

INNOVATING THROUGH THE CRISIS

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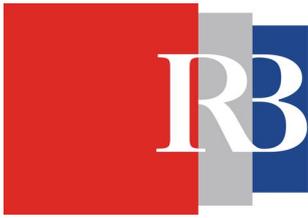
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Report of the High-Level Workshop
9-10 June 2011, Dubrovnik, Croatia



ORGANIZER PROFILES



The Ruder Boškovic Institute of Croatia

The Ruder Boškovic Institute (RBI) is the largest multidisciplinary research center in Croatia with strengths in basic science and applied science research as well as higher education. The multidisciplinary character of the Institute is manifested in different research fields in physics, chemistry, oceanography (including marine and environmental research and geosciences), biology, biomedicine, computer science and electronics/engineering. The Ruder Boškovic Institute seeks to achieve its objective of advancing knowledge in these research fields by continually improving and enhancing its facilities and capabilities as well as by establishing strategic partnerships and links with recognized organizations, scientific and academic institutions and industry. The activities of the RBI also result in various forms of intellectual creations. One important mission of the RBI is the protection of intellectual property and its commercialization.



The Korea Development Institute

The Korea Development Institute (KDI) is an autonomous policy-oriented research organization founded in 1971. KDI was established by the Korean government as an economic think tank to provide a rigorous academic perspective on the various economic policy issues that had arisen during rapid growth and development in the 1960s. Since then, the scope of KDI's activities has grown, and it is now called upon to provide expert analysis and advice on all aspects of long- and short-term government policies in areas ranging from domestic economic policy to international trade and investment.

KDI strives to set new targets for Korea to achieve greater prosperity. With its eyes on the economic horizon, KDI will focus on research activity that can provide vision and direction for greater prosperity. In doing so, KDI aims to answer the need for growth models suited to the ever-changing domestic and international environments.



THE WORLD BANK

The World Bank Group

The initiative was jointly delivered by the World Bank Institute and the Europe and Central Asia Private and Financial Sector Development Department (ECSPF).

The World Bank Institute (WBI) is a global connector of knowledge, learning and innovation for poverty reduction. It is part of the World Bank Group. WBI connect practitioners, networks and institutions to help them find solutions to their development challenges. With a focus on the 'how' of reform, WBI link knowledge from around the world and scale up innovations. They work with and through global, regional and country-based institutions and practitioner networks and help them develop customized programs that respond to their needs. WBI connects globally and delivers locally.

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LIST OF ABBREVIATIONS AND ACRONYMS

APJ	Asia Pacific, and Japan
BICRO	Croatia's funding agency for innovation
CEE	Central and Eastern Europe
CEO	Chief Executive Officer
CIS	Commonwealth of Independent States
DGR	Directorate-General for Research
DM	Deputy Minister
EC	European Commission
ECA	Europe and Central Asia
ECSPF	Private and Financial Sector Development, Europe and Central Asia
EIF	European Investment Fund
EMEA	Europe, the Middle East and Africa,
ERA	European Research Area
EU	European Union
EUREKA	Pan-European Research and Development Cooperation
FCS	Financial Crisis Survey
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
ICT	Information and Communication Technologies
IP	Intellectual Property
IPR	Intellectual Property Rights
IRCRO	R&D Cooperation between research groups and SMEs
IRR	Internal Rate of Return
ISCED	International Standard Classification on Education
ISCED 6	Second stage of tertiary education
ITO	Infrastructure Technology Outsourcing
KDI	Korea Development Institute
KOSDAQ	Korean Securities Dealers' Automated Quotation
MNC	Multinational Corporations
NBU	New Bulgarian University
NGO	Non Government Organization
NPV	Net Present Value
OECD	Organization for Economic Co-operation and Development
PCT	Patent Cooperation Treaty
POC	Proof of Concept
PPP	Public Private Partnerships
PPSE	Purchasing Power Standard Euros
PRO	Public Research Organizations
PSD	Private Sector Development
Q&A	Question and Answer
R&D	Research and Development
RAZUM	Seed capital for innovative firms
RBI	Ruder Boškovic Institute
RTD	Research and Technology Development
RTR	Renault Technologie Romanie
SEZ	Special Economic Zones
SME	Small and Medium Enterprise
STEPI	Science and Technology Policy Institute
STI	Science Technology and Innovation
TEHCRO	Innovation & business infrastructure funding program
TU	Technical University
VAT	Value Added Tax
VP	Vice President
WB	The World Bank
STP	Technical Permanent Secretariat
VC	Venture Capital
WBI	The World Bank Institute

EXECUTIVE SUMMARY

On June 9-11, 2011, the Ruder Boškovic Institute of Croatia, the Korea Development Institute and the World Bank organized a high-level policy workshop in Dubrovnik, Croatia, which was the culminating event of a joint capacity development initiative "Innovating through the Crisis – How to Do It?", conducted between February and May 2011, covering Bulgaria, Croatia, Poland and Romania. The initiative comprised a series of activities (position papers, country case studies and a policy workshop) targeting key actors in resource allocation for innovation policy within broader development agendas. The workshop's objective was to help the group of four economies mainstream innovation and R&D policies into their development agendas including in the context of aligning with the requirements of the Europe 2020 Strategy. The event was attended by policymakers and private sector leaders from all participating countries. Moreover, delegations of high representatives and key experts from the Korea Development Institute, the European Commission and the World Bank took part in the workshop. Speakers included high level officials from the European Commission as well as public officials from Finland, Ireland, Korea, and Switzerland and top management of multinational corporations, like Hewlett Packard, Yahoo!, Renault Technologie and others. This report outlines the main findings of the workshop.

As private companies feel the effects of an economic downturn, in the form, for example, of a reduction in sales income, net revenues and core capital, they reallocate internal funds to finance their working capital, leading in some cases to a reduction in private R&D expenditure. At the same time, fiscal constraints for many countries have meant that governments have been unable to release public funds to support R&D and innovation during a downturn.

Counter-cyclical innovation policy is becoming a common practice among the OECD countries

Advanced economies, however, have adopted counter-cyclical innovation policies to create a basis for new growth. Innovation activities – defined broadly as conceiving, designing and implementing changes in the available set of products, services and processes, (i.e. production, organizational and marketing processes) may have a positive contribution to export, competitiveness and economic growth.¹ For example R&D, especially when financed and conducted by private firms or with their participation, encourages scientific advancement which has commercial or social value.

Framework conditions that need to be in place to foster innovation include public and private investment in R&D, simplified and skilled labor markets, a favorable taxation rate, along with an efficient public administration system and tax regime. Innovation policy that is

effective in creating growth will look at national reforms in order to create favorable long-term conditions in line with this framework.

However, having these factors in place does not by itself create innovation-led growth: the responses must be tailored to the country context. Countries differ in the way they promote innovation. In many ways national innovation strategies are path-dependent and reflect the traditional thinking and historical relationships between key actors, representing business, universities and research institutes. They are also reflections of the country's natural environments, cultural inheritance, economic developments and geographical locations.

In the context of fiscal constraints, governments face key common challenges in adjusting the innovation policy agenda namely competing development priorities, drops in private financing of R&D and innovation and declining foreign investments, among others. At the same time, as exemplified by the experience of Korea and Finland, the effects of the crisis can present a number of opportunities which, if capitalized upon, can act as a springboard for post-crisis innovation-led growth. These challenges and opportunities, along with current policy responses, are discussed in Chapter 1: Innovation after the Crisis: How Central European Countries Compare with International Best Practice. Two main questions that

¹ This definition of innovation includes, but is not limited to R&D activities. Innovation means new to the firm, new to the market, or new to the world.



arise for innovation policy in an economic crisis are: how can the private sector be incentivized to invest in innovation even during a downturn? What methods are there to leverage these investments to areas most conducive to growth?

In the context of fiscal constraint, it is important to continue the reform in order to increase the efficiency of public expenditure

The answer is essentially found in the improvement of returns on public investment in innovation and R&D through (i) mainstreaming and improved coordination of innovation policies across sectors and public agencies, which reduces duplication and inefficiency in public spending; (ii) increased relevance and commercialization of public research; and (iii) the establishment of cross-cutting policies that are long-term in nature and which ensure the market environment is conducive to innovation. Incentivizing long-term investments in innovation, for instance, can tap the potential of innovation as a new growth source.

Governments, however, face a number of common challenges when formulating and implementing long-term innovation strategies, which are discussed in Chapter 2: Mainstreaming Innovation Policies. It is found that framework conditions and culture often do not support the development of innovation and an entrepreneurial environment (including lack of support through intellectual property (IP) law; governance and monitoring indicators; competitiveness needs and labor markets). In addition, skills needed by innovative firms are in shortage, domestic private sector investments in innovation need to be encouraged and there is limited innovation and research infrastructure in place.

For successful mainstreaming of innovation policy, political commitment centered on three main pillars is required:

- Continuous support to technical skills, entrepreneurship and R&D talent ;
- Adequate and sustained funding sources for innovation policy;

- An enabling business environment and technological infrastructure.

R&D-intensive FDI can encourage local innovations, if conditions for capturing spillovers are in place

The role of FDI in increasing investments in innovation is discussed in Chapter 3: Increasing Business Investment in R&D – Could FDI Provide a Solution? Attracting R&D-intensive FDI is seen as one of the solutions to increase business investment in innovation. However, to successfully capture the full spectrum of benefits from foreign R&D, government policies should aim at undertaking measures that improve the host country's characteristics determining its absorptive capacity and, sustaining business climate friendly to investors, domestic and foreign alike.

Promising lessons of international experience includes examples from Finland, Ireland, Korea, and Switzerland

In the age of ICT and globalization, political will should focus on knowledge sharing and collaborative approaches. Knowledge can be traded, just as we trade in commodities and goods. As a result, "Stories of failure and success must be shared with many countries," as one way of improving cross-cutting productivity (Dr MoonJoong Tcha, Managing Director, Center for International Development, Korea Development Institute).

This workshop and the key take-aways from it share knowledge from previous success stories of Finland, Korea, and Switzerland and of current or planned policy responses from Bulgaria, Croatia, Poland and Romania. The stories from the countries discussed demonstrate how collaborative approaches between the private and public sectors bring employment gains and increases in standards of living. The stories show the importance of the cross-fertilization of ideas, technology and policy initiatives, as emphasized by Mr Hongjoo Hahm, Country Manager Croatia, the World Bank. In the European

context, EU-wide innovation and funding policy can spur beneficial macro-regional collaboration, which requires cross-country cooperation to match regional to national targets.

Some take-aways for the participant countries

Workshop participants, in discussion with experts and policymakers from the four ECA countries, identified ways to prioritize innovation policy. They brought together promising solutions to country challenges based on international lessons of experience and good practice including:

- **Counter-cyclical innovation policy allows the country to turn crisis into opportunity for new growth** – several examples illustrated how OECD countries tackle the structural foundations of the crisis. Countries



emerging from the current crisis have the “follower” advantage and can successfully learn from the experiences of Korea and Finland which emerged from the 1990 crisis with more productive and competitive economies.

- **Establishing monitoring frameworks for innovation policy** – It was suggested, while discussing the case of Poland, for example, that the development of a unified framework of key performance indicators across Europe, would help provide a clearer definition of innovation for countries which have not already established monitoring indicators as part of their national innovation strategies.

- **Introducing incentives for technology transfer and commercialization of research outputs** – for example Korea’s successful innovation policy was centered on the transfer

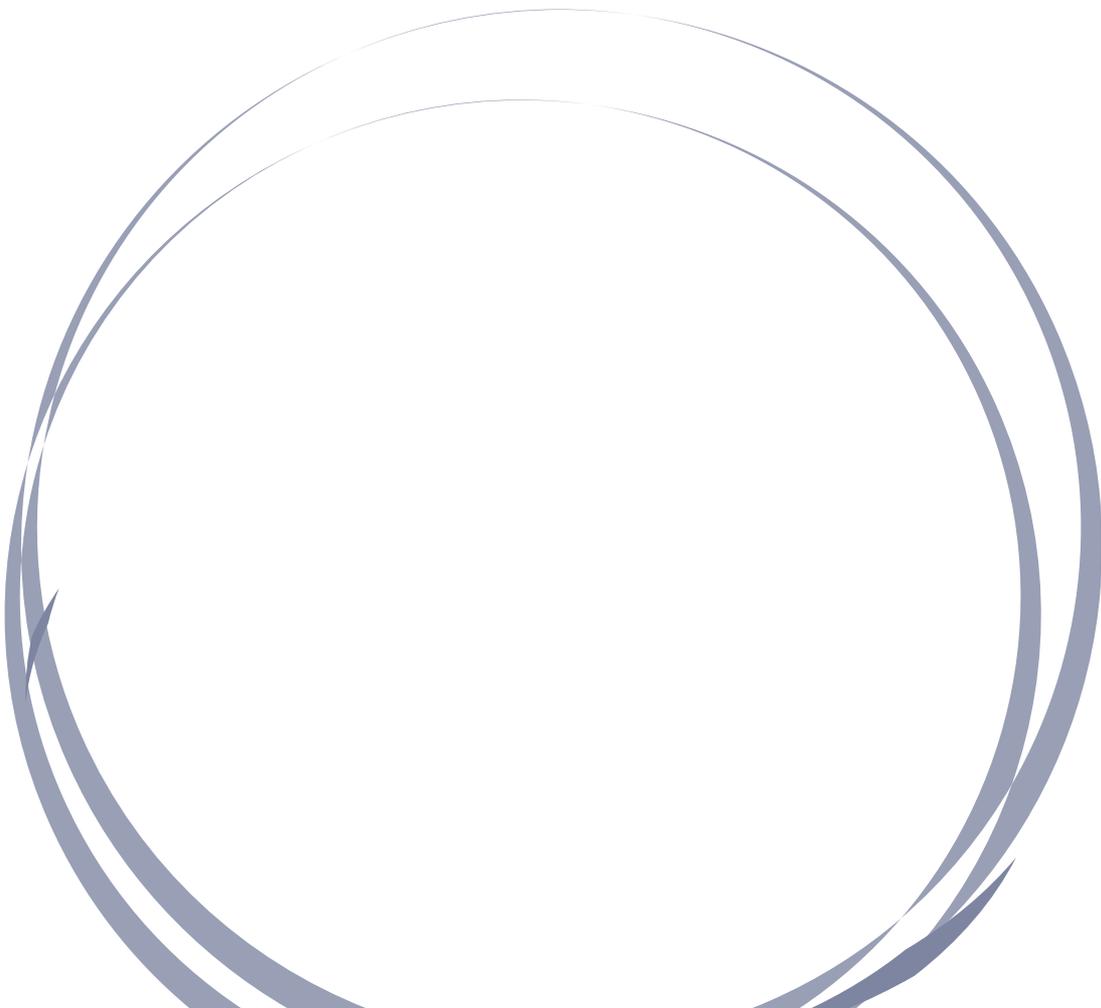
and acquisition of technology. Meanwhile technology transfer in Croatia is seen as a key gap to fill, whereas the Irish experience provided an example of how a country could take advantage of EU membership to facilitate technology transfer and access new markets.

- **Encouraging public and private sector collaboration** – the MARIBIC Center in Croatia is a strong example of successful collaboration between public and private sectors to fill a market gap whilst playing to the country’s competitive advantages;

- **Introducing venture capital funding** – Korea introduced targeted Venture Capital (VC) funding opportunities for small and medium enterprises (SMEs), which were undertaking the bulk of innovative activities.

- **Encouraging R&D-intensive FDI** – Bulgaria, Poland and Romania have developed attractive incentives to encourage foreign investment in innovation. But these countries could only capture full benefits from these investments if they support absorptive capacity of local firms, continuously invest in high quality human capital, and maintain attractive framework conditions for innovation.

Strengthening of existing financial support programs and regulation (particularly in the form of strong Intellectual Property (IP) laws). A strong factor in Finland’s success, for example, has been simplified patenting acquisition and strong regulation, and Poland’s restructuring of its patenting system was highlighted during the discussions as an essential factor in its ongoing transition to an innovation economy.



1

INNOVATION IN A EUROPEAN CONTEXT AFTER THE CRISIS



Overview

The recent financial crisis unveiled several weaknesses of a growth pattern based on increasing consumption, public expenditures, and dependency on large inflow of capital. The crisis has led to sharp declines in GDP growth and export volumes for many European countries. This has presented a significant obstacle for emerging economies hoping to foster export-led growth and for countries looking to maximize the benefits of recent accession to the European Union (EU). At the same time, **the crisis offers a number of opportunities for innovation policy adjustments to catalyze post-crisis growth.**

Many developed nations have included R&D and innovation incentives in their stimulus packages. In fact, three-quarters of OECD countries look to foster innovation after the crisis (Correa, P.). The European Commission (EC), for its part, aims to mainstream innovation policy by including it as part of a country's national recovery strategies through its Europe 2020 plan for green growth and jobs (Silvia Viceconte, Policy Coordinator, Strategic Objective Prosperity, European Commission).

But what is the rationale for increasing focus on long-term cross-cutting innovation policies in a post-crisis economy? In its simplest terms, countries can leverage long-term cross-cutting innovation policy as a means of kick-starting growth and consequent economic recovery. As Mr Mikko Alkio, Adviser to the Prime Minister (former State Secretary, Ministry of Employment and Economy) put it "Innovation Policy in an economic downturn can act as a spring-board for new growth".

Case-studies from Korea and Finland demonstrate how they seized opportunities presented by the 1990s' crisis to transform their economies and to foster new growth through innovation.

Key policy areas included:

- Enhancing the efficiency of public expenditure on innovation and R&D
- Fostering market relevance and commercialization of public R&D;
- Building a basis for new growth through supporting new start-ups;
- Facilitating wide-ranging policy reform;
- Exposing local markets to international competition and collaboration.

"Innovation Policy in an economic downturn can act as a spring-board for new growth"

Mikko Alkio, Adviser to the Prime Minister, former State Secretary, Ministry of Employment and Economy.

However, in the context of fiscal constraints resulting from the recent global financial crisis, countries face a number of specific challenges in adjusting the innovation policy agenda. Workshop participants set the scene by discussing these challenges encountered in catalyzing growth through innovation, including:

- Private firms reduce their R&D expenditures and increasingly rely on internal funds to finance their working capital and swift payments gain importance;
- Riskier and longer-term R&D projects are delayed or cancelled;
- Public-private partnerships suffer.

of developing an innovation economy. As a result, countries promote innovation through different methods. In many ways national innovation strategies are the reflections of the countries' natural environments, cultural inheritance, economic developments and geographical location. The policy focus for Bulgaria and Poland, for example, which have come out of the crisis with low sovereign public debt, will be based on different priorities to countries such as Romania, which has been struggling with severe fiscal deficits. While the country situations vary, a common area of agreement amongst workshop participants was that all view innovation as a means of producing growth.



Workshop participants set the scene by discussing the key common **challenges** and **opportunities** they encounter in catalyzing growth through innovation during and after an economic downturn. These are discussed along with current, past and possible **policy responses**, below.

“More bang for the buck will be necessary” Paulo Correa, Lead Economist, ECSPF, World Bank

In that context, the quality and efficiency of public spending, and return on investment in R&D and innovation become of paramount importance. In the brainstorming sessions, workshop participants discussed a **broad range of key common opportunities for innovation policy in European countries in a post-crisis economy**. Country case-studies from Bulgaria, Croatia and Poland show how these countries are stimulating post-crisis growth through innovation policy adjustments in response to the current crisis. Additional opportunities for European countries in the context of the current crisis include:

- increased awareness of competitiveness and innovation as drivers of growth – the ability to draw on lessons learned and the possibility of building broad consensus for reforms;
- the availability of EU funding - leverage and EU commitment to increase R&D and innovation expenditures;
- and a paradigm shift of the knowledge base from West to East

The specific mix of challenges and opportunities relies heavily on the country context. Fiscal constraints in some ECA countries resulted in governments' inability to leverage public funds for innovation and some countries are far advanced in terms

Challenges, Opportunities and Policy Responses

The national stimulus packages of many nations include R&D and innovation incentives. The rationale behind including these incentives is that innovation fosters growth. **Reaching the Lisbon R&D target (3 per cent of GDP) is expected to raise GDP up to 13 per cent and exports up to 16 per cent**² (Soete, L.). Investment in R&D generates results: R&D increases commercial potential through inculcating higher level skills and generating scientific papers, patents and findings. R&D also leads to technology absorption and builds technological capabilities. (Mr Shahid Yusuf, Chief Economist, The Growth Dialogue, George Washington University). **Government intervention is called upon when the country fails in providing adequate support to any of the three key factors – pressure for innovation, innovation capability and environments conducive to innovation** (Dr Sungchul Chung, Senior Fellow, Emeritus, and Former President of Science and Technology Policy of Korea (STEPI).

Challenge: private expenditure on innovation falls

The primary characteristics of a severe economic downturn are a reduction in GDP growth rates and declining exports. For private companies, this translates into a reduction in sales, incomes and core capital. The World Bank's Financial Crisis Survey (FCS) of 2,819 firms across six countries in the ECA region to capture the impact of the crisis, shows that sales declined steeply at the onset of the crisis; across the six countries, net sales decreased between 15 per cent (Hungary) and 40 per cent (Latvia; Lithuania) during June 2008-June 2009. As a result, companies often have to reallocate internal funds to finance their working capital (Paulo, C.) as companies start to feel these effects, private expenditure on innovation dives. A survey conducted during the 1990s' crisis, for example, showed that Korean businesses in 1998 planned to reduce R&D investments and personnel by 20 per cent during the year (Chung, S.). Consequently, the first common challenge governments face is stabilizing or compensating for reduced private funding in the short-medium term. In the Korean case, as the country relied on the private sector for 80 per cent of investments in R&D, the expected 20 per cent reduction would have resulted in a virtual collapse of the R&D and innovation system (Chung, S.).

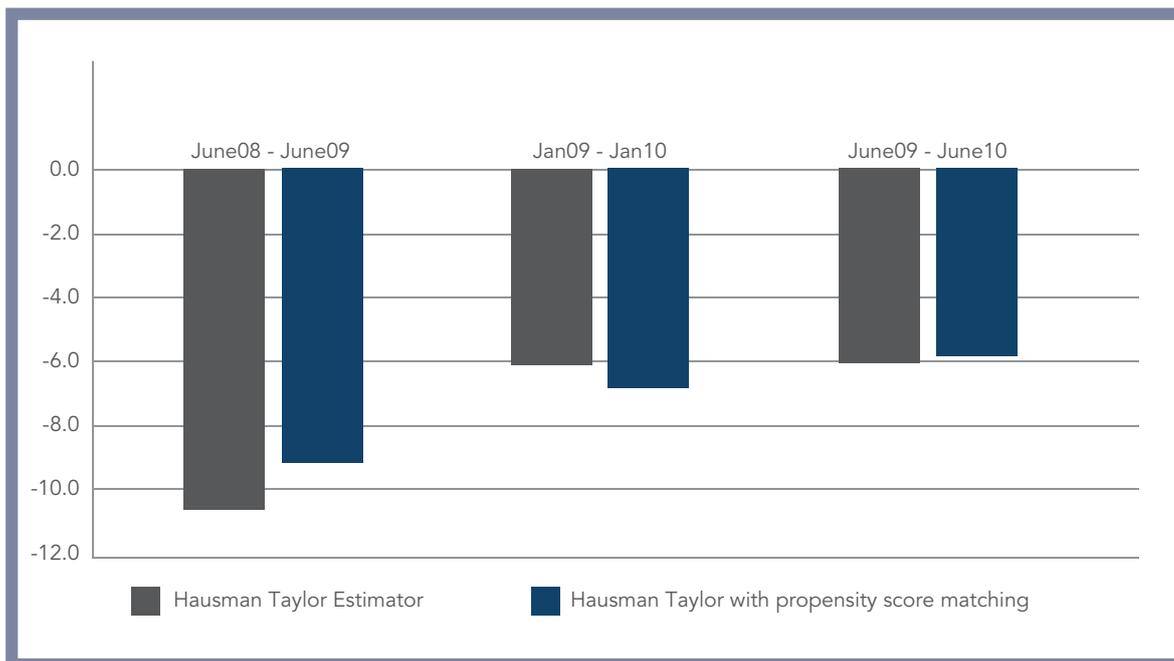
In the context of the ECA region, the current crisis has affected innovative firms more than non-innovative firms, and nearly 28 per cent of innovative companies in 2009 and 25 per cent in the first quarter of 2010 reduced their R&D expenditure ³(Correa, P). While the current downturn has hit private manufacturing, retail and service sector companies hard in ECA countries, it has affected the position of innovating firms greater than non-innovating ones, according to data from the FCS survey. Prior

to the onset of the crisis, innovative firms' sales growth was faster than that of non-innovative firms and there was a positive premium on the ability to innovate. The sales growth rate for innovative firms reduced by an estimated 9.32 percentage points between June 2008 and June 2009.⁴ From the onset of the crisis to June 2010, there was also a clear declining trend in the innovation premium (bringing it to negative).⁵

Opportunity: Governments are aware that innovative firms are essential to post-crisis growth

Countries emerging from the current crisis have the advantage that they are aware of the importance of innovation for growth after the crisis. Korea's growth following the economic crisis of the 1990s, for

Graph 1: Impact of the crisis on the growth rate of innovative firms in ECA countries



“Innovation is the key driver in increasing productivity”

Mikko Alkio, Adviser to the Prime Minister, former State Secretary, Ministry of Employment and Economy.

example, has been shown (see case-study below) to be largely attributable to innovating SMEs in the ICT sector (Chung, S.)⁶. Similarly, Finland emerged as one of the most productive countries in the world, in part by developing a cross-cutting system of innovation with efficient public institutions and competitive private sectors (Chung, S.). Mr Alkio emphasized that there are only two paths to creating growth: through capital and productivity, “and innovation is the key driver in increasing productivity”.

Governments are in a position to draw on lessons learned from

success stories that came out of the crisis in the 1990s and in response, try to encourage private investment in innovation.

² Soete, L., (2010) Towards a Sustainable Knowledge-based Economy in Europe: from the Costs of “Non-Europe” to the Costs of Europe, *Intereconomics*, vol. 45, nr. 3, pp. 160-166.

³ The World Bank conducted the third round of its Enterprise Financial Crisis Survey in Bulgaria, Hungary, Latvia, Lithuania, Romania and Turkey in June 2010, covering firms in both the manufacturing and service sectors. The survey's objective is to assess the effects of the global financial crisis on key elements

of each country's private economy, such as sales, employment, finances and R&D.

⁴ Correa, P., Loopty, M., Ramalho, R., Rodriguez-Meza, J. and Yang, J., 2010. How Firms in Eastern and Central Europe Fared through the Global Financial Crisis: Evidence from 2008–2010. *Enterprise Note Series*, No.20.

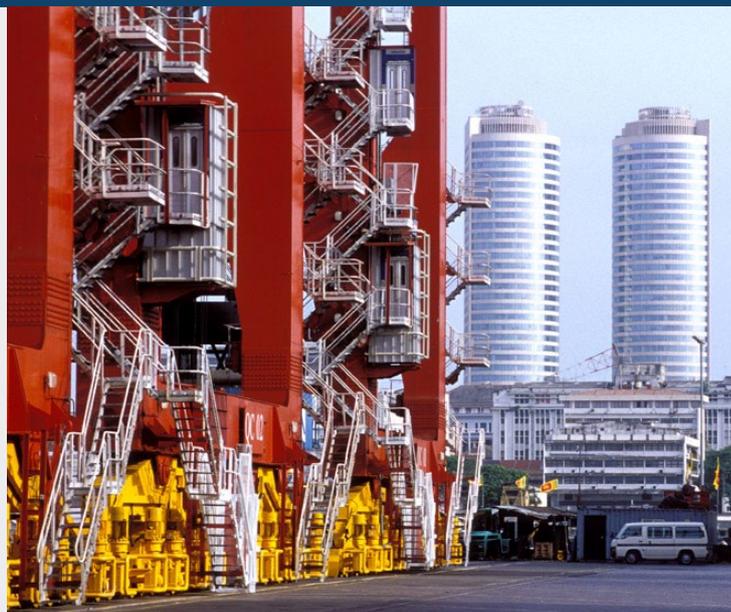
⁵ However, the impact of the crisis on innovative firms has not been enough to erode the positive difference in sales between innovative and non-innovative firms (which is still positive in favor of innovative companies) presented before the crisis (Correa, P).

⁶ Chung, S., Senior Fellow, Emeritus, and Former President of Science and Technology Policy of Korea (STEPI). Chair's summary of Workshop Day 2 Session: Counter-Cyclical Innovation Policies – Common Agenda for Action.

Country case-study 1: Korea's forward-thinking innovation policy

The Korean economy has been transformed from a producer and exporter of low-/mid-tech commodities to a high-tech, ICT-oriented industrial power. Korea has established world prominence in technology areas such as semi-conductors, electronics, mobile handsets, displays, automobiles, steel, and shipbuilding, among many others.

In the Korean case, public support for R&D is a clear feature of the success story. The strength of innovation strategy lay in it being part of the country's overall recovery plan and economic structural adjustment. This ensured innovation policy cut across economic policy and was framed in a long-term perspective.



When the downturn first hit in the 1990s, public support included:

- The government initiated massive R&D investments and launched specialized diverse policy programs to promote the ICT industry as a new source growth in response to the declining growth potential of national innovation. It established the ICT Promotion Fund which mobilized 1-1.5 billion dollars every year for investment in ICT R&D and innovation.
- Strengthened governance through the creation of the Ministry of Information and Communication.
- The provision of necessary innovation infrastructure through the launch of a ten-year Information Infrastructure Initiative to lay a foundation for ICT industry.
- Various incentive programs, including tax deduction programs, R&D subsidies, loan programs, information services, technical and legal consulting services, among others, have been offered to promote R&D and innovation in the private sectors.
- A regulatory framework to meet the requirements of the new trade regime. The new trade regime also provided an enabling environment for innovation through measures including the liberalization of trade and investments, strengthening of IPR protection, and realignment of the subsidy programs for industries.

This was a relatively forward-thinking policy at the time for the region and Korea benefitted from significant first mover advantage. Perhaps this presents a lesson for new policies in that while they should provide certain common conditions for innovation through long-term policy in order to capitalize the potential of innovation, policies should also think about how they can be pioneering.

The 1997 East Asian Financial Crisis hit the science and technology sectors hard in Korea. The government responded to this in two ways: first the government increased the R&D budget in order to make up for the expected decline in R&D activities in the private sectors: most of the increased fund was used for SMEs and ICT sectors; and second the government took a broad range of reforms in both public and private sectors to enhance the efficiency of the economy.

These reforms brought about big changes in many sectors of the economy, such as in business structures, business practices and through increased transparency in public sectors, to name a few. What is most notable, though, was the level of increased entrepreneurship among young people in Korea. New technology-based start-ups mushroomed around the end of the 1990s, which helped lead to a quick financial recovery. The number of new start-ups increased from about 2000 in 1998 to over 11,000 in 2001. This phenomenon was led by young people in the ICT sectors taking advantage of the new regulatory framework and support for SME creation.

Drawing on lessons learned, governments compensate for reduced private R&D investment

Governments (if they can) compensate for reduced private R&D investments by providing fiscal stimulus for the sector. During the 1990s' crisis, with the prospect of the collapse of the innovation system in Korea, the government supported the sector with an increased R&D budget to make up for the expected decline (Chung, S.). This ensured the survival of the sector and laid the founda-

tions for new growth. Bulgaria, Poland and Croatia, which are emerging well from the current crisis, are also providing fiscal stimulus for the sector.

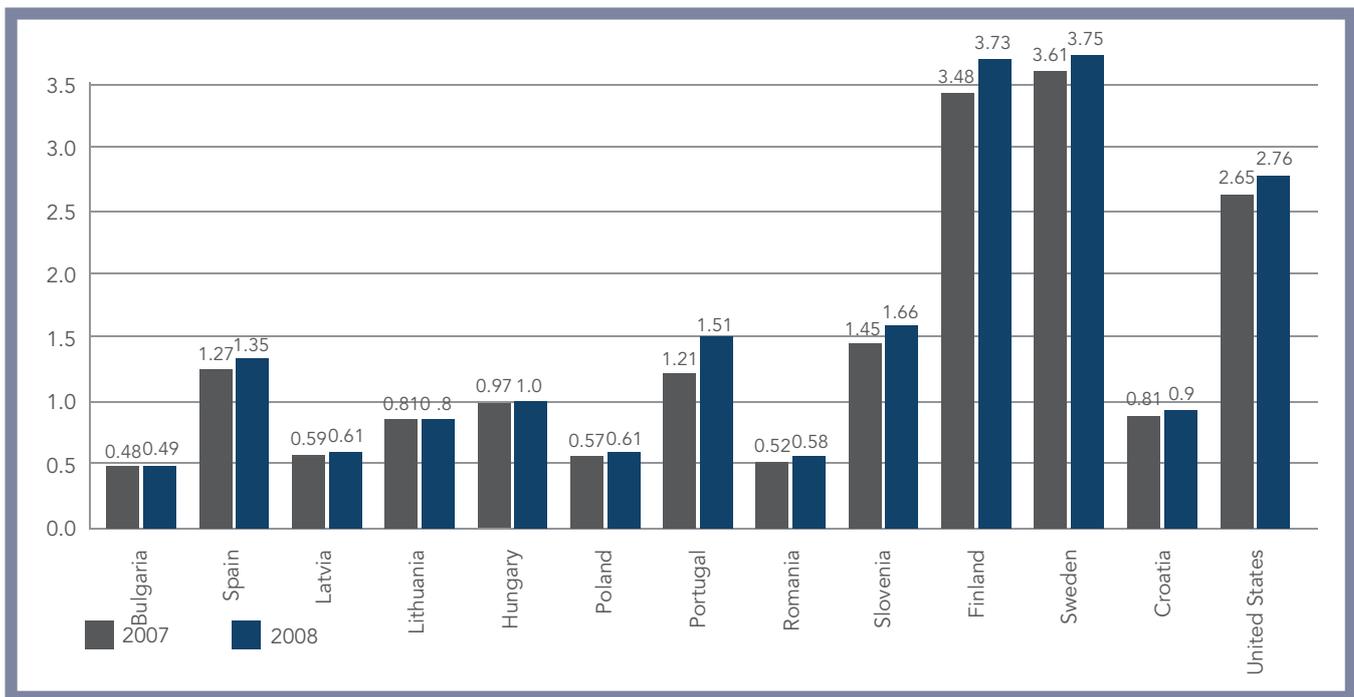
In ECA countries (and middle income countries in general) innovation is often used as a means of increasing factor productivity, which is an important growth source for these countries (Correa, P., Yusuf, S.). Middle income countries with low rates of investment become increasingly reliant on total factor productivity, which is a function of technological catch-up and innovation (for which R&D is the driver) and of inter and

intra sectorial allocated efficiencies. However, in focusing on total factor productivity, countries can often fail to maximize the returns from R&D investment (Yusuf, S.).

Fiscal constraints in many Central European countries did not allow for the adoption of fiscal stimulus packages. For example, Latvia, Lithuania and Romania need to undergo fiscal adjustments of at least 7 per cent of

GDP (primary balance). As a result, these countries imposed dramatic expenditure cuts. In Romania, for example, the share of public expenditure of R&D in total R&D declined

Graph 2: Share of government expenditure on R&D as a percentage of GDP



Source: Paulo Correa, Lead Economist, Europe and Central Asia Region, Finance and Private Sector Development, the World Bank.

from 1.28 per cent in 2007 to 0.78 per cent in 2010, suggesting that R&D was relatively more affected by fiscal consolidation (Correa, P.).

Challenge: short to medium solutions alone do not compensate for areas in which investments fall

Governments often fail to provide adequate short- to medium-term support for the areas in which investment has declined. Many responses to reduced private sector investments in innovation include the short- to medium-term responses of increasing R&D tax credits or providing additional grants. Indeed, some

countries use both methods, such as France and Norway, but the question of how to tap the growth potential of innovation in the long-term, needs to be explored, especially in the context of tailored funding options. This is because successful government incentives focus on areas which are immediately affected by a reduction in private investments in innovation, namely:

There is less private funding for riskier and long-term projects which are often also the most innovative and potentially higher yielding investment areas. An economic downturn increases risk averseness in companies resulting in these types of projects being cancelled or delayed. Collaboration between the private sector and universities/research

institutes suffers. This results in a lower level of technology transfer and commercialization of research outputs, as well as an imbalance between basic and applied research. The headline challenges for Croatia, for example, when it developed its National Science and Technology Plan, was commercialization of research outputs from public research organizations and a lack of collaboration between private companies and academia (Dalibor Marijanovic, CEO, Croatian Funding Agency for Innovation (BICRO)).

It is also worth remembering that corporate spending on science and innovation are reduced in times of economic crisis. For example, the cost of R&D of enterprises in Bulgaria in 2009 increased by 6.98%

compared with 2008. For 2010 compared to 2009 their cost of R&D increased by 94.68%

Opportunity: Long-term innovation policy can tap the growth potential of R&D and innovation

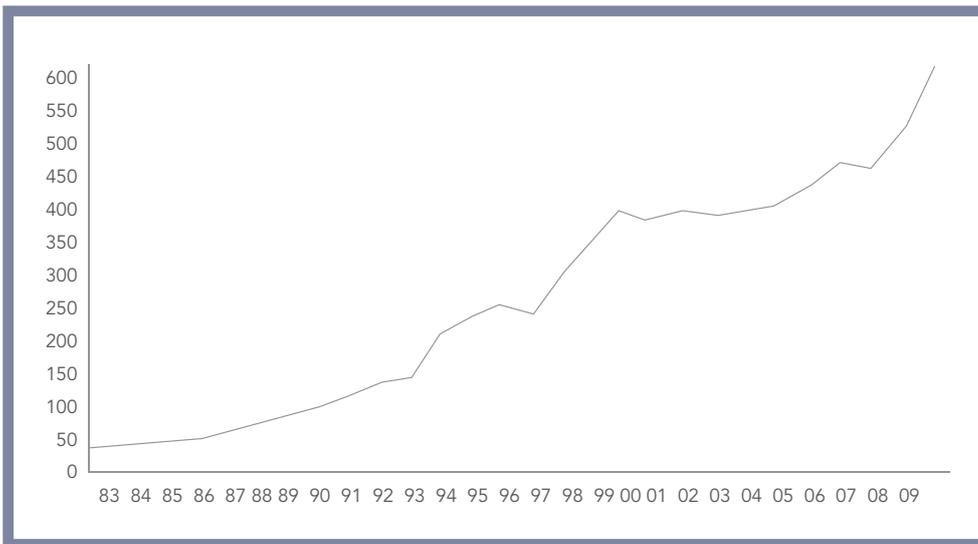
Cross-cutting long-term innovation policy is needed. An EU communiqué acknowledges that perhaps the biggest challenge for the EU and its Member States is to adopt a

more strategic approach to innovation, which has led to the Innovation Union Initiative (one of seven flagship initiatives of the Europe 2020 Strategy for jobs and growth) setting out such an approach.⁷ The Korean government in the 1990s, for example, launched diverse policy programs to promote the ICT industry as a new growth source including the creation of the Ministry of Information and Communications, the ICT Promotion Fund mobilizing US\$1-1.5 billion every year for investment in ICT R&D and innovation, and a ten-year Information Infrastructure Initiative to lay a foundation for the

ICT industry (Chung, S.)

Longer-term R&D and innovation investments play an essential role in turning the crisis into an opportunity for “creative destruction” and in building a basis for new growth. Mr Alkio also emphasized that long-term counter-cyclical innovation policies and funding create the foundations for growth. The Tekes Foundation increased public support during periods of downturn helping to spur growth: (see graph 3). Funding from the foundation peaked during Finland’s financial crisis of the 1990s, when exports had declined

Graph 3: Evolution of Tekes’ Public Funding for industrial R&D

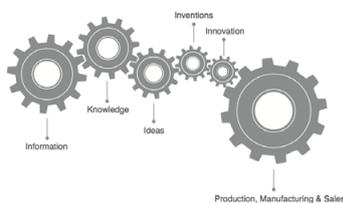


by an average of 20 per cent from 1991 to 1994 and GDP fell 13 per cent. The same was the case when the recession intensified in 1997. When the recent crisis started to take effect in 2007, more public funds were again made available to compensate for scarcity of private financing at firm level.

⁷ Europe 2020 Flagship Initiative, Innovation Union, SEC (2010) 1161, Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions. (COM(2010) 546 final) Brussels, 6.10.2010.

Country case-study 2: Finland’s counter-cyclical responses

How Wealth is Created: Tangible Wealth Starts with Intangible Value



Finland suffered from a significant economic downturn in the crisis of the 1990s but emerged as one of the most productive economies in the world. The country’s successful counter-cyclical policy response to the crisis hinged upon the notion of how wealth is created: innovation is a key component of intangible value and productivity, which are essential to wealth creation and growth.

Based on this notion of wealth creation, innovation was seen by the government as essential to growth. As a result, it responded to the crisis by introducing cross-cutting policy reforms to create a wider enabling environment for innovation. The government’s strategy involved creating an efficient innovation system; including the provision of public procurement, venture funding and internationalization services. The central piece of which was a well-developed IP system.

A strong and streamlined IP system allowed the number of patents from the mobile phone industry – in which innovation-led growth for the country was concentrated – to boom.

The government, however, faced a number of key challenges in adjusting the innovation policy agenda: reduced private R&D spending; long-term and riskier projects were delayed or cancelled; collaboration with universities decreased; and the private venture market for innovation was frozen. The government responded by introducing funding which encouraged long-term projects and projects in collaboration with universities and research institutes through the setting up of the Finnish Funding Agency for Technology and Innovation. Mikko Alkio, Adviser to the Prime Minister (former State Secretary, Ministry of Employment and Economy).

Policy response: the European Commission is putting innovation at the heart of its long-term strategy for jobs and growth

The European Commission views the EU's competitiveness, its ability to create jobs to compensate for those lost in the crisis, as well as Europe's future standard of living, as being dependent on innovation in products, services, processes and business models. It also sees innovation as the best bet for meeting climate change, energy and resource scarcity challenges.⁸ Unlike the previous Lisbon plan 2000-2010, which it replaces, it is tied to the Growth and Stability Growth Pact, allowing better monitoring and evaluation and giving the EU the mandate to pressure governments that lag behind in meeting 2020 targets. Specific innovation targets for governments are listed in Appendix I: Checklist of Europe 2020 innovation targets.

Europe 2020 presents a pivotal shift in policy thinking towards 'smart' sustainable growth based on knowledge and innovation and away from the unsustainable growth experienced in the boom periods (Viceconte, S.). It aims to address key main challenges of the European innovation system: under-investment in knowledge generation and diffusion; insufficiently innovation-friendly framework conditions; fragmentation and duplication of effort; low involvement of users and insufficient alignment of public actions.⁹ It is built around a number of key interlinked priorities: which are to be achieved through fiscal consolidation; tackling macroeconomic imbalances and structural reforms "transforming economies to create new growth and jobs" (Silvia Viceconte, Policy coordinator, Strategic Objective Prosperity, European Commission).

Smart Growth – The headline target which is for 3 per cent of EU GDP to be invested in R&D by 2020. The technical rationale behind the

target increase in R&D is that it gives impact on the ground (Viceconte, S.). Reaching this target by 2020 could create 3.7 million jobs and increase annual GDP by close to €800 billion by 2025.¹⁰

Table 1. The effects of Lisbon Agenda R&D target in 2025: Simulations on the World Scan Model

	GDP	Exports
Croatia	6.0	12.9
Poland	5.5	8.5
Romania	11.7	13.5
Hungary	6.4	8.0
Slovakia	8.9	10.4
Slovenia	6.9	10.5
Bulgaria	13.1	8.3

Correa, P. Lead Economist, Europe and Central Asia Region, Finance and Private Sector Development, The World Bank. Presentation: "Innovation and R&D during the crisis: Evidence from firm-level data for selected ECA Countries"

Sustainable Growth – This is based on promoting a more efficient, greener and competitive economy through enabling "20/20/20" climate/energy targets to be met (i.e. 20 per cent lower emissions and 20 per cent of energy to be produced from renewable energy sources by 2020).

Inclusive Growth – Through fostering a high-employment economy delivering social and territorial cohesion. The headline targets for this are: a 75 per cent employment rate for 20-64-year-olds by 2020 and 40 per cent of 30-34-year-olds to have completed tertiary education. One key failing of the Lisbon strategy was that it did not include education targets.

Countries that are emerging in good positions from the crisis, share policy commonalities with The Europe 2020 Strategy. In

doing so, they can leverage EU strategies to promote innovation. Switzerland has a high-employment economy and has made critical contributions to innovation in Europe in the areas of its specialty; it already spends 3 per cent of its GDP on R&D. Poland is close to the target with 2.7 per cent of GDP spent on R&D, and the new national target for R&D spending in Bulgaria is to triple in term of its percentage of GDP by 2020 (from 0.5 per cent baseline).¹¹

Access to EU funds offers a further opportunity for collaboration. Macro-regional cooperation is an opportunity, but can sometimes be in conflict with the national targets. Cross-country collaboration is needed to minimize this conflict and the EU funding system can play a central role in this; collaboration is a requirement for qualifying for certain EU funds, for example. Charlina Vitcheva, Deputy Director, DG Regio, EC, said on this subject in one of the discussion sessions that "smart specialization strategies (are) to be assessed by peers. The process needs to be steered into collaboration."

Bulgaria, Croatia and Poland have strong potential for leveraging innovation for growth. Bulgaria is emerging rapidly from the financial crisis. In the third quarter of 2010, Bulgarian exports totaled approximately €4.3 billion, up 6 per cent on the pre-crisis highs reached at the end of 2008 and up 44 per cent from the third quarter of 2009. GDP growth has returned to positive figures, reaching 3.7% per cent at the end of 2010, up from the lows of -8.9% per cent at the end of the year before (Evgeny Angelov, Ministry of Economy, Energy and Tourism). Similarly, Poland's GDP growth rate outpaces that of the European average: in 2009, its GDP growth rate was 1.7 per cent, compared with an EU average of -4.2 per cent.

⁸ Europe 2020 Flagship Initiative, Innovation Union, SEC (2010) 1161, op. cit.

⁹ Europe 2020 Flagship Initiative, Innovation Union, SEC(2010) 1161, op. cited.

¹⁰ Zagamé, P., 2010. The Cost of a non-innovative Europe cited in EU communiqué

¹¹ (from discussion session flipchart).

"Smart specialization strategies (are) to be assessed by peers. The process needs to be steered into collaboration."

Charlina Vitcheva, Deputy Director, DG Regio, EC

Country case-study 3: Croatia's political commitment to innovation

The World Economic Forum (2010) classifies Bulgaria and Romania as economies in the stage of efficiency-driven growth and Croatia and Poland in a transition stage from efficiency- to innovation-driven economic growth. In terms of global competitiveness, Croatia ranked behind the other three countries, at 77th, by the World Economic Forum in its 2011 Global Competitive Rankings.

Croatia faces key challenges in the transition to an innovation-driven economy, primarily centered on issues of commercialization. These key challenges include: low commercialization of research results generated by public research organizations (PROs); poor collaboration between PROs and companies; low level of private investments in R&D and poor governance of national innovation policies.

As the crisis hit, the country's original policy response was to address public budget constraints. Public budget cuts, however, were coupled with reducing funding needs through the introduction of impact assessment strategies and an emphasis on targeted support and incentives for SMEs.

Following a World Bank loan of €30m for the development of a National Innovation System, Croatia has been able to focus policy on those areas in which the country's innovation system faces particular challenges, namely enabling R&D institutions to commercialize research outputs and R&D activities to develop, adapt, commercialize and use technology (Marijanovic, D. et al.).

A necessary prerequisite for this policy change was political commitment centered on three pillars: an excellent scientific research base; appropriate funding sources; and adequate business and technological infrastructure.

In terms of technological infrastructure and adequate funding sources, for example, the government set up the TEHCRO – building innovation & business infrastructure funding program. Through the Croatian Funding Agency for Technology and Innovation (BICRO), the program provides funding for the establishment of Science & Technology Parks, Incubators and Centers of Competence (R&D Centers), as well as post-establishment growth funding for these innovation centers. TEHCRO contributes up to fifty per cent of total project costs over five years, in the form of grants, soft loans and equity investments. Involvement of a technology provider is a must and funding is provided through a competitive procedure (i.e. through the evaluation of multi-annual business plans).

To secure long-term viability, the program builds in a requirement for self-sustainability after five years, providing financing on a declining scale until self-sustainability is reached. A system of governance is also built into the program through close monitoring of progress (in the form of quarterly reporting, on-site visits, mid-term evaluations, among others).

Other challenges that came out of the round table discussion sessions on the country include: lack of continuity of funding and lack of funds; and difficulties in prioritization and resistance to change within existing structures. Broader market challenges included a lack of entrepreneurial skills and skilled management in science; a small market size and a lack of VC funding. As a result, suggested further policy responses that are needed to address these challenges are:

- Establish governance across the innovation system by setting up monitoring systems and indicators. This provides a benchmark, against which priorities and change can be met and a mandate to enforce structural change.
- Restructure higher education curricula, primarily through creating an advancement system for academics to address issues of specialized management structures.
- Strengthen IP Law – a necessary prerequisite for any innovation economy, as it provides the basis on which innovative goods and knowledge can be traded.

Alongside these key aspects, policy response in Croatia, it was suggested, should also strengthen existing innovation support programs, introduce VC funding and raise public awareness.

Dalibor Marijanovic, CEO, Croatian Funding Agency for Innovation (BICRO), Dr. Ivana Nagy, Sr. Executive Director, BICRO R&D and Ivo Friganovic, Sr. Executive Director, Innovation, BICRO.

They share commonalities with previous success stories in formulating and implementing cross-cutting long-term innovation policies and wide-ranging reforms. Bulgaria's new economic strategy, for example, was developed focused on Intensive Innovation sectors and included the amendment of investment law to allow government grants of up to 50 per cent of R&D project costs. Croatia's National Innovation Plan also involved long-term policies to support the country's innovation infrastructure and national strategy included the strengthening of Intellectual Property (IP) regulation. Poland's National Scientific Research and Development Program provides a medium- to long-term plan, covering the period between 2007 and 2013 to support the innovation

sector, including a strengthening of professional academic qualifications and providing support to R&D infrastructure.

Similarly, an added opportunity ECA countries have in the current crisis, as compared to that of the 1990s, is the access to EU markets. Many of the country case-studies presented and discussed in the workshop (Bulgaria, Croatia, and Poland) highlighted the importance of the EU as a trading partner. For example, 91 per cent of Poland's FDI inflows are from countries within the EU (Mr Marek Łyzwa, Member of the Management Board, Polish Information and Foreign Investment Agency) and the EU's share of Bulgaria's exports in absolute terms, is five times higher now than it was in 1995 (increasing

50 percentage points) (Angelov, E.).

Governments, however face a number of key challenges in developing, formulating and implementing long-term innovation strategies.

Framework conditions and culture often do not support the development of innovation and an entrepreneurial environment, and there is a lack of innovation infrastructure. In some cases there is a lack of an entrepreneurial base (Bulgaria, Croatia, Romania); and there is a lack of monitoring and evaluation indicators (Poland, Croatia). These challenges are discussed along with effective solutions and details of success stories in Chapter 2 'Mainstreaming long-term innovation strategies'.

Country case-study 4: Bulgaria's national 2020 R&D strategy

There are several preconditions for Bulgaria to attain the full benefits of integration into the European Research Area (ERA), especially improving the institutional and policy framework, increasing R&D investments to 1.5 per cent of GDP and strengthening the capacity of public research organizations and private companies. In view of this, the objectives of the strategy are to encourage:

- Concentration of public resources and investment in priority scientific areas;
- Support for the scientific infrastructure;
- Strong inclusion of the private sector;
- Encouragement of mobility of the human capital, knowledge and technologies.

Strategy implementation will be supported by an Action Plan for the period 2011-2013, which includes:

- Introduction of a new model for R&D financing, which will translate into a better balance of the institutional and competitive program financing. Longer-term scientific programs in priority areas will be introduced, which will be subject to regular evaluation by external experts;
- Prioritizing scientific research in five areas that will concentrate 70 per cent of the national R&D financing. This is expected to concentrate a critical mass of intellectual potential and scientific infrastructure;
- Improving the conditions for scientific careers, professional development, qualification and specialization of scientists;
- Integration of the Bulgarian science in the ERA through support offered to Bulgarian scientific communities to take part in European Community initiatives;
- Strengthening the knowledge triangle through improvement of the institutional coordination and development of schemes for start-ups; availability of business angels; supporting the capacity of SMEs to absorb technologies and increased financing by the private sector in R&D;
- Development of the scientific infrastructure through the establishment of regional partnership structures, which can be integrated with large European scientific infrastructures;
- Introducing an assessment system for science;
- Reinforcing the social dimensions of science via support of national scientific awards, support for publications in journals with a high-impact factor, among others.

The Action Plan for the national R&D strategy for Bulgaria specifies the public authorities that are responsible for the implementation of each measure and introduces new instruments to be used for financing. Specific indicators are outlined that will be measured and reported by March 31st, 2014.

Source: Bulgaria Innovation Policy Note (World Bank, 2011), forthcoming.



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MAINSTREAMING INNOVATION POLICY



Overview

It is increasingly recognized that mainstreaming innovation policy can be a means of increasing growth in a post-crisis period. Long-term cross-cutting policies that ensure the market environment is conducive to innovation and incentivizing long-term innovation investments, can tap the potential of innovation as a new growth source. The difficulty is mainstreaming innovation policy when an economy is not in crisis: a main challenge for the innovation sector is that financing varies greatly depending on the economic climate (Alkio, M.).

Workshop participants in discussion with experts and policymakers from the four ECA countries identified ways to prioritize innovation policy. They brought together promising solutions to country challenges based on experience and good practice from around the world.

A necessary prerequisite for the formulation of a successful long-term innovation policy is political will. Indeed, countries that promote innovation "have in common the fact that innovation can take place only when there is pressure for it." (Chung, S.).

Successful mainstreaming of innova-

"Innovation can take place only when there is pressure for it."
Sungchul Chung, Senior Fellow, Emeritus, and Former President of Science and Technology Policy of Korea (STEPI)

tion policy needs political commitment to be found, guided by three requirements:

Continuous support to technical skills, entrepreneurship and R&D talent ; adequate and sustained funding sources; enabling business environment and technological infrastructure.

Countries that are in a better position to formulate and implement forward-looking national innovation policies to foster growth begin nurturing innovation policy prior to the main post-crisis innovation policy drive. Countries that are fostering (Poland, Croatia, and Bulgaria) or have fostered a strong post-crisis innovation sector (Finland, Switzerland, Korea) share this in common. They build themselves a strong knowledge

base and create a commercially enabling environment for innovation through wide-ranging policy reforms and during the downturn they support the industry by providing public funds in the absence of private financing.



BOX 1. SUCCESSFULLY MAINSTREAMING INNOVATION POLICY CHECKLIST

- Broad based public support for innovation is essential to ensure country ownership of innovation policy reforms. Attractive costs, including a low corporate tax rate (10 per cent) and the lowest labor costs in European Union.
- The key contribution of a comprehensive innovation policy is not in putting forward new instruments for R&D financing, but in ensuring cross-sector collaboration and coordination of policy agendas that facilitate local innovations. A skilled workforce and one of the highest proportions of students studying abroad in EU.
- The array of policy instruments that can be used to support innovation means that policy-making needs to be highly selective in choosing instruments that are most suitable for country context. Benefitting from having the EU as trading partner.
- The innovation policy will only achieve impact if government actions are predictable, but predictability does not mean that innovation policy is designed once and for all: it should be periodically reviewed and, if necessary, adjusted, to changing conditions. A strengthened IP legislative system.
- Focus on results and M&E is critical for enabling the points above.
- Strong knowledge base needs to be fostered through higher education reforms and long-term investment in the education system.

Key take-away of lessons learned from the international experience

the commercialization of research outputs and a secure, regulated market for innovation in products, processes and services. Country situations vary, and any solution must be tailored to the country context.

this framework. Governments can use a reduction in private innovation financing as an opportunity for increased market efficiency

"There is a general consensus about key framework conditions that make a country, or a region, innovative."

Mauro Dell'Ambrogio, State Secretary for Education and Research, Federal Department of Home Affairs, Switzerland

During the workshop, a number of common, key lessons learned on mainstreaming innovation policy as a means of fostering growth, were drawn out:

Real commitment to innovation must start with long-term investment in the education system. While any serious innovation policy must start with setting up monitoring indicators to ensure an efficient and effective innovation system. Continued investment in the innovation system needs to be largely driven by the private sector, with public investments flexibly structured to compensate for market and systemic failures.

Meanwhile, governments need to foster an enabling environment for

Indeed, "there is a general consensus about key framework conditions that make a country, or a region, innovative" (Mauro Dell'Ambrogio, State Secretary for Education and Research, Federal Department of Home Affairs, Switzerland). These include levels of investment in R&D, efficiency of public spending, along with a skilled and well-regulated labor market and an attractive taxation rate. Countries must also ensure a good standard of living to attract and maintain skilled labor. It is also agreed that for a country to be innovative, public services and administration need to be fit for purpose and efficient. To create growth, mainstreamed innovation policies will need to consider national reforms that create attractive, long-term conditions aligned with

A reduction in funding can present an opportunity to foster favorable conditions for investments in innovation. Workshop participants highlighted that this can be achieved through encouraging more efficient general market conditions and, in particular, by creating more efficient innovation systems. At the end of the 1990s, for example, when Korea's high growth period came to an end and the rapid expansion of the country's labor unions led to a lessening of its competitive advantages, Korea used the opportunity to create a more efficient economic system and foster innovation. It did this in part through setting up information services, along with the provision of technical and legal consultancy services for innovating firms and individuals. As innovative companies are essential to growth, innovation strategies need to increase the impact of innovation policies on competitiveness, especially during an economic downturn.

A reduction in private innovation funding can also offer an opportunity for the structural transformation of a country's economy. The Korean government, for example, turned the crisis into an opportunity for the structural transformation of its economy. By investing heavily in strategic technologies and by improving the business climate through a broad range of public and private sector reforms to enhance the efficiency of the economy, Korea fostered a quick recovery from the crisis of the 1990s (Chung, S.). This may be even

more applicable in the future as economies move toward innovation-led growth. As Mr Alkio explains, there is paradigm shift taking place in the way wealth is being created from those who control the means of industrialization as the creators of wealth to "...in the future, those who control the means of innovation will be the creators of wealth."

Effective innovation policy must start by establishing governance through the set-up of monitoring indicators

A monitoring and evaluation framework ensures from the start that both the resultant innovation policy and innovation system are efficient and effective. It does this, in part, by reducing the need for funding and by

ensuring political commitment. The EC, for example, has built M&E into its Europe 2020 innovation policy by linking innovation targets to the Growth and Stability Pact.

Better monitoring and evaluation is identified as a need in the ECA region, and workshop discussions about Poland pointed to a lack of clear evaluation indicators in the country, resulting in a lack of any clear definition for innovation in the country. Similarly, for Croatia, poor governance of the national

Country case-study 5: Korea's structural adjustment and innovation

Innovation played a central role in the country's ability to implement changes in its trade regime as part of its wider structural adjustment to export-led growth from import-substitution-led growth. Succeeding in the country's structural transformation into high-tech high-value added products played a central part in its story to export-led growth. The emergence of a new trade regime in the 1990s, calling upon Korea to revise policy programs designed to support an export-oriented growth strategy, added to the challenges Korea faced during the downturn of the 1990s. By being forced to support the R&D sector as private investment fell, and through the need to foster technology transfer to remain competitive in the shift to export-led growth, Korea's innovation policy cut across its structural adjustment plan.

The regulatory framework to meet the requirements of the new trade regime favored an innovation economy, such as: liberalization of trade and investments; strengthening of IPR protection and realignment of the subsidy programs for industries provided an environment conducive to innovation.

Sungchul Chung, Former President, Science and Technology Policy Institute, Korea.

innovation system was one of its main challenges (Marijanovi, D., et al.). It was suggested in discussions on Poland that a European-wide framework of key performance indicators, unifying them across Europe, would help provide clarity in definition for innovation in countries which do not have monitoring indicators in place.

An innovation society must start with long-term investment in the education system

This is required as the basis for producing world-class science and the specialization required to compete internationally (Alkio, M.). Hewlett Packard, for instance, conducts a market skills test as part of its process of off-shoring and goes on

"Unless politicians are bound by a concrete target, their commitment to innovation will be an empty promise."

Silvia Viceconte, Europe 2020 Strategy coordinator, Secretariat-General, European Commission

to build a high-performance team which benefit from constant qualification and a high-performance environment (Sasha Bezuhanova, Hewlett Packard CEE Public Sector Director). A major concern for companies in Bulgaria, Croatia, Poland and Romania was the quality of tertiary educa-

tion and falling numbers of

¹² Kaminiski, B. Snapshots of R&D-intensive FDI in Bulgaria, Croatia, Poland and Romania. Background paper for the high-level Policy Workshop on "Innovating through the Crisis – How to Do It?" June 8-11, 2011 Dubrovnik, Croatia.

graduates in fields at the frontier of R&D activities (i.e., computer sciences, engineering, biology, mathematics, etc.)¹². Indeed, Mr Broder highlighted that “bad research is worse than no research” (Andrei Broder, Vice-President, Yahoo! Research).

Country situations vary and successful policies are tailored to the country

context. Bulgaria and Poland have high university completion rates, similar to Finland and Korea (see box 3 below). Subsequent innovation policies are able to use this knowledge base to kick-start an entrepreneurial innovation economy (as in Finland and Korea) and to attract FDI in R&D (for example, Bulgaria and Poland). In contrast, low human capital and

entrepreneurship was highlighted in the discussions as key challenges for Romania’s innovation system. While Croatia had a reasonable number of graduates, there has been a lack of entrepreneurial skills and managerial competence in science. Planned education policies to address this include the introduction of competitive research grants to

BOX 2. Education and innovation in Korea and Switzerland

Korea’s successful response to the 1998 financial crisis is largely attributable to: (i) the visionary government committed to the innovation agenda; (ii) sustained investment in R&D capacity, including institutional capacity since early 1960; and (iii) a large base of entrepreneurial-educated youth that created its vast SME innovation sector.

The financial crisis of 1998 led to a dramatic decrease of business expenditures in R&D – from 80 per cent of all R&D expenditures in 1997 to 70 per cent in 1998. At the same time the crisis reduced job opportunities in large industrial firms, especially for recent university graduates. To counterbalance the effects of the crisis and tap into the large pool of young talent, the Korean government decided to increase its financial support for innovation, with a particular focus on SMEs and the ICT sector. This approach, combined with the corporate sector reforms and improvements in business transparency, led to “new technology-based start-ups mushrooming around the end of the 1990s”, especially in the ICT sector (Chung, S.). The number of new technology start-ups grew from about 2000 in 1998 to 9,000 in 2000 and 11,000 in 2001, helping produce a quick financial recovery for the Korean economy (Chung, S.).

Switzerland has developed a sophisticated apprenticeship system that fosters an innovation economy. Having historically resisted European-wide changes in education systems that focus on tertiary university education, apprenticeship is still today in Switzerland the main form of education, as it was in the middle ages across much of Europe. About 70 per cent of 15-year-olds leave the full-time education system to go to an apprenticeship position in the real working world and it has become a societal commitment to find a job for everyone at this age. Professional education is seen as an equally important form of education and there is the opportunity to go on to university later, which is then usually undertaken part-time. “In Geneva, to be admitted to an apprenticeship as a juvenile between the age of 16 and 19, is more selective and prestigious than to study at high school. It is not unusual in Switzerland that a president of a bank started his career as an apprentice in a bank” (Alkio, M.). The result is among the lowest unemployment rates (at only 2.7 per cent) among 20-30-year olds in Europe.

These two systems may not be replicable in other country contexts, but they highlight the effectiveness of forward-thinking policies tailored to country situations. The Korean model, for example, would not have been as effective if its large pool of unemployed young people in the 1990s had not been through tertiary education and provided a specialized skills base. The Swiss apprenticeship system requires the full commitment of the private sector: it cannot be implemented by a ministry of education alone, “...especially small and medium companies, ready to take charge of the professional education of young people, with the risk that they will later work for the competition” (Dell’Ambrogio, M.). This system is effective in Switzerland because of a certain cultural attitude that has historical roots in the system of guilds in the middle ages – a system Switzerland built upon, rather than rejected in historical periods of Europe-wide educational reform. Companies need to have a cultural attitude of competing with each other to assume the teaching of a future generation of skilled people in their field as a common mission and goal (Dell’Ambrogio, M.). The Swiss example also highlights the importance of knowledge sharing internationally: “40 per cent of professors in Swiss universities are foreign nationals, you have to integrate and tap into global knowledge to be successful” (Alkio, M.).

Dr Sungchul Chung, Senior Fellow, Emeritus, and Former President of Science and Technology Policy of Korea (STePI).

increase math and science specializations and the restructuring of higher-education curricula to incorporate an advancement system for academics. Poland too, has a large labor pool, but this is largely unutilized due to a mismatch between workforce skills and the needs of employers. As a result, Poland's policy should address this skills gap, which is an obstacle to modernization and growth for the private sector.

Discussions suggest the emergence of a critical mass that will enable the current transition of these economies to efficiency and innovation-led development, provided that governments take further steps to nurture a business-facilitating environment and increase their country's absorptive capacity. Among these initiatives, gearing education to satisfy demand of the private sector for skilled labor, with qualifications in science and engineering, is considered to be

"40 per cent of professors in Swiss universities are foreign nationals: you have to integrate and tap into global knowledge to be successful."

Mikko Alkio, Adviser to the Prime Minister, Finland (former State Secretary, Ministry of Employment and Economy)

nanotechnology involve mostly R&D activities requiring tertiary education, the production processes, per se, in other sectors, for example the automotive and chemicals sectors, may not be necessarily R&D-intensive and may not necessarily require labor

– Mr Correa elaborated in one of the discussions – is that "tons of money are thrown for research and there is no assessment whether this can be commercialized"¹³. It was concluded that since markets are not good in providing information, the key objective of technology transfer offices should be to be engaged in commercialization. Incentives could be put in place for technology transfer offices and linkage offices at Public Academic Organizations, for instance.

Mr Benedikt Herrmann, RTD, European Commission opined that technology transfer centers rarely pay off, citing an example from the UK, where a professor found a way to go through a foundation that created a start-up instead of going through the University. Therefore, the recommendation was "Be careful with the incentives!"¹⁴.

Similarly, in workshop discussions, it was suggested that one of the main reasons that Ireland had stood back from investing significantly in the public research system, was that "nothing was coming out of it" (Mr Keith O'Neill, Director of Lifescience & Food Commercialization Department, Enterprise Ireland). Indeed, commercialization policy often needs to focus on encouraging technology transfer (Yusuf, S., Correa P.). In the Korea case, for example, "R&D was

"People are key for innovation and competitiveness: steal, buy, borrow or grow talent."

Andrei Broder, Vice-president, Yahoo! Research

one of the most important measures (Kaminski, B.).

Korea and Switzerland provide particularly insightful case-studies on how country situations vary and how successful reforms are tailored to the country context. An important consideration which the Korea and Swiss stories also show is that the education system must be designed with accompanying high levels of employment in mind, which again depend on the country context. While some innovative sectors, such as artificial intelligence, biotechnology and

with tertiary education (Kaminski, B.).

All case-studies present an important consideration when looking at education reform, primarily the need to allow technology transfer and the commercialization of research outputs and an accompanied balance of focus between basic and applied research.

Market relevance of public research should be encouraged

Promoting the potential for commercialization of public research was generally highlighted as a common need in workshop discussions. It is identified as an ongoing need in the ECA region (Correa, P.) and was the headline challenge for Croatia when it came to developing its National Science and Technology Plan (see Croatia box) (Marijanovic, D., et al.). The problem in Croatia

¹³ (from discussion session The Unfinished Reforms Agenda: Accelerating the commercialization of public research and fostering business innovation", Summarized by Evgenii Evgeniev, PSD Specialist, World Bank)

¹⁴ From discussion session The Unfinished Reforms Agenda: Accelerating the commercialization of public research and fostering business innovation", Summarized by Evgenii Evgeniev, PSD Specialist, World Bank



CASE-STUDY 1.

MARIBIC – Innovation Driven at an Industry-wide level

Workshop participants visited MARIBIC, Croatia's leading Technology and Business Innovation Center for Mariculture - a prime example of how innovation can be driven at an industry-wide level in partnership with local government and scientific institutions.

MARIBIC was established in 2008 as part of the Croatian Government's TEHCRO program. It was endowed with initial funds of €4.2m. The World Bank provided €1.8m (70 per cent grant, 30 per cent loan) and €2.4m was secured through the University of Dubrovnik, Croatia, in conjunction with BICRO and the Ministry of Science and Education.

Through its center for research, practical education and technology and innovation, MARIBIC provides a vital link between the aquaculture industry and University-level theoretical education and science.

"MARIBIC provides continuous education and information about new technologies, trends, equipment, marketing, and about the problems shared by the local aquaculture industry and aquaculture producers. The center is also active in the scientific field, working with the University of Dubrovnik and other scientific institutions, local governmental institutions and producers' organizations on scientific and development programs" <http://maribic.com/>.

Indeed, its mission is to fill the gap between science and education, and active and prospective aquaculture companies. It aids market development, by selecting locations which specifically require investment and technology transfer.

"MARIBIC's mission is to become a missing link between scientific/educational institutions and active and prospective aquaculture producers, taking a vital role in the advancement of practical education and student research, and in the development of the aquaculture industry" <http://maribic.com/>.

MARIBIC provides multi-level support for the mariculture industry in Croatia as a response to a market need for the consolidation and modernization of the industry. It enhances innovation infrastructure and production along the aquaculture value chain through facilities which include: specialist installations for breeding and farming of saltwater fish and shellfish; aquaculture R&D laboratories; a purification unit, shellfish collecting and shipping center (under construction).

Jurica Jug-Dujakovic, Director of MARIBIC.

"In Korea's case R&D was not at the center of innovation policy; technology transfer and acquisition was at the center of innovation policy."

Sungchul Chung, Senior Fellow, Emeritus, and Former President of Science and Technology Policy of Korea (STEPI).

not at the center of innovation policy, technology transfer and acquisition was at the center of innovation policy" (Chung, S.).

In the discussions, it emerged that in order to commercialize the knowledge created by research institutes, Ireland would need to invest in promoting technology transfer: lack of technology transfer was the key reason nothing was coming out of the research system (O'Neill, K.).

Technology transfer requires background conditions that governments should provide for in mainstreaming innovation policies. These key determinants of technology transfer and assimilation include: a competitive and globally



integrated market environment; an industrial mix favouring tradable goods and subsectors where SMEs are active; investment in productive activities and sources of, and technology content of, imports; managerial skills and quality of workforce; volume and composition of FDI; technology licensing and reverse engineering, and R&D and its composition (Yusuf, S).

The issue of technology transfer has no easy solution, however, and large companies such as Yahoo! make this work through complex processes and long-term vision. Mr Andrei Broder, the VP for Research of Yahoo!, pointed out that companies are reluctant to invest and pay a lot for an idea that comes from a University which is isolated from the company. Mr Broder explains "If there is an idea with a professor, he is invited at Yahoo! for sabbatical, for instance".

Mr Benedikt Herrmann, RTD, European Commission, spoke about the feedback he received from SME entrepreneurs in Romania and Bulgaria. They said that the European Commission can do something more powerful by introducing an EC Label that could increase inter-firm trust, which is particularly low in these economies. He also spoke about the recommendation from Danish universities to invite, on a regular basis, successful high-tech entrepreneurs. Mr Herrmann was asked by the audience about the linkage programs and how well they work. Based on replies from companies, Mr Herrmann said that the impact of these programs is very positive. What the European Commission representative further emphasized was the need to develop measures to support creation of talents. He added that the CEE countries have an advantage: the best of talents

from Finland and Switzerland would queue to work in CEE countries because of the nature of the countries and the work.

There also needs to be a balance between basic and applied research. Successful programs, like the MARIBIC center depicted above (case-study 1) link basic and applied research. A better balance between these research types is identified as a need in the ECA region (Correa, P) and initiatives such as these go some way in filling this gap. However, country situations vary and this must be taken into account.

Switzerland successfully balances funding for applied and basic research by splitting the funding priorities between the private and public sectors. More than 70 per cent of R&D investment in Switzerland is made by business companies. The private sector in the country is accustomed to asking for public support for good teaching, good financing of fundamental research in universities, and good PhD programs. One thing they ask not to be interfered with is applied research, considering applied research as a matter that should be exclusively for the business sector. "There are some exceptions, but if you compare the Swiss figures with other countries, you can be surprised by seeing that 80 per cent of the spending of the public funding in R&D in Switzerland is spent on fundamental basic research" (Dell'Ambrogio, M.).

Favorable market conditions need to be fostered

Competition and innovation-friendly markets are essential for growth

through innovation (Alkio, M.). Innovation policies that achieve this, focus legislative reform on strengthening country IP systems and regulatory efficiency while enhancing innovation infrastructure and considering alternative methods for raising private funds.

To do this, political will and commitment are needed. For example, Finland and Korea, made a remarkable transformation in the second half of the twentieth century into industrial powers and emerged as some of the most productive economies in the world (Chung, S)¹⁵. The Finnish government played an important role in transforming the country from a resource-based economy into an industrial one. The government developed a well-structured system of innovation with efficient public institutions and competitive private sectors (Alkio, M.). Even though it is a small country in terms of population, it has free access to the EU market which is large enough to sustain its mobile phone industry (Chung, S.). The weakness, however, is that it has concentrated heavily on the mobile phone industries, where markets are already overcrowded (Alkio, M.). However, like most small countries, Finland needed to find specialized niches in order to compete with global giants: other examples of successful specialization include industrial machinery, marine engines, pulp and paper, among others. In Korea, political leadership was also important: science, technology and innovation (STI) had to be mainstreamed across all policies. This is something the EU is doing (albeit to a lesser degree than was done in Korea, which was ingrained in structural adjustment to export-led growth) with Europe 2020.

Both hard and soft infrastructure needs to be developed. Examples from Eastern Europe show how a central geographical location, with good through-country transport links, fosters a healthy innovation market that can lead to increased exports and FDI. Bulgaria's hard infrastructure is well developed and encourages innovation-led export growth and FDI in R&D.

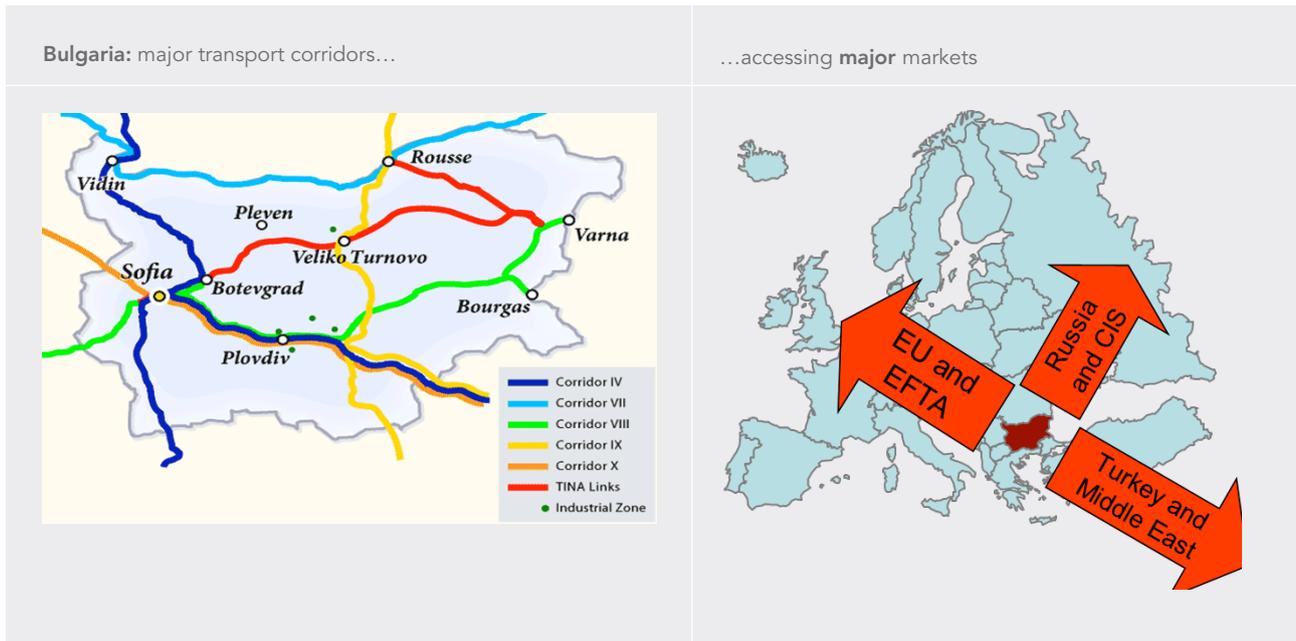
¹⁵Chung, S., Senior Fellow, Emeritus, and Former President of Science and Technology Policy of Korea (STEPI), Chair's summary of Workshop Day 2 Session: Counter-Cyclical Innovation Policies – Common Agenda for Action.

For example, it has good through-country transport links leading to major established and emerging

markets. Similarly, Romania's geographical location allows good access to Turkey, Slovenia and Russia,

among other countries in the region. Cases such as these are playing a part in the shift from West to East.

Map: Bulgaria's major transport corridors...accessing major markets



Case-Study 2: New approach to promoting innovation and R&D in Bulgaria – the JEREMIE Holding Fund

A holding fund with capital of EUR 199 million will be registered under the JEREMIE Initiative, called the JEREMIE Holding Fund. The JEREMIE Holding Fund is foreseen to exist for 10 years with an option of a further 2 more years, targeting SMEs that have their main economic activity in Bulgaria. It will manage funds on behalf of the Bulgarian government. Three funds for equity investments in the Bulgarian economy will be set up as part of the holding fund, namely, for small start-up companies (venture capital), for small companies in the process of development (growth equity), and a mixed instrument between equity investments and loans (mezzanine).

It is envisaged that the Fund for small start-up companies will begin operations with a capital of EUR 30 million. EUR 21 million of this will be under the "JEREMIE", the remaining amount will come from external financing. The Fund for small start-up companies will invest up to a ceiling of EUR 1.5 million annually in a business, while there is no such restriction for the other two funds. The other two funds will have a capital of EUR 60 million, half provided by JEREMIE and the other external funding must be secured by their future managers. Finding this extra financing will be one of the criteria for selecting the risk fund managers.

Risk financing for businesses will benefit from a total of EUR 81 million in borrowed capital from the JEREMIE Initiative, while the amount will reach EUR 150 million with the external financing. The JEREMIE Program will provide EUR 74 million for guarantees covering losses of a portfolio of debt instruments and the total guarantees are estimated at EUR 370 million for SMEs under the JEREMIE Holding Fund.

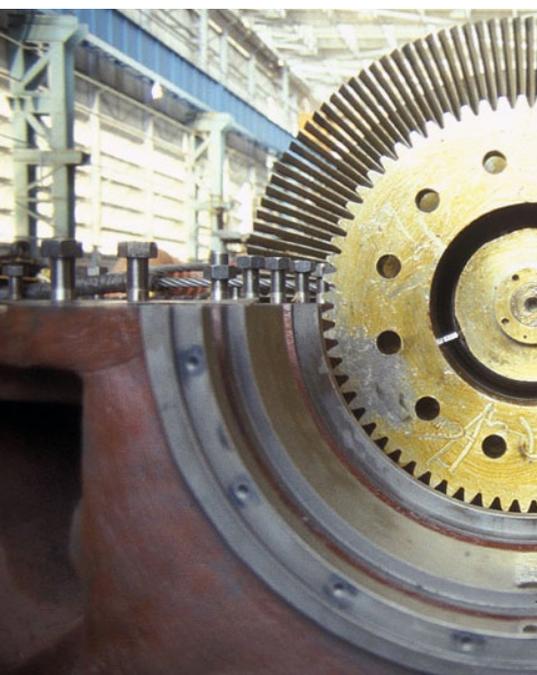
The key decisions affecting the operation of the three private equity funds will be taken only after prior coordination with the Ministry of Economy, Energy and Tourism. Its representatives will participate in the Board of Directors of the JEREMIE Holding Fund.

Source: Bulgaria Innovation Policy Note (World Bank, 2011), forthcoming.

While hard infrastructure was well-developed, soft infrastructure in Bulgaria required more attention. The Ministry of Economy, Energy and Tourism in Bulgaria conducted a study in 2010 of 35,000 companies to develop an understanding about their revenue, R&D and innovation spending. Two issues emerged as key findings

- a) Access to finance is an issue for companies;
- b) Access to Infrastructure (in the broader sense) is problematic. The JEREMIE program and the Fund of Funds, developed in cooperation with the European Investment Fund (EIF), are to be key ways of solving these constraints for companies. "We found a market gap", added the Deputy Minister (DM) Evgeny Angelov "and through the JEREMIE funding we are trying to fix it".

The strategies of Bulgaria, Croatia and Poland include a variety of instruments to support private innovation and R&D. The Bulgarian government offers investors, who invest a minimum of €10m (or €2m in high-tech services) faster administration procedures, preferential acquisition of municipal land, and financial support for training and infrastructure subsidies (Angelov, E.). Croatia has five main support programs that run across different stages of development of the innovative sector: from POC (Proof of Concept) and RAZUM (seed capital for innovative firms); to longer-term TECHCRO (creating sustainable innovation and business infrastructure); IRCRO (Co-operation between research groups and SMEs on R&D projects); EUREKA (Pan-European Research and Development Cooperation) (Marijanovic, D. et al.). Poland's National Scientific Research and Development



Program released approximately €8bn in funds, attracting an additional estimated €3bn of EU funds for innovation for the period 2007-2013.¹⁶ It includes innovation vouchers of up to €2m for R&D services, however,

centers and universities is instrumental in raising absorptive capacity and attracting more R&D investments.¹⁹ According to Sasha Bezuhanova, Hewlett Packard CEE Public Sector Director, "technoparks have proven

"Technoparks have proven their worth in many regions as catalysts for innovation and economic development."

Sasha Bezuhanova, Hewlett Packard CEE Public Sector Director

spending on R&D as a percentage of GDP remains low in the country – at an estimated 0.4 per cent of GDP annually.¹⁷

Venture Capital (VC) is one aspect highlighted as a potential for many economies looking to mainstream innovation policy. Alongside public funding for innovating SMEs, Korea also provided for VC as a means of raising private capital for R&D, with a particular focus on SMEs – its main growth source in the post-crisis period. In 1996, as a branch of the Korean Stock Exchange, the Korean Securities Dealers' Automated Quotation (KOSDAQ) was opened to facilitate the financing of technology-based SMEs. This opens a new source of private capital for SMEs in the sector.

One of the challenges in Ireland has been to attract experienced fund managers and the question arose in one of the Q&A sessions as to whether Bulgaria faced this challenge. The response of DM Evgeny Angelov, Ministry of Economy, Energy and Tourism, Bulgaria, was quite optimistic in that Bulgaria was attracting high-level fund managers, and they have been able to secure decent managers with soft commitments.¹⁸ The DM, however, pointed out that raising risk capital has two challenges: a) who is the fund manager? and b) the raising of co-financing.

Long-term innovation policies should also include programs for developing industrial clusters and local and international innovation hubs. The promotion of linkages amongst firms, foreign owned R&D corporate centers, local research

their worth in many regions as catalysts for innovation and economic development". They could improve competitive abilities of local firms and have been seen as the basis of regional development for some Asian countries, through technoparks such as Cyberabad in Hyderabad and Electronics City in Bangalore, India. "Bulgaria has the potential of becoming the 'Silicon Valley' of Balkans" (Bezuhanova, S.). To do this, governments need to encourage the broader requisites for successful mainstreaming of innovation policy, with a particular focus on:

- Education, in particular in ICT, languages, management and entrepreneurial skills;
- A legislative framework designed to stimulate knowledge investments;
- Infrastructure, including high speed internet, business and innovation parks;
- Stimulating entrepreneurial innovative concepts, through seed and grow incentives;
- Encouraging innovative business based in Bulgaria, with local and international focus;

¹⁶ The Ministry of Science and Higher Education, Poland http://www.nauka.gov.pl/mn/index.jsp?place=Menu08&news_cat_id=894&layout=2, accessed 28/07/2011.

¹⁷ DG Economic & Financial Affairs, European Economy, European Papers 367, 2009.

¹⁸ Q&A session (Summarized by Evgeni Evgeniev, PSD Specialist, World Bank).

¹⁹ Kaminiski, B. Snapshots of R&D-intensive FDI in Bulgaria, Croatia, Poland and Romania. Background paper for the high-level Policy Workshop on "Innovating through the Crisis – How to Do It?" June 8-11, 2011 Dubrovnik, Croatia.

- Stimulating modern R&D in Bulgaria, making it part of a world R&D network;
- Creating a 'Brand Bulgaria' as best shore location;
- Positioning Bulgaria as regional hub.

Intellectual Property (IP) is crucial when fostering open innovation and is needed for the second-order creation of IP and technology markets (Alkio, M.). IP Law must be part of mainstreaming innovation policies. Mr Sorin Buse, Executive Director, Renault Technologie, in discussing challenges in Romania, highlighted that "there is a huge issue with IP

Better regulation does not mean more regulation; it means, in part, capitalizing on the opportunity to create a more efficient system. For example, it can mean reducing the administration procedures for SMEs (as suggested in workshop discussions on Poland) through the creation of 'one-stop shops' and removing barriers. The countries discussed are taking steps in this direction. Poland, for instance, simplified VAT and excise duties. Bulgaria, Poland and Croatia all provide simplified administrative procedures, including land acquisition and permits to

Director, DG REGIO, European Commission²⁰ illustrated by asking "How to smartly spend money on smart innovation?"

It emerged that a key policy response from Poland, for example, should be to have a clearer prioritization of funds. The problem with the current national plan is that it sprinkles funds across a number of priorities and so renders spending less effective.

The fundamental fact is that technology takes a long time to de-

"There is a huge issue with IP legislation in Romania. Leakage of information from employees and suppliers is difficult to deal with – nobody gets properly punished. The R&D investment is not coming because of the legislation."

Sorin Buse, Executive Director, Renault Technologie

legislation in Romania. Leakage of information from employees and suppliers is difficult to deal with – nobody gets properly punished. The R&D investment is not coming because of the legislation".

Mr Andrei Broder, VP of Yahoo! Research, echoes this when discussing the main reasons why multinational corporations (MNCs) establish innovation operations in other countries stating that: "The IPR is a crucial issue, a good IPR protection is a must".

operate as part of specific incentive packages.

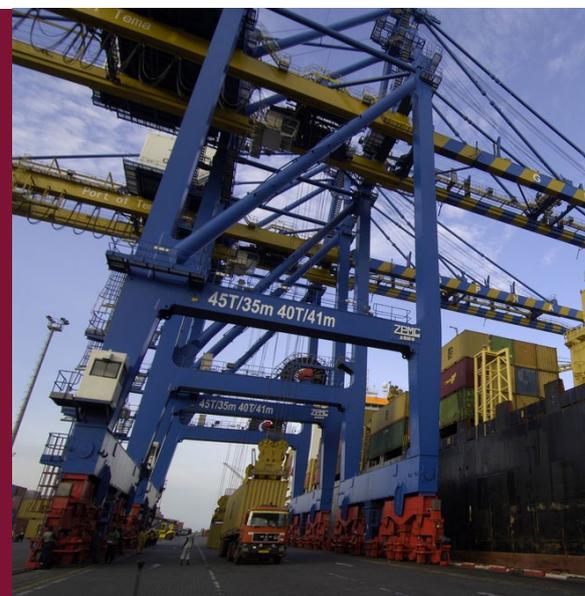
Continued commitment to innovation means sustained funding. Continued funding support is a necessary condition for maximizing the benefits of innovation in terms of growth.

Strengthening existing support streams means prioritizing spending not just increasing it. One key question is how to frame these targets as Ms Charlina Vitcheva,

velop, and it is important to have a long-term perspective in terms of funding support mechanisms. R&D expenditures, nonetheless, need to be focused on relevant topics and innovators need to be educated about what is available. An example from Croatia shows that even with the current low levels of R&D spending, things can be done better. A new Science Law in Croatia has been developed to improve efficiency of public R&D spending and its relevance for the market. While current and 2012 budgets are set and the

"Innovation policy should be about not adding more regulatory burden under its name, but reducing the burden of regulatory constraints on innovators and entrepreneurs."

Cornelia Simeon, Director, Romanian Ministry of Economy, Commerce and Business Environment



“A one per cent increase in public R&D will not turn you into Silicon Valley, but without public investment in innovation infrastructure and resources it is very difficult to jump-start innovation-led growth.”

Benedikt Herrmann, RTD, European Commission

R&D budget is fixed, there is EUR 0.5 billion in public tenders that can be flexibly used.

One topic of relevance, which workshop participants highlighted (as well as the case-studies from Korea and Finland show) is the importance of a particular focus on providing funding mechanisms for SMEs. This is based on the fact that “people not organizations innovate” (Alkio, M.).

And so there is a need to incentivize the individual. As Dr Cornelia Simeon, Director, Romanian Ministry of Economy, Commerce and Busi-

ness Environment, points out “The crisis presents an opportunity for investing in people.” This can be in the form of early stage financing and strengthening policies to nurture start-ups, which is also needed to support commercialization of both public and private research outputs (Correa, P.). Examples from Croatia include RAZUM – the Seed Capital funding stream, which has provided 14.4 million Euros in funding, generating 22.3 million Euros (inclusive) of investment to date. RAZUM provides funding of up to 70 per cent of project costs (30 per cent must be contributed by the private sector) in the form of conditional loans (i.e. repayable advances). Planned effects of the program include generating a net present value (NPV) of 82.9 million Euros (up four times on the corresponding figure before the inception of RAZUM) and an internal rate of return (IRR) of 60.8 per cent. Net income tax on salaries generated through the program is expected to total 20.2million Euros (one and half times higher than before RAZUM was in place). Poland similarly stimulates the development and growth

of innovation-based companies by funding R&D activities towards development of new products. **Funding should also include incentives for collaboration between private companies and public research institutes.** As seen in the section above, this is a key challenge, particularly during a downturn to which private companies respond by reducing collaboration with research institutes (Alkio, M.). This was identified as a key challenge for Croatia when putting together its Technical Permanent Secretariat (STP). The STP set up a funding stream dedicated to financing collaboration between

internationalized branches, and this type of decentralization can be seen in Croatia, Poland, Bulgaria and Romania (as discussed below in Chapter 3: Increasing business investment in R&D – could FDI provide a solution?).

²⁰ Vitcheva, C., Director, DG REGIO, European Commission, quotation from one of the discussion sessions.

“We need to teach people what responsible R&D spending means.”

Danica Ramljac, Director General, RBI

ness Environment, points out “The crisis presents an opportunity for investing in people.” This can be in the form of early stage financing and strengthening policies to nurture start-ups, which is also needed to support commercialization of both public and private research outputs (Correa, P.). Examples from Croatia include RAZUM – the Seed Capital funding stream, which has provided 14.4 million Euros in funding, generating 22.3 million Euros (inclusive) of investment to date. RAZUM provides funding of up to 70 per cent of project costs (30 per cent must be contributed by the private sector) in the form of conditional loans (i.e. repayable advances). Planned effects of the program include generating a net present value (NPV) of 82.9 million Euros (up four times on the corresponding figure before the inception of RAZUM) and an internal rate of return (IRR) of 60.8 per cent. Net income tax on salaries generated through the program is expected to total 20.2million Euros (one and half times higher than before RAZUM was in place). Poland similarly stimulates the development and growth

business and academia. It provided 50:50 match funding for SMEs, partnering with research institutes on R&D. This has increased public-private collaboration on research outputs and has leveraged private capital for R&D: Every €1 invested from the public budget has attracted €1.35 of private capital intended for R&D (Marijanovic, D., et al.).

The managers of public R&D institutes need to be re-educated.

The culture of the private sector also needs to change since they do not know what they can do in R&D, and neither how they could, nor why they should, get involved in it. Human resources are still the largest constraint in Croatia: a local pharmaceutical leader Pliva, for example, decided to fund 5-10 independent training organizations, because the necessary skills are hard to find locally.

National innovation strategies, while focusing on the individual and on home-grown SMEs should at the same time not neglect policies to encourage FDI. In fact, the innovative departments of MNCs are often



BOX 3: COMMON THEMES IN MAINSTREAMING INNOVATION POLICY

International Best Practice		Current/Planned Policies	
Country/Region	Innovation Policy Lessons Learned	Country	
Finland experience	<ul style="list-style-type: none"> • Start with long-term investment in the education system. • Keep investing in the innovation system through world-class science and commercialization (in the short-term need to increase public investment for these in periods of downturn). • Competition and innovation-friendly markets are key. • Incentives, thinking of individuals as innovators rather than organizations. • Intellectual Property (IP) is crucial when fostering open innovation and is needed for the second-order creation of IP and technology markets (Alkio, M.) 	Bulgaria – current policies	<ul style="list-style-type: none"> • Has fostered a strong education system with 60,000 graduates every year. • Good system of government incentives with the Investment Promotion Plan. • Good market conditions with land-acquisition breaks for foreign investors; cross-cutting infrastructure. • Encourages collaboration between universities and the private sector.
Korea	<ul style="list-style-type: none"> • Achievements owing to several factors: well educated human resources, private industries' R&D capabilities, focused strategy of the government, and most important, the sense of crisis that was shared by the Korean population. 	Poland	<ul style="list-style-type: none"> • Fostered a strong education system with 40,000 graduates every year. • Is looking to close the skills gap by matching skills to those needed by employers. • Continues to support research institutes that provide public goods, but is considering the restructuring of those institutes that provide private goods. • Simplification of VAT. • Simplification of company start-up. • SME one-stop shops. • Prioritizing innovation policy that will have highest impact on employment. • Science and R&D reform.
Switzerland	<p>Swiss Innovation Policy:</p> <ul style="list-style-type: none"> • Investments in R&D. • Human Resources. • Incentives to entrepreneurship. • Education to work. • Government regulation of the private sector market. • Public administration: light and efficient, tax system and tax rate. 	Croatia	<ul style="list-style-type: none"> • Commercialization. • Public support for R&D during downturn with obtaining WB loan. • Loan helped institutions to commercialize research outputs. • Technology Transfer. • Increase ability of SMEs (links in with Finland point of individuals not organizations). • Investment in R&D activities to develop, adapt, commercialize and use technology.
		ECA Countries	<ul style="list-style-type: none"> • Preserving public support to private R&D. • Promoting the commercialization of public research. • Rebalancing country priorities on public R&D expenditures. • Adopting cost-saving measures in public research organizations. • Better monitoring and evaluation of existing programs (Correa, P.).



"People not organizations innovate"

Mikko Alkio, Adviser to the Prime Minister, Finland, former State Secretary, Ministry of Employment and Economy

3

INCREASING BUSINESS INVESTMENT IN R&D – COULD FDI PROVIDE A SOLUTION?



OVERVIEW

To encourage business investments in R&D and innovation activities, essential framework conditions need to be put in place, as discussed in the previous section. To entice foreign investors and MNCs, which have a wide scope of investment locations to choose from, targeted FDI policy is required to add further impetus and for a country to remain attractive and competitive. This is particularly the case during an economic downturn when the importance of external sources of capital increases as insufficient credit supply and higher risk aversion result in lower capacity for many countries' domestic firms to finance R&D investments.

In Bulgaria, Croatia, Poland and Romania, the foreign owned R&D sector is well established and expanding. It has not been particularly affected by the recent slump in the global economy, suggesting that it has helped cushion these countries from the most severe effects of the financial crisis.

Furthermore, given that MNCs undertake the bulk of global R&D expenditure, their location decisions determine, to a large extent, the geography of R&D activity (Jaruzelski, B. and Dehoff, K., 2008). With

the offshoring of R&D, MNCs seek to tap local knowledge and lower their costs in order to cope with pressures of global competition and the rapid pace of technological change.

MNCs can encourage technology transfer, internationalization, and global integration through embedding R&D into their value chain. Many successful business models, such as those highlighted at the workshop of Hewlett Packard, Yahoo!, and Renault Technologie Roumanie include strong communication networks and information sharing across their subsidiaries. MNCs also generate employment directly and indirectly and their investments can be leveraged to provide community regeneration and innovation, and R&D education.

However, many countries often fail to maximize returns from FDI R&D. In East Asia, for example, FDI in R&D has not been a significant source of start-up activity or cluster formation. Benefits are also often internalized by firms and the growth effects of R&D-intensive FDI are uncertain; and MNC R&D can enhance national research capacity but can also crowd out local research (Yusuf, S.).

The ultimate answer as to whether FDI can provide a solution to reduced private and public investments in innovation, however, is that it depends on the country and the response of the domestic private sector (Yusuf, S.). Nevertheless, countries that convert FDI in R&D into spillovers and consequent growth, share some commonalities. These commonalities highlight the importance and success of long-term investment in education systems, technological transfer, industrial hubs, and market conditions and positioning. They also highlight the importance of implementing FDI policies alongside policies to support the home-grown innovation industry to avoid larger MNCs crowding out smaller innovative domestic firms.

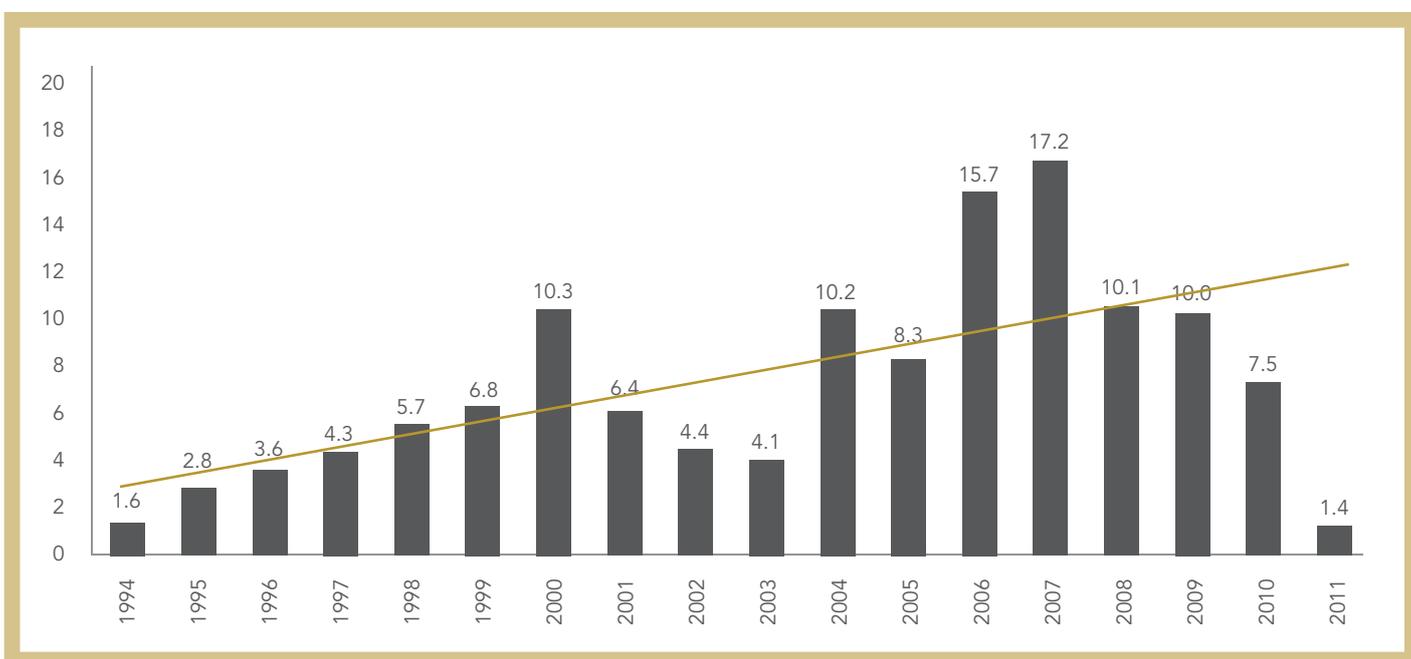
Innovation-intensive FDI can be growth promoting, provided local conditions for capturing positive spillovers are in place

R&D-intensive FDI can bring significant benefits to host countries by enabling an upgrading of technological capabilities as well as better access to international markets (Cantwell,

j. and Piscitello, L., 2000; Carlsson, B., 2006; Santangelo, G., 2005).²¹ It can also create spill-overs, increase patenting, and enhance national research capacity (Yusuf, S.). Mr Keith O'Neill, Director of Lifescience & Food Commercialization Department, Enterprise Ireland, emphasized that a lot of the success of Ireland is attributed to attracting FDI which had positive spillovers that were captured by local firms. It was also suggested in discussions on the ECA region, that R&D-intensive FDI has helped cushion some countries from the impact of the financial crisis on R&D.

In the ECA countries discussed –

Graph 4: Poland FDI Trends



Source: Marek Łyzwa, Member of the Management Board, Polish Information and Foreign Investment Agency.

Bulgaria, Croatia, Poland and Romania – the foreign owned R&D sector has not been particularly affected by the recent global economic downturn. Poland has been experiencing an upwards trend in FDI inflows, attracting approximately USD 11.5 billion in 2009 and the highest amount among 12 new EU states (Łyzwa, M.).²² Similarly, FDI to Bulgaria has been growing steadily over the last ten years (Angelov, E.). Bringing in external sources of capital has reduced the impact of limited domestic funding capacity during the recent economic crisis on the R&D sector in these countries.

MNCs effectively integrate R&D into their innovation value chain and FDI in R&D links national innovation systems with international ones (Yusuf,

S.). This is in part because MNCs conduct R&D activities not only at home but across their networks of subsidiaries across the world. The largest 1,000 companies by R&D expenditure allocate, on average, 55 per cent of their R&D budget outside the countries where they are headquartered and 91 per cent of MNCs conduct some R&D in overseas centres.²³ MNCs' activities are organized on a global scale and allocated through intra-firm information networks, of which R&D is an organic component. Establishing distribution, information sharing, virtual and informal networks is consequently a core part of their R&D business models, as insightful information on Yahoo!, Hewlett Packard and Renault Technologie provided by representa-



from the fact that initial FDI may not qualify as being an R&D-intensive activity. If the government offers

tives of these companies shows.

R&D by MNCs is mostly, albeit not exclusively, based on "captive offshoring," i.e., conducted in a foreign affiliate of the same MNC. This may take two forms: first, R&D centers are part of wider industrial development complexes with initial investment preceding the establishment of an R&D corporate center; and second, R&D centers are established directly, without any link to manufacturing, as illustrated by software R&D related centers in Bulgaria, Croatia, Poland, and Romania. While the second form can be linked directly to R&D-intensive activities, the first form cannot and, thereby, the policy implication is different, as attracting R&D FDI cannot be detached from attracting FDI in general. The difference stems

21Cantwell, J. and Piscitello, L., 2000. Accumulating technological competence: its changing impact on corporate diversification and internationalization. *Industrial and Corporate Change* 9(1), 21-51. Carlsson, B. (2006). Internationalization of innovation systems: A survey of the literature. *Research Policy* 35(1), 56-67. Santangelo, G. (ed.), 2005. *Technological Change and Economic Catch-up. The Role of Science and Multinationals*. Edward Elgar, Cheltenham.

22 Quoting Source: World Investment Report, UNCTAD 2010, AmCham, KPMG, January '10

23 See Jaruzelski, B. and Dehoff, K., 2008. "The Global Innovation 1000," *Strategy + Business*, Issue 54, 2008 quoted in World Bank, 2011. "R&D-intensive FDI: Overview of global trends and policy implications," background paper prepared for a High-Level Policy Workshop "Innovating Through the Crisis—Counter-Cyclical Innovation Policies – How to Do It?" held in Dubrovnik, Croatia, on June 8-11.

preferential treatment to R&D-intensive FDI and, by the same token, discriminates against other investments, an opportunity to have a follow-up, in the form of an investment in an R&D corporate center may be missed.

MNCs can also bring benefits in terms of employment. Although it was suggested that one drawback may be that small companies never make it to the big time because they get bought. In the discussion sessions, though, it was drawn out that the practice in Ireland shows that companies that were acquired by

international companies generated larger employment gains, compared to those in Irish ownership.

Attracting FDI in R&D in Eastern Europe

To attract FDI in R&D in the first instance, the business environment must be conducive to innovation (including favorable market and labor conditions, IP protection, and so on, covered above in Chapter 2: Mainstreaming Innovation Policy). In

general, as the global strategies of multinationals change in response to evolving conditions in global markets, governments should not erect barriers but rather assist a local subsidiary in making necessary adjustments and enhancing its 'bargaining position' vis-à-vis headquarters. The development of information and communication technologies, combined with a more liberal trade and investment environment in developing countries, have made them increasingly attractive for allocation of both production and R&D activities.

"Build up [of] countries' reputation and trust of the MNCs takes time and a lot of work from various stakeholders"

Sasha Bezuhanova, Hewlett Packard CEE Public Sector Director

BOX 4. COMMON FACTORS IN ATTRACTING FDI

<p>Bulgaria</p>	<ul style="list-style-type: none"> • Stability (including low government debt). • Attractive costs, including a low corporate tax rate (10 per cent) and the lowest labor costs in European Union. • Good market access to EU, Russia & CIS, Turkey & Middle East markets. • A skilled workforce and one of the highest proportions of students studying abroad in EU. • Major transport corridors passing through the country (see Bulgaria Map in Chapter 2: Mainstreaming Innovation Policies). • Benefitting from having the EU as trading partner. • The government supports specific industries under the Investment Promotion Act, which has attracted high-impact programs. Leading global investors include IBM, EoN, Solvay and many more (Angelov, E.). • A strengthened IP legislative system. • Sources: Evgeny Angelov, Ministry of Economy, Energy and Tourism, Bulgaria and discussion session notes.
<p>Poland</p>	<ul style="list-style-type: none"> • Stability (including low government debt). • An effective incentives' system including those derived from EU funds. • A skilled workforce, with 20 million enterprising and young people and 2million students. • High-impact programs have been attracted, with the vast majority of FDI inflows coming from the EU (Łyzwa, M.). • Strengthened IP law and protection. • Sources: Marek Łyzwa, Member of the Management Board, Polish Information and Foreign Investment Agency and discussion session notes.
<p>Romania</p>	<ul style="list-style-type: none"> • Good market access to EU, Russia & CIS, Turkey & Middle East markets. • A skilled workforce. • An effective incentives' system which includes leveraging EU funds. • IP regulation, however, is an ongoing challenge. • Source: Discussion session notes.
<p>Croatia</p>	<ul style="list-style-type: none"> • Economic and political stability. • An effective incentives' system which includes leveraging EU and World Bank funds. • The government provides targeted support for specific industries. • An increasingly skilled workforce. • Sources: Dalibor Marijanovic, CEO, Croatian Funding Agency for Innovation (BICRO); Dr Ivana Nagy, Sr. Executive Director, BICRO R&D; Ivo Friganovic, Sr. Executive Director, Innovation, BICRO, and discussion session notes.

Box 4 below, which details common factors in attracting FDI, shows how the countries discussed have created an environment conducive to companies in innovation and conducive to FDI in R&D. The theme running throughout these is that a long-term view to creating this environment is needed. As Ms Sasha Bezuhanova, Hewlett Packard CEE Public Sector Director, put it “build up [of] countries reputation and trust of the MNCs takes time and a lot of work from various stakeholders”.

However, many countries often fail to maximize returns from FDI R&D as FDI spillovers are mainly vertical, in that they are linked suppliers and buyers, and direct multiplier effects

of employment in MNC R&D facilities are small. R&D by MNCs is also rarely a significant source of start-up activity and cluster formation. The aggregate effects of FDI on R&D is uncertain: while FDI in R&D increases patenting, the benefits of this are internalized by firms; while R&D by MNCs can enhance national research capacity directly and through spurring a competitive response from local firms, it can also supersede local research, soak up the best researchers and lead to brain drain (Yusuf, S.).

Governments, however, can foster FDI in a way that creates spillovers and ensures inclusive growth. One interesting vehicle is the provision of targeted business environment and

fiscal incentives that foster inclusive growth. Poland, for example, provides incentives for investments in Special Economic Zones (SEZ) to aid regional development and raise standards of living. At the end of 2010, more than 10 per cent of Poland's FDI was in these regions. In these 14 zones, manufacturing or distribution activities can be conducted on preferential terms. Benefits in being granted a permit to operate in these zones include the eligibility for income tax exemption; a plot of land prepared for an investment project and assistance with formalities relating to the investment. There is also state aid of €100,000 available for qualifying projects. One key feature of these projects is that they must

Case-study 3: Yahoo! – what it looks for in FDI locations

Yahoo! is a major player in ICT and it is a highly creative and innovative company. It is a Fortune 500 company with \$600 billion in sales, has been profitable since its inception and affects 700 million users. During the Tsunami, for example, one billion people consulted the Yahoo! website in 3 days.

Innovation in the service industry is poorly understood, and as Yahoo! is a service industry player, it provides valuable insight into innovation in this sector. Its success is powered by technology behind the scenes: technology powers the development of the company, and R&D is the critical input. For example, advertising tied to search engines depend on complex mathematical modeling; if the estimation increases by a small percentage, it has a large impact on profits; also substantial economic research is required (experimental eco, game theory, etc.) if Yahoo! is looking to have an impact on the community of science as an innovative company in the services industry.

Yahoo! – what it looks for in FDI locations:

- Technology powers the development of the company, therefore looking for top people who can make an impact on the community of scientists (many papers in top conferences). The value of people: very specific calculations about profits and R&D.
Strategies for governments: Where do you get talented people?
 - Grow, steal, buy or borrow? Grow – local education is key, talent is “sticky”. The more excellent education and research systems you have, the better talent it breeds (takes a long time);
 - Buy – make them an offer they can't refuse (Texas, UAE), if enough money is available;
 - Borrow – bring the well-established diaspora or other people on temporary assignments, provide excellent working conditions, financial incentives (happens a lot in China and India). Bring people back through Public Private Partnerships (PPP) – can promote the creation of centers of excellence. It is probably the most concrete strategy for jump-starting the process (attractive, particularly if there is a large diaspora, good quality of life—e.g., India, China).
- Major lab in US; satellite labs in large cities in emerging countries (Haifa, Bangalore, Beijing, Santiago, Barcelona), to tap the pool of talented people, sometimes through partnerships with universities; they tweak products for local markets, can also work on central problems outsourced from center – but only if there is senior management that can enable the technology transfer; leadership is key!
- Why have labs in distant locations with the added complexity, language, time difference? Because some talented people will not relocate; research should be close to major markets to understand local trends and behaviors. Satellite R&D - why do MNCs go to these places? They

already have large developments in these places (Bangalore and China) Tapping into infrastructure and people (Haifa) university connections, cross-employment, financing arrangements, joint appointments (30-40 people), cross-seeding, cross-fertilization (Spain and Colombia)

Mr Andrei Broder, Vice-President, Yahoo! Research.

Country case-study 6: Poland – Attracting R&D-intensive FDI

In 2010, Poland ranked 2nd in Europe and 6th worldwide in Kearney's FDI Confidence Index, showing the largest increase in confidence worldwide since 2007, when it ranked 22nd.

Poland has been successful in attracting FDI due to having the background conditions in place conducive to business investments, which include:

- **Stable economic conditions:** Poland is the only EU country to exhibit stable GDP growth during the crisis. The country's GDP growth rate at the end of the third quarter of 2010 stood at 4.7 per cent.
- **The country's main competitive advantages, namely geographical location and the size of its market:** with an internal market of 38 million people, unlimited access to the EU market and strong relations with CIS and Balkan states.
- **A skilled workforce:** "there is no cheap labor in Poland, but a very skilled one" (Marek Łyzwa, Member of the Management Board, Polish Information and Foreign Investment Agency).
- **Specific policies to attract FDI** in the form of CIT exemption in special economic zones, which has been maximizing the impact of FDI on growth and on lifting people out of poverty. Government grants have been made available and these are managed through individual relationships and approved at the Ministry of the Economy to ensure adequate and efficient governance. In some cases, real estate exemption is granted and cash grants are available through EU funds.

Marek Łyzwa, Member of the Management Board, Polish Information and Foreign Investment Agency

maintain their investment for at least five years (three years in the case of SMEs) ensuring not only longer-term investments but also economic stability for the region. FDI in the Special Economic Zones (SEZs) had created an estimated 167,000 new jobs by the end of 2010, which itself has created spillover effects: every work placement generated in a SEZ, generated 0.75 work placements outside the SEZ (Łyzwa, M.).

Maximizing Returns from FDI in R&D

The effect of FDI depends heavily on the country circumstances and response but there are ways to maximize returns from R&D and to leverage MNC R&D. These include having an environment conducive to research; a mix of basic and applied research, global networking, specialization, and a strategic focus of firms on innovation (Yusuf, S.). To do this,

R&D should be a part of strategy for growing technology-intensive subsectors and foreign R&D should complement specialized domestic research capacity building. Mr Yusuf highlighted key aspects of strategy for governments to consider when thinking about how to best leverage MNC R&D. Strategy should embrace:

- SME and linkage development as in Ireland, especially with smaller MNCs.
- Lowering the impact of 'crowding-out' effects; policy must include incentives for research and innovation by leading national companies.
- University research focus, scholarship and post-doctorate programs, entrepreneurship and business linkages.
- Services and extension to increase new entry and growth of firms.
- Urban development that fosters entrepreneurship, innovation and R&D: key ingredients – skills, social services, affordable housing, recreational amenities, and supporting infrastructure (as is the case with Bulgaria, for example).
- Business environment and fiscal incentives for FDI – Irish experience.
- Centralized agency to coordinate economic and technological development, as in Finland.

FDI has been seen to be a solution across a number of varied countries – case-studies from Ireland, Poland, Bulgaria, and Romania have drawn out some key common take-aways of how to best leverage FDI in R&D.

In particular, the discussions showed that these countries share important common features in maximizing the potential of cross-cutting spillovers from FDI in R&D:

1. **Foreign owned R&D centers in countries discussed are fully embedded in respective companies' global innovation networks.** Through being mutually embedded, foreign R&D can encourage growth in technology-intensive subsectors, and should complement specialized



domestic research capacity building. Hewlett Packard in Bulgaria, for example, sees itself as having a key role in transferring the world-leading know-how that it enjoys. It has set up key projects with the government, and national telecoms and banking

sectors. It has set up consultative bodies, IT strategies, and business concepts for the public and private sectors, including SMEs (Bezuhanova, S.).

2. Foreign owned firms have been a catalyst for establishing various forms of clusters. Hewlett Packard, for example, is positioning itself as a catalyst for establishing technopark clusters. Ms Sasha Bezuhanova, CEE Public Sector Director, Hewlett Packard, is vocal about Bulgaria's potential of becoming "the 'Silicon Valley' of the Balkans" and outlines how the government can foster this development (see Chapter 2: Mainstreaming Innovation Policies). Nevertheless, hubs often grow organically (Yusuf, S.) such as Renault Technologie Romanie (RTR) development of a regional hub for automotive engineering, with core activities in Romania and spoke activities across Turkey, Slovenia and Russia (Buse, S.) (See Case-Study 7 below).

Foreign owned firms have been

engaged in different forms of education. For example, Hewlett Packard in Bulgaria has set up IT academies and collaborated in the design and sponsoring of university programs, collaborating with Technical University (TU), Sofia University, and the New Bulgarian University (NBU). It sees the growth of high profile engineers as an essential demonstration of its commitment to the country. It saw its collaboration with public research institutes as part of its efforts to sell Hewlett Packard within Bulgaria. However, according to Ms Bezuhanova "confidence building and long-term relationship-building takes time, you cannot jump directly into R&D-intensive FDI."

Case-study 4: Hewlett Packard's Best Shore business model

Hewlett Packard ensures that it contributes economically, intellectually, and socially to the countries and communities it does business in. Its policy ensures that its FDI and offshore locations benefit from widened access to technologies and transfer of world-leading know-how. Its model hinges upon 'Best Shore' strategy.

Hewlett Packard has been in Bulgaria for more than 40 years and employs 4000 people. It has been recognized as the number one IT company in the Bulgarian market for the last 10 years and the Hewlett Packard Bulgaria team has contributed to Hewlett Packard worldwide best practice.

Best Shore is a strategy for providing a homogeneous network of high quality, cost advantaged delivery centers. The Best Shore Delivery Centers work closely with the regional teams and the global functions to deliver a comprehensive suite of ITO (Infrastructure Technology Outsourcing) services to Hewlett Packard's customers, using standard tools and processes.

It becomes embedded in the country's processes and systems by establishing long-term relationships and commitment to the country, for instance, it took two years to sell Hewlett Packard within Bulgaria. This involves working closely with the public sector and building trust and public awareness through collaboration with universities, community programs and through providing consultancy services. These activities and close relationships with the public sector, Non Government Organizations (NGOs) and companies have led to Hewlett Packard achieving a strong place in the country's innovation sector, exemplified by Ms Sasha Bezuhanova, Hewlett Packard CEE Public Sector Director, being voted most influential woman in Bulgaria.

Hewlett Packard also ensures strong linkages by having an end-to-end portfolio in the country. This includes ITO services, data centers, workplace network, security services desk and remote management. R&D activities in the Americas and EMEA regions are closely linked with large-scale cost advantaged APJ Centers (Asia Pacific and Japan), supplementing their activities, which helps create regional clusters.

Ms Sasha Bezuhanova, Hewlett Packard CEE Public Sector Director

Country case-study 7: Romania – Renault’s creation of Regional Hubs

Renault Technologie Roumanie (RTR) has positioned itself as the biggest Renault engineering center outside of France, and the only automotive engineering center in Eastern Europe, building a basis for a regional automotive engineering hub based in the country.

This situation, in part, grew organically out of a long-term relationship between Renault France and the Romanian State. The state-owned car company’s relationship with Renault dated back to a ten-year licensing agreement it signed with the firm, running from 1968-1978. When privatization of the company became a possibility, with a general liberalization of the Romanian economy in the 1990s, Renault had the competitive advantage when starting negotiations on absorbing the public company as it already had a proven track record, and knowledge of systems and processes in-country. In 1999 Dacia, the Romanian state-owned car manufacturer signed a privatization contract, becoming Dacia Renault Group.

Dacia Renault Group has produced bench-mark products, the existence of which help produce a ‘Brand Romania’. In 2004, it produced the Dacia Logan, a bench-mark in terms of performance and price and reaffirmed this bench-mark through the Dacia Duster, launched in 2010. These achievements provide the background conditions for skills transfer in the long-term and enable the future growth of an automobile engineering specialty in Romania.

Renault Technologie Roumanie has positioned Romania as a regional hub for the automotive industry. Its activities’ hub in Romania employs 2,400 people across three sites and its spoke activities employ a further 1,470 people across Turkey, Slovenia and Russia. It is building on this model through the Titu Technical Center, inaugurated in September 2010, which houses the second biggest test center for Renault Worldwide. Importantly, Renault is, at the same time, linking these regional activities to home country R&D and integrating R&D activities further along its value chain. The Titu Technical Center, for instance, complements technical centers in Aubevoye and Lardy (France).

Mr Soren Buse, Renault Technologie Roumanie, General Manager.

“Confidence building and long-term relationship-building takes time, you cannot jump directly into R&D-intensive FDI”

Sasha Bezuhanova, Hewlett Packard CEE Public Sector Director

CONCLUDING SUMMARY

It is clear that R&D and innovation can promote growth and can help countries recover from an economic downturn. R&D and innovation provide new growth products and services, lead to higher level skills and greater knowledge and technology absorption, while building technological capabilities. They also encourage scientific advancement and the generation of patents, which have potential commercial value (Yusuf, S.).

Although R&D fosters growth, much depends on the country context. That is, it depends on a country’s particular mix of challenges (for example, the areas in which private investment needs most encouragement) and opportunities (such as competitive advantages, geographical location and access to markets). Perhaps one of the key points arising from the discussions of innovation is that our need to understand country-specific policy requirements warrants further research. Policy responses should play to a country’s starting endowment, which varies, although the issues encountered are similar (Hahm, H.).

Indeed, Dr MoonJoong Tcha, Managing Director, Center for International Development, KDI, in his summary of the workshop, talks about playing to a country’s current or desired comparative advantage. If a country wants to foster labor-intensive comparative advantage it must have a good labor base; if it wants to foster a capital-intensive comparative advantage it must have sufficient capital; and if it wants to foster a knowledge-intensive comparative advantage it must have a strong knowledge base. The way to achieve this is through cross-cutting innovation policies.

Having said this, one commonality of success stories and solutions currently being explored in the countries discussed is that long-term cross-cutting innovation policies can provide a basis for an innovation-led economy and post-crisis growth. To implement and mainstream innovation policies successfully, we should take into account the following key points:

- Strategies to mainstream innovation policy need to consider factors in raising public awareness, because to ensure country ownership of resultant reforms, it is necessary to have broad-based support for innovation.
- The key contribution of a comprehensive innovation policy is in ensuring cross-sector collaboration and coordination of policy agendas that facilitate local innovations.
- Many successful innovation policies prioritize and reduce the need for public funding, rather than develop new instruments for R&D financing.
- Policy-making needs to be highly selective in choosing policy instruments that are most suitable to the country context.
- The innovation policy will only achieve impact if government actions are predictable, which can be achieved, in part, through effective monitoring and evaluation systems and indicators. Predictability, however, does not mean that innovation policy is set: it should be periodically reviewed and, if necessary, adjusted, to changing conditions.
- A strong knowledge base is essential, and can be fostered through higher education reforms and long term investment in the education system as well as through encouraging international knowledge transfer.

All these factors not only increase innovation impact on growth but also incentivize FDI in R&D. FDI in R&D can be part of countries' success stories, but it must be balanced with promoting SMEs (this can be achieved through SME and linkage development, as in Ireland) and incentives for home-grown research to avoid negative effects of crowding-out. A centralized agency to coordinate economic and technological development, as in Finland, can help ensure this balance. MNC R&D spillover effects and returns can also be encouraged by focusing on university research, scholarship and

post-doctorate programs and on providing services to increase new entry, efficiency and growth of innovative firms.

Alongside this, urban development needs to foster entrepreneurship, innovation and R&D. The key ingredients of this are adequate skills, social services, recreational amenities, affordable housing and supporting infrastructure (as is the case with Bulgaria, for example).

All workshop participants agreed that innovation policy can be part of a continued recovery and growth strategy. As has been emphasized, country specific policies should be formulated in the context of the organic nature of growth in the R&D sector and by prioritizing those areas which show signs of becoming new growth areas. Finland, for example, focused on the promotion of the mobile phone industry. Whereas, in Croatia and Korea, the most appropriate use of innovation policy was to develop the aquaculture and ICT industries, respectively.

As Mr Hongjoo Hahm, Country Manager Croatia, World Bank, summed up, we can learn as much, if not more, from stories of failures as from stories of success. The Finland mobile phone industry case also illustrates the fact that in the prioritizing of certain areas for development, we should take care not to oversaturate any given market. Croatia and Ireland have been held back in their commercialization of research

outputs due to insufficient technology transfer, which highlights the importance of technology transfer in fostering an innovation economy.

Mr MoonJoong Tcha, Managing Director, Center for International Development, KDI, points out that knowledge is a public good and as we are living in the era of ICT and globalization, we should trade knowledge, just as we trade in commodities and goods. The previous success stories of Finland, Korea, and Switzerland and of current or planned policy responses from Bulgaria, Croatia, Poland and Romania, show how the private and public sectors, along with research institutes, come together for the benefit of their countries by bringing employment gains and human welfare. The stories show the importance of the collaborative approaches that lead to the cross-fertilization of ideas, technology and policy initiatives (Mr Hahm, H.).

The issues raised in the workshop discussions have provided a basis for analysing the next steps to be taken in innovation policy decision-making. The size of R&D public and business expenditure, for example, one of the targets of the Europe 2020 Strategy, should be used as a measure of progress in shifting towards knowledge-intensive economy, rather than an objective. The take-away points discussed in the workshop report can be used as a measure for success as well as a guide to policy prioritization.

Box 5. Workshop Reflections

Dr MoonJoong Tcha, Managing Director, Center for international Development, KDI and Mr Hongjoo Hahm, Country Manager Croatia, World Bank, provided insightful reflections on the workshop as part of their closing remarks. These include:

Through being one of the most "vocal and active" conferences on the subject (Mr Hongjoo Hahm, Country Manager Croatia, World Bank), **the workshop has facilitated valuable knowledge sharing:** "Stories of failure and success must be shared with many countries; this is one way of improving cross-cutting productivity". (Dr MoonJoong Tcha, Managing Director, Center for international Development, KDI).

As the workshop has helped increase connectivity and cross-fertilization of ideas, Dr Tcha said he had found it very "interesting and insightful" and admitted that he had "learned a lot" from the workshop.

Mr Hahm concluded that the workshop had provided **"practical hands-on knowledge"** of what other countries are doing in the field of innovation policy and has allowed policymakers to learn from other policymakers.

APPENDIX I: CHECKLIST OF EUROPE 2020 INNOVATION TARGETS

The list of indicators below provides the basis for an annual performance score-board, as part of the monitoring of the Innovation Union. The data, using the latest available statistics, will be presented for each

Member State, for the European Union, and for main non-EU countries. The score-board will be maintained until 2020 and will be subject to review periodically, depending on the availability of new data sources

and/or new policy orientations. The Commission will look for an additional performance indicator reflecting gender for inclusion in the score-board.

EUROPE 2020 INNOVATION TARGETS CHECKLIST

1. Human Resources

New doctorate graduates (ISCED 6) per 1000 population aged 25-34

New doctorate graduates (ISCED 6) per 1000 population aged 25-34

Percentage population aged 30-34 having completed tertiary education

Percentage youth aged 20-24 having attained at least upper secondary level

2. Education

International scientific co-publications per million population

Scientific publications among the top 10 per cent most cited publications worldwide as a percentage of total scientific publications of the country

Non-EU doctoral students per million population

3. Finance and Support

Public R&D expenditures as a percentage of GDP

Venture capital (early stage, expansion and replacement) as a percentage of GDP

4. Firm Activities

Business R&D expenditures as a percentage of GDP

Non-R&D innovation expenditures as a percentage of turnover

SMEs innovating in-house as a percentage of SMEs

Non-domestic doctoral students for non-European countries.

Innovative SMEs collaborating with others as a percentage of SMEs Eurostat

Public-private co-publications per million population

PCT patents applications per billion GDP (in PPS€)

PCT patent applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)

Community trademarks per billion GDP (in PPS€)

Community designs per billion GDP (in PPS€)

5. Outputs
SMEs (more than 10 employees) introducing product or process innovations as a percentage of SMEs
SMEs (more than 10 employees) introducing marketing or organizational innovations as a percentage of SMEs
High-growth enterprises (with more than 10 employees) as a percentage of all enterprises
Employment in Knowledge-Intensive Activities (manufacturing and services) as a percentage of total employment
Medium and High-tech manufacturing exports as a percentage of total product exports
Knowledge-Intensive Services exports as a percentage of total service exports
Sales of new-to-market and new-to-firm innovations as a percentage of turnover
License and patent revenues from abroad as a percentage of GDP

APPENDIX II: LIST OF WORKSHOP PARTICIPANTS

Bulgaria

	Invitee	Position
1	Mr Evgeny Angelov	Deputy Minister, Ministry of Economy, Energy and Tourism
2	Prof. Kostadin Kostadinov	Chief Secretary of the Bulgarian Academy of Sciences
3	Ms Sasha Bezuhanova	Hewlett Packard CEE Public Sector Director

Croatia

	Invitee	Position
4	Ms Danica Ramljak	Director, Ruder Boškovic Institute
5	Mr Hrvoje Meštric	Director for Science, Ministry of Science, Education and Sports
6	Mr Dalibor Marijanovic	Director, Business Innovation Center of Croatia – BICRO
7	Ms Ivana Nagy	Sr Executive Director, R&D, Business Innovation Center of Croatia – BICRO
8	Mr Branimir Berkovic	Executive Director, Croatian Bank for Reconstruction and Development – HBOR

9	Nico Raic	Director, Ministry of Finance
10	Branko Glamuzina	Vice Rector for Science and Technology, Dubrovnik University
11	Jurica Jug-Dujakovic	Director, Technology and Business Innovation Center for Mariculture - Maribic

Poland

	Invitee	Position
12	Mr Marek Radzikowski	Chief of the Policy Cabinet of the Minister of Finance
13	Mr Leszek Grabarczyk	Deputy Director, National Center for R&D
14	Mr Zbigniew Kamienski	Deputy Director of the Innovation Policy Unit, Ministry of Economy
15	Ms Beata Lubos	Head of Innovation Policy Unit, Ministry of Economy
16	Mr Marek Lyzwa	Member of the Management Board, Polish Information and Foreign Investment Agency

Romania

	Invitee	Position
17	Mrs Cornelia Simion	Director, Ministry of Economy, Commerce and Business Environment Youth and Sports
18	Mr Alexandru Cabuz	Adviser to the President, National Authority for Scientific Research
19	Ms Roxana Petrescu	Director, Ministry of Public Finance
20	Mr Sorin Buse	Executive Director of Renault Technologie Romania

International Experts

	Invitee	Position
21	Andrei Broder	Vice President of Yahoo! Research
22	Anna Vidos	Expert, RBI
23	Arabela Aprahamian	Senior Operations Officer, World Bank
24	Benedikt Herrmann	RTD, European Commission
25	Charlina Vitcheva	Director, DG Regio, European Commission
26	Evgeny Evgeniev	Country Officer, Bulgaria
27	Gabriel Goddard	Economist, ECSPF
28	Hongjoo Hahm	Country Manager for Croatia, World Bank

29	Jang Saeng KIM	Education and STI Specialist, Policy Research Division, Center for International Development of KDI
30	Igor Radusinovic	Associate Professor at the University of Montenegro, former Deputy Minister for science, research and technological development at Ministry of Education and Science
31	Keith O'Neill	Director of Lifescience & Food Commercialization Department, Enterprise Ireland Head of Research and Innovation, Enterprise Ireland
32	Kurt Larsen	Senior Innovation Specialist, World Bank Institute
33	Ljiljana Kundakovic	Serbia Innovation Fund
34	Mauro Dell'Ambrogio	State Secretary for Education and Research, Federal Department of Home Affairs Switzerland
35	Michael Mowlam	Director, Inspiris
36	Mikko Alkio	former State Secretary of the Ministry of Employment and the Economy and adviser to the Prime Minister on globalization issues
37	Moon-Joong Tcha	Managing Director, Center for International Development, KDI
38	Natalia Agapitova	Program Officer, WBI
39	Natasha Kapil	Private Sector Specialist, Poland
40	Paulo Correa	Lead Economist, World Bank
41	Sabine Germe	European Commission, Directorate General for Regional Policy
42	Sereen Juma	Senior Country Officer, World Bank
43	Shahid Yusuf	Economic Adviser, World Bank Institute
44	Silvia Viceconte	Policy Coordinator, Strategic Objective Prosperity, European Commission
45	Sungchul Chung	Korean Experience in Prioritizing Innovation, Representative from Korea

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- Correa, P. Lead Economist, Europe and Central Asia Region, Finance and Private Sector Development, The World Bank. Presentation: “Innovation and R&D during the crisis: Evidence from firm-level data for selected ECA Countries”.
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