. Martinelli, and A. Nuvolari)

This paper investigates the extent to which companies combine different IP protection methods on a single product or process, using a novel dataset on companies IP strategies built by means of a survey. Early evidence shows that, overall, companies do adopt mixed IP protection strategies at each stage of the development process, with different mechanisms prevailing depending on the innovations' type, technological readiness and firms' characteristics.

» **Technology giants in patent wars: competition, litigations and innovation** (H. Koski and J. Luukkonen)

This paper uses quarterly data from 2005 to 2014 to empirically explore the relationship between the patent litigations and the quantity and quality of patent applications filed in the USPTO by 20 major technology companies. The results support the view that patent portfolio races driven by the threat of legal disputes are not generating more valuable patented inventions. Instead their quality tends to be lower measured both by forward citations and patent family size.

Supporting R&D - 2 (D1)	Thursday, 28 / 10:00-11:15
Chair: Marzenna A. Weresa (Warsaw School of Economics, PL)	

» **The impact of R&D subsidies under different institutional frameworks** (S. Bianchini, P. Llerena and R. Martino)

This paper assesses the impact of public support to business R&D in heterogeneous regional institutional contexts. The preliminary results suggest that public support to business R&D is characterised by both crowding-in and additionality independently from the regional institutional framework. Furthermore, our results seem to confirm that public support to R&D yields the highest impact in the less favourable environments, where economic actors are more constrained.

» **Successfully obtaining public R&D grants: The importance of project and firm characteristics** (M. Falk and R. Svensson)

The aim of the paper is to provide new empirical evidence on the main determinants of receiving a R&D grant. In addition to firm characteristics, explicit focus is put on indicators of the quality of the R&D project applications. Data is based on linked firm- and project-level information, covering 22,000 firms for the period 2005-2015 and is provided by the Austrian R&D funding agency (FFF).

» **Impact of Eureka Projects on the performance of R&D SMEs** (M. Cincera and E. G. Fombasso)

This paper assesses the impact of Eureka network (NP) and cluster (CLS) projects on the performance of beneficiary firms over the period 2005-2010. Beneficiaries of Eureka projects (which are typically R&D SMEs) are compared with a control group of more or less similar firms. We find that beneficiaries of NP and CLS projects have created on average more jobs and have increased their sales more than non-funded firms over the period of study.

Intellectual property strategies - 2 (D2)	Thursday, 28 / 10:00-11:15
Chair: Pierre Mohnen (United Nations University, NL)	

» **Spillover from the Haven: Cross-border Externalities of Patent Box Regimes within Multinational Firms** (Th. Schwab and M. Todtenhaupt)

This paper analyses the international effects of patent box regimes. By combining information on patents, firm ownership and specific characteristics of patent box regimes; we show that regimes without nexus requirement induce positive cross-border externalities on R&D activity within multinational groups. Furthermore, our findings suggest that patent boxes generate negative spillovers on average patent quality. This has important implications for international tax policy and the evaluation of patent box regimes.

» **How much does a patent cost? An analysis of technology specific R&D investments** (P. Gkotsis and A. Vezzani)

In this work we provide results of an extensive exercise to estimate R&D related costs by technology. Traditionally, differences in patent to R&D ratios, the so called patent propensity, have been used to explore specificities of technological development across firms and industries. Our results, attempt to go one step further; by allocating R&D investments to specific technologies we show that R&D costs vary significantly across technologies and industries, and identify some factors determining technology costs.

» **Open Innovation Network: the case of healthcare firms of Nasdaq-100 index** (M.A. Oliveira Luqueze, S. Kannebley Junior, and G. S. Porto)

This paper analyses how companies in the healthcare segment of the Nasdaq-100 Index behave by studying co-ownership patents, investments in R&D and mapping the cooperation network among them. By approaching a horizon of 20 years, the conclusions allowed the diagnosis of a pattern of behaviour among the companies classified into an open innovation matrix and the mapping of the configuration and scope of their cooperation networks.

Investing in intangibles (D3)	Thursday, 28 / 10:00-11:15
Chair: Sandro Montresor (Kore University, IT)	

» **The Impact of Investment in Knowledge-Based Capital on Productivity: Firm-Level Evidence from Ireland** (M. Di Ubaldo and I. Siedschlag)

This paper examines the impact of investment in knowledge-based capital on firm productivity. The analysis is based on a dynamic econometric model estimated with micro-data from Ireland over the period 2006-2012. The results indicate that, on average, an increase in investment in knowledge-based capital of 10% increases firm productivity by 2%. Further, the estimates indicate that firms' productivity is more responsive to investment in R&D than to investment in non-R&D intangible assets.

» **Unlocking Investment in Intangible Assets** (A. Thum-Thysen, P. Voigt, B. Bilbao-Osorio, Ch. Maier and D. Ognyanova)

This paper provides contextual information concerning intangible assets by discussing conceptual aspects, illustrating recent trends in terms of investments in intangibles and their corresponding impact on productivity and Gross Value Added (GVA) growth. With a view at specific characteristics of intangibles, potential drivers and barriers to investments in intangibles are identified and tested.

» **Knowledge as an economic good: exhaustibility vs. appropriability?** (C. Antonelli)

The analysis of knowledge as an economic good has paid much attention to its limited appropriability. Lesser attention has been paid to its limited exhaustibility. This paper analyses the implications of the limited exhaustibility of knowledge both for economics and economic policy. The effects of the limited exhaustibility of knowledge may compensate the effects of its limited appropriability.

Simulation and innovation strategies (E3)
Chair: Cristiano Antonelli (Università di Torino, IT)

Thursday, 28 / 11:45-13:00

» **Regional knowledge creation in a global industry: an empirical agent-based model of the Austrian semiconductor industry** (M. Paier, M. Dünser and A. Unger)

In this paper, we present an empirical agent-based model (ABM) of knowledge creation in a system of researching organizations that accounts for technological aspects, micro-level dynamics and knowledge exchange in networks. We then run a simulation applied to the Austrian semiconductor industry to draw some preliminary conclusions for RTI policy in Austria.

» **Innovation and Imitation Strategies in the Age of the Upgrade – An Agent-Based Simulation Model** (P. F. Simmering and D.S. Hain)

Product life-cycles in markets for innovative products are shortening, consumers rapidly upgrade from one product generation to the next and demand constant technical improvement. This study uses an agent-based simulation model to analyse the dynamics of firm-level innovation and imitation strategies in such a market. It is found that strategies combining imitation with technical innovation are most successful. Further, it is shown that consumer preferences for upgrading dictate the pace of technical innovation.

» **Asymmetries, Passive Partial Ownership Holdings, and Product Innovation** (A. Bayona and Á. L. López)

We study how asymmetries affect R&D investments, competition, and welfare in markets with passive partial ownership holdings between rival firms. In contrast to previous findings, we find that, due to asymmetries, passive partial ownership holdings can increase total surplus in markets with competition in prices and quality-enhancing R&D with no spillovers. In these markets, our finding suggests that competition authorities should take into account the potential beneficial effects of asymmetric passive partial ownership holdings.

Internationalisation, Globalisation and other Territorial dimensions

Global value chains (B2)
Chair: Alexander Tübke (European Commission, ES)

Wednesday, 27 / 16:30-17:45

» **Tourism global value chains and technological capabilities in the hotel industry** (F.-R. Cáceres-Carrasco, J. Fernández-Serrano, and I. Romero)

This article investigates the tourism intermediaries' influence on the investment in technological capabilities of SMEs in the hotel industry. The results show that those hotels that are more dependent on tour operators to commercialize hotel rooms invest more in their technological capabilities. Tour operators therefore seem to have a positive effect on the upgrading process of hotel SMEs.

» **How do trademarks affect the economic performance of global R&D leading firms?** (C. Castaldi, and M. Dosso)

This paper provides a statistical investigation of the links between trademarks' portfolio and corporate economic performance in terms of net sales growth. It argues that, for R&D-leading companies, complementing R&D efforts and patenting activities with strong and specific market capabilities can yield significant growth premiums, depending on the industrial sector.

» **The role of openness to external knowledge sources in innovation value chains. How do high- and low-tech firms differ in their behaviour?** (Ph. Schulz)

This article uses the resource based view (RBV) as a theoretical point of departure and argues that high-tech and low-tech firms possess different capabilities. These differences result in different collaboration patterns along the innovation process in an open innovation context. The analysis uses data from the Mannheim Innovation Panel (MIP) and reaches back on a survey wave with special focus on the innovation process.

Industry-university cooperation (F1)	Thursday, 28 / 14:00-15:15
Chair: Daniele Archibugi (Consiglio Nazionale delle Ricerche, IT)	

» **Does learning from prior collaboration help firms to overcome the 'two worlds' paradox in university-business collaboration?** (N. Hewitt-Dundas, A. Gypalib and S. Roper)

Building university-business collaborations confronts the 'two-worlds' paradox, and the difference in institutional logics and priorities between businesses and universities. Here, we consider whether firms' experience from prior collaboration can generate learning which can help to overcome the two-world's paradox and improve their ability to generate new-to-the-market innovations in collaboration with universities. Based on panel data for UK companies, we find evidence of significant learning effects in the commercialisation pipeline for new-to-the market innovation.

» **The division of labour between academia and industry for the generation of radical inventions** (U. Rizzo, N. Barbieri , L. Ramaciotti and D. Iannantuono)

The paper investigates the relationship between radical technological development and public research. It assesses whether the proximity of the invention to public research is related to a higher probability of the invention being radical. Provided companies patent the far larger share of radical inventions, results show that, depending on the type of novelty embodied by the radical invention, different forms of public research relate to the radicalness of invention in different ways.

» **Do Firms Publish? A Cross-Sectoral Analysis of Corporate Science**
(R. Camerani, D. Rotolo and N. Grassano)

The present paper examines the phenomenon of corporate science, i.e. corporates involvement in publication activities. To do so, we analyse the publication activity of the top-2,500 worldwide corporates R&D investors and found evidence of a considerable contribution of these corporates to academic literature: about 84% of the corporates in our sample co-authored at least one publication from 2011 to 2015 and produced overall 345,816 publications in the same observation period.

The regional dimension of innovation (F3)	Thursday, 28 / 14:00-15:15
Chair: Mafini Dosso (European Commission, ES)	

» **Green technologies and regional specialisation: a European patent-based analysis of the intertwining of technological relatedness and Key-Enabling-Technologies** (S. Montresor and F. Quatraro)

The paper investigates the process through which regions get specialised in green technologies to place them at the basis of a sustainable kind of growth. In particular, it addresses the extent at which the regional acquisition of new green knowledge is driven by its technological relatedness to pre-existing one, and the role of Key-Enabling-Technologies (KETS) in making such a relatedness less binding for regional green specialisation.

» **European disparities in regional health R&I performance**
(M. Plechero, C. Cozza and R. Ortega-Argilés)

We argue that the propensity of MNEs to set up technical linkages with local firms and institutions depends on the balance between the advantages of multinationality and the liability of foreignness. This interpretive framework is tested using data on R&D investors active in Italy and controlling for indicators of firms' internal R&D efforts, internationalisation and regional distribution of R&D activities.

» **Are multinationals better at creating technical linkages with local firms and institutions?** (C. Cozza, G. Perani, A. Zanfei)

The paper provides an analysis of possible determinants of EU regional Health R&I inequalities, disentangling the factors related to publication propensity from those related to patent propensity. The results show that despite one of the most relevant determinants of R&I in the Health sector remain the level of R&D expenditure, other factors such as the size or degree of Health specialisation of the region should also be taken into account.

Innovation and Internationalisation (G2)	Thursday, 28 / 15:45-17:00
Chair: Nola Hewitt-Dundas (Queen's University, UK)	

» **Location determinants of foreign R&D investments in European regions** (G. Damioli and D. Vértesy)

Our study investigates the factors affecting the degree of attractiveness of European regions from the perspective of a company investing abroad. The analysis is based on evidence gathered from all the FDI in R&D realized between 2003 and 2014. On average, the fiscal regime and the size of destination regions as well as the sharing of a common language in the sending and receiving regions are the most important determinants.

» **The Value of Human Capital Signals for Investment Decision Making under Uncertainty - An analysis of foreign venture capital investments in Europe and sub-Saharan Africa** (D. S. Hain, J. L. Christensen, and R. Jurowetzki)

In this paper, we analyse the interaction between human capital signals of entrepreneurial founding teams and the contextual experience of potential investors, aiming to explain investment decision making. We do so using the case of cross-border venture capital (VC) investments in volatile and uncertain environments. We find human capital signals from the entrepreneurs to be of higher importance for investors when investing in uncertain environments.

» **Exports, R&D Activities, and Labour Productivity of SMEs** (F. Figueira de Lemos and M. Falk)

This paper investigates the link between the export behaviour, labour productivity and R&D activities of Austrian SMEs for the period 1995-2011 using 18,000 firm observations. The results show that the export participation and export share of SMEs depends significantly and positively on their labour productivity level (relative to that of large firms in a given industry) and R&D-sales ratio.

Knowledge spillovers and collaborative innovation (G3)	Thursday, 28 / 15:45-17:00
Chair: Thomas Schwab (University of Mannheim, DE)	

» **What determines international and inter-sectoral knowledge flows? The impact of absorptive capacity, technological distance and spillovers** (F. Seliger)

This paper studies the determinants of knowledge flows as measured with patent forward citations occurring between 'input' and 'output sector-countries'. We look at the impact of absorptive capacity of a focal sector-country, knowledge spillovers and technological distance between sector-countries on further knowledge flows. Our results indicate that knowledge accumulated in the output sector-country and - in some cases - external spillovers are keys in generating further knowledge flows that go to the output sector-country.

» **The cost-quantity relations and the diverse patterns of "learning by doing": Evidence from India** (G. Dosi, M. Grazzi and N. Mathew)

This paper investigates different patterns of "learning by doing", studying learning curves at product level in a catching-up country, India. Cost-quantity relationships differ a lot across products belonging to sectors with different "technological intensities". In some cases we find also, puzzlingly, that the relation price / cumulative quantities is increasing. We conjecture that this is in fact due to quality improvement and 'vertical' product differentiation.

» **European Creative Synergy: Application for Energy Transition Efficiency** (K. Maziz, J.-Ch. Guilhem, M. Julien and J. Laforcade)

In this paper Air Liquide and two start-up (Meetys and 2B1st) share their global experience to create an ecosystem to favour collaborative innovation. Moreover, we will present their vision on the way this type of synergy could be developed in the next decade in a European environment characterised by disruptive technologies challenging organizations, social relationships and regulations.

4. The key note speakers' contribution

Dr **Dirk Pilat**, will speak about some of the new evidence on innovation and industrial dynamics that has emerged from OECD research in recent years, the new insights that have emerged from that evidence, and the questions this raises for research and policy. His talk will touch on three key areas of work, namely: 1) the divergence in productivity between global leaders and followers, and possible factors driving this divergence; 2) the broad-based decline in business dynamics; 3) the ongoing digital transformation and its impacts on jobs and skills. He will emphasize the importance of micro-data for further analysis of these issues and to support the development of appropriate policy responses.

During his speech, he will also launch the joint EC/JRC - OECD/STI report *World Corporate Top R&D Investors: Industrial Property Strategies in the Digital Economy*, which shines a new light on the digital transformation and on the strategies pursued by top innovators worldwide to generate knowledge and to appropriate the returns from their knowledge-based investment through industrial property (IP) rights.

Prof. **Uwe Cantner** will talk about "Innovation Roads Ahead". This talk takes a look at long run development of innovation activities and provides (policy) proposals for the near future. It addresses the secular productivity slowdown and the related innovation slowdown, discussing causes and providing new evidence. The consequences of the innovation slowdown are discussed from a Neo-Schumpeterian viewpoint stressing the need for a shift in innovation research from innovation intensity to direction. More specifically, topics such as the direction of innovative activities and issues of radical innovation are covered as well as innovation and technology policy – this finally leads to addressing the potential new role of state and public intervention in innovation, partly combined with elaborations on the future of capitalism.

Prof. **Scott Stern** speech will focus on "Innovation-Driven Entrepreneurial Ecosystems: A New Agenda for Measurement and Policy". Accelerating regional entrepreneurial ecosystems is increasingly at the forefront of regional economic strategy and policy. But, many efforts aimed at encouraging growth-oriented new business formation flounder due to a lack of accountability and coordination. Drawing from research coming out of the MIT Regional Entrepreneurial Acceleration Program, this talk focuses on the role of stakeholder-led initiatives in accelerating entrepreneurial ecosystems, and the role of real-time and granular measurement in that process. A key insight is that, to create a share understanding among stakeholders and ensure accountability with the implementation of program and policies, measurement must be timely, granular, and meaningful. The Startup Cartography Project – where we use predictive analytics across the full population of business registrants – offers a promising approach for allowing for real-time measurement of entrepreneurial founding and scaling.

Prof. **Luc Soete**'s talk will further elaborate on the way "openness" could be used as a guiding principle in the current debate on "mission-oriented" research policy. "Openness" as a concept is discussed in more detail in the RISE report on Europe's Future: Open Innovation, Open Science and Open to the World[14]. A full endorsement of "openness" might form a new set of guiding policy principles for research addressing the grand societal challenges of our time; with Europe as central player in addressing those challenges with applications at the global level and at the local (city) level, enabling new firms to emerge both in newly constructed markets and in the scaling-up of existing firms.

5. The policy stakeholders panel contribution

The round-table of policy stakeholders is the space where the topics and evidence presented during the conference – and summarised by members of the scientific committee beforehand – will be discussed and connected with the EU and international policy agenda (see Annex 1). Policy stakeholders from the European Commission and other international institutions will contribute to the discussion providing input from the perspective of their respective services/institutions. The following main areas will be addressed:

* Research and innovation: Analysis and monitoring of national research policies
* Regional and urban policy: Smart and sustainable growth
* Support to strategic investments, including in research and innovation
* Promotion and acceleration of inclusive and sustainable industrial development
* Evidence-based policy advice on the contribution of science, technology and innovation to economies and societies
* Internal market, industry, entrepreneurship and SMEs: Innovation and Industrial policy

The objective of this roundtable is to contribute to identify policy-relevant conclusions from the conference and, as referred to in the title, the research and policy challenges for the decade to come. It will also offer a timely opportunity to contribute to policy discussions around a new EU industrial policy strategy for the future and the design of related EU financial support instruments in the context of the post-2020 multiannual financial framework.

[14] http://ec.europa.eu/research/openvision/pdf/publications/ki0217113enn.pdf

ANNEX

I) Introduction to the EU innovation and industrial policy agenda

The support to corporate R&D and innovation activities is a major element of the **Europe 2020** strategy, which aims at stimulating smart, sustainable and inclusive growth in Europe. The European growth strategy is outlined around five main Headline targets in the areas of employment, R&D investment, energy/climate, education and poverty. In addition, seven flagship initiatives are defined under the priority themes.

The **Innovation Union** considers the R&D and innovation activities as the privileged and smart path to respond to the grand societal challenges. The Innovation Union aims at creating an innovation-friendly environment that facilitates the commercialization of new ideas and innovations in order to foster growth and jobs. Several actions targeting corporate R&D and innovative activities are already undertaken or planned.

The **Industrial policy flagship** defines the European policy strategy for a more dynamic, competitive, sustainable and modern EU industry. The main priorities for the industrial policy are set out in the communication "For a European Industrial Renaissance". They reflect the Commission commitment for an "Industrial Renaissance" that requires the modernisation of Europe's industrial base across all industrial sectors.

The EU overall strategy for jobs and growth will also be supported by the recently launched **Investment Plan** and the establishment of a new European Fund for Strategic Investments (EFSI) aiming at mobilising public and private resources to be invested in strategic areas including among others research, innovation and education, as well as risk finance for small businesses (around 30% of the total budget).

The programme for Competitiveness of Enterprises and Small and Medium-sized Enterprises, **COSME** aims to help enterprises access finance and markets, to promote entrepreneurship, and to support favourable conditions for business creation and growth. In addition, the **Small Business Act** encapsulates the actions aiming at fostering entrepreneurship and growth by reducing the administrative burden on small businesses, facilitating access to funding for small and medium-sized enterprises (SMEs), and supporting access to global markets for EU companies. Moreover, the European Commission is setting up a complementary European Scale-Up Action for Risk Capital, called **ESCALAR**, to enable venture capital funds to triple their investment capacity thus, addressing the need for larger venture capital investments after the start-up phase.

Furthermore, the EU takes action to **empower businesses to access and use intellectual property rights** more effectively, as generating policy on the protection and enforcement of industrial property rights, coordinating the EU position and negotiations in the international intellectual property rights (IPR) system, and assisting innovators on how to effectively use IP rights;

Horizon 2020 is the main EU Research and Innovation programme for the period 2014-2020, which targets the excellence in science, the industrial leadership and the development of solutions to the grand challenges. Horizon 2020 is the main financial instrument for the implementation of the Innovation Union flagship. Under the programme, dedicated support has been designed to foster the corporate R&D and innovation activities.

In addition, the **European Structural and Investment Funds** (ESIF) devote important financial resources to support EU research and innovation policy priorities in the context of the EU structural and cohesion policy. In order to benefit from such investments, national and regional authorities have been requested to prepare Research and Innovation Strategies for Smart Specialisation (RIS3 strategies) to support technological as well as practice-based innovation and stimulate private sector investment.

As part of the yearly cycle of economic policy coordination called the **European Semester,** the implementation of the Europe 2020 and its related flagship initiatives is monitored. The progress at EU level is evaluated and national reform programmes, which include research and innovation policies, are evaluated and, when required, country specific recommendations are provided.

The European Commission RTD policy activities are currently framed under the banner of **"Open Science, Open Innovation and Open to the World"** (the 3Os). The 3Os paradigm reflects the increasingly international dimension of science and innovation and the changing ways of working and sharing in a world shaped by digital technologies.

Recently the European Commission has underlined the importance of manufacturing to foster competitiveness and suitable growth (European Commission, 2014 "For a European Industrial Renaissance COM(2014). To the extent that manufacturing industries provide a foundation for innovation and productivity growth, then the **target of manufacturing to occupy 20% (by 2020) of a country's value added** may result in increased R&I investments. Relevant European Commission initiatives as the 'emerging industries', highlighting the key role played by the "Future and Emerging Technologies".

There are **other EU initiatives** in place which focus on industrial dynamics and innovation. These include, for example, the Investment Plan, Capital Markets Union, Circular Economy, Energy Union, Digital Single Market and Single Market Strategy including the Start-up and Scale-Up Initiative, the Digitising European Industry Initiative, rule-based trade, the Skills Agenda and the Commission's work on research and innovation (including the industrial pillar in the existing framework programme), smart specialisation and economic diplomacy.

Addressing the problems of under-investment in R&I across most of the EU, compared to the main global R&I players, is another aim. **EU R&I policy therefore focuses on increasing the private share of R&I investment, whilst establishing synergies with other public or private investment sources** – notably the Structural and Cohesion Funds and / or the European Fund for Strategic Investment.

Finally, the European Council on competitiveness of 29 April 2017 called on the European Commission "to provide a **holistic EU industrial policy strategy for the future** in time for the European Council meeting in spring 2018; this strategy should present medium to long term strategic objectives for industry (R.e.: Commission's 2018 work programme)". As a matter of fact, the European Commission has released in mid-September 2017 the communication on "**Investing in a smart, innovative and sustainable industry – A renewed EU industrial policy strategy**".

In this line, at the end of June 2017 several European Commission' services have confirmed their commitment to work together with regions in the **Smart Specialisation Platform on industrial modernisation**. Such platforms work as mechanisms to stimulate industrial innovation and cross-border learning and projects, for example they bring together regions and their R&I, cluster and SME strategies and first cross-border cooperations are emerging, complementary to Horizon 2020.

II) Posters presented at CONCORDi 2017

Title	Author(s)	Affiliation
Internationalization of R&D and Host-Country Patenting: Do International Research Teams Innovate Better? The Case of Germany and the USA	**Daniel Sommer**	University of Hohenheim, Stuttgart (DE)
Persistence of innovation in times of crisis: evidence from Italian firms (2005 - 2010)	**Davide Antonioli, Sandro Montresor**	University of Chieti-Pescara (IT) Kore University (IT)
Product Upgrading. The Role of Imported Machinery in Export Development	**Judit Rariga**	Central Bank of Hungary and Central European University (HU)
(When) Do R&D Subsidies Stimulate External Collaboration? The Role of Collaboration Experience	Gary Chapmana, Abel Lucena, **Sergio Afcha**	De Montfort University (UK), University of the Balearic Islands (ES), University of Valencia (ES)
Improving access to finance: analysing the impact of policy measures supporting the emergence of high-growth innovative enterprises	Gonzalez Verdesoto E, Ianshyna A., Mitchell J., Stamenov B., Szkuta K., **Giuseppina Testa**	European Commission (BE)
Invited Posters		
Smart Specialisation, seizing new industrial opportunities	Antonio Vezzani[♠], Marco Baccan[♣], Alina Candu[♣], Alessio Castelli[♣], Mafini Dosso[♠], Petros Gkotsis[♠]	[♠] European Commission, JRC [♣] Finlombarda (IT)
EU R&D Scoreboard	Héctor Hernández	European Commission, JRC
R&D and Innovation across Global Value Chains: Trends and Policy Implications	Mafini Dosso, Lesley Potters and Alexander Tübke	European Commission, JRC
Sector dynamics, specialisation and R&D growth of top innovators in the global economy	Pietro Moncada-Paternò-Castello	European Commission, JRC
European R&D networks: A snapshot from the 7th EU Framework Programme	Sara Amoroso[♥], Alex Coad[♦], Nicola Grassano[♥]	[♥] European Commission, JRC [♦] CENTRUM Católica Graduate Business School, Pontificia Universidad Católica del Perú,
The spatial computable general equilibrium model of the European Commission focusing on EU regions	Andrea Conte	European Commission, JRC
The 2017 EU Survey on Industrial R&D Investment Trends	Lesley Potters, Nicola Grassano and Alexander Tübke	European Commission, JRC
Globalisation of private R&I in EU28: The case of Solar PV and Wind	Alessandro Fiorini, Aliki Georgakaki, Francesco Pasimeni	European Commission, JRC
The organisational and geographic diversity and innovation potential of EU-funded research projects	Daniel Nepelski, Annarosa Pesole and Vincent Van Roy	European Commission, JRC

III) Members of CONCORDi 2017' Scientific and Steering Committees

Scientific Committee

* Róman Arjona (European Commission, BE)
* Mária Bieliková (Slovak University of Technology, SK)
* Uwe Cantner (Friedrich Schiller University Jena, DE)
* Alex Coad (Pontificia Universidad Católica del Perú, PE)
* Giovanni Dosi (Scuola Superiore Sant'Anna, IT)
* Bronwyn H. Hall (University of California at Berkeley, USA)
* Jackie Krafft (Centre National de la Recherche Scientifique, FR)
* Pierre Mohnen (United Nations University, NL)
* Pietro Moncada-Paternò-Castello (European Commission, ES)
* Mariagrazia Squicciarini (Organisation for Economic Co-operation and Development, FR)
* Scott Stern (Massachusetts Institute of Technology, USA).

Steering Committee

Alessandra Colecchia (Organisation for Economic Co-operation and Development)
Marta Dominguez Ternero (European Commission, JRC)
Nicola Grassano (European Commission, JRC)
Fernando Hervás (European Commission, JRC)
Pietro Moncada-Paternò-Castello (European Commission, JRC) - *Coordinator*
Alessandro Rainoldi (European Commission, JRC)
Alexander Tübke (European Commission, JRC)
Antonio Vezzani (European Commission, JRC).

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: http://europea.eu/contact

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:
- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696, or
- by electronic mail via: http://europa.eu/contact

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: http://europa.eu

EU publications

You can download or order free and priced EU publications from EU Bookshop at: http://bookshop.europa.eu. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see http://europa.eu/contact).

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.

EU Science Hub
ec.europa.eu/jrc

@EU_ScienceHub

EU Science Hub - Joint Research Centre

Joint Research Centre

EU Science Hub