



Croatia's Science and Technology Project Unleashes Innovation

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Key Messages

- **The economic crisis has hit the Europe and Central Asia (ECA) region hard and made it important for countries to accelerate productivity by reaping the benefits of increased innovation and R&D.**
- **The large demand for financing under the Science and Technology Project (STP) in Croatia indicates that the expansion of R&D in transition economies might be limited more by lack of public support than businesses ideas.**
- **Firms that cooperated with public research organization in the STP programs showed satisfaction and willingness to continue with this cooperation.**
- **The process of commercializing public research managed to overcome cultural, ideological, institutional, and operational constraints is set to generate tangible results within the project's lifetime.**
- **A simple, transparent and merit-based mechanism for allocation of research grants is helping to attract Croatian scientists working abroad.**

Introduction

Croatia's economic and social development achievements in the last decade have been impressive; the country closed its income gap with the European Union and now has some of the best social development indicators in the region. However, growing current account deficits--in the context of increasing domestic wages, small productivity gains and scarce innovation--suggest that this pattern may not be sustainable. With the economic crisis hitting the region hard, accelerating

productivity and reaping the benefits of innovation for the country's development have become even more urgent.

Why Science and Technology?

Fostering R&D and innovation is a good policy option: simulations prepared for a World Bank study in 2009, the *Croatia EU Convergence Report*, show that increasing aggregate R&D to 3% can raise GDP by 5.8% above its baseline and exports by 13% by 2025. Yet, currently, public support to R&D corresponds to about 0.7% of total Government expenditure, a value that is insufficient to make a dent in Croatia's growth path (Spain's R&D programs, for example, correspond to about 2.4% of total Government expenditure). The challenge Croatia faces, therefore, is to find ways of scaling up its current R&D programs in the context of fiscal tightening and last stages of EU accession.

Legacies of Soviet-era central planning still persist in many ECA countries in the form of outdated policies and institutions for science, technology and innovation. Croatia is no exception. Despite the country's notable history of scientific discoveries (Nikola Tesla, probably the most famous inventor from Croatia, literally lit the world a century ago), its recent performance in the arena of science and technology has been relatively modest. The public sector is responsible for most R&D expenditures but usually does not commercialize its research to the business sector. In parallel, a forceful process of brain drain has threatened the country's science base.

The Science and Technology Project

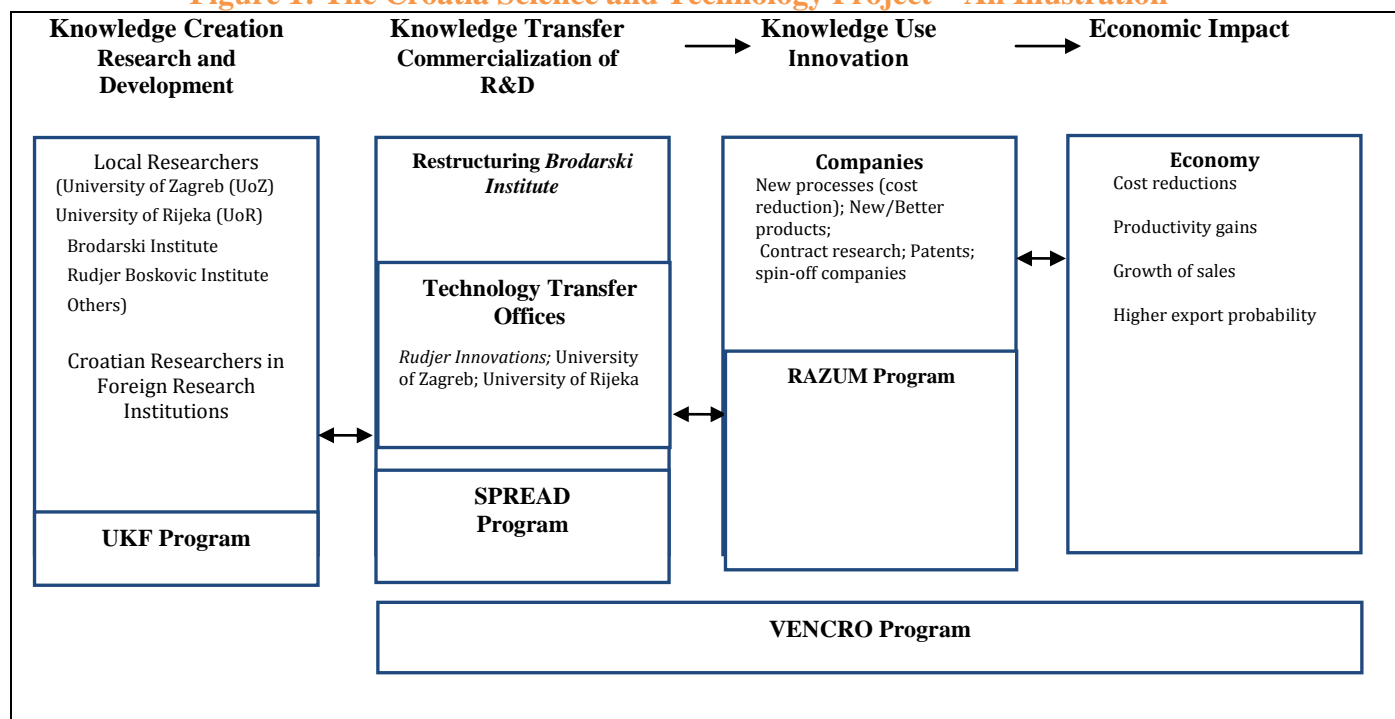
It is in this context that the Science and Technology Project (STP) has become the new backbone of the country's science and technology policy, helping to create an innovation environment that will likely serve the country well in its development agenda. The Project was conceived with the goal of unleashing the

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innovative potential inherent in the country and it was implemented in the 2006-09 period. The original loan from the World Bank was for EURO 31 million but this was subsequently reduced to EURO 30 million as a result of project restructuring by mid-2008. The STP programs were designed to cover the different stages of

the “innovation value chain” through which knowledge affects economic development: knowledge creation, knowledge transfer and knowledge use (see Figure 1). This Knowledge Brief describes the STP programs, the main implementation challenges and some initial promising results.

Figure 1: The Croatia Science and Technology Project – An Illustration



Encouraging Private Sector R&D: The RAZUM Program

RAZUM is a soft loan mechanism, designed to encourage the private sector to spend more on R&D, particularly in the later stages of product development, and reduce the risk that firms often face in the innovation process. By March 2010, the RAZUM program was supporting sixteen projects with a total of about EURO 11.5 million (about EURO 7.5 million of the financing came from STP and the rest from the Government). The private sector provided additional EURO 9.3 million in R&D funding to the program. The RAZUM program provides loans covering up to 70% of product development costs, with repayments conditional on success; companies begin to repay loans when the projects start generating revenues from sales resulting from the innovations (repayment can be 3-5% of these sales). Support is limited to a maximum of EURO 1.5 million for a period of up to three years per project.

Eligible expenditures encompass a large number of activities, including patent applications. The selection process aims to identify projects that have a higher likelihood of commercial success and assesses both technical feasibility and market potential.

As of March 2010, there was a pipeline of more than 35 projects waiting for additional complementary financing under the RAZUM program. This strong interest demonstrates high demand in the Croatian economy for programs that facilitate private sector investment in R&D. It also indicates that, at least in the initial years of economic transition, innovation activity in Croatia was constrained by limited access to financing and not by a lack of ideas or projects; the lack of financing also possibly contributed to the decline of important industries and the brain drain that followed.

Fostering Collaboration between Businesses and Public Research Organizations: the SPREAD Program

The SPREAD Program consists of a matching-grants scheme to foster joint research between the private sector and public research organizations—the limit is 50% of the total project cost and a maximum of EURO 120,000 per project. The program is managed by the Business Innovation Center of Croatia (BICRO), a Government-owned limited liability company. Research projects by small- and medium-size companies, performed jointly with public research organizations, are eligible. The application process is relatively simple and decisions are made within six weeks.

SPREAD had already committed EURO 2 million to 14 projects in less than 18 months since its inception. The majority of projects are with micro and small companies, predominantly in the information communication technology (ICT) and electronics sectors, for an average of one year. Faculty members from the departments of electrical engineering, mechanical engineering and shipbuilding of the University of Split, and faculty from the electrical engineering department at the University of Zagreb have been frequently involved in these projects. Currently, eleven public research organizations are participating in the SPREAD program. The program will end in May 2011, unfortunately leaving 15 projects in the pipeline that could not be supported due to lack of funding. Interviews with the beneficiary companies indicate that they are satisfied and willing to cooperate with the public research organizations again in the future. Beneficiaries also indicated that, in the absence of the grants, they would not have collaborated with these organizations or developed their projects (at least not with the same speed and quality). The preliminary evaluation suggests that the SPREAD program has had a positive impact on the commercialization of public research.

Accelerating Commercialization of Public Research through Technology Transfer Offices

Technology Transfer Offices (TTOs) are responsible for managing the intellectual property (IP) that emerges from public research—evaluating its commercial potential, identifying potential users in the business community and defining the best way of commercializing the research.

Financing the operational costs of TTOs is critically important because, as international experience shows, not all TTOs manage to become financially independent

and those that do often take about a decade to do so. Start-up costs for TTOs are not negligible.

Yet, returns in the initial years tend to be comparatively small even though some gains may be had from eliminating the informal commercialization (the grey market) of the products in the short run. This happens because the licensing to patenting ratio is very low; returns from spin-offs need time to mature and contract research expands only as businessmen and researchers gradually realize the mutual benefits of closer collaboration.

The STP project is financing three TTOs: the Rudjer Boskovic Institute's (RBI's) *Rudjer Innovation*, and the TTOs of two large Croatian public universities—the University of Zagreb and the University of Rijeka. Activities financed by the project include developing the legal framework for intellectual property management, as well as staff salaries and training costs. The project also finances the initial expenditures involved in the process of commercialization itself, such as, screening and patenting costs and providing seed capital to spin-off companies.

The project aims to achieve the following results by May 2011: (i) at least 20 patents filed, six patents granted, and eight licensing agreements signed; (ii) EURO 8 million in contract research mobilized by the TTOs in benefit of their parent organizations; and (iii) eight spin-off companies created through discoveries from ongoing research. By mid-2010, the project seemed on track to achieve these results (one of RBI's patents has been licensed to the prestigious Massachusetts Institute of Technology). The engagement of top scientists from RBI is also a major achievement since, overall, researchers are now beginning to perceive that academic excellence and research commercialization can be compatible and mutually beneficial.

Strengthening Croatia's Science Base: the Unity through Knowledge Fund (UKF)

The UKF provides grants for joint scientific projects between Croatian scientists living in the country and those living abroad. By March 2010, 57 research projects worth EURO 4.1 million were under implementation under the UKF, with STP providing EURO 3.3 million of the financing. Thirteen of these projects have been completed and received positive evaluations. Cooperation with leading research institutes has been strengthened, as illustrated by joint projects sponsored by the program between RBI in Zagreb and the Max Planck Institute for Molecular Cell Biology and Genetics in Germany in the field of bio-photonics methods.

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The success of UKF in attracting Croatian researchers living abroad can mostly be attributed to the way the Program is administered and governed. Since the first call for proposals, the selection process has been driven by academic excellence, fairness and transparency. This, in turn, was achieved through a combination of simple rules, streamlined processes, expert evaluation, and a sounding board comprising local and international researchers as well as leading representatives from the business community.

The novel idea of bringing in leading figures from multinational and local companies to supervise the program was aimed at strengthening the credibility of the program, ensuring that it was merit-based and impartial, and encouraging the best researchers, particularly those living abroad, to apply for the grants. The International Labour Organization and the European Regional Economic Forum recognized the UKF as good practice for improving the mobility of highly qualified experts, and critical to promoting linkages between migration and development.

Two sub-programs under the UKF are worth noting. The first is the support provided to joint projects between Croatian researchers living abroad and local Croatian companies and research institutes. While the key outcomes of these projects are of more academic relevance, they may possibly generate discoveries that can be commercialized. The second project provides grants to young researchers and supports the employment of recent engineering graduates and researchers in natural sciences in Croatian enterprises; the objective of this sub-program is to prevent brain drain and help research-related professionals remain permanently in the country.

Sustaining the UKF Program beyond STP's existence is the major challenge ahead.

Lessons from the Croatia STP

In several other ECA countries--including Romania, Bulgaria and Poland - the situation is similar to Croatia in that the returns expected from innovation and R&D are high but investments by the public sector are low. The challenge is to implement innovation policies that can have an immediate impact on economic development. Some of the lessons learned from the

Croatia STP can be valuable in this respect:

- The large demand for innovation financing under RAZUM confirms the existence of untapped sources of innovation (ideas) in the business sector in Croatia; this experience clearly demonstrates that the supply of ideas and entrepreneurial skills is not limited in developing countries and their R&D sectors would benefit from expansion.
- When the SPREAD Program was created, it was assumed that SMEs were reluctant to cooperate with R&D organizations, either due to lack of information or because there was a perception that the services of the public research organizations would be incompatible with the companies' needs. However, as the results showed, participating companies were satisfied with the collaboration and expressed a desire to cooperate again in the future, indicating that setting up matching grants to reduce the risk of joint projects might pay off.
- Cultural and ideological barriers that constrain commercialization of public research, as well as legal, institutional and operational difficulties, were gradually overcome as initial results demonstrated that academic excellence and commercialization of research are not contradictory activities and may be even mutually beneficial. Croatia's experience shows that efforts to commercialize public research can achieve tangible results in a relatively short period of time.
- Croatia's past brain drain threatened the quality of the country's science base. An effective governance structure, transparency in the application process, and the UKF program's strong reputation helped gain recognition and interest from the scientific community, including the Croatian research diaspora. This experience shows that simple, transparent and merit-based allocation of research grants can help attract scientists from abroad.

About the Authors

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