



# **“Evaluation of research and innovation policies” - Final SIMPATIC Conference in Brussels**

**Thursday 26 February and Friday 27 February, 2015**

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## **Thursday 26 February 2015**

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### **Economics of Public R&D Support**

9.30 - 10.15 Subsidies, financial constraints and firm innovative activities in developing economies

**Simona Mateut**, Nottingham University Business School

Simona Mateut studies the relationship between public subsidies and firm innovation in developing economies. Given the high level of risk involved in innovative activities, finance always play a central role. Moreover, as financial market are typically more underdeveloped in emerging economies, firms’ innovative activates can be further impeded. Thus, with more firms being likely to be financially constraint, public subsidies to innovation may play a more important role in these economies.

In order to analyse this hypothesis, this paper models firm innovative activities as a function of subsidies received, firm financial strength, R&D effort and other controls. The empirical analysis is performed using data drawn from the Business Environment and Enterprise Performance Survey, which covers 11,998 enterprises in thirty countries of Eastern Europe and Central Asia, and that allows to measure whether firms innovate (introducing or upgrading products).

The results show a positive association between receipt of subsidies and firm innovation, an effect that is stronger for financially constrained firms. Therefore, it seems that public intervention is beneficial, given the importance of innovation for economic growth and the likelihood that firm innovation in developing countries is financially constrained.



10.15 - 11.00 Science and Productivity: Evidence from a randomized natural experiment

**Cedric Schneider**, Copenhagen Business School

Academic research plays an important role in industry performance as it contributes, for example, to increase productivity, create new patents, products and processes, or even to create new industries. This happens through the dissemination of basic scientific knowledge, but also with pre-commercial research. Thus, interactions between universities and corporations are important. However, this interaction is more difficult for SMEs, given, for example, their lower absorptive capacity.

With the purpose of fostering partnerships between SMEs and research institutes, the “Innovation Voucher Program” was introduced in Denmark, providing SMEs with vouchers to collaborate with universities or Research and Technology Organizations (to access scientific consulting or equipment). As the assignment to treatment was random, the program effects that are similar to those arising from a randomized trial allowed the authors to assess the causal impact from the voucher.

It was found that qualified firms became 20% more labour productive and with 17% higher wages, in comparison with the firms that did not receive the vouchers. Operating profitability went up, but only significant three years after the program.

11.30 - 12.15 Direct and Cross-scheme effects in a Research and Development Subsidy Program

**Hanna Hottenrott**, KU Leuven

This study is interested in estimating at which stage of the R&D process subsidies are more effective. While they are usually considered together, Research (R) and Development (D) are different activities that show fundamentally different characteristics as research typically relates to more tacit knowledge, higher intangibility, higher outcome uncertainty and



further market distance, and these differences may also explain different financing constraints.

The authors analyse a subsidy policy in Flanders (Belgium) which explicitly distinguishes between research activities and development activities and measure the direct (within) and cross-scheme effects. In order to do this, they use propensity score matching to estimate the average treatment effect on the treated of the subsidy policies, which gives the incremental effect of the subsidy policy on R and D investment compared to the potential outcome in which the firm did not receive the subsidy. They find that public grants increase net R&D spending, on average, meaning that there is neither total nor partial crowding out, and that research grants yield a higher average additionality than development grants. Furthermore, the study finds that research and development subsidies not only generate direct but also cross effects: while development subsidies have a relatively small direct effect on net development expenditures, they stimulate research expenditures; Research subsidies on the other hand spur own research as well as development, and this to a similar extent.

These findings seem to suggest that specific schemes that take into account the peculiarities of the different components of the R&D process may increase the efficiency of public co-funding programs and that support is especially needed in the early research stages of R&D activities, which are more likely to be affected by potential market failures.

## 12.15 – 13.00 Welfare Effects of European R&D Support Policies

**Tuomas Takalo**, Hanken School of Business and **Otto Toivanen**, KU Leuven

In OECD countries, a lot of money (more than \$1 bn per year) is spent in supporting R&D and the justifications for these policies are mostly twofold. First, due to imperfections in the capital markets firms may not be able to raise funds for promising projects. Second, the output of these R&D expenditures will produce spillovers to other firms and consumers, ultimately resulting in welfare improvements for the whole society. These spillovers are not taken into account by firms when deciding how much to invest in R&D, thus leading to a total investment below what would be socially optimal. It is therefore of paramount

importance to have robust empirical evidence of the welfare effects of these policies. The study tries to provide this evidence by estimating the welfare effects of R&D support policies (subsidies and tax credits) used to support R&D in Belgium (Flanders), Finland and Germany using a structural econometric model that explicitly includes capital market imperfections and compare the results with several counterfactuals, including a EU-wide innovation policy that takes into account cross-country spillovers within EU.

The theoretical model consists of a four-stage game of imperfect information between a firm, a government agency and competitive financiers that describes the application and financing decisions of the firm and the government decisions on subsidies. The firm has one idea per period and the quality of the idea has two dimensions, a private one (profitability for the firm) and a public one (the spillovers it generates). The firm however has no funds and has to raise private and public funding to finance the idea. The firm incurs sunk costs both to start the R&D process and to apply for public funding. The timing of the model is the following:

1. In the first stage the firm decides whether or not to apply for a subsidy;
2. The agency then screens the project and decides on whether to grant the subsidy and the subsidy rate; while the firm knows the rules adopted by the agency to screen the project and decide the subsidy rate, it does not know the type of the agency (which is represented by the parameter of the spillover that the idea will generate for society according to the agency);
3. The firm then raises outside funds through competitive financiers;
4. The firm decides whether and how much to invest in R&D.

From this model the authors obtain equations describing the firm application and R&D decisions and the decisions of the choice of subsidies of the agency. The empirical approach is based on revealed preference, that is it uses actual decisions to infer parameter values (firm R&D reveal the profitability of the last euro spent in R&D, firm decision not to invest in R&D reveals the sunk cost of investment, firm decision not to apply reveals the sunk cost of applying for subsidy and the government agency decisions on the subsidy rate reveals value



of the last R&D euro to the government). The authors use data from Flanders, Finland and Germany to estimate the welfare effects of subsidy policies and compare them with several counterfactual: the first best where the agency decides both the R&D expenditure and the participation, the second best where the agency only decides the R&D expenditure, a laissez-faire approach, the optimal R&D tax credit and an EU-wide subsidy policy that takes into account spillovers within EU countries (measured by citations of foreign patents in national patent applications). The current policy and tax credit seem to produce some benefit compared to a laissez-faire in terms of investments in R&D, but are a far cry from the first and second-best, while the difference is much less pronounced when considering firm participation. When considering welfare effects, current policies generate only modest improvement compared to a laissez-faire approach, while an EU-wide subsidy policy seem to generate larger improvements by internalizing cross-country spillovers.

13.00 -15.00 Evaluating innovation policies,

**John Van Reenen, LSE**

This study provides a descriptive picture of the lifecycle of inventors and tries to gain some insight into whether the socioeconomic background of the family of an individual affects the likelihood he or she may become an inventor (“What would have happened if Einstein was born poor?”) and whether we have some misallocation of talent. While innovation and spillover are at the core of modern theories of growth, empirical research has mainly focused on firm-level analyses rather than on individual incentives to innovate and little is known about characteristics and life trajectories of individual inventors.

The author uses data on patents as a measure of innovation (with the caveats that as is commonly known there are many issues with using patents as measure of innovation) and links them with data on tax records of individual inventors to characterize the lives of inventors. He finds that there is a strong correlation between the rate of patenting and the income of the parents of an individual inventor (especially in the top-10 percentile where the rate displays an abrupt increase) and these differences in patenting rates seem to be only partially explained by ability or preferences, which suggests a potential misallocation of



talent. The author also points out that potential gains from tax incentives are probably small due to the significant and highly skewed returns from highly cited patents.

The author also notes that the data suggests that the place where an individual grew up is important in explaining whether he becomes an inventor (children raised in areas where there are more inventors are more likely to become inventors themselves) and that there may be patterns within technological sectors (e.g. Silicon Vally may raise more ITC innovators and Minnesota more medical innovators).

## 15.00 - 15.45 Public Funding and Its Relationship to Research Outcomes: Evidence for an Elite US University

**Jacques Mairesse, ENSAE**

The presentation was based on a pilot (Starmetrics) conducted in the US at Caltech. Public funding places government agencies and universities under pressure to show relationship between research inputs and outputs. However, there is a lack of both methodology and data to support an analysis of the relationship between research output and research input, in particular with funding. In this study the authors do an analysis at the grant level to investigate differences in returns to public funding. They need to link the outcomes of the research to the grant. While there are many outcomes (publications, patents, PhD dissertations, PhD placements in academia and industry, etc.), they focus only on publications of research. There are several methods to identify this link, but they focus on two, one based on a pure chronological order, i.e. the publication followed the grant, and one based on the relationship between PhD students and post-docs coauthorships on publications and grants.

They found that accounting for attribution matters in terms of predicting the quantity of output related to a specific flow of funds; but it makes no difference for measuring elasticities (however, the results are for a highly selective university and for federal grants and are hence preliminary).