



MINISTRY OF
EDUCATION

Evaluation of the Finnish National Innovation System Policy Report

www.evaluation.fi



TYÖ- JA ELINKEINOMINISTERIÖ
ARBETS- OCH NÄRINGSMINISTERIET
MINISTRY OF EMPLOYMENT AND THE ECONOMY

This page is intentionally left blank
for double-sided printing

Evaluation of the Finnish National Innovation System – Policy Report

www.evaluation.fi (Also available: Full Report)

Chair of the evaluation panel:	Professor Reinhilde Veugelers Katholieke Universiteit Leuven (Belgium)
Other international panelists:	Professor Karl Aiginger Austrian Institute of Economic Research (WIFO) Professor Dan Breznitz Georgia Institute of Technology (USA) Professor Charles Edquist Lund University (Sweden) Professor Gordon Murray University of Exeter (UK) Professor Gianmarco Ottaviano Bocconi University (Italy)
Finnish panelists:	Professor Ari Hyytinen University of Jyväskylä Research Professor Aki Kangasharju VATT, The Government Institute for Economic Research Adjunct Professor Mikko Ketokivi Helsinki University of Technology Head of Unit Terttu Luukkonen ETLA, The Research Institute of the Finnish Economy Research Director Mika Maliranta ETLA, The Research Institute of the Finnish Economy Professor Markku Maula Helsinki University of Technology Professor (Emeritus) Paavo Okko Turku School of Economics Research Director Petri Rouvinen Etlatieto Oy (a subsidiary of ETLA) Professor Markku Sotarauta University of Tampere Researcher Tanja Tanayama HECER, Helsinki Center of Economic Research and Etlatieto Oy Director Otto Toivanen HECER, Helsinki Center of Economic Research CEO Pekka Ylä-Anttila Etlatieto Oy (a subsidiary of ETLA)

Publisher: *Taloustieto Oy* (on behalf of the *Ministry of Education* and the *Ministry of Employment and the Economy*)

Helsinki University Print, 2009

Cover design: *Porkka & Kuutsa Oy*
Cover photo: *Kai Kuusisto / Plugi*
ISBN 978-951-628-490-6

Sounding Board

Chairs of the sounding board:	State Secretary Mikko Alkio (until 31 July 2009) Ministry of Employment and the Economy
	State Secretary Riina Nevamäki (since 1 August 2009) Ministry of Employment and the Economy
Other members of the board:	Ministerial Advisor Pirjo Kutinlahti Ministry of Employment and the Economy
	Director Anita Lehikoinen Ministry of Education
	State Secretary Heljä Misukka Ministry of Education
	State Secretary Velipekka Nummikoski Ministry of Finance
	Director General Petri Peltonen Ministry of Employment and the Economy
	State Secretary Terttu Savolainen Ministry of Social Affairs and Health
	Special Government Advisor Ilkka Turunen Ministry of Education

Members of the research and support team

Ali-Yrkkö, Jyrki; **Autio**, Erkki; **Deschryvere**, Matthias; **Dixon**, Roderick; **Hyvönen-Rajecki**, Kaija; **Koski**, Heli; **Kotilainen**, Markku; **Kotiranta**, Annu; **Nikula**, Nuutti; **Nikulainen**, Tuomo; **Paasi**, Marianne; **Pajarinen**, Mika; **Palmberg**, Christopher; **Rogers**, John; **Saariokari**, Pirjo; **Tahvanainen**, Antti; **Takalo**, Tuomas; **Väänänen**, Lotta.

This **Policy Report** summarizes the key findings of the evaluation. The **Full Report** provides further details and elaboration. Some of the studies conducted to support the evaluation are also available separately:

- Autio, E. (2009). High-Growth Firms in Finland: Issues and Challenges. *ETLA Discussion Papers*, 1197.
- Deschryvere, M. (2009). A Comparative Survey of Structural Characteristics of Finnish University Departments. *ETLA Discussion Papers*, 1195.
- Kotiranta, A., Nikulainen, T., Tahvanainen, A.-J., Deschryvere, M., & Pajarinen, M. (2009). Evaluating National Innovation Systems – Key Insights from the Finnish INNOEVAL Survey. *ETLA Discussion papers*, 1196.
- Nikulainen, T., & Tahvanainen, A.-J. (2009). Towards Demand Based Innovation Policy? The Introduction of SHOKs as Innovation Policy Instrument. *ETLA Discussion Papers*, 1182.
- Tahvanainen, A.-J. (2009). Finnish University Technology Transfer in a Whirl of Changes – A Brief Summary. *ETLA Discussion Papers*, 1188.
- Takalo, T. (2009). Rationales and Instruments for Public Innovation Policies. *ETLA Discussion Papers*, 1185.
- Tanayama, T., & Ylä-Anttila, P. (2009). Tax Incentives as Innovation Policy Tool (in Finnish with an abstract in English). *ETLA Discussion Papers*, 1189.

Free electronic versions of all reports and studies as well as other related material are available at www.evaluation.fi.

To obtain printed copies of the reports, please fill a form at the web site or contact

Riikka **Pellikka**, Ministry of Employment and the Economy, riikka.pellikka@tem.fi, +358 50 302 7671.

Contacts

Pirjo **Kutinlahti**, Ministry of Employment and the Economy, pirjo.kutinlahti@tem.fi, +358 10 606 3548

Petri **Rouvinen**, Etlatieto Oy, petri.rouvinen@etla.fi, +358 9 6099 0202

Ilkka **Turunen**, Ministry of Education, ilkka.turunen@minedu.fi, + 358 9 1607 7299

Table of Contents

Preface > 4

Executive Summary > 9

Overview and General Conclusions

1. Evaluation Task > 12
2. Future Challenges and Ongoing Reforms > 14
3. Policy Governance and Steering > 20

Six Main Points of View: Summaries by Sub-Panel

4. Broad-Based Innovation Policy > 34
5. Demand- and User-Driven Innovation > 42
6. Globalization of Business Activities > 52
7. Growth Entrepreneurship and Finance > 60
8. Geography of Innovative Activity > 70
9. Education, Research and the Economy > 78

Growth Strategy: A Strong Commitment to Education, Research, and Innovation

10. The Way Forward > 88

Bibliography > 90

Endnotes > 92

Preface

In the fall of 2008 the *Ministry of Education* and the *Ministry of Employment and the Economy* commissioned an international evaluation of the Finnish national innovation system. As I was in the final months of my term as an economic advisor at the *Bureau of European Policy Analysis* to JM Barroso, European Commission, and not yet fully returned to my professorship at *Katholieke Universiteit Leuven* (Belgium), the timing was perfect for me to learn about the features of the innovation system that continues to be admired and imitated worldwide.

Shooting a moving target

The evaluation mission turned out to be challenging not only due to its considerable scope and shortness of time, but also because of the several ongoing transitions in the Finnish system, in part induced by the new innovation strategy (Aho, *et al.*, 2008) that served as our starting point; at least four major reforms advanced along with our evaluation and dozens of new policy initiatives have seen the light this year alone. Our solution to this **moving target** problem was to employ heterodox approaches and work (partly) in smaller groups. Despite the evolving nature of the system, as well as the valuable and welcomed diversity in the opinions of the panel, we ended up with a coherent joint view on conclusions that should help

in *implementing the Strategy* and in *steering the system* towards a better future.

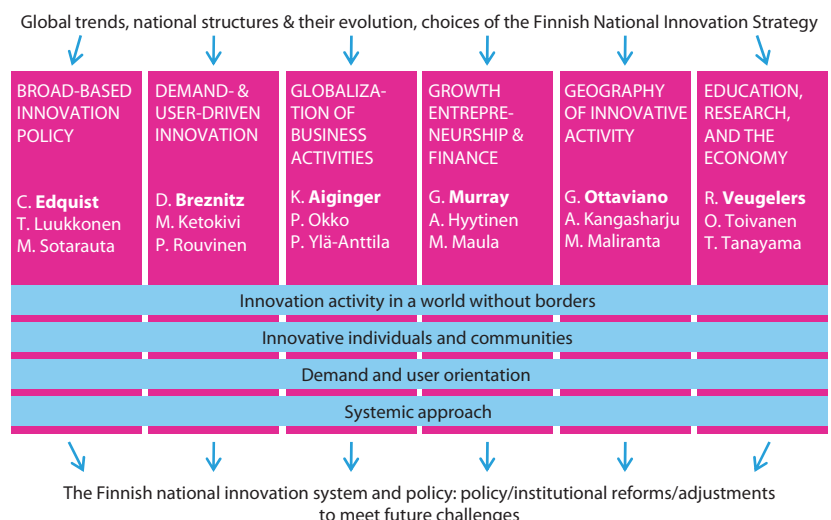
Our evaluation **task** is outlined in the original contract notice (ref. no. 2327/420/2008), as well as in the evaluation brochure, prepared for the opening press conference on 11 December 2008: The Ministries specifically wanted an *independent outside view* of the system. We were to look into the current and *future challenges* and consider whether or not they are sufficiently acknowledged and addressed. We were to point out needs for institutional and policy *adjustments and reforms*, as well as to draw conclusions on *policy governance and steering*. Given the short time and broad coverage of our task, we were to evaluate the system as a *whole* rather than focus on individual actors, organizations, and instruments. In our evaluation we looked particularly at whether public bodies and policies assist and incentivize both public and private individuals and organizations in generating and utilizing novel ideas.

In collaboration with the two Ministries, the evaluation panel settled on **six main points of view** in the evaluation (Exhibit 1); the basic choices of the Strategy underlie each point of view. We organized ourselves into six sub-panels, one for each main point of view. Based on the work by the sub-panels, we draw our overall conclusions as the whole panel.

Each sub-panel was led by an international expert working with two Finnish ones: an academic

Exhibit 1: The basic choices underlie the six main points of view, each studied by a sub-panel led by an international expert.

Source: The brochure prepared by the *Ministry of Education* and the *Ministry of Employment and the Economy* for the opening press conference of the evaluation on 11 December 2008.



scholar and an innovation researcher representing ETLA. Given the task and the time, each sub-panel had to make hard choices as to its approach and emphasis; all pressing issues could not be addressed. In writing the report we have attempted to produce self-contained chapters, even if this necessarily brings about some repetition.

Innovation policy remains an art rather than a science

In the context of this evaluation, we largely took the premises for innovation policy for granted, even if we are fully aware that the underlying theories and empirics remain less-than-satisfactory to effectively guide policymaking, which poses a challenge.

Society's interest in innovation stems from its central role as a sustainable source of long-term economic growth and thus improving welfare (Aghion & Howitt, 2009). Innovation policy is primarily motivated by failures in the market for information (Arrow, 1962). While the central role of innovation and related policy justifications are both clear and undisputable, they become much more fraught with difficulty when considered in detail.

For instance, small open economy considerations call for adjustments in policy rationales. While this is indeed frequently acknowledged (Toivanen, 2008), in reality the employed theories and thinking have not been adjusted accordingly.

Even if innovation policy should be as dynamic and evolving as its targets, decades can go by with little real change in policy conduct. Unfortunately, innovation policy theories are often mute on how to adapt and change existing policies into new directions, overcoming resistance to change.

The perspective of aggregate societal benefits does receive some attention, but discussion quickly slips into considering individual public bodies and their actions. One should more often have an overall systemic view of the incentives and actions of individuals and organizations currently targeted by a bewildering array of instruments and measures; how they work in tandem is largely unknown.

The above (and several others) are not just issues in the scholarly research agenda; they are also prac-

tical policy concerns. Finland is in a unique position to lead innovation policy thinking *globally* by filling these gaps in scholarly knowledge and by providing the scene for real policy experiments.

Some personal observations on Finland and the Finns

Finland certainly has more than its fair share of capable civil servants, which (as a group) seem to be influential in steering and developing the system. Often they are not only willing, but also *eager to accept new ideas* and rapidly integrate them into policy discussion. Nevertheless, Finland seems to share the same institutional inertia as other countries when it comes to implementing reforms.

Curiously enough, there is almost an *expectation* of intervention in Finland. The possibility of a government failure in fixing the market is not always considered in depth. There seems to be a culture of *direct and visible public involvement* – on the other hand there seems to be less trust in alternative more indirect measures. Broader effects, say with respect to competition or re-allocation of resources, occasionally escape policymakers' attention. As in many other countries, consideration of the interaction of the new (to-be-introduced) and the old (still continuing) measures is sometimes lacking. Even if there is a host of available tools (Takalo, 2009), there seems to be a tendency to stick with the same traditional instruments and sectors. For example, green innovation seems to be less integrated into Finnish mainstream innovation policy discussions.

Incentives of individuals and organizations are often mentioned in Finland, but considering them is not fully integrated into policy thinking. Cutting-edge innovative and entrepreneurial activity needs to engage the best and the brightest individuals and organizations globally. This is most likely to happen in countries where their *successful* efforts are rewarded appropriately.

Finns seem to be superb at institutionalizing things. However, more attention should be paid to steering and developing institutions, once established, to meet changing needs and perhaps discontinuing them when they become obsolete. Indeed, in

some cases *successful public institutions render themselves obsolete* by assisting development to the extent that sustainable private solutions emerge.

Upon seeing and hearing all the top innovation policy actors one after another in January 2009, I was struck by how uniformly they seemed to think and how reluctantly they expressed even remotely controversial opinions. While this remarkable consensus is an asset in certain ways, (also) in the domain of innovation policy Finland would benefit from more high-flown thinking and outside exposure, for example, in the form of exercises such as ours.

Finland has ample upside potential

While not obvious on the surface, a closer look suggests that Finland appears to have certain structural challenges. Reactions to them may have been hampered because, according to many indicators, up until recently Finland was doing well in its traditional strongholds. Now there is both a need and an opportunity to make a clear break with the past. It remains to be seen whether or not there is sufficient courage and political will to see these reforms through. It is certainly my hope that our exercise does not turn out to be just another report but that it leads to further material developments.

In the course of its history the Finnish system has grown complex to both access and administer. Reactions to the Strategy we have been observing during our exercise mostly add to the existing clutter. As in many other countries, touching institutional boundaries seems to be a taboo in Finland. Yet, it is hard to imagine how the necessary streamlining could be achieved without it.

In my understanding the ongoing university reform is the most important change in the public aspects of the Finnish innovation system since establishing *TeKes*. While the reform has its risks, the panel takes a strong stand for it. We welcome its ambitions and encourage its implementation to be even more radical than what is currently being suggested. One of the main issues to be dealt with is the highly divided attitudes and views of the actors within the educational system. Furthermore, it would be equally important to reform non-university public research, as

well as to forge a clear division of labor between universities and polytechnics.

The two main weaknesses of the Finnish system, (somewhat dismal) growth entrepreneurship and (lacking) internationalization, arguably remain **orphans** in the system, that is, they are both mostly side issues for a number of public institutions and not forcefully advanced by any. One of the problems in addressing these two issues is that neither is really represented where decisions are made.

Overall, the Finnish innovation system and its policy-making are very 'Finnish' (which in many ways is a great asset). Efforts to change this are yet to bear fruit. While more global exposure is needed in Finland, it should be kept in mind that it is a tool rather than an end to itself. Internationalization is perhaps better advanced by removing its explicit and implicit obstacles than by direct measures.

Global – and even European – considerations seem to be somewhat remote. While the European Union is looking at Finland, to learn from its innovation policy design, Finland should also look more at the European Union. The Finnish innovation system has much to gain from integrating into the single European market for goods and services, as well as into the European Research and Higher Education Area. Indeed, in my opinion the success of the Finnish university reform hangs in part on having a single European market for researchers and students.

The ongoing economic and financial crisis started to fully unfold only after we had submitted our evaluation proposal and had laid-out our detailed work plan. Thus, some issues related to the crisis are not integrated into our analysis. In any case, developing a country's innovation system is a medium- and long-term issue. The current crisis may nevertheless be of such a nature that it induces more long-term and even permanent changes in the geography and locus of specialization in innovative activity.

It is quite possible that Finland currently **has** one of the best national innovation systems worldwide. Even that may not be enough in an era, where the global operating environment is rapidly evolving and the whole concept of a **national** innovation system has rightly been questioned (Nelson, 1993). Companies have been the primary object of the innovation policy but, as they become increasingly footloose and

geographically dispersed, the focus may have to shift to nurturing and attracting creative individuals.

The survey conducted to support the evaluation suggests that the actors of the Finnish innovation system are optimistic about the ongoing reforms and the future of the system. I personally share this optimism: while some of our proposals are laborious to implement, with some adjustments the good Finnish system could be much better equipped to meet future challenges!

Acknowledgements

In the course of the past year or so, the evaluation exercise proved to be both enjoyable and educational. The final outcome can be seen in this **Policy Report**, as well as in the complementing **Full Report**. The former serves as a gentle introduction and summary of our core findings; the latter provides further details and elaboration. I must say that I am personally very happy with the outcome, since in my opin-

ion we managed to meet and even exceed the high expectations (at least my own). Obviously this is first and foremost due to my fellow panelists, impeccably supported by *Etlatieto Oy* (a subsidiary of *ETLA, The Research Institute of the Finnish Economy*) and the research team – thank you very much to all those involved! Over a dozen separate studies were conducted to support our work. Some of these are published separately along with the two main reports.

On behalf of the whole panel, I would like to express our gratitude to the two Ministries, as well as to the Sounding Board overseeing the project, not only for their generous support, but also for vigorously defending the integrity of the panel.

In the course of the exercise we have interviewed and heard over one hundred key actors and experts of the innovation system, the names of which are listed in Exhibit 2. Furthermore, around two thousand individuals responded to the survey conducted to support the evaluation. The inputs of these individuals and organizations is highly appreciated – without it, we could not have completed our work.

Brussels, 18 September 2009,

A handwritten signature in black ink, appearing to read 'R. Veugelers', with a long horizontal stroke extending to the left and a vertical stroke extending downwards to the right.

Reinhilde Veugelers, on behalf of the evaluation panel.

Exhibit 2: In the course of the evaluation, the panel interviewed and heard over one hundred key actors and experts. The panel would like to thank them all – without their help, it could not have completed its work.

Aho Esko, Nokia; **Alahuhta** Matti, Aalto University; **Alitalo** Sirpa, M. of Empl. and the E.; **Alkio** Mikko, M. of Empl. and the E.; **Andersen** Dorte Nøhr, Danish Enterpr. and Constr. Auth.; **Antikainen** Janne, M. of Empl. and the E.; **Antola** Tuula, Kaipaus; **Anttila** Tapio, Sitra; **Bason** Christian, Mind Lab; **Björkroth** Johanna, U. of Helsinki; **Cardwell** Will, Technopolis Ventures; **Dammert** Ritva, Academy of F.; **Eerola** Essi, VATT; **Eskelinen** Jarmo, Forum Virium Helsinki; **Eskola** Antti, M. of Empl. and the E.; **Gädda** Lars, Forestcluster; **Grundstén** Henri, Finnish Ind. Inv.; **Hägström-Näsi** Christine, Forestcluster; **Hakkaraïnen** Maija, Tekes; **Halme** Kimmo, Advansis; **Hämäläinen** Timo, Sitra; **Hammer-Jakobsen** Thomas, Copenhagen Living Lab; **Hansen** Marie Louise, Danish Enterpr. and Constr. Auth.; **Hassinen** Saara, SHOK Health and Well-being; **Hautamäki** Antti, U. of Jyväskylä; **Häyrynen** Kari, FinPro; **Heikkilä** Pauli, Finnvera; **Helve** Heikki, City of Kuopio; **Hermans** Raine, Tekes; **Hetemäki** Martti, M. of Finance; **Holstila** Eero, City of Helsinki; **Honkanen** Seppo, Helsinki U. of Techn.; **Husso** Kai, R. and I. Council; **Järvi-kare** Terhi, M. of Finance; **Kallasvaara** Heikki, U. of Helsinki; **Kalliokoski** Petri, VTT; **Känkänen** Janne, M. of Empl. and the E.; **Kari** Seppo, VATT; **Karjalainen** Sakari, M. of Educ.; **Kauppinen** Petteri, M. of Educ.; **Kavonius** Veijo, M. of Empl. and the E.; **Kekkonen** Timo, EK, C. of Finnish Ind.; **Kemppainen** Hannu, Tekes; **Kervola** Petri, City of Kuopio; **Kivikoski** Jussi, Tekes; **Koppinen** Seija, VTT; **Korhonen** Kalle J., M. of Empl. and the E.; **Kosonen** Mikko, Sitra; **Kulmala** Harri, FIMECC; **Kutinlahti** Pirjo, M. of Empl. and the E.; **Laine** Seppo, Finpro; **Laino-Asikainen** Tiina, FinPro; **Lehikoinen** Anita, M. of Educ.; **Lehto** Petri, M. of

Empl. and the E.; **Lemola** Tarmo, Advansis; **Löppönen** Paavo, Academy of F.; **Löytökorpi** Sari, The Adv. Board for Sectoral Res.; **Lystimäki** Jussi, Idean; **Marjosola** Juha, Finnish Ind. Inv.; **Martikainen** Mikko, M. of Empl. and the E.; **Mattila** Markku, Academy of F.; **Misukka** Heljä, M. of Educ.; **Mustonen** Riitta, Academy of F.; **Nevamäki** Riina, M. of Empl. and the E.; **Nieminen** Markku, GE Healthcare; **Niiniluoto** Ilkka, U. of Helsinki; **Nummikoski** Velipekka, M. of Finance; **Nybergh** Paula, M. of Empl. and the E.; **Ollila** Jorma, Nokia; **Ormalala** Erkki, Nokia; **Paloheimo** Annamarja, Finnvera; **Parkkari** Tuomas, R. and I. Council; **Pauli** Anneli, EU Commission; **Pekkarinen** Mauri, M. of Empl. and the E.; **Pellikka** Riikka, M. of Empl. and the E.; **Peltonen** Petri, M. of Empl. and the E.; **Pikkarainen** Mika, M. of Empl. and the E.; **Pohjola** Hannele, EK, C. of Finnish Ind.; **Pötz** Marion, Copenhagen Business School; **Pulkinen** Raimo, Tekes; **Pursula** Tiina, Gaia; **Rintala** Kari, TE-Centre; **Romanainen** Jari, Tekes; **Rosted** Jørgen, Fora; **Saapunki** Juha, PKT-Foundation; **Saarnivaara** Veli-Pekka, Tekes; **Savolainen** Terttu, M. of Social Affairs and Health; **Seppälä** Esko-Olavi, R. and I. Council; **Sipilä** Jorma, U. of Tampere; **Suurnäkki** Anna, VTT; **Syrjänen** Mikko, Gaia; **Toivanen** Hannes, M. of Empl. and the E.; **Tukiainen** Pauliina, KCL; **Turunen** Ilkka, M. of Educ.; **Vähä-Pietilä** Kirsi, Tekes; **Valle** Antti, M. of Empl. and the E.; **Vartia** Pentti, The Adv. Board for Sectoral Res.; **Vesa** Heikki, M. of Empl. and the E.; **Vestala** Leena, M. of Educ.; **Virkkunen** Henna, M. of Educ.; **Virtanen** Erkki, M. of Empl. and the E.; **Vuola** Olli, Neapo; **Wentzel** Johan, Sentica Partners; **Wilhelmsson** Thomas, U. of Helsinki; **Ylikarjula** Janica, EK, C. of Finnish Ind.

Executive Summary

This section summarizes some of the key findings of the evaluation. It also serves as an introduction and reading guide for the three parts and ten chapters of this Report.

Introduction

This report completes an international evaluation of the Finnish national innovation system commissioned by the *Ministry of Education* and the *Ministry of the Employment and the Economy* and conducted by an independent outside panel. The assigned tasks are

- To point out needs of institutional and policy *adjustment and reforms*,
- To draw conclusions on policy *governance and steering* (Chapter 1).

The panel took six main points of view (Preface, Exhibit 1), each of which was studied by a sub-panel led by an international expert accompanied by two Finnish ones. The panel commissioned several supporting studies and carried out an extensive survey. Both qualitative and quantitative methods were employed in conducting an *evidence-based* evaluation.

The panel makes critical but constructive remarks that should help in improving the Finnish education, research, and innovation system, which is currently undergoing its biggest changes in the postwar era. It envisions a system that would get the most out of the *currently deployed* (public) resources; it was *not* asked to consider their appropriate level. The panel's mandate was *not* to consider individual organizations or their budgetary allocations, but on occasions they are touched upon.

Even if the current state of the Finnish innovation system is **good**, it is not enough: While some of the panel's proposals are laborious to implement, they are indeed needed to meet Finland's future challenges. The survey conducted to support the evaluation reveals that the actors of the Finnish innovation system are **optimistic** about its future. They are ready for, and even demand, major changes.

The findings have implications for all innovation policy organizations. The panel does not wish to imply that any particular organization would not have fulfilled its mission in the past.

Premises

Both the new innovation strategy (Aho *et al.*, 2008) and the subsequent Government's Communication to the Parliament (henceforth the two are collectively referred to as the Strategy) call for a broad-based and systemic approach as well as demand- and user-orientation in innovation policy. The Strategy highlights the increasing role of information and knowledge in the society as well as stresses the urgency in addressing the challenges induced by globalization (Chapter 3). The Strategy's basic choices constitute the premises of this evaluation.

The Strategy warns against partial solutions in developing the system. It rather calls for comprehensive renewal and structural development requiring strategic management within the public administration. It notes that individual and separate policy measures will **not** suffice.

Reflections on the Strategy

The Strategy defines **productivity improvement** as the main objective (Chapter 2), implying a balanced consideration of

- Developments *within* existing units,
- Re-allocation *between* existing units,
- *Entry* of new units, and
- *Exit* of old units.

The last three re-allocative elements have previously been waved aside. Second, the emphasis is on **pioneering**, which suggests less (innovation policy) concern for individuals and organizations that are not (seeking to be) at the global frontier.

The panel *welcomes* the ambitions of the Strategy but challenges some of its key measures. Overall the panel finds the Strategy *vague*, leaving room for misinterpretation. The panel calls for caution on several accounts: broad-based innovation policy can indeed be too broad (Chapters 3 and 4). Demand and user orientation (Chapter 5) should be interpreted as impartiality as to the source, type, and application domain of innovation, **not** as a shift to the other extreme from the current technology and supply-side emphasis. Analysis reveals that the Finnish system is less international than conventionally thought and that

there are signs that it is falling further behind (Chapter 6); current ways of addressing the issue are clearly not working.

The Finnish innovation system lacks explicit cross-ministerial decision making and execution (Chapters 3 and 7). The panel **hesitates** with the Strategy's proposal to extend the *Cabinet Committee on Economic Policy* to include innovation matters, even though it is in line with the panel's proposal that the *Ministry of Finance* and the *Ministry of Employment and the Economy* should assume a joint responsibility for the enterprise-side of innovation (and growth) policy (Chapter 7). A broader and stronger *Research and Innovation Council* is seen as an alternative for renewing the Cabinet Committee.

A call for a systemic renewal

One consequence of weak coordination within the system is that occasionally several organizations go after the same societal problem (e.g., lacking growth entrepreneurship) with similar tools, which leads to wasteful replication and adds to institutional clutter.

Current (public) aspects of the system are an outcome of an evolution of several decades. The system has grown complex to both access and administer. Thus, the evaluation calls for a reform of the current research and innovation system, including its rationales and goals as well as its organizations and instruments. The provided **outline** (Chapter 10) should not be taken as a blueprint or an organization chart but rather as a guiding principle. It is nevertheless the case that the desired outcome cannot be reached without touching existing organizational boundaries.

Taken individually, most new policy measures are consistent with the Strategy. Taken jointly, they appear *piecemeal solutions* the Strategy warns against. The panel calls for pre-screening of new actions in order to prevent duplication and overlaps (Chapter 3).

Several sub-panels touch upon the issue of using tax incentives and on the role of the *Ministry of Finance* more generally (Chapters 3, 4, and 7), which in innovation policy has been tolerating but remote. The panel urges for consideration of **all** possible innovation policy tools: *Knowledge and human capital* as well as *enablers* of innovative activity are important, but

incentives and ample rewards on success in risky endeavors are needed as well.

Since the 1980s Finland has been in transition from an investment-driven catching-up country towards an innovation-driven and knowledge-based frontier economy (Chapter 2). With this transition the locus of Finnish innovation policy has to change towards more experimentation, risk-taking, and acceptance of failure. Innovation policy should mostly be concerned with the coming up with, and employment of, truly novel ideas (new-to-the-world and radical/disruptive innovations) with considerable societal significance.

Due to changes in operating environment (e.g., globalization), logic of innovation (e.g., democratization), and internal developments in Finland (e.g., reaching the frontier), the work of all six sub-panels points towards shifting innovation policy emphasis from established incumbent companies and other organizations towards individuals and their incentives.

Reforms

The panel takes a strong stance for the university reform and encourages it to go further than what is currently being suggested (Chapter 9). The panel calls for a continuation of the higher education reform: Polytechnics are important actors in the system with their strong *regional* and *applied* role and emphasis on bachelor-level education. In the course of the 2000s, however, there seems to be an increasing tendency to make them more like nationally- and globally-orientated research universities.¹ In the panel's view this does not serve the interests of the system.² There should be a clear division of labor between universities and polytechnics.

The panel is cautiously optimistic about the national *Strategic Centres for Science, Technology and Innovations (SHOKs)* but suggests limiting public resources devoted to them (Chapter 4).³ In the panel's view *SHOKs* are mostly about incrementally renewing larger incumbent companies in traditional industries.

The true reform of sectoral research (public research organizations, PROs) remains in gridlock (Chapters 4 and 9). Even if the PROs make a worthy so-

cietal contribution as well as provide quality research and services, the panel believes that they have considerable upside potential that could be unleashed. The panel recommends moving their academically-orientated research to universities and organizing the remaining tasks into 4–5 units in accordance with larger societal needs (as opposed to the ministries' administrative boundaries). A long-term binding action plan is needed to implement the reform.

The panel calls for a *clarification and coordination* of national, regional, and local **innovation** policies as well as their links to other (non-innovation) policies (Chapter 3 and 8). Local and regional actors have grown important also in innovation policy matters. They have, e.g., assumed similar tasks as TE-Centres.⁴ Currently national innovation support has an 'unspoken' regional bias. Primarily through the previously ignored re-allocative elements, national direct support for private innovative activity may

have a negative overall impact in the relatively disadvantaged regions (Chapter 8). While direct cost is not very large, the total cost becomes considerable in terms of hampered regional development and foregone growth. The panel's proposal is to make the system transparent and not to make regional imbalances a concern for national direct support of private innovative activity.⁵

Final remark

The Finnish system is at a crossroads due to both internal and external factors. Innovation (policy) is in turmoil worldwide. While Finland is quite well-positioned to meet future challenges, there is a unique **opportunity** for further reforms. Furthermore, both structural challenges and the financial crisis bring about a sense of **urgency** that should not be wasted.

1. Evaluation Task

The brochure prepared by the *Ministry of Education and Ministry of Employment and the Economy* for the opening press conference on 11 December 2008 outlines the evaluation as shown below (Sections **Evaluation**, **Objectives**, **Premises**, and **Task** are direct copies from the brochure; *italics* as in the original; additions in parenthesis).

Evaluation

In August 2008 the *Ministry of Employment and the Economy* issued a contract notice on a public procurement regarding an *International Evaluation of the Finnish National Innovation System*. The Ministry selected the project through a group of international panelists (the members of the panel: Page 1 of this Report) coordinated by *Etlatieto Oy*, a subsidiary of *ETLA, The Research Institute of the Finnish Economy*. The work will be completed in September 2009.

The evaluation is headed by a panel of internationally acknowledged experts. Each foreign panelist works with two Finnish panelists. The panelists will draw their overall conclusions in part based on these sub-projects.

The project is overseen by a Sounding Board primarily consisting of state secretaries in various ministries (the members of the board: Page 2 of this Report).

Objectives

The objectives of the evaluation are:

- To form an *outside view* of major drivers of change in the system, as well as to evaluate how well they are addressed in innovation policy.
- To identify ways of addressing the current and *future challenges*.
- To point out needs for institutional and policy *adjustments and reforms*.
- To draw conclusions and recommendations for the *policy governance and steering*.

Premises

The evaluation is based on the basic choices of the *National Innovation Strategy*:

- Innovation activity in a world without borders.
- Demand and user orientation as a basis for innovation activity.
- Individuals and communities create innovations.
- Systemic approach – interdependence of success factors.

Task

Given the short time and broad coverage of the task, the innovation system is mostly evaluated as a *whole*; thus the focus is *less* on individual actors, organizations, and instruments. The evaluation is *less* about history or current structure and *more* about coming up with proposals for enhancing the system to meet future challenges. The main points of view in the evaluation are defined by the six sections in the figure above (see Exhibit 1 in the Preface of this Report); the basic choices of the strategy underlie each of the sections.

Remarks

The panel commissioned about a dozen supporting studies and conducted an extensive structured survey. It interviewed and heard over one hundred actors and experts. It received nearly two thousand survey responses. All available information was analyzed both qualitatively and quantitatively. To the extent possible, the panel's aim has been an **evidence-based** evaluation.

As touched upon in the Preface of this Report – with some gaps in scholarly knowledge, limited budget/time, and a constantly evolving surrounding world – analysis will not provide solid guidance in all issues. In these cases the panel has understood that it is specifically requested to provide its *informed opinion* and judgment. On some issues there is necessary and welcomed *diversity* in these opinions, which is not forcefully ironed out in this Report.

On several accounts the evaluation has proceeded in the spirit of the two most important innovation policy documents in Finland – the new innovation strategy (Aho *et al.*, 2008) and the subsequent Government's Communication to the Parliament. One choice is the panel's inclusive definition of innovation, even if insufficient theoretical and empirical backing on occasion forces it to resort to the prevailing convention.

This **Policy Report** is accompanied by the **Full Report**, which provides further details and elaboration. With these two reports, the work of the evaluation panel is complete, even if many panelists have already volunteered for disseminating the findings,

refining the proposals, and overseeing their implementation.

Structure

This Report is divided to three main parts and ten chapters:

- This first part provides an overview of the evaluation and its general conclusions (Chapters 1–3).
- The second part contains the summaries of the contributions by the six sub-panels (Chapters 4–9).
- The third part briefly elaborates on the longer-term future of the system (Chapter 10).

Exhibit 3: Plenty of international interest on the evaluation.

Upon introducing the project on 11 December 2008, the web site www.evaluation.fi was launched. The site provides general information on the evaluation process as well as links to rele-

vant documentation. Towards the end of September 2009, the site had attracted around 2,500 visits of 1,600 unique visitors from 52 countries worldwide.

2. Future Challenges and Ongoing Reforms

This chapter provides the context of the evaluation in a nutshell by first reviewing some aggregate innovation-related indicators and then summarizing its actors' opinions on the Finnish innovation system.

Catching up and forging ahead?

Productivity improvement and **pioneering** in innovation are the two foremost policy goals according to the Proposal for *Finland's National Innovation Strategy* (Aho *et al.*, 2008). On both accounts, Finland's postwar track record is rather **admirable**, at least if the latter goal is understood to include catching up with the leading economies:

- According to the broadest measure of productivity we can reasonably compare across countries (Exhibit 4, left), Finland has almost caught up with the United States, which is typically considered to be the global productivity leader.

- Pioneering in innovation does not lend itself to direct measurement, but for instance Finland's share of the applications at the *European Patent Office* has been on a continuous rise up until the new millennium (Exhibit 4, right). While it is true that this is in considerable part attributable to *Nokia*, if also other countries' most influential company with respect to patenting is removed, Finland's relative position does not change drastically (Exhibit 5).

Finland's relatively brisk economic growth in the early 2000s hid the fact that its strongholds – forest- and ICT-related businesses as well as industrial machinery and equipment – were facing structural challenges (Rouvinen, 2009). In innovative activity this was manifested by the fact that R&D working hours declined somewhat in 2005 and considerably in 2007 (Exhibit 6) – for the first time in the postwar era.

Also the composition of the R&D hours worked conducted within the Finnish national borders is changing towards *more challenging* coordination, conceptual design, and managerial tasks, while *routine* tasks (such as basic technical drawing) as well as

Exhibit 4: Catching up with the US productivity – Pioneering in innovation.

Finnish and US labor productivity of non-financial corporations in 2004 Euros (left). Finland's share of the annual European Patent Office applications right).

Finland has almost reached the US labor productivity level (left). Finland's share of the applications at the European Patent Office has been rising up until the new millennium (right).

Sources: Left – calculations by Nevalainen and Maliranta (2009) with the data of *Statistics Finland* and the *US Bureau of Labor Statistics*. Right – ETLA calculations with OECD data.

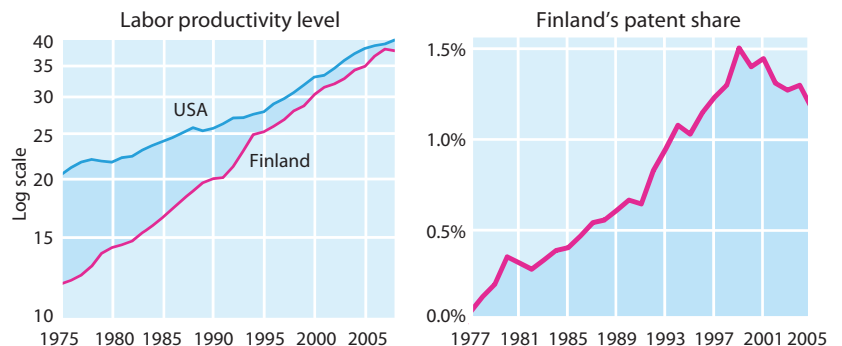
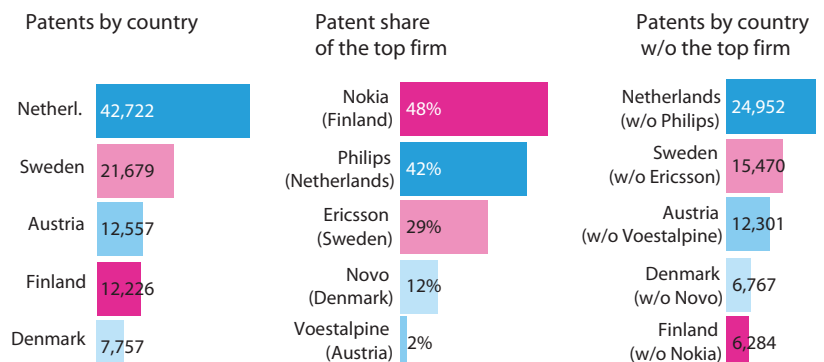


Exhibit 5: Nokia accounts for much of Finnish patenting, but so does the leading corporation in some other countries.

Applications at the European Patent Office, 2000–6.

Note: Refers to simple counts and is thus not adjusted for the size of the country. Only those patent applications of the top firm that were applied for from the location of the country in question have been included in that firm's and country's data. Patent applications have been collected from the database based on the applicant's country code, and firm name (top firms).

Source: ETLA calculations on the basis of the OECD PATSTAT database.



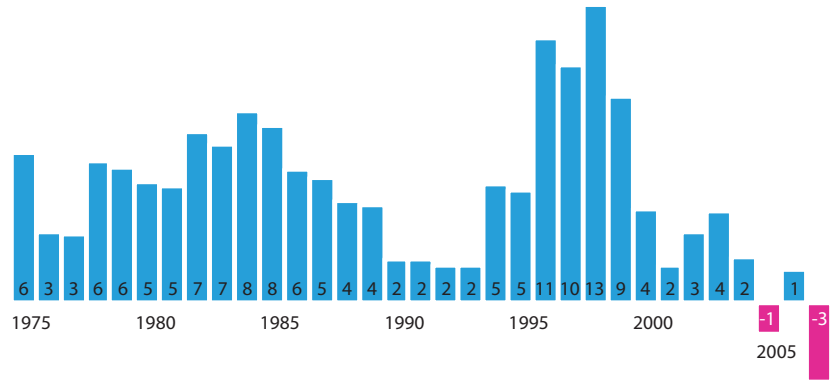
Globalization is inducing a qualitative change in innovative activity.

Exhibit 6: R&D working hours in Finland declined in 2005 and 2007.

Annual change of all R&D working hours done in Finland (%).

Structural challenges have put downward pressure on R&D hours worked in Finland. For the first time in the postwar era, hours dropped in 2005 and again in 2007.

Source: Statistics Finland.⁶



market adaptation and customization are increasingly being located overseas, also in the case of predominantly Finnish-owned and -operated companies (Ali-Yrkkö & Tahvanainen, 2009). Becker, Ekholm, and Muendler (2009) echo this for Germany; they note that off-shoring is associated with a shift towards more non-routine and more interactive tasks in Germany as well as with a labor-composition shift towards highly educated workers. Their last observa-

tion seems to be a long-term trend in Finland (Exhibit 7, bottom). The changing task-by-task composition of innovative activity in many developed countries is more recent; it reflects the exploitation of global opportunities for cost and talent arbitrage and thus the changing locus of specialization across countries (and even across individuals).

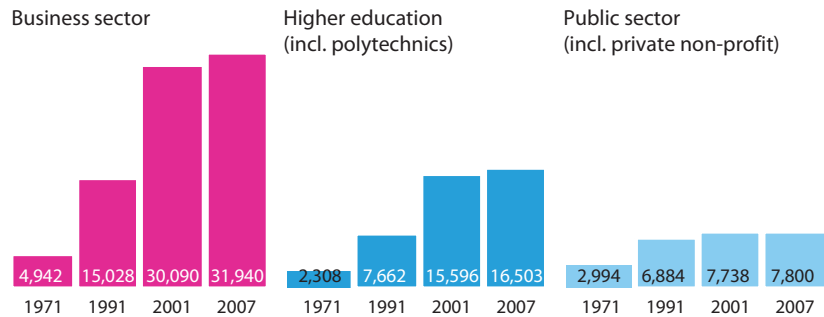
The changing locus of specialization in the provision of goods and services does **not** imply that every-

Exhibit 7: Most R&D hours worked are carried out in the business sector – hours are increasingly done by more educated R&D workers.

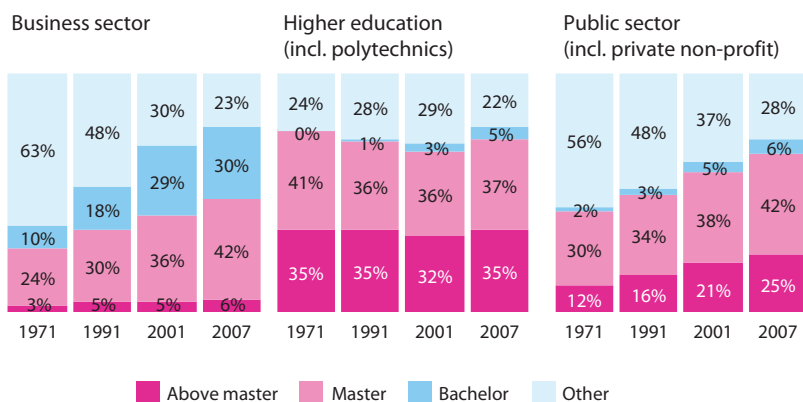
Evolution of total R&D hours worked in Finland by sector (top) and the composition of hours by workers' educational level (bottom).

Source: Statistics Finland.⁶

R&D labor hours



Educational composition of R&D labor hours



thing would move to China or to other off-shore locations. It does, however, mean that innovation and other business activities will become more geographically dispersed. In principle each narrowly-defined activity will seek its *globally* optimal location. While many supply chains remain quite local, it is nevertheless worthwhile to consider what the great *second unbundling* (Baldwin, 2006) implies for innovation and other business activities.

Finland is currently in a situation where traditional locomotives of economic growth – expanding quantity and quality of available skills and competences of its citizens, deepening of tangible and intangible capital, catching up with the global leaders, intensifying productivity-enhancing creative destruction (and market competition driving it), as well as improving institutions – are either out of the game or have reached a level at which major jumps are unlikely. Given that old strongholds are no longer expanding, Finland is actively seeking new sources of welfare.

A considerable part of the Finnish success in the past decades is attributable to increasing openness of the economy as well as to the long-term commitment to (and volume-wise expansion of) education and research. While this policy mix is still held dearly in Finland, increasing openness, R&D intensity, or educational attainment are in themselves insufficient for reaching the desired growth rates.

Policies that supported the accumulation of wealth in the catching up phase are not the same as the policies needed to support prosperity in a leading economy in the current global environment. Acemoglu, Aghion, and Zilibotti (2006) note that *countries at early stages of development pursue an investment-based strategy – maximize investment but sacrifice selection*. In the postwar era Finland made heavy tangible and intangible investments in part at the expense of selection. Due to its past success, Finland should move on: Acemoglu *et al.* note that *closer to the world technology frontier an economy should switch to an innovation-based strategy with short-term relationships, younger firms, less investment, and better selection of firms and managers*.

When Finland was far from the global productivity frontier, it could advance by adopting technologies and ways of conduct that were already established elsewhere. Imitation and incremental improvement were good strategies. Finland is on its way to make

the transition Acemoglu *et al.* describe. In the 2000s some of the aggregate productivity growth in Finland is attributable to intensifying creative destruction and renewal – now particularly in services (the same process was intense in manufacturing from the mid-1980s to the mid-1990s) – and new micro-dynamism, i.e., slowly emerging more entrepreneurial Finland.

Finland is nevertheless facing a double challenge: The old welfare trajectory – and industries associated with it – should not lose steam too fast; at the same time new sources of welfare should emerge. There is a strong desire among policymakers to learn where the next leading companies and industries might be found. While this desire is understandable, global business, and Finland as a country, has evolved in such ways that it is increasingly doubtful that the question could be answered to any relevant degree of accuracy. The future of the country is *less* on a few leading industries and companies and *more* on widespread entrepreneurial activity. This poses a challenge to traditional Finnish policies, which have a (successful) history of national missions and targeted programs, even if the system is **not** – and never was – a top-down planning system. Finland's structural challenges were present well before the ongoing financial crisis, which only heightens the sense of urgency in addressing them.

In the context of the current crisis, much of the Finnish stimulus is passive or automatic, i.e., funneled via its extensive social safety nets. Finland is nevertheless making considerable active stimulus as well and with that – like in its great economic slump of the early 1990s – again signaling its sustained commitment to innovation. As compared to 2008, government R&D expenditure will increase 7–10% in 2009. As for 2010, a further 5–10% increase is being considered, along with possible tax incentives for venture capital and business angel investment as well as with a general R&D tax incentive scheme.⁷

How its actors see the Finnish innovation system

The survey conducted to support the evaluation (Kotiranta *et al.*, 2009) covers a wide range of actors and provides new insights. In the survey *the national in-*

The current performance of the Finnish innovation system is quite satisfactory.

*novation system (NIS) refers to the totality of private and public actors producing and applying knowledge and information to promote the welfare of Finnish citizens.*⁸

The respondents of the survey were asked to grade the overall performance of the system on the Finnish school grading system from 4 (fail) to 10 (excellent) in three points of time: five years ago, currently (spring of 2009), and in five years. Most groups of respondents think that the system has been *improving* in recent years, its current performance is *quite satisfactory*, and that its performance *will improve* in the coming years (Exhibit 8). The average grade goes from 7 in 2004 to 7½ in 2009; the average (expected)

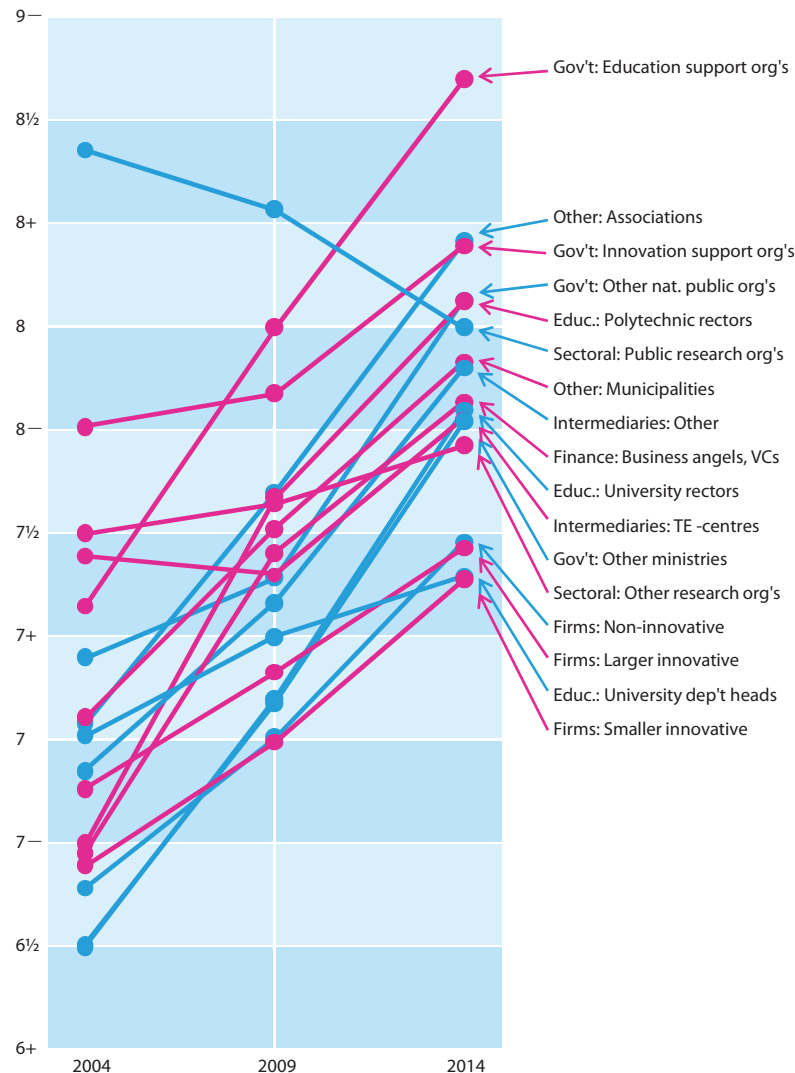
grade for 2014 is 8-. The representatives of public research organizations constitute the only group believing that the performance of the system will *deteriorate* in coming years. The representatives of national public education support organizations (comprised of the *Ministry of Education (ME)* and the *Academy of Finland*) are the most optimistic about the system's future performance – perhaps reflecting the upside potential of the ongoing reforms in their core domain – followed by associations (including labor market participants on both sides) as well as national public innovation support organizations (comprised of the *Ministry of Employment and the Economy (MEE)* and *Tekes*,

Exhibit 8: Most stakeholders think that the Finnish national innovation system has been improving and will continue to do so – its current performance is quite satisfactory.

The past, present, and future school grades by group.

The past, present, and future average grades are 7 (2004), 7½ (2009), and 8- (2014). The representatives of *public research organizations* constitute the only group believing that the performance of the system will deteriorate in coming years. The representatives of national public *education support organizations* are the most optimistic about the system's future performance; smaller innovative firms are the least optimistic. Overall private actors consider the performance worse than public ones.

Note: The respondents of the survey were asked to grade the overall performance of the system on the Finnish school grading system from 4 (fail) to 10 (excellent).
Groups: *Gov't: Education support org's* – The Ministry of Education (ME) and the Academy of Finland. *Gov't: Innovation support org's* – The Ministry of Employment and the Economy (MEE) and Tekes. *Gov't: Other ministries* – All besides ME and MEE. *Gov't: Other nat. public org's* – Includes, for example, Sitra, Finnvera, and Finpro. *Intermediaries: Other* – Includes, for example, regional development centers and companies and science and business parks. *Firms: Smaller innovative* – Firms employing less than 50 employees that have had innovative activity in the past three years. *Firms: Larger innovative* – Firms employing at least 50 employees that have had innovative activity in the past three years. *Firms: Non-innovative* – Firms that have not had innovative activity in the past three years. *Other: Associations* – Several interest groups such as the Confederation of Finnish Industries EK and the Federation of Finnish Technology Industries. More information on the respondent groups in the survey report.
 Source: Kotiranta et al. (2009).



The system has grown complex to both access and administer.

the Finnish Funding Agency for Technology and Innovation). Smaller innovative firms are the least optimistic about the future performance. Overall private actors consider the performance worse than public ones.

The respondents were asked to consider the entity of *public bodies* in the system as well as the (public) promotion of *private innovative* activity on a scale from *very complex* to *very simple*. Exhibit 9 summarizes the results. As to the public aspects of the system (left), with the exception of education support organizations (ME, Academy) having a virtually neutral position, all groups of respondents lean towards considering the system **complex** rather than simple. As to the promotion of private innovative activity (right), it is interesting to note that the system appears the most complex to the TE-Centres, private business angels and venture capitalists, as well as other intermediaries (comprised of public or publicly-supported regional/local competence, expertise, innovation, and technology centers) that are supposed to be the frontline in assisting businesses in maneuvering the system especially when it comes to growth-seeking entrepreneurial startups.

The ongoing **university reform** is the system's most important change in several decades. Its objectives are to improve research quality, to improve teaching quality, to enhance the societal impact of

universities, as well as to support the internationalization of universities.

Given the importance and extent of the reform, it is comforting to note that for **all** objectives across **all** groups – with the exception of *teaching quality* in the case of *university department heads* – the reform is considered to be an **improvement** over the current state of affairs (Exhibit 10). The divergence of the views of university rectors and department heads is noteworthy and indeed a problem requiring attention.

In enterprise innovation policy the establishment of the *Strategic Centres for Science, Technology & Innovation* or **SHOKs** is the most significant new policy instrument in the 2000s. SHOKs are viewed rather positively (Exhibit 11, left), especially by the representatives of the national central administration.

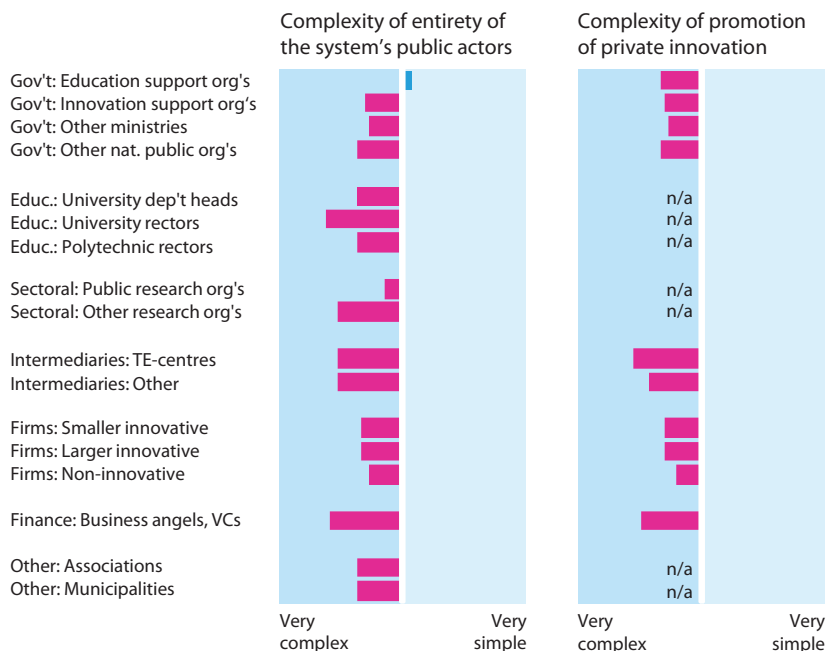
The possible reform of **public research organizations** (PROs or *sectoral research*, as they are collectively referred to in Finland has been on the agenda in Finland for several decades with little visible progress to date. The respondents were asked how they would see a *possible* reform of PROs. All respondent groups believe that a reform would improve the performance of PROs, which arguably reflects the belief that there is considerable unrealized potential in them that is currently held back by administrative hurdles.

Exhibit 9: The system is viewed as being quite complex.

Complexity of the national innovation system as a whole (left) and of the promotion for private innovative activity (right).

Virtually all groups of actors considered the system rather complex. The national public education support organizations stand out as the only group that deems the system to be simple rather than complex (even if their position is virtually neutral).

Note: Illustrates deviations from a neutral position. See the survey documentation (Kotiranta *et al.*, 2009) for details. See the note in Exhibit 8 for definitions of the groups. Source: Kotiranta *et al.* (2009).



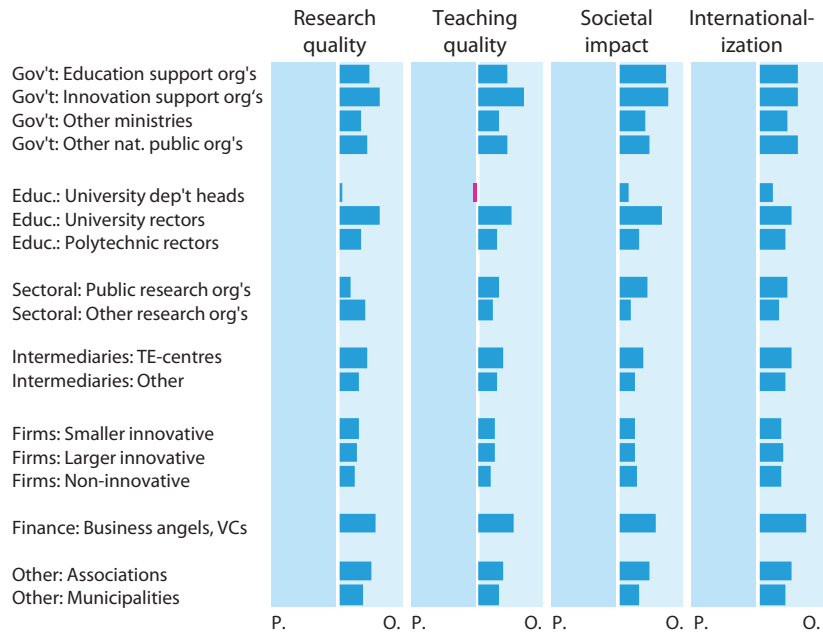
The ongoing university reform is considered to be an improvement over the current state of affairs.

Exhibit 10: The forthcoming university reform is expected to have positive impacts on all key dimensions.

The expected success of the university reform in promoting its four main objectives.

The university reform is considered to be an improvement over the current state of affairs. The divergent views of university rectors and department heads are noteworthy.

Note: Illustrates deviations from a neutral position. See the survey documentation (Kotiranta *et al.*, 2009) for details. See the note in Exhibit 8 for definitions of the groups. Source: Kotiranta *et al.* (2009).

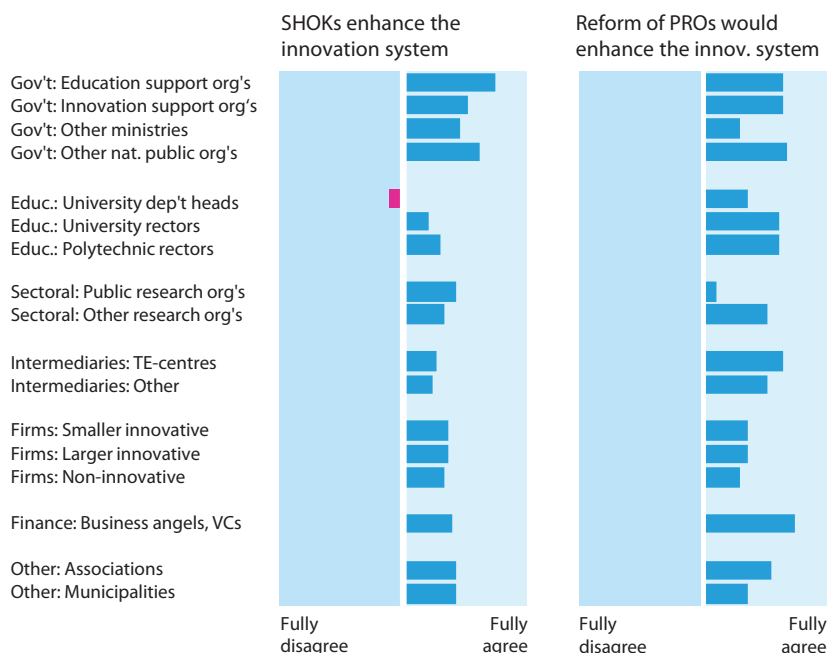


P. = Pessimistic: Respondents **disagree** that the reform promotes the objective in question (up to all fully disagreeing on far left).
O. = Optimistic: Respondents **agree** that the reform promotes the objective in question (up to all fully agreeing on far right).

Exhibit 11: SHOKs are seen in a positive light (left) – Sectoral research is believed to have upside potential (right).

Most stakeholders believe the Strategic Centres of Science, Technology and Innovation (SHOKs) will have a positive impact (left). There is considerable unrealized potential in public research organizations (right).

Note: Illustrates deviations from a neutral position. See the survey documentation (Kotiranta *et al.*, 2009) for details. Source: Kotiranta *et al.* (2009).



3. Policy Governance and Steering

This chapter first provides some of the panel's reflections on the Strategy and empirics on how it has been received by the actors within the system. Second, it discusses system-level steering and governance.

Reflections on the Strategy

The Proposal for *Finland's National Innovation Strategy* (Aho *et al.*, 2008, see Exhibit 12) defines **productivity improvement** – as opposed to more direct input or output measures of innovative activity – as the main objective. Thus, it suggests that *innovation policy* is ultimately about elusiveness and efficiency of the whole society in bringing about *welfare*.

While the Strategy does not explicitly coin the term, it implies that we should perhaps rather talk about the *growth system* (as opposed to the innovation system), since innovation is recognized to be only an intermediate objective rather than an end in itself. The growth system is about managing complementarities in knowledge generation and use, when market failures (externalities) and systemic coordination failures are present (Aghion, David, & Foray, 2009). If fully written out, in the spirit of the Strategy the innovation system should be understood as *the education, research and innovation system*.

The Strategy emphasizes **pioneering**, which suggests *less* concern for entities that are not (seeking to be) at the global frontier (laggard entities are not to be publicly supported). Combining pioneering with the first goal of productivity improvement implies a balanced consideration of all four main ways of fueling the aggregate country-level productivity growth:

- Improvements in productivity within existing units,
- Productivity-enhancing re-allocation of resources and/or market shares between existing units,
- Entries of more productive new units, as well as
- Exits of less productive old units.

In a narrower interpretation of innovation policy the last three re-allocative elements are not emphasized.

The Strategy warns against partial solutions in developing the system. It rather calls for *comprehensive renewal* and *structural development* requiring *strategic management* within the public administration

(p. 11). In particular, the *fragmented nature* of current structures and steering is considered a problem (p. 20). It is acknowledged that individual and separate policy measures will **not** suffice for Finland to reach a pioneering position (p. 10).

The panel welcomes the basic ambitions of the Strategy: The two main goals – productivity improvement and pioneering in innovation – are undoubtedly the right ones. Likewise the four basic choices – global networking, demand and user orientation, individuals and communities, as well as a systemic approach – are easy to accept. With its ten key sets of measures – some of which the panel does not agree with (see Exhibit 13) – the Strategy takes a step towards defining what these goals and choices imply for policy. The panel nevertheless finds the Strategy quite vague, leaving too much room for misinterpretation.⁹ In fact, the fear is that the Strategy may already be dissipating and that it might even turn against its own objectives, unless the premises to implement policies are put in place (see Chapter 4).

Empirical observations on the Strategy

The survey (Kotiranta *et al.*, 2009) inquires about the penetration of the Strategy **and** the *Government's Communication on Finland's National Innovation Strategy to the Parliament*, which builds on the Strategy. Some of the findings are summarized in Exhibit 14.

It seems that most respondents of *innovation support* and *education support* organizations feel that their own organizations have had concrete responses induced by the two documents (top).

Other ministries – besides the *Ministry of Education* and the *Ministry of Employment and the Economy* included in the afore-mentioned two groups – have mostly **not** had an organizational-level response (Exhibit 14, top). In part this may reflect the fact that within these ministries it is thought that the two documents have no implications for them (middle).

Only the representatives of *innovation support organizations* have found the two documents mostly helpful in steering their organizations (Exhibit 14, bottom). This is not the case for the *education support organizations*, even if they have otherwise been attentive to the two documents.

“Being exposed to competition brings out the best in institutions. A famous economist once said that the best of all monopoly profits is a quiet life. You don’t want a quiet life for a firm: you want it forever trying to improve its productivity.”

Nobel Laureate Robert M. Solow (Commission on Growth and Development, 2008).

Exhibit 12: A concise summary of The Proposal for *Finland’s National Innovation Strategy* (Aho et al., 2008).

Goals

The Proposal for *Finland’s National Innovation Strategy* (p. 4) sets two goals for the country’s innovation system:

- **Productivity** improvement in enterprises and other communities, as well as
- **Pioneering** in innovation on a global scale in selected sectors.

In the Strategy an *Innovation is perceived as an exploited, competence-based competitive asset* (p. 2).

Basic choices

To attain the goals, the Strategy calls for making four **basic choices** (p. 5):

- *Innovation activity in a world without borders*: Active Finnish participation and considerable influence in global knowledge networks, as well as its citizens’ high international mobility and the country’s attractiveness relative to globally leading alternative locations for innovative activity.
- *Demand and user orientation as a basis for innovative activity*: Better attendance of customers’, consumers’, and citizens’ needs; higher involvement of users in innovation processes.
- *Individuals and communities creating innovations*: Providing better abilities and more incentives for individuals and entrepreneurs to innovate.
- *Systemic approach – interdependence of success factors*: More broad-based innovative activity promoting renewal and structural change.

Key measures

The strategy (pp. 14–16) proposes ten key sets of measures to address future challenges as outlined below.

1. The government’s steering of innovation policy

- Expanding the *Cabinet Committee on Economic Policy* into a *Cabinet Committee on Economic and Innovation Policy*.
- Renewing the *Science and Technology Policy Council* into a wider *Research and Innovation Council*.

2. Regional innovation centers

- Establishing world-class regional innovation centers on the basis of national choices and local strengths.

3. An entity for growth entrepreneurship

- Redefining the roles and offerings of various public operators regarding growth entrepreneurship to form a clear (new) entity operating with entrepreneur and investor orientation.

- Motivating investors and experts to commit to businesses’ growth and internationalization by means of taxation.
- Motivating institutional venture capital investment via new public–private cooperation.

4. Market incentives for innovative activity

- Using public procurement to enhance demand for innovations.

5. Public support for demand and user orientation

- Updating public finance and services for innovative activity to incentives and support demand- and user-oriented innovative activity.

6. New emphasis in education

- Introducing internationality, interactive skills, entrepreneurship, creativity, and innovation at the core of teaching.
- Providing incentives and opportunities for life-long learning.

7. World-class universities

- Enhancing the research capacity of universities and research institutions.
- Establishing considerably larger and more modern higher education entities in terms of size, management, the ability to change, resources, and administration.
- Inducing closer cooperation between universities and research institutions.
- Supporting interaction between universities, trade and industry, and other parts of society.

8. Competitive personal taxation

- Having an active immigration policy to attract international talent.

9. Management training

- Developing Finnish management training to meet international top standards.

10. Compatibility with the Strategy’s choices

- Align the strategies and operations of parties implementing innovation policy with the basic choices of the national innovation strategy.
- Conducting an international assessment on the compatibility of current policy decisions, operating models, structures, and resourcing with the key themes and goals of the national innovation strategy.

Exhibit 13: Reactions to the ten key sets of measures proposed in the Strategy (Aho, et al., 2008, pp. 14–16).

Key measure	Reflection
1) The central government's corporate steering will be renewed for the purpose of becoming a worldwide pioneer of systemic reforms.	The panel agrees that public efforts to promote innovation are not sufficiently coordinated. There are significant overlaps and redundancies. Including innovation policy among the Cabinet Committee's duties is not as straight forward as it seems. See Chapter 3.
2) Content-oriented and regional centres of innovation driving renewal will be formed in Finland.	Finnish regional innovation policy is active, even if often ignored nationally. Certain tools are ill-suited to address regional inequalities. The 'unspeakable' regional aspect of direct support should be made explicit. There is a wealth of regional centers; founding new ones is hardly an appropriate solution. See Chapters 3, 4, and 8.
3) The financing and service system promoting growth entrepreneurship will be renewed into a clear entity, operating with entrepreneur and investor orientation.	The system is an outcome of a long evolution. It has become costly to both access and administer, especially when it comes to high-growth entrepreneurial firms. The Panel calls for a reconsideration of (public) actors and their responsibilities. See Chapters 7 and 9.
4) New competitive and market incentives activating enterprises and other communities in innovation on a broad basis will be created and exploited.	Finland would benefit from redesigning its policies to foster the reallocation of resources to their most productive uses. This – as well as incentives for innovation – are promoted by intense competition among current providers and low barriers of new market entry. See Chapters 3 and 8.
5) The national ensemble of expert and financing services will be updated to meet the needs of demand- and user-oriented innovation activity.	Old emphasis on the supply side; new balancing with the demand side is worthwhile. There is little scope to promote the orientation via direct intervention; a host of indirect measures hold promise. The orientation is consistent with promoting new entrants and radical/disruptive innovation. See Chapter 5.
6) A learning environment motivating innovation on a broad basis will be developed for Finland.	Promoting internationality, interactivity, entrepreneurship, creativity, and innovation in teaching as well as providing incentives and opportunities for life-long learning are agreeable objectives. See Chapters 6, 7, and 9 for refinements.
7) Finnish research and higher education system will be developed into an internationally competitive development environment for expertise and innovations.	The most pressing challenge is to increase the quality of research in Finland; an adequate unit size is a prerequisite for this. Higher quality will in itself promote better industry–science links, which will materialize when universities have something businesses desire. See Chapter 9.
8) Personal taxation and other key factors essentially weakening Finland's attractiveness will be revised to a competitive level.	Personal taxation is among the issues in recruiting international talent to Finland, which is partly addressed in the current legislation. Entrepreneurship is also likely to be affected by the average (and not only by marginal) tax burden. See Chapter 7.
9) Finnish management training will be developed to meet international top standards.	The panel does not study various disciplines. In the panel's understanding Finns, as individuals and company representatives, do interact with international top management institutions. There is no evidence that particularly this would be Finland's Achilles heel. See Chapters 6 and 9.
10) The strategies and operations of parties implementing innovation policy will be adapted so as to be in line with the basic choices of the national innovation strategy.	The Strategy has been actively implemented, even if the premises for it have not been in place. As a consequence, some new actions unintendedly go against the Strategy's aims. With this report the first round of the proposed assessment has been completed. See Chapters 3 and 4.

“A mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model.”

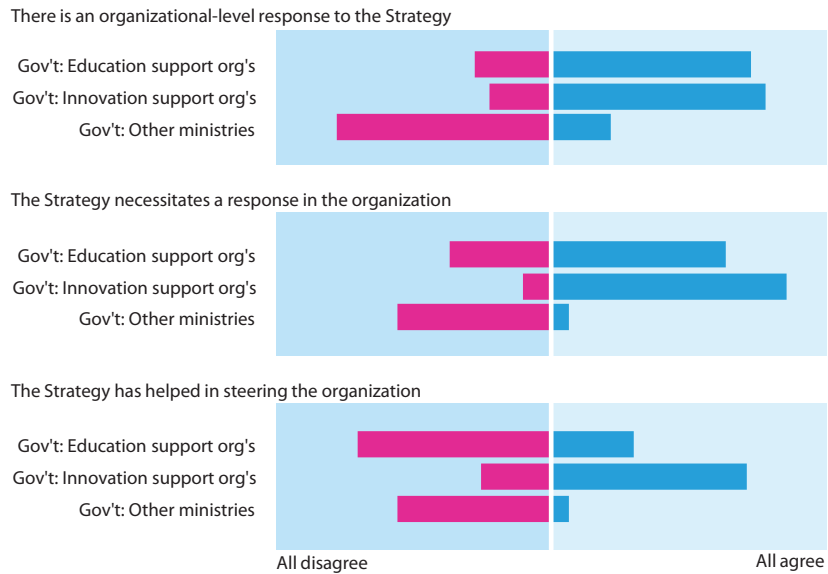
Chesbrough (2009).

Exhibit 14: The Strategy and the Government’s Communication have penetrated national public education and innovation support organizations.

The presence of an organizational-level response to the two policy documents (top), perceived need for such a response (middle), and the helpfulness of the two documents in steering one’s own organization (bottom). Percentage shares of the representatives of the group agreeing (bars to the right) and disagreeing (bars to the left).

Note: The bars do not add up to 100%, as some respondents were unable or unwilling to provide an answer. See the survey documentation (Kotiranta *et al.*, 2009) for details.

Source: Kotiranta *et al.* (2009).



An inclusive definition of innovation

The broad-based approach of the Strategy implies that one should employ a very inclusive definition of innovation, even if the one employed – *innovation [is] perceived as an exploited, competence-based competitive asset* – seems to primarily refer to companies (as they are the ones directly competing in the market place).¹⁰

The most generally accepted definition stems from the Oslo Manual (OECD & Eurostat, 2005) – the ‘bible’ on the issue – in which (pp. 46–47) an **innovation** is defined as the *implementation of*

- a novel (new or significantly improved) good or service,
- a novel production process,
- a new marketing method, or
- a new organizational method (in-business practice, workplace organization, or external relations).

Innovative activity includes all scientific, technological, organizational, financial, and commercial steps aimed at implementing innovations (p. 47). Some activities are themselves innovative; others are not novel but necessary for the implementation.

As to the required degree of novelty or newness/improvement (sometimes referred to as an innovative step) the alternatives include the following (p. 57):

- New to the implementing **organization** (e.g., firm).
- New to the relevant **market**, i.e., to the firm and to its competitors in the markets it is currently active in.
- New to the **world**, i.e., to all actors in all markets globally.

The innovative step may also relate to the impact of innovation in the market place (p. 58): Innovations opening altogether new markets or being so much better or cheaper that they (potentially) render old offerings obsolete may be considered **radical** or **disruptive**, although it may take a long time for the radicality/disruptiveness to be apparent.

It should be noted that innovation is not the same as differentiation, e.g., by means of conventional marketing. Innovation is also not to be mixed with an efficient execution (or good conduct in general) or good design, although *in combination* with novel goods, services, processes, as well as new marketing and organization they are powerful ways of creating societal value.

Our evaluation proceeds in the spirit of an inclusive definition, i.e., *an innovation is considered to take place when new ideas are put to use* either in the private or in the public sector. The minimum requirement for newness is that the idea has not been previously employed in the activity by the actor in question. While

Exhibit 15: Motivations for innovation policy.

Innovation is a fundamental component and enabler of societal welfare. Due to well-known inefficiencies largely stemming from the very nature of information and knowledge, the provision of innovations is considered sub-optimally low in a competitive market environment. Failures in private markets that may make them fall short of the socially most desirable outcomes (in the absence of intervention) can be classified into three categories:

- Financial market imperfections.
- Externalities of various sorts.
- Systemic failures.

In developed financial environments under normal economic conditions, financial market imperfections are unlikely to be, by themselves, a sufficient reason for intervention (Takalo, 2009), save it for small and young innovative companies. In their case high capital costs are partly mitigated by the presence of venture capital (VC), even though VC investment is likely to be confined to a few sectors and be specific as to the size, ownership structure, and future ambitions of the prospect company (Hall & Lerner, 2010). Furthermore, prerequisites for a functioning VC market include the existence and interaction of at least three institutions: private risk-tolerant investors, experienced and (internationally) networked fund managers (both in terms of the target industries and the financial sector), as well as a relatively thick and stable exit market for young innovative companies (ample opportunities for initial public offerings as well as for trade sales). As for non-normal times, there may be some room for counter-cyclical innovation support policies (Takalo, 2009).

While financial market imperfections have over time diminished and are less frequently used as a justification for public innovation policies, the significance of various kinds of externalities (Rouvinen, 2007) – such as knowledge spillovers and network effects – has increased and are the main motivation for innovation policy.

Systemic failures have gained more attention over the past decade or so. There are two basic insights in the systemic failure argument: First, innovation is seen as a complex process consisting of not only research and development, but also finance, marketing, design and other related activities. Second, there is a continuous interaction between different organizations and individuals involved in the innovation, i.e. firms or other organizations do not innovate in isolation. O'Doherty and Arnold (2001) identify several types of systemic failures:

- *Failures of institutions.* The innovation system is configured in such a way that it does not enable a privately sustainable market for innovation to form.
- *Network failures (or failures to co-operate).* There are unexhausted benefits of interaction among participants of the innovation system.
- *Framework failures.* Laws, regulations, standards, culture, norms, and/or values are of such a nature that innovative activity is not initiated and/or carried through.

Innovation policy in an advanced country, such as Finland, is mostly concerned with the coming up with, and employment of, truly novel ideas (new-to-the-world and radical/disruptive innovations) with considerable economic and societal significance.

commercial applicability may well be the focal point, it is acknowledged that innovations are to be found in *all* walks of life and the role of *cultural and social innovations* is not to be underestimated. While companies may well be the most relevant unit of analysis, the panel wishes to acknowledge that innovations are invariably brought about by (groups of) ingenious *individuals* that may or may not be brought together by various types of organizations. While this is indeed the spirit – due to issues outlined in the preface of this report – often we are forced to resort to more conventional definitions in conducting the evaluation.

Can broad be too broad?

Including technical and non-technical as well as commercial and non-commercial (cultural and social) in-

novations, considering both manufacturing and service industries, as well as having a balanced view of both the supply- (provision) and demand-side (diffusion) determinants of innovation are all very worthwhile aspects of modern innovation policy. But beyond these: What are the risks of the broad-based approach? Can broad be too broad?

There are two obvious ways to go wrong with the broad-based approach:

- First, to downgrade the definition of innovation to include even minor changes and modifications as innovation. If anything, Finland and Finnish policies should rather do the reverse.
- Second, to label all enterprise policy – including old-style industrial policies and/or those not directly related to the generation and utilization of novel ideas – as innovation policy.

Two ways to go wrong with the broad-based approach: to consider even minor changes as innovations, to label all enterprise policy as innovation policy.

In the course of its work, the evaluation panel has seen practical examples of both, so these are not merely scholarly concerns. These emerging developments should be halted.

There are also other concerns:

- As the scope of innovation policy expands – and resources for it are not expanded accordingly – it unavoidably means that resources are spread more thinly. As each policy measure involves both a sunk cost (an initial cost that is not recoverable when discontinued) and a fixed cost (an “administrative” expense not directly related to the size of the activity that has to be paid for each period the activity continues), broadening might mean that effectively there are *fewer resources* actually reaching *policy targets*. Furthermore, spreading resources too thinly is an anti-thesis of a *strategy*.
- The costs of conducting policy – the public administration expenses, the (private) applicants’ or targets’ costs, and the dead-weight loss of taxation – are sometimes ignored. As the number of actors involved expands, also these costs grow (possibly rapidly, as relatively disinterested and unrelated parties might have to spend significant amounts of time for both learning about and being involved in innovation policy).

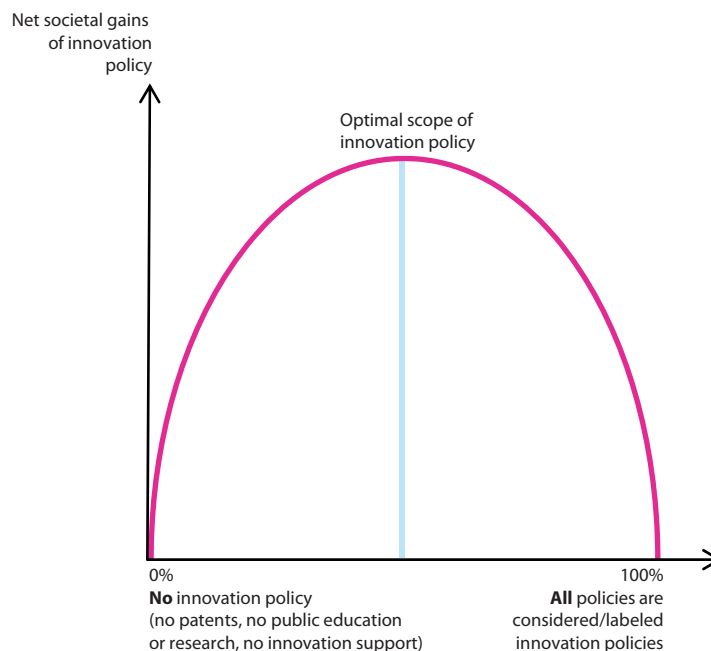
- As discussed below, current innovation policy is conducted in a triangle of tensions. While perhaps cumbersome, it has certainly been manageable. Fully implementing the broad-based approach might lead to a **web of tensions**, in which the number of bilateral connections is manifold as compared to the *triangle of tensions*. Thus, maneuvering in the conflicting interests might be more complicated than what one would anticipate.

Currently the Strategy’s broad-based or systemic view is **not** materially reflected in policy. Actions that have been implemented since the Strategy was launched are mostly individual and separate policy measures, i.e., exactly what the Strategy warns against. On other accounts (i.e., considering their contents separately rather than as a part of a bigger picture), they nevertheless **are** mostly consistent with the Strategy. It seems that most new measures are born out of a frustration for the unachievability of comprehensive renewal and structural development, at least to the extent that it would mean touching any of the old institutional structures.

Chapter 4 considers implications of the broad-based approach to innovation policy in more detail. It finds that the premises to conduct broad-based innovation policy are not yet in place.

Exhibit 16: The scope/broadness of innovation policy and its net gains to the society.

The Laffer curve (originally attributed to Arthur Laffer and used to show that increasing taxes does not necessarily increase tax revenue) illustrates that including too many aspects under the rubric of innovation policy may be harmful – broad can be too broad. The fear is that the scope implied by the Strategy may take Finland beyond the inflexion point.



Reflections on governance and steering

A new Cabinet Committee on Economic and Innovation Policy?

One of the Strategy's (p. 14, emphasis added) key proposals concerns the highest level steering: *The Cabinet Committee on Economic Policy will be expanded into a Cabinet Committee on Economic and Innovation Policy to act as the forum for the strategic management of the state consortium.*¹¹

Since the intention is to broaden the policy scope and to expand innovation outside the domain of the traditional two ministries, it would seem natural to include innovation issues in the agenda of the *Cabinet Committee* where all the key ministers are represented. It may also seem attractive to force innovation policy to the official agenda of the *Ministry of Finance* that serves as its secretariat. The systemic approach presumes horizontal cross-ministry coordination, which is currently weak. The *Cabinet Committee on Economic and Innovation Policy* could serve as a **delivery unit** for system-wide actions and reforms.

As proposed in the Strategy, a high-level working group was set in fall 2008 to prepare a proposal regarding the *Cabinet Committee's* possible new role. The working group completed its work by the end of 2008. The content of the final proposal was not, however, revealed to the evaluation panel.

We see the respective responsibilities of the key ministries in this domain roughly as follows:

- *Ministry of Education* is responsible for nurturing and providing **knowledge and human capital** as well as for administering research that tends to be more fundamental and curiosity-driven in nature.
- *Ministry of Finance* is the 'balancing force' in desires to expend taxpayers' money as well as a key actor in designing and providing **incentives** for both individuals and organizations (primarily via setting the parameters of the tax system).
- *Ministry of Employment and the Economy* is an **enabler** of application-minded innovative activity.

Disentangling the respective roles and interactions of the three key ministries lead us to consider natural (and necessary) tensions among them (Exhibit 17). Currently there is a tendency for each ministry

to strongly defend its turf and to be somewhat absent-minded with respect to the needs of others. There is no explicit mechanism for conflict resolution and enforcement of joint decisions over more than one ministry, even if there are certainly a number of somewhat less blunt mechanisms for reaching consensus. Especially if many further ministries will be engaged in innovation policy decision-making, a more explicit coordination mechanism will be needed.

Redefining the tasks of the *Cabinet Committee on Economic Policy* to include innovation issues is in line with our proposal that the *Ministry of Finance* and the *Ministry of Employment and the Economy* should assume a joint responsibility for the enterprise-side of innovation (and growth) policy. The evaluation panel is, however, **hesitant** to recommend the reform of the *Cabinet Committee*. First, the composition of the reformed committee depends on the more *precise definition* of the broad-based and systemic innovation policy – work that is only now under way. Second, extending the agenda of the Cabinet Committee too much entails a risk of dissipating its strength as an efficient decision maker on urgent matters. Third, such a change should be accompanied with a significant overhaul of the secretariat of the Cabinet Committee, as in the proposed form it should have a keen eye on long-term growth, welfare, and well-being issues.

The need for horizontal coordination, however, remains, and it is likely to even increase in the future. The simple reason is that innovation, knowledge, and know-how are becoming ever more important in all walks of life. Obviously, different ministries have different interests and ambitions but *maintaining the overall view on innovative activities needs to be addressed more often and more broadly than is the case today.*

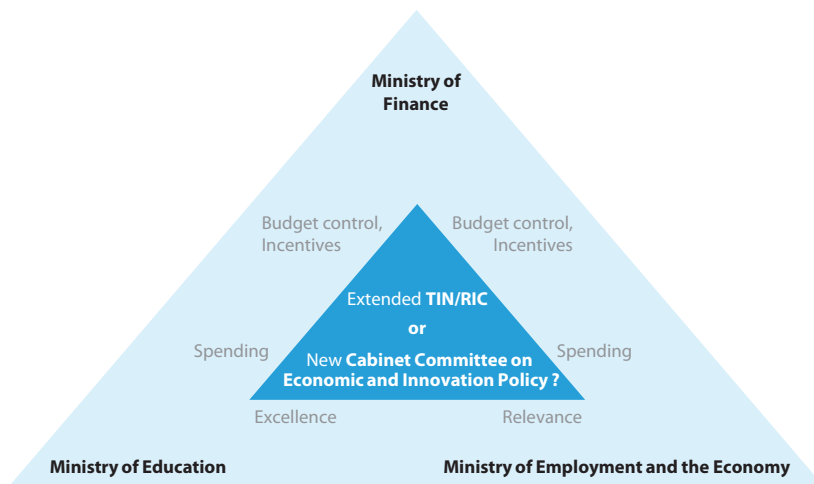
There are natural inherent tensions within the society: Under budgetary constraints support for inventive/innovative activity is always competing with alternative uses and with the desire for lower taxation; within innovation policy basic and applied research as well as development and market introduction are (partly) competing for the same resources. There might be reasons to (still) shift the society's overall emphasis towards innovative activity: The significance of knowledge in society continues to grow, and hence, demand for resources to enhance both the *creation* and *use* of novel ideas continue to in-

An extended and strengthened Research and Innovation Council may be seen as an alternative to a renewed Cabinet Committee.

Exhibit 17: Triangle of tensions?

The inherent tensions among the three key ministries in the education, research, innovation, and growth policy.

Disentangling the respective roles and interactions of the three key ministries lead us to consider tensions among them. Currently there is a tendency for each ministry to strongly defend its turf and to be somewhat absent-minded with respect to the needs of others. There is no explicit mechanism for conflict resolution and enforcement of joint decisions over more than one ministry. An extended *Research and Innovation Council* or a renewed *Cabinet Committee on Economic and Innovation Policy* may be seen as alternatives in reaching this goal.



crease. The renewed *Cabinet Committee* as well as the extended *Research and Innovation Council* would obviously relate to mitigating budgetary and other tensions, although it is not obvious that either would be an improvement over the existing arrangement: The tensions will not go away in *any* institutional or organization setup. It is thus more a matter of dealing with them in a manner that best meets the society's overall (future) welfare and well-being objectives.

As to the more substantive tensions, it is important to notice that, from the knowledge-based society's vantage point, basic and applied research, or *relevance* and *excellence*, do not contradict. Often it is a question of the time horizon: The economic and societal impacts of more fundamental research show up with a time lag of several decades. Furthermore, basic research is not detached from practical concerns – it is often fundamentally inspired by real world problems and the quest to solve them. However, the tensions remain – small countries have to make strategic choices that should be conditional on their (desired) role in the global economy as well as on their state of development.

The *Research and Innovation Council* (previously the *Science and Technology Policy Council*) **continues** to be a forum where innovation policy issues **are** discussed at the highest level with the presence of the *Ministry of Finance* (at least officially). It **is** an authoritative body chaired by the Prime Minister. It advises the Government and authorities on innovation policy, e.g., by providing a seal-of-approval for the (rela-

tively general) policy documents prepared by its staff and the key ministries. Currently the Council does **not** seem to be serving a direct coordinating role.

Curiously enough, the *Minister of Finance* has been too busy to attend the meetings (Exhibit 18) – the one time that he did attend is the exception that confirms the rule.¹² Besides tight scheduling, this may be attributable to the reluctance to be associated with spending of any kind (regardless of long-term net effects on public finances) as well as to the prevailing state of the Finnish discussion culture; it is much easier to fail to show up than to voice a dissenting opinion.

It is hard to judge whether or not the absence of the Minister of Finance has influenced innovation policy in one way or another. As an institution the Ministry has nevertheless proved to be quite interested in and accommodating to innovation issues despite its well-cultivated off-putting public image.

The *Research and Innovation Council* was quick to change its name as a response to the new Strategy. As far as we can discern, however, there is no material change in its composition or conduct, perhaps in part because the new Strategy has not fully materialized yet.

An extended (composition) and strengthened (with real decision-making powers and explicit system-wide coordination) council could be seen as an **alternative** to the renewed cabinet committee. Regardless of any adjustments in either of the two, both institutions are needed in the Finnish system.

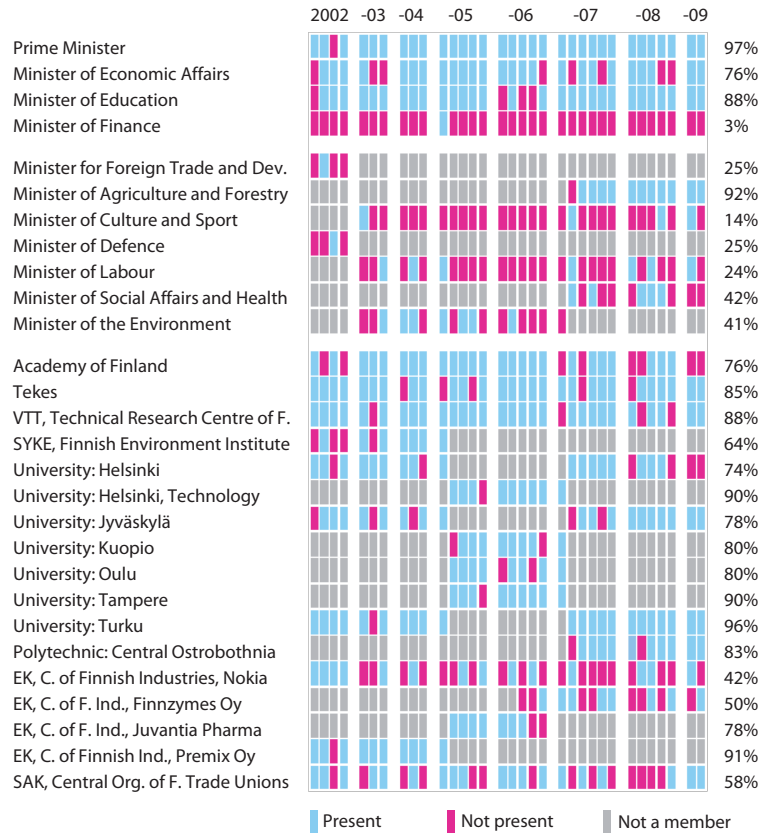
The lack of cross-ministerial decision making and execution is evidenced by the repeatedly failed attempts to reform sectoral research.

Exhibit 18: Attendance of the Councils meetings.

Attendance matrix of all members of the Research and Innovation Policy Council (or its predecessor) from the second meeting in 2002 to the second meeting in 2009.

The minutes of the meetings reveal that the Minister of Finance has attended the meetings once and even that may be considered an exception that confirms the rule.¹² The top pane shows the permanent members; the middle pane shows the four other member ministers; the bottom pane shows the ten other members. The illustration extends over the Council's four terms of office; thus, in the middle and bottom panes memberships may start or end. The percentages to the right of the matrix refer to the proportion the member in question has been present while a member.

Source: Minutes of the Research and Innovation Council (or its predecessor).



Sectoral research

The lack of cross-ministerial decision making and execution is evidenced by the repeatedly failed attempts to reform the sectoral research system (i.e., the system of public research organizations), even if the need for a reform is widely acknowledged and agreed on.¹³

The current allocation of resources within the sectoral research reflects the past and does not correspond to future needs. Often the institutions are positioned to serve their respective ministries rather than broader societal interests. They have developed gradually over time and adopted new functions, also beyond their original mission. Some have expanded abroad, which has mostly – but not solely – positive implications for Finland. In addition to research, many institutions have an important role – stipulat-

ed by law – to produce basic information on their respective fields. Sometimes their role as guardians of public information is a problematic one, as they have an exclusive right to collect data and in the process they tend to assume commercial intellectual property to it, in which case they – perhaps unintentionally – become legal monopolies. The role of public organization in this respect should be clarified.

Even if we take a critical stance on certain aspects of sectoral research, we wish to emphasize these institutions **do** make a *significant societal contribution* and broadly speaking **do** provide, even by international standards, *high-quality research* and other societal services. Our critique rests more on the belief that these institutions could be so much more. Indeed, the volume of sectoral research – and thus its potential role in the innovation system – is roughly compared to the *Academy of Finland* or *Tekes*: these organizations

The panel calls for clarification and coordination of national, regional, and local innovation (and other) policies.

provide some 10,000 person-years of effort with a total budget of €500 million and have a direct budget funding of €300 million (Exhibit 19).¹⁴

Reorganization of sectoral research is vital for the future development of the Finnish society. Most likely it will **not** be achieved without introducing an explicit central government steering and governance mechanism for innovation policy.

In the panel's view – as discussed in Chapters 4,5, and 9 – some sectoral research could be outsourced and moved to universities. The remainder could be reorganized into 4–5 institutions, the missions of which would reflect societal rather than sectoral interests, which could be better served by a larger share of competitive funding for both public and private entities. The obvious bias in resource allocation should be corrected.

Regional and local aspects of the innovation system

In Finland, science and technology as well as particularly education policies have had a strong regional dimension. From the late 1950s to the 1970s the higher education system was built to support regional development; as a consequence of this and subsequent developments, higher education is now dispersed to over one hundred geographical locations, many of which try to be fairly comprehensive across and within disciplines despite their modest size.

Although Finnish **innovation** policy is primarily national, there seems to remain an important 'unspeken' regional dimension, which is – to some extent – linked to (non-innovation) regional policy. Looking from the other – regional and local – perspective, there are numerous programs and instruments of local administration and other local and regional agencies to build innovation capacities in their respective regions. These are mostly **not** recognized in national-level policy making. National, regional, and local actions and instruments are not considered jointly.

Municipalities are eager to promote local innovative activities and have adopted similar tasks as TE-Centres in enterprise and innovation policy matters. Our survey reveals that as many as 20% of the some 350 municipalities have their own innovation strategy or similar program promoting innovation. Our survey suggests that they directly spent some €100–300 million annually (our upper bound estimate is €500 million) to promote innovative activity (on top of which comes non-innovation enterprise spending) within their geographies. Thus, collectively they are roughly comparable to the *Academy of Finland*, *Tekes*, or sectoral research in terms of the tax-payers' money spent.

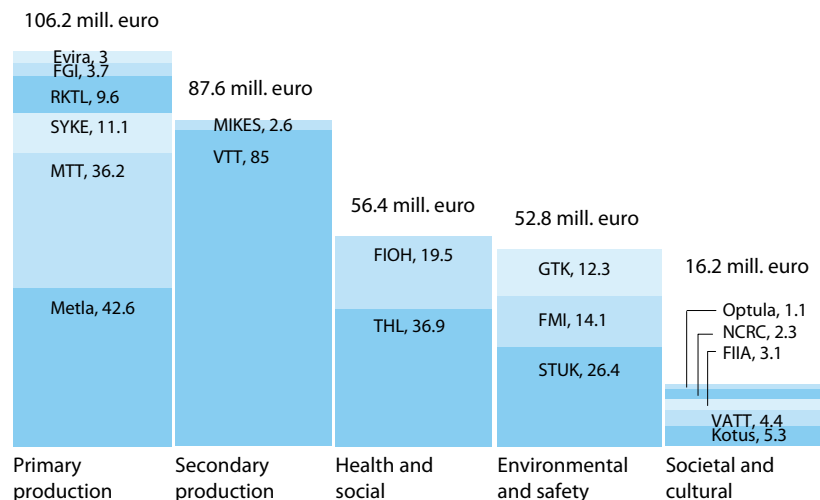
The panel calls for a *clarification and coordination* of national, regional, and local **innovation** policies as well as their links to other (non-innovation) policies. Within innovation policy, in the spirit of the Strategy, we emphasize a broad view on productivity improve-

Exhibit 19: Sectoral research in Finland by research area, budget funding.

Budget funding of public research organizations by category of economic activity in 2009, millions of Euros.

The volume of sectoral research is roughly comparable to the *Academy of Finland* or *Tekes*. Public research organizations have a total budget of some half a billion euros and the provided some 10,000 person-years of effort.

Source: ETLA based on the data of *Statistics Finland*.



ment – including its previously ignored re-allocative elements. The analysis in Chapter 8 focuses on the ‘unspoken’ and subtle regional bias in public direct R&D support. It is found that regionally-motivated public R&D funding seems to contribute to misallocation of resources, which promotes *divergence* in regional competitiveness.¹⁵ Although, admittedly, public innovation funding in ‘disadvantaged’ regions is quite small, running innovation policy with a regional agenda may come at a high cost in terms of *forgone growth* both at the regional and national level. Instead of direct innovation subsidies, other policy instruments – like traditional redistributive tools – could be used to even up regional disparities.

It is evident that Finland is too small a country to support many truly world-class innovation centers. That could mean that policies should simultaneously promote a small number (4-5 or even less) of science- and technology-driven innovation centers as well as a larger number of *experience-based innovation and learning centers* in regions. That would mean, e.g., rethinking the roles of regional *Centres of Excellence* (CoEs) and national *Strategic Centres for Science, Technology and Innovations* (SHOKs). Science and technology-oriented activities should be moved, as far as possible, from CoEs to SHOKs. When designing the next round of the *Centre of Expertise Program* this should be taken into account and redirect CoEs activities should be clearly directed towards experience-based innovation and applications to serve the needs of the local economy and society.

Polytechnics are **important** actors in regional innovation systems. There are currently 26 polytechnics with an extensive regional coverage. Our survey results reveal that actors of the national innovation system generally see the role of *polytechnics as serving the local and regional needs*. A great majority of the respondents considered polytechnics to perform **well** in providing competencies for the needs of the local and regional businesses and economy, while the production of international business competencies and research in general received much weaker grades.

Polytechnics should strengthen their *applied and regionally-oriented role*, while, at the same time, universities should be regarded as *global* rather than regional institutions. This would clarify the division of labor within the higher education sector.

Streamlining

The Finnish national innovation system is widely regarded as complex. It includes, making a conservative estimation on the basis of information available, more than a **thousand** different instruments,¹⁶ hundreds of public organizations and programs, and thousands of officials in direct daily contact with (typically somewhat larger) enterprises.¹⁷ Not surprisingly, about half of the actors within the system see that there are overlaps between the functions of different organizations. Firms that use the services perceive the system difficult to access. Furthermore, the current possibility of *forum shopping* – applying for multiple forms of public support for the same activity – is not in the society’s best interest.

Reducing the number of instruments should be *an objective in itself*, even if this meant that some needs are not served. One cannot help the feeling that the main reason for some instruments to be around is that there is *no* particular reason why they should *not* be. One should take just the opposite angle: There is *no justification for instruments that do not have clear, measurable, and quantifiable societal benefits*. Given the administrative cost for implementators and targets as well as accounting for dead-weight loss in taxation, the *benefits of any public intervention have to be quite sizable*.

Implementing the new innovation strategy includes an obvious risk that new instruments are introduced before the existing ones have been critically screened. We recommend that in conjunction with implementing the strategy, a structural reform of the innovation system should be enforced which includes a *pre-screening* procedure – there should be an arrangement in place evaluating all new instruments before taking them in use, particularly considering how they work in tandem with the previous ones. Upon implementing instruments, measuring and quantifying its impacts should be addressed simultaneously.

The evaluation reveals a need to re-think the organizations and responsibilities within the current (national) system of innovations in light of the system’s ability to meet the future challenges. There are overlaps in the tasks and instruments of various innovation agencies; the responsibilities of different

Exhibit 20: Coordination dilemma – From the six-pack to the customer strategy.

Six-pack

Given the complexity of the system, it is no wonder that several efforts have been taken to make it easier for firms to access. In the previous 2003 evaluation of the Finnish innovation support system (Georghiou, Smith, Toivanen, & Ylä-Anttila, 2003) a reference was made to the collaboration of the key innovation organizations – the *Finnish Industry Investment*, *Finnvera*, *Finpro*, *Sitra*, the *TE-Centres*, and *Tekes* – forming the *group of six* or the *six-pack*. That evaluation regarded the initiative as promising, since the aim was to develop a one-stop-shop particularly for smaller companies. The effort did not, however, reach its objective. It turned out that the attending organizations had different modes of operation and having an access to services of all six agencies through one service point proved to be impossible.

Two of the six-pack – the *Finnish Industry Investment* and *Sitra* – diverted shortly. The rest – now the *quartet* – decided to focus on growth-oriented companies instead of trying to cover the business sector as whole. In order to serve the specific needs of high-growth companies, a special *growth-company-service* was launched. The idea was that the four organizations would offer focused, coordinated, and tailored services for those with high-growth aspirations. This service started in 2005 and in 2005–6 regional TE centres selected some 500 smaller companies as its targets. The director generals of the quartet organizations actively oversaw, steered, and coordinated the effort via frequent meetings. Those operationally involved with the efforts describe it as being **massive**.

The Growth Company Service

The *growth-company-service* is such a unique policy experiment that it was empirically analyzed in the context of this evaluation (see Exhibit 21). The preliminary results show that the coordinated and focused measures did not have an identifiable impact from the point of view of measurable innovation policy objectives. Quite the contrary, the analysis suggests that re-allocation of employment among the supported firms has been productivity-deteriorating rather than productivity-enhancing. It is nevertheless too early to make definitive conclusions, as the service started only a couple of years ago. The results nevertheless show that it is difficult for the government officials to pursue *picking-the-winners* -type of policies, however refined. On the positive side, there seems to be some evidence that the targeted firms were satisfied with more flexible and less bureaucratic communication with organizations involved.

yrytyssuomi.fi

At the time of the previous evaluation it was also claimed that the yrytyssuomi.fi web portal would (also) solve the companies' challenges in accessing public services. While the portal remains active and is quite advanced, claims that it in itself would be a sufficient solution have since faded out.

Asiakkuusstrategia

The analysis of the various attempts to reduce the complexity of the system is important because a new effort has been initiated recently to tackle the same issue. A new *customer strategy* (*Asiakkuusstrategia*) is currently being developed with the idea of segmenting firms into different groups according to their customer needs (as users of public services), and provide tailored services accordingly. The basic idea is that all the innovation and business policy organizations could follow similar principles in their service provision and communication with firms, according to the customer segment they belong to.

In our interviews in January 2009 none of the key actors of the innovation system mentioned the new customer strategy. It was brought to the attention of the panel only in the context of presenting our interim report at the *Research and Innovation Council* in March 2009. Thus, we have not considered the customer strategy as much as we perhaps should have.

What can be learned from the available documents reveals that the customer strategy has subsumed the jargon used in the private sector's *Customer Relationship Management* (CRM) practices. In doing so it indirectly suggests that, among other things, the objective of public agencies would be to keep the firms as customers as long as possible. Just to be clear, in the case of direct support the objective is obviously exactly the **opposite**: to have as **few** customers as possible for the **shortest** possible time. The ultimate customer is not a company but broader societal interests (current and future citizens).

In the case of providing *framework conditions* most, if not all, private actors are continuously 'customers' of the system. Nevertheless, there is a risk that adopting ideas from the private sector CRM practices waters down the basic justifications of public enterprise and innovation policies. This type of 'all-embracing' policies aiming at long-term 'customer relations' – even though benevolent – may have unintended consequences worsening the market outcome. That looks quite possible in the light of the outcomes of the growth-company-service exercise discussed above.

Customer strategy may, of course, be a worthwhile tool in prioritizing and economizing public responses to companies' requests, if properly implemented.

Exhibit 21: The *Growth Company Service* – Has the policy experiment been successful?

As discussed in Exhibit 20, a special Growth-Company-Service was launched by four public organizations. The idea was that they would offer focused and coordinated services for companies with high growth aspirations. Wave 1 of the service carried out in 2005 with a couple of hundred of small and medium-sized companies as its target; wave 2 in 2006 added a somewhat larger number of companies. The first treatment group (wave 1) is comprised of both existing and new client companies of the four organizations, whereas the second treatment group (wave 2) has more genuinely new clients. Firms that have never been clients of the service constitute a control group.

In 2009 some 500 companies are covered by the service. The analysis looks into how they perform in terms of *employment* and especially in terms of relative *labor productivity*. Firms that create jobs with high productivity performance have the largest contribution to economic growth and thus to societal welfare.

Simple comparisons between the control and the two treatment groups (i.e., waves 1 and 2) indicate some important differences. First, the employment share of R&D occupations is much higher in the treated firms (as compared to the firms in the control group); this reflects the aim to select *more innovative* firms. Second, the average treated firm is *smaller* (in terms of employment). Third, the average treated firm is *younger*. Fourth, labor productivity is higher (wave 2).

Fifth – and most interestingly – even if the level of labor productivity of the treated companies is relatively high, its development across time is not as favorable as for the untreated ones. The analysis suggests that the allocation of employment is not, at least initially, productivity-enhancing among the treated firms. As for the control group, on the other hand, the allocation component is quite substantial.

The crucial policy question is: *How to facilitate job creation in high productivity firms?* The preliminary analysis gives some indication that *job creation* has been indeed somewhat *higher* in the treatment than in the control group. Two points, however, are worth noting. First, higher job creation cannot be attributed to the policy without more careful econometric analysis. The challenge is to evaluate what would have been the job creation in the absence of treatment. Second, the results suggest that relative aggregate productivity of the treated firms has *declined* rather than increased during the first years of the treatment. This finding is somewhat alarming for two reasons: First, declining competitiveness is bad news for the viability of the created new jobs. Second, the treated firms do not seem to have contributed to economic growth and thus societal welfare.

Source: A preliminary analysis by Aki Kangasharju and Mika Maliranta conducted to support the evaluation.

ministries could be clarified, and internal division of labor at least in the *Ministry of Employment and the Economy* needs to be re-organized.

An example of the need of re-organization is public support for high-growth firms: In the Ministry's *Innovation Department* there is a special unit to promote growth ventures and high growth entrepreneurial firms, and the *Department of Employment and Entrepreneurship* is running the growth-firm-service (Exhibit 21). Furthermore, there are more than half a dozen other public agencies – none of which is under the two units – that promote growth entrepreneurship in various ways. The outline we propose for actors and their responsibilities in the system (Exhibit 64) particularly suggests a division of tasks in this domain.

Evaluation practices need to be reformed

Evaluation is an important instrument in steering and redesigning policies. There is a fairly long tradition in the Finnish innovation system to evaluate various organizations and programs within the system. Evaluation started to become an established practice in the 1980s and early 1990s with an idea of using international panels of peers and publishing the evaluation results and recommendations. In this respect Finland has been a global forerunner. The *Academy of Finland* was the key organization in this respect. Today, practically all innovation policy agencies as well as universities are evaluated more or less regularly.

The *Audit Office Report*¹⁸ pays attention to the poor utilization of the evaluation results. The report stud-

An evaluation should be commissioned by a third party that is not among its targets.

ies the previous evaluation of the Finnish innovation support system (Georghiou, Smith, Toivanen, & Ylä-Anttila, 2003) as a case. The *Ministry of Trade and Industry* (predecessor of the *Ministry of Employment and the Economy*) started to prepare policy actions based on the recommendations of the evaluation and even made an action plan to see them through. The outcome nevertheless was that practical measures were never taken and the evaluation results were hardly used at all in the Ministry's policy design.

Potentially evaluation is an important instrument in steering the innovation system. Its current organization and practices mostly lack, however, accountability and independence, which are necessary in utilizing the results. The current way of organizing eval-

uations may nevertheless serve as worthwhile consulting to the management of the target organizations, even if the two should perhaps not be mixed.

Therefore the evaluation panel recommends that the evaluation system should be reformed so that a third party – other than the one that is being evaluated – commissions the evaluation and serves as the customer. As pointed out in Chapter 4, the Finnish *Higher Education Evaluation Council* could serve as an example of an organization that could undertake a role in the evaluation of the whole innovation system. Another option could be that the *Ministry of Finance* assumes a role here – either as an organization commissioning the evaluation or as a stakeholder in the Evaluation Council.

4. Broad-Based Innovation Policy

On the basis of **Edquist**, **Luukkonen**, and **Sotarauta** in the Full Report

We welcome the basic ambition of the broad-based innovation policy. The concept is, however, fuzzy; a clear content should be provided in order to prevent it from dissipating. Reducing the existing overlaps in services offered by public organisations should be high up on the agenda. In the near future special attention should be paid (again) to the wasted potential of the public research organizations.

Extending the scope of innovation policy

The notion of a **Broad-Based Innovation Policy** (BBIP) is the over-arching principle in the Proposal for *Finland's National Innovation Strategy* (Aho *et al.*, 2008). The meaning of the concept is not, however, evident in the Strategy. We offer two clarifications:

1. The BBIP entails the broadening of the concept of innovation to include product innovations in *services*, as well as *organizational* process innovations; and relates to not only economic significance, but also *wider societal benefits*, as well as measures targeted to support innovation in public services.
2. The BBIP takes *all* determinants of the development and diffusion of innovations into account when designing and implementing innovation policies. This would then include policy instruments operating from the *demand side*. It would also include acknowledging a wider spectrum of sources of knowledge and more versatile interactions with producers and users of knowledge.

The idea in introducing the concept of *Innovation System* in the late 1980s was to broaden the view on innovation and its determinants, and hence, the policy scope. The system of innovation approach has since diffused and enjoyed acceptance to an enormous degree among researchers and policy-makers with Finland being one of the prime examples.

The system of innovation thinking emphasizes interaction between various actors and organizations affecting the innovation process and outcomes. Firms do not innovate in isolation, nor are policymakers independent from each other; innovations emerge as a result of these interactions in different institutional contexts. In that sense, broad-based innovation pol-

icies are close to *systemic* innovation policies. Therefore, we look below at the network of actors in the Finnish innovation system, their interactions, and importance, with the purpose of identifying important nodes, as well as potential gaps or overlaps.

Risks of the broad-based concept

We *welcome* the basic ambitions of the broad-based innovation policy and recognize that the new innovation strategy represents an ambitious move towards a new balance between the supply and demand sides of innovative activity.

At the same time it must be noted that there are significant risks involved due to the vagueness of the BBIP concept. Unless properly defined, there is a chance that innovation policies become **too broad** and actually dissipate. Policies may actually turn against their own objectives.

Our interviews reveal that broad may have already become too broad: All enterprise (business environment) policies tend to be seen as innovation policies. Furthermore, normal business development – usually driven by markets – is seen as a potential policy target. Therefore, it is all the more important that policymakers provide a clear content to the concept.

When formulating broad-based innovation policies, or any policies, in a market economy, the rationales of public intervention must be considered. They can be in the form of three conditions:

1. Private organizations are unable or unwilling (because of high risks or the inability to benefit from the innovation) to achieve, or be unsuccessful in achieving, the policy objectives, in the simplest form the most efficient allocation of resources. Hence, a **problem** exists.
2. The reasons for the problem can be analyzed and **understood**.
3. The government (national, regional, local) and its public agencies can solve or mitigate the problem, that is, a government failure does not exist.

Only if the above conditions are fulfilled, is it justified to design policy instruments and choose among potential forms of intervention.

It is evident that a broad-based innovation policy that would meet the above conditions is still in its

Caution is needed in the implementation of broad-based policies so as not to add complexity to the support system.

infancy. The basic conclusion is that all the *premises for implementing broad-based policies are not yet in place*, even though policy agencies have designed and introduced new instruments and programs. Since the innovation support system is already complex for firms to access and for the government to administer, there is a real risk that adding new elements will make it even more so. *Streamlining is urgently needed.*

How do its actors see the Finnish innovations system?

Our survey (Kotiranta *et al.*, 2009) targeted all groups of actors within the system. From the point of view of the BBIP, it provides a number of interesting insights:

1. Perhaps not surprisingly, there are substantial differences between respondent groups. Smaller innovative firms grade the performance of the system clearly below that of the national innovation and education support organizations. They are also more pessimistic about the future performance (five years from now) of the system, even if both smaller and larger firms expect an improvement. This is clearly a challenge for policymakers,

since the viewpoint of firms using the public support services has repeatedly been emphasized by policy agencies when reforming the system.

2. The system is considered rather complex by nearly all respondent groups. Having this as a starting point, it is interesting to note that only **two** actors, *Tekes* and the *universities* are regarded as *rather important* by both smaller and larger firms. In addition, VTT (Technical Research Centre of Finland) is rated *rather important* by larger firms. While looking at the opinions of **all** respondent groups, it transpires that in addition to *Tekes*, *VTT* and *universities*, *Ministry of Employment and the Economy (MEE/TEM)*, *Ministry of Education, Ministry of Finance, Finnvera*, and the *Research and Innovation Council (RIC/TIN)* are highly regarded by other groups of actors in the system. Interestingly, *TE-Centres* and *other intermediary organizations* (there are over 300 of these with very different missions) are considered relatively **unimportant** both by companies and other actors. A descriptive network analysis suggests that there are only a few of central actors in the system. Many organizations are regarded as being relatively unimportant and having overlapping functions with others.

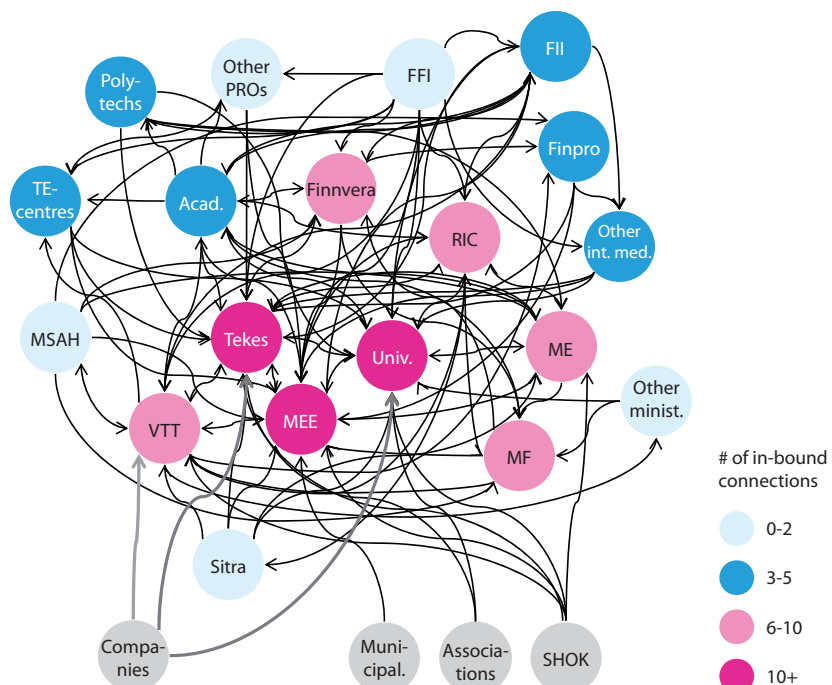
Exhibit 22: The complexity of the Finnish innovation system.

Importance of various public actors as evaluated by other actors within the system.

From the point of view of the other actors in the system, the *universities* and *Tekes*, the *Finnish Funding Agency for Technology and Innovation*, are the core public institutions of the Finnish innovation system.

Note: A connecting link is established if the relevance is 3.5 or higher (on a scale of 1 to 4). Grey circle actors have only out-bound links. A dark grey line indicates a threshold of 3.0 (only for companies). A light grey line indicates a threshold of 3.0 (only for large innovative companies). Abbreviations: **Acad.**, The Academy of Finland, **FFI**, The Foundation for Finnish Inventions, **FII**, Finnish Industry Investment, **ME**, Ministry of Education, **MEE**, Ministry of Employment and the Economy, **MF**, Ministry of Finance, **MSAH**, Ministry of Social Affairs and Health, **Other int. med.**, other intermediaries besides TE-Centres, **Other minst.**, all other ministries besides ME, MEE, MF, and MSAH, **Other PROs**, Public Research Organisations (sectoral research) besides VTT, and **RIC**, The Research and Innovation Council.

Source: Kotiranta *et al.* (2009).



3. The organizations' opinions on the overlaps among the public actors' functions confirm this. Nearly half of the respondents see overlaps or duplication. The share is highest (70%) among the respondents representing intermediary organizations, including TE-Centres. While overlaps can not, and perhaps should not, be completely avoided, the survey results clearly indicate one of the key problems of the system. Hence, there is a real need for streamlining and re-defining the roles of regional and national support organizations (also Chapters 7 and 8 emphasize this).
4. As for the ongoing reforms in the innovation system, respondents have a clear view that the public research organizations would indeed benefit from a comprehensive restructuring and, thereby, have a positive impact on the performance of the national innovation system as a whole. It is particularly interesting to note that ministries, as the primary principals of public research organizations, seem to be among the most convinced proponents of potential reforms. The survey also provides evidence regarding the public research organizations and universities' ability to match the information needs of ministries. It is somewhat surprising to observe that the ministries and other public sector organizations systematically assess universities and polytechnics to achieve a slightly better match with their needs than public research organizations under their command.

Are the ongoing reforms consistent with the broad-based approach?

There are several ongoing reforms in the Finnish innovation system, many of which were initiated well before the new Strategy and its broad-based concept. It is nevertheless important to consider how these reforms fit with the future innovation landscape and the principles of broad-based innovation policy, in order to identify what is potentially missing in the policy repertoire.

Overall it can be said that many of the reforms in the Finnish system provide a good basis for pursuing a broad-based innovation policy. This applies, for example, to the new *University Act*, which provides favorable framework conditions for the universities to respond to societal needs, in addition to becoming more competitive in scientific and scholarly capabilities. Much depends on the way in which the reform will be implemented and how well the opportunities will be seized.

The intention underlying the abolishment of the teachers' exemption in patenting was to promote the utilization of university inventions and to further their wide dissemination. However, how well the latter reform is achieving its targets, is not yet known.

From the point of view of a broad-based innovation policy, there is an urgent need for reform in the *sectoral research* system, as outlined by Neuvo's committee. Applying the broad-based approach to secto-

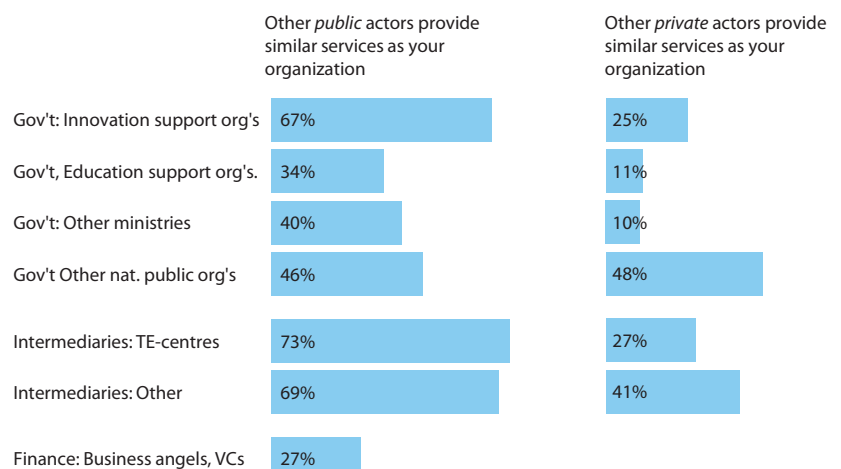
Exhibit 23: There is significant overlap between different actors.

Percentage of Yes answers to the overlap between different actors.

The innovation support organizations and intermediaries see there is significant overlap between public actors (the overlap between public and private actors is reported by other public sector organizations and other intermediaries).

Note: Business angels and venture capitalists were asked *Would you say that PUBLIC actors provide services similar to your organization?*

Source: Kotiranta et al. (2009).



There is an urgent need for a reform in the sectoral research system.

ral research implies, among other things, closer user-producer interaction in innovative activity, and utilizing innovations in the delivery of public services.

Presently, the allocation of the resources in the public sector research follows the needs of earlier decades, that is, too large a proportion of the support goes to *primary production*. The system has **not** been able to change the allocation or to respond to new needs. The reform would require new and innovative models of organizing research activities and ensuring that the information needs of the public administration and society at large are met effectively. This includes the fact that not all the research currently pursued in the public research institutes would continue to be carried out in these, but as far as possible, would be outsourced, for example, to universities.

The reform of sectoral research has not, however, been put in practice, probably because of its threat to established interests and because of a lack of resources in terms of power and money. This is an area where the government is called upon to show its commitment to a broad-based view. The most recent new decisions provide a step, though a very modest one, into the right direction.

The *Strategic Centres for Science, Technology and Innovation* (Finnish acronym: SHOK) initiative may provide some ground for experimentation for user-

and demand-oriented programs, though so far, it is too early to judge whether this will be the case. The basic principle of the SHOKs is fairly *traditional* and **not** likely to support the emergence of new clusters, even though as such, the concept is an interesting and valuable experiment to provide incentives for larger firms to renew their technological base.

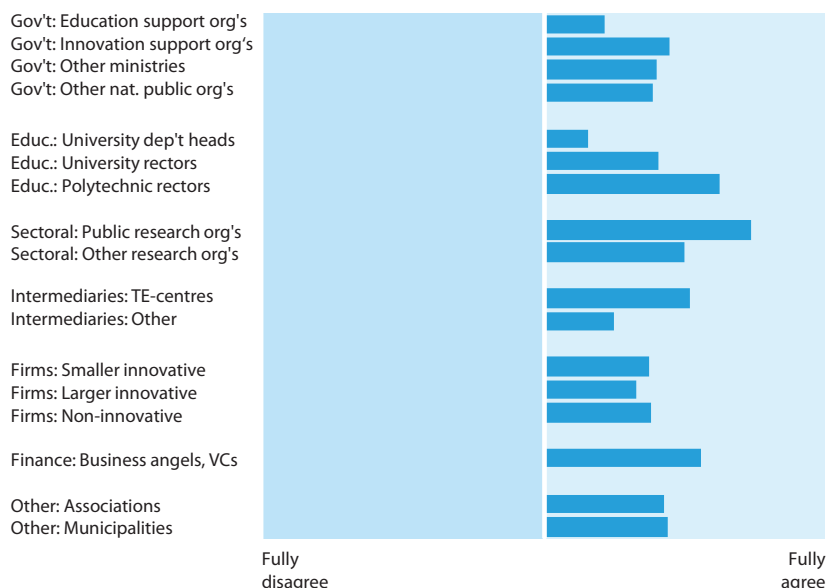
The regional dimension provides a firm foundation for experimentation in pursuing a broad-based innovation policy, which takes into account experience-based innovations as well as local structures and needs arising from them. The development of a regional *innovation* policy is, however, still in its infancy and would need further clarification of its goals, actions, and division of tasks with other support schemes.

The repertoire of demand-based policies includes direct and indirect measures for both public and private sectors. We welcome the aim of the government to adopt demand-oriented policies and to experiment with new initiatives. This could be especially pertinent to the *public sector* activities, where it may have a considerable influence. Furthermore, in vital areas such as energy and environment, it can exert great influence by setting norms and regulations, thus providing powerful incentives for the development of new technologies of the future. These areas

Exhibit 24: Actors of the system are optimistic about the University Inventions Act.

While similar reforms have received a fair amount of criticism in other countries, actors of the Finnish system seem to be quite optimistic regarding the impact of the University Inventions Act on facilitating collaboration. It is expected to dismantle the culturally introvert ivory tower of the academia, streamline rigid and hierarchical administrative practices and routines at universities, and increase resources allocated to university-industry cooperation. Identified challenges, on the other hand, include still ambiguous IPR-regimes and a lack of committed university resources dedicated to facilitating cooperation.

Source: Kotiranta *et al.* (2009).



are already on the research and innovation agenda, but they need a more focused approach to be really effective. The ICT is another example of an area where public action through, for example, support to diffusion of innovations can greatly benefit the sector and public welfare purposes. Chapter 5 elaborates on these issues.

It is to be further noted that a demand-oriented innovation policy is not without risks: In its attempt to hasten the market adoption of new technological solutions, the government may promote technologies which in the end turn out to be losers, and in the worst case, lengthen the dissemination period of a more viable solution. Experimentation and failures are inevitable in the adoption of radical innovations, and only experimentation will show the viability of the different solutions.

Weak international dimension

Finnish innovation policy and policy documents do emphasize *internationalization* and *international collaboration*

in the context of innovation policy.¹⁹ While the issues have been on the policy agenda for a long time, Finland remains exceptionally inward-looking in these respects. Indeed, only international trade and cross-border direct investment have in the past been forcefully promoted forms of globalization. According to many available indicators, such as the mobility of academic people, Finland is among the least internationally-oriented countries in its innovative activity.²⁰ As discussed in Chapter 9, the share of international teacher and researcher visits from and to Finland has slightly decreased in the 2000s, contrary to expectations and explicit policy goals.

The joint programme of the Academy of Finland and Tekes, *FiDiPro* (Finland Distinguished Professor Programme), provides one way to counteract the above-mentioned trends and to further internationalization of Finnish academia. The FiDiPro program enables distinguished researchers, both foreign and returnees, to work in Finland with the 'best of the best' Finnish academic researchers.

Finnish funding agencies have agreements about research collaboration and exchange with a number

Exhibit 25: Key activities in systems of innovation.

I Provision of knowledge inputs to the innovation process

1. *Provision of R&D* and, thus, creation of new knowledge, primarily in engineering, medicine, and natural sciences.
2. *Competence building*, for example, through individual learning (educating and training the labor force for innovation and R&D activities) and organizational learning.

II Demand-side activities

3. *Formation of new product markets*.
4. *Articulation of quality requirements* emanating from the demand side with regard to new products.

III Provision of constituents of Systems of Innovations (SI)

5. *Creating and changing organizations* needed for developing new fields of innovation. Examples include enhancing entrepreneurship to create new firms and entrepreneurship to diversify existing firms; and creating new research organizations, policy agencies, etc.
6. *Networking through markets and other mechanisms*, including interactive learning among different organizations (potentially) involved in the innovation processes.

This implies integrating new knowledge elements developed in different spheres of the SI and coming from outside with elements already available in the innovating firms.

7. *Creating and changing institutions* – for example, patent laws, tax laws, environment and safety regulations, R&D investment routines, cultural norms, etc. – that influence innovating organizations and innovation processes by providing incentives for, and removing obstacles to, innovation.

IV Support services for innovating firms

8. *Incubation activities* such as providing access to facilities and administrative support for innovating efforts.
9. *Financing of innovation processes* and other activities that may facilitate commercialization of knowledge and its adoption.
10. *Provision of consultancy services* relevant for innovation processes, for example, technology transfer, commercial information, and legal advice.

Source: Edquist (2006).

Relative to its R&D effort, Finland ranks poorly in EU Framework Programme participation.

of countries outside the European Union. These are made with countries where official contracts are important for achieving joint action such as joint calls. The EU Framework Programmes and other European funding schemes, such as Eureka, COST, and ESF, however, play a major role in Finland’s innovation policy-related international funding schemes. Funding of R&D activities, performed in specified support regions, is also channeled via EU Structural Programmes.

The EU Framework Programme plays a key role due to its sheer size, the multitude of research areas and support instruments it covers, and the fact that it provides substantial money for research activities. The Seventh Framework Programme furthers – besides collaborative research projects and networking among the funding agencies – mobility of researchers (Marie Curie) and aims to create a truly European research area where knowledge, researchers, and technology can move freely, and national research activities and policies are coordinated.²¹

Finnish researchers and organizations actively participate in the EU Framework Programmes, both in terms of *juste retour* (as compared with Finland’s share of the EU R&D budget) and population size (Exhibit 26). If Finnish participation is considered relative to its R&D expenditures, however, it is well below the EU average. Thus, there is room for improvement in this respect. Finnish organizations and researchers have not been, when related to the R&D expenditures, much more active in the new integrating and ambitious instruments of the Sixth Framework Programme – ERA nets, Integrated projects, and Networks of Excellence. ERA nets and Networks of Excellence represent tools specifically aimed at furthering integration among research performing and funding organizations across the EU member states.

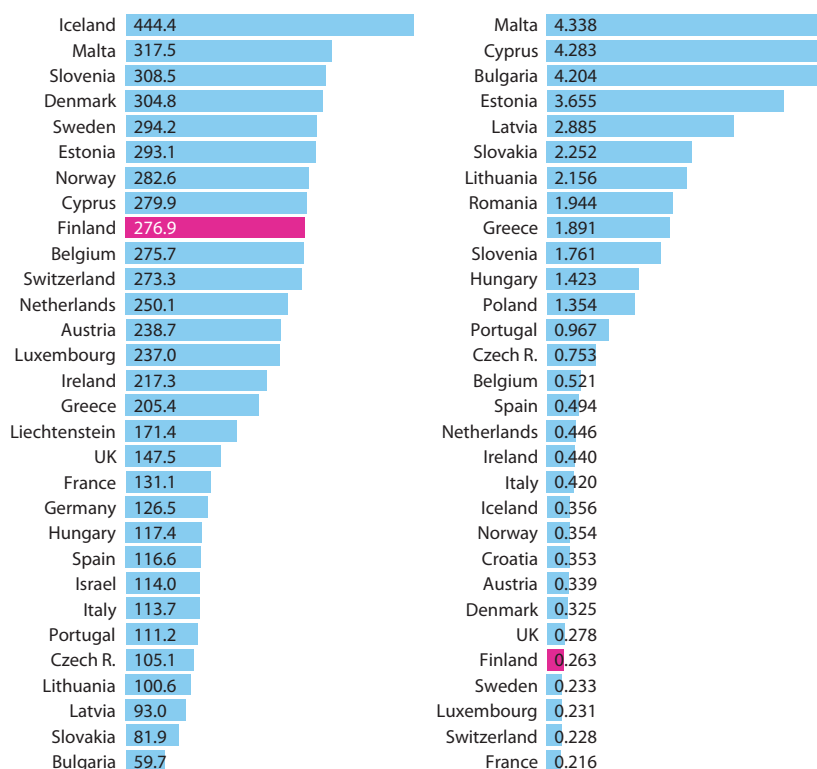
New member states participate most actively relative to their national R&D expenditures, while high R&D spenders such as Finland and Sweden rank low. This raises the question: Does national R&D support crowd out European-level R&D funding? The Euro-

Exhibit 26: Relative to its national R&D effort, Finland ranks poorly in EU framework programme participation.

Ranking based on the number of participants in the EU FP per million inhabitants (left) or per the gross domestic expenditures on R&D (right).

Finland ranks fairly high when the number of program participants is compared to the population but low when compared to the national R&D effort.

Source: Tekes, European Commission, Eurostat, and UNFPA.



pean Framework Programmes have an advantage over national ones, as they require European/international collaboration as a prerequisite. European and international collaboration will bring important competence and network building effects as well as competition. Considering that Finnish research environments and researchers are surprisingly and persistently domestically-oriented in terms of mobility or the composition of university personnel, more international exchange and mobility would be highly recommended. Empirical research further shows that foreign researchers are more productive in bringing new ideas and competition (Kahn & MacGarvie, 2009). The same applies to domestic researchers abroad after they return.

The EU is an important arena for international collaboration of Finnish researchers and companies. The EU research policy is a significant forum for pursuing important socio-economic issues which affect the development of European societies.

Influencing the EU research policy is a new challenge for Finnish stakeholders and requires new capabilities and action. Influence takes place at several levels and through a multitude of channels, for example, from the special period of a country's Presidency, which offers an unprecedented opportunity to introduce issues to the European research policy agenda, to active membership or special functions in committees and expert groups, to participation in events organized to formulate and assess policies, and to activate networking, lobbying, coordinated action, and contacts in between events and special occasions.²² According to the interviews the Panel has conducted, there is room for improvement in Finland in these capabilities.

In order for Finnish civil servants to gain competencies and better understand the ways in which the EU arenas function, the Finnish government should actively endorse careers abroad as a prerequisite for promotions in tasks needing competencies in international networking.

ERASMUS for civil servants provides new opportunities for building up knowledge and competences concerning EU policy-making and should be taken as part of Finland's internationalization strategy.

Conclusions

We welcome the basic ambitions of the broad-based innovation policy and recognize that the new innovation strategy represents an ambitious, but a fuzzy, move towards a new balance between the supply and demand side innovation policies. We consider it important that the government will soon provide clear contents to the now vague concept of the broad-based innovation policy, so as not to let it dissipate.

Basic organizational structures for formulating overall strategies and coordinating policies are in place in Finland. A major drawback in the workings of the present system is, however, that the *Ministry of Finance* is less involved in research and innovation policy formulation. Its more active role is recommended. We also recommend a more active involvement of the Prime Minister's Office in some central coordination functions, especially concerning the public sector. Reforming sectoral research is a great and long overdue opportunity for Finland – we hope there is enough political will to make things happen.

Overall the Finnish innovation system lacks strong coordination mechanisms. In principle the *Research and Innovation Council* has such a role, but it rarely touches upon the division of tasks among various public bodies. Over time public organizations have increasingly expanded into each others' territories, which has led to significant overlaps.

Conducting periodic evaluations and seeking outside expertise is an important way to steer the innovation system and its public bodies. Finland has adapted an evaluation culture where the targets commission evaluations of themselves, as well as publish the results (of their liking). This is clearly too inward-looking and decreases the objectivity and independence and thus usefulness of evaluation. The evaluation system is rendered healthier if a third party that is not being evaluated commissions these exercises. The Finnish *Higher Education Evaluation Council* is an example of an organization that could have a broader role and undertake (commission) evaluations of other public sector organizations and their activities. Alternatively, e.g., the *Ministry of Finance* could organize such an activity.

Sitra, the Finnish Innovation Fund, is an important organization in the Finnish system and has an

role in policy experimentation. It adds diversity to the system and can help to avoid the risk of too one-sided ideas, policies, and funding opportunities.

Many of the ongoing or recent reforms in Finnish research and innovation policy provide a good basis for pursuance of a broad-based innovation policy. This applies, for example, to the new University Act, which provides favorable framework conditions for the universities to respond to societal needs, in addition to becoming more competitive in scientific and scholarly capabilities. Much depends on the way in which the reform will be implemented and how well the opportunities will be seized.

It is too early for a verdict on the impacts of the law change concerning the Intellectual Property Rights of university-based inventions in Finland. Examples from other countries, however, highlight that changes in IPRs in the context of universities may bring about impacts which are opposite to what was originally sought. Emulating institutional solutions from other countries is always risky and may not work in the new environment. This is also a case where it is not at all clear that the original model (Bayh-Dole) worked and that too hasty conclusions were drawn based on a few exceptional cases which brought high revenues for the universities. It is also evident that in Finland the resources of technology transfer offices are sub-optimal.

The SHOK initiative is an interesting and worthwhile experiment in promoting the technological renewal of large firms in existing industrially strong areas in Finland. It is to be remembered, however, that the SHOKs will **not** contribute to the emergence of new industries or new clusters. Therefore, we recommend that the public resources devoted to the SHOK initiative be limited to enable the support policies promoting more radical and disruptive innovation. We endorse experimentation with innovation promotion in a demand-based mode in the SHOK programs. We further recommend that the international dimension be more strongly aligned with the new SHOK programs and their procedures.

With regard to the sectoral research reform, we recommend a multi-year binding plan concerning the steps to be taken. Such a plan could take advantage of retirements of personnel in the reallocation of resources.

In order to facilitate a structural reform, the long-term goal of the sector research reform should be a reorganization of the public research organizations into a small number of groups according to broad societal questions, and not according to the present administrative sectors. Some of the research activities in the public research organizations should be moved to the universities, as well as outsourced to other research organizations.

Exhibit 27: Summary and recommendations.

We welcome the basic ambition of the broad-based innovation policy. It provides a balance between the supply and demand sides of innovative activity, includes non-technical innovations, has a direct economic impact, and emphasizes wider societal considerations.

The new broad-based innovation policy remains, however, a fuzzy concept. It should soon be provided clear contents in order for it not to dissipate.

The Finnish system has no strong systems-wide coordination. The lack of involvement of the Ministry of Finance and less active involvement of the Prime Minister's Office in coordination of research and innovation policy formulations is a drawback. There are significant overlaps in the services offered by public organizations. Streamlining is urgently needed.

Broadly speaking, the ongoing reforms provide a good basis for pursuing a broad-based innovation policy. The uni-

versity reform offers great opportunities for Finland. We have some concerns as to the University Inventions Act, but its final impact cannot be conclusively assessed yet.

The SHOK initiative may be helpful in incrementally renewing traditional Finnish industries, but it is unlikely that it would breed new clusters or promote radical/disruptive innovations.

The reform of public research organizations (PROs) seems to be in a permanent gridlock, which is unacceptable and unaffordable. PROs could be a thrust in the Finnish system – an opportunity that is now being wasted.

Sitra is a uniquely Finnish construction and the 'libero' of the system. While its position has at times been challenged, it has served a purpose in the past and in our opinion will continue to do so. The Finnish system is highly consensus-driven and needs more diversity in ideas as well as parties willing to take a more long-term view.

5. Demand- and User-Driven Innovation

On the basis of Breznitz, Ketokivi, and Rouvinen in the Full Report

The emphasis of Finnish innovation policy has previously been on the supply side. The Strategy's (Aho *et al.*, 2008) **balanced view** of supply- and demand-side considerations is a good extension of policy scope. Otherwise we challenge the Strategy's argumentation. Our thinking is nevertheless roughly in line with the *Ministry of Employment and the Economy's* forthcoming framework. We conclude that public promotion of demand- and user-orientation should primarily be *indirect*. We are *not* against direct public support for private innovative activity – we simply urge it to be *impartial* to the initial source, type, and application domain of innovation. To the extent that this has not been the case, we recommend adjusting towards impartiality.

Change of course

Demand and user orientation is – in addition to the related broad-based approach – the most significant call for change in the Proposal for Finland's National Innovation Strategy (Aho *et al.*, 2008, p. 8): *Newer innovation policy will emphasize the development of products and services meeting the needs of customers and the strengthening of users' and developers' mutual development work. There is room for improvement in Finland, particularly as concerns the development and introduction of user-oriented service innovations.*

As for the public actions, the Strategy (p. 15) notes that *The system of research, development and innovation activity expert services and public financing incentives will be updated to meet the needs of a demand- and user-oriented approach. New operating forms and incen-*

tives will be created to support broad-based interaction required to provide genuine support for demand- and user-oriented innovation activity.

We will demonstrate that both of the above premises must be approached with caution. It is puzzling that – as pointed out by the *Ministry of Employment and the Economy* (henceforth the Ministry)²³ – the Strategy neither defines the content of demand- and user-driven innovation policy nor discusses related empirics.

Some of the Strategy's problems are alleviated in the Ministry's preliminary summary of *the content and conceptual framework for demand- and user-oriented innovation policy*.²⁴ As it was published on 10 June 2009 when most of our work was done, its insights are not fully integrated into our analysis. It is our understanding that most actions based on the new framework are to be implemented in 2010 and beyond.

Innovation is a coupling process

An **innovation** (OECD & Eurostat, 2005, pp. 46–47) is the *implementation of*

- a novel good or service,
- a novel production process,
- a new marketing method, or
- a new organizational method (in-business practice, workplace organization, or external relations).

Innovative activity includes all steps aimed at implementing innovations (Exhibit 30). It proceeds clockwise from *exploration* of rudimentary ideas (lower left) to *implementation* (lower right) and (possible) diffusion of the innovation in the market place.²⁵

Exhibit 28: Some Definitions.

Market demand is understood as a purchase of a good or service (or an ability and willingness to do so). A user (potentially) consumes or applies the good/service.

The prevailing understanding seems to be that *demand* is a macro and *user* is a micro concept, i.e., that demand is simply the aggregation of individual users' needs. This is, however, not always the case: in fact many of the policies in this domain specifically build on the fact that there is sometimes an outside demand generator or accelerator, e.g., the public sector.

Businesses supplying goods and services mostly interact with other organizations (intermediate users) as opposed to individuals (ultimate users); thus they respond to the *derived demand* transmitted by the supply chain.

For example, *Google's* demand is for targeted online advertising, even if its core offering to end-users is a free Internet search engine. Medical equipment is typically used by a public healthcare professional upon serving an individual; in a typical case neither has direct control over demand for equipment.

Demand-driven innovation policy stimulates demand for innovations and conditions for their take-up. User-driven innovation policy stimulates user-inspired (and user-to-user) collaborative activities.

The authors' interpretation of the Ministry's (10 June 2009) framework with the addition proposed by Eric von Hippel in the parentheses.

Considerable scholarly debate has been carried out on whether it is scientific *curiosity-driven research* (i.e., the generation of new ideas without particular domain of application), **technology push** (attributed to Schumpeter, 1934, 1942), or user/market *needs and desires*, **demand pull** (attributed to Schmookler, 1966), that gives the initial impetus for innovative activity. As Exhibit 31 suggests, according to this dichotomy the Finnish system is a tech-push environment: Particularly business angels and venture capitalists, who observe the issue first hand, think so.

The push-pull distinction is potentially misguided. More appropriately, Freeman (1979, p. 211) states that *Innovation is a coupling process, which first takes place in the minds of imaginative people somewhere at the ever changing interface between science, technology and the market. The coupling is far more than an intuitive flash: it is a continuous creative dialogue over a long period of research, experimental design, and development.* Exhibit 30 illustrates the interaction and feedback between the existing pool and curiosity-driven *inventive activity* and application-minded *innovative activity*.

Exhibit 29: A demand- and user-orientated innovation policy consists of public measures that influence provider-user(-demand generator) interaction with the aim of generating and utilizing novel ideas.

Source: Breznitz, Ketokivi, and Rouvinen.

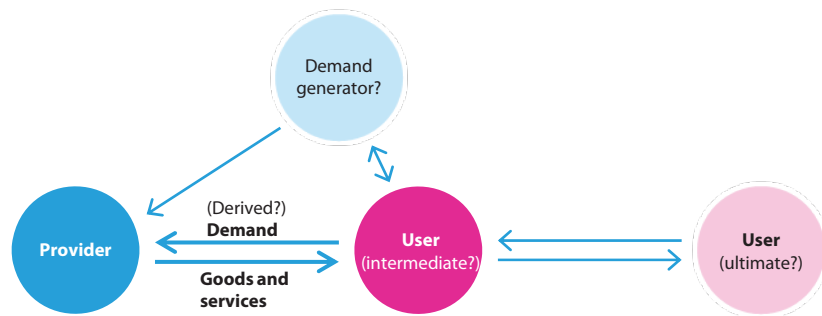
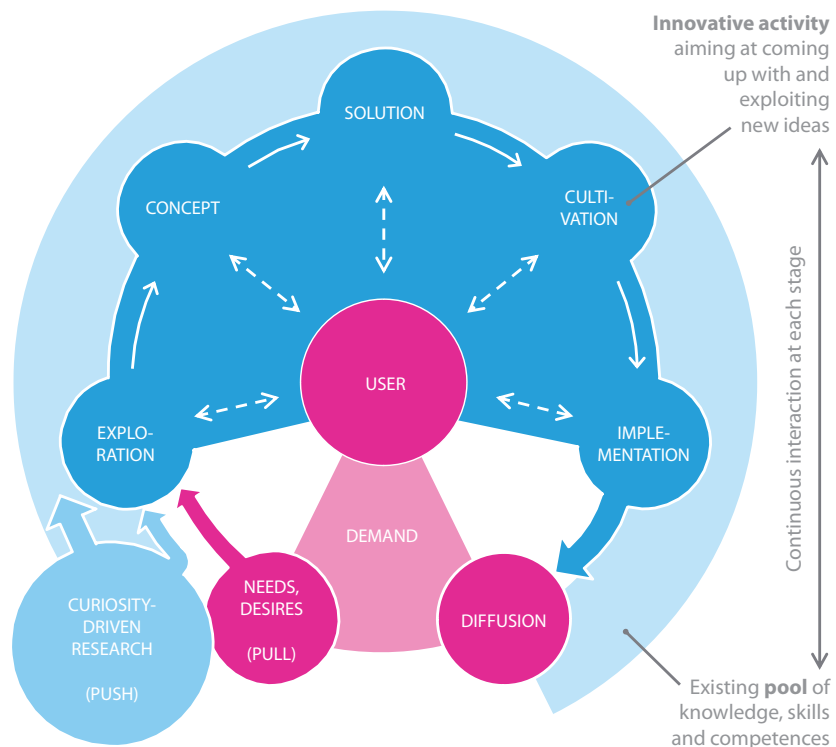


Exhibit 30: A stylized illustration of the steps and interaction in innovative activity.

Innovative activity proceeds clockwise from exploration of rudimentary ideas (lower left) to implementation (lower right) and (possible) diffusion of the innovation in the market place. The user is placed at the center.

Source: Breznitz, Ketokivi, and Rouvinen.



No commercial innovative activity exists without some demand and user orientation.

No commercial innovative activity exists without **some** demand- and user-orientation. Furthermore, it is the *implementation*, the introduction and market roll-out of a novel idea embodied in a good/service (or in its provision) that defines innovation. Thus, at least at the very beginning and at the very end (and to a varying degree in the intermediate steps), commercial innovative activity is squarely focused on markets and users. This is why Exhibit 30 places the user at the center of innovative activity; this has always been the norm in for-profit innovative activity.

With technological advances such as the Internet, the role of users in innovation **is**, however, changing in noteworthy ways:

- Companies involve users as **co-creators** in innovative activity; they are no longer just targets whose needs are solicited – their *user expertise* is becoming instrumental in the innovation process.
- Businesses increasingly seek to uncover unroused and **unarticulated** user needs, which can only be done via extensive observation and interaction. Anthropology and ethnography – not business, engineering, or market – form the intellectual foundation in this case.²⁶
- There are new possibilities to engage users in diffusing and **complementing** the innovation once introduced. To be sure, *Apple iPhone's* current advantage in the US market is significantly affected by *crowdsourcing*, where users provide a constant flow of ingenious applications and content.
- Thanks to constantly falling computing and communications costs, users have an improved ability

to innovate directly for **themselves**.

Freeman's point of continuous fusion between science, technology, and the market in innovative activity, is precisely why considering both the **supply side** (providing new ideas) and the **demand side** (nurturing and diffusing them), must be incorporated into innovation policy. This constitutes the most important premise for this chapter: *there are always both supply and demand side issues to demand- and user-orientation.*

Empirical evidence

Innovation studies (see, e.g., Florida, 1997; von Hippel, 1988) overwhelmingly confirm that businesses regard customers (consumers, other businesses, and/or public bodies) as the most important external source of new ideas. Our survey echoes this.

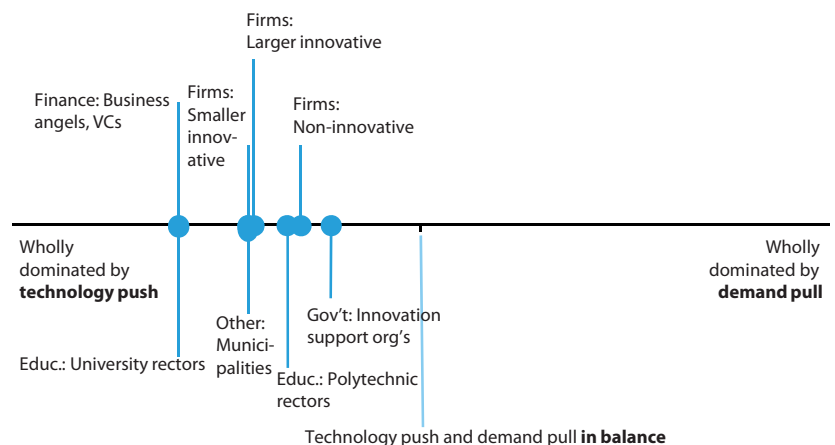
In Exhibit 32, the percentage in each case refers to the proportion of Finnish companies that consider the source in question a *very important* input to their innovation activity; the percentage in parentheses refers to those that consider it *important* or very important. Virtually all consider customers *important* (97%); no other external source comes close. Comparing the *very important* percentages nevertheless suggests that in-house innovative activity is the main source. Exhibit 32 includes both domestic and international sources – in Exhibit 33 the two are separated. With the exceptions of suppliers and competitors, domestic sources tend to be more important.

Exhibit 31: The Finnish system is a tech push environment.

Respondents were asked to evaluate the system's orientation on a 5-point scale with strong tech push and demand pull as the extremes.

All respondent groups consider the Finnish innovation system as a technology pushed environment. Particularly business angels and venture capitalists, who observe the issue first hand, think so.

Note: Refers to the mean responses by group. See the survey documentation for details.
Source: Kotiranta et al. (2009).



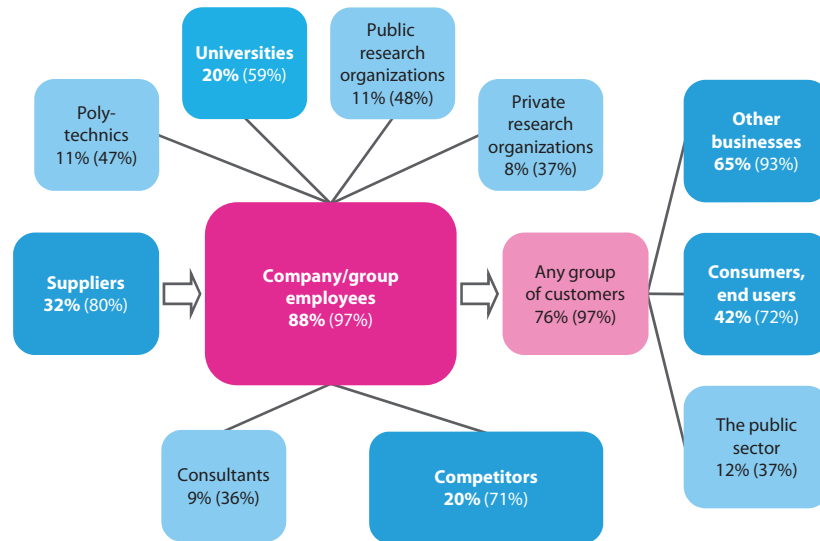
Demand and user orientation is not lacking among Finnish businesses; for practical purposes its penetration is complete.

Exhibit 32: Customers are the most important external source of new ideas.

Share of Finnish companies engaged in innovative activity that consider the source in question as being a very important (or important) contributor to their innovative activity.

The most important source is the company's/group's own employees. The most important external source is customers, of which business-to-business customers are the most important sub-group.

Note: See the survey documentation for details.
Source: Kotiranta et al. (2009).



At least from the chosen point of view, demand- and user-orientation is **not** lacking among Finnish businesses; for practical purposes its penetration is complete. Thus any (public) effort to promote the orientation *per se*, as opposed to its more qualitative aspects or going beyond businesses' current customers, would be wasted.

But how exactly do customers and users participate in the innovative activity? To examine this, we looked at the different roles that users may have in innovative activity (Exhibit 34). We find that in 25% of the cases, users are **co-creators** in the innovative activity, engaging their own expertise (not just needs and wants). In 16% of the cases users have no significant role. The remaining 53% are somewhere in between.

These percentages are on par with or, considering the respective samples, above those of the Netherlands (de Jong & von Hippel, 2009), the only international benchmark we are aware of. These percentages by themselves do not call for policy intervention.

We perform a statistical analysis to study further the four categories of Exhibit 34. Our first observation is that being in one of them is not correlated with the usual business demographics (size, industry etc.). Presumably it is nevertheless the case that the role of user expertise (co-creation) tends to be less significant in *more matured* industries and in contexts where *specialized in-depth expertise* is needed.

As for the 16% for whom users play no significant (direct) role, the first (wrong) reaction might be

Exhibit 33: Domestic sources of new ideas remain more important.

Share of innovative companies considering the specified domestic/foreign source as being very important (or important) for their innovation activity.

Note: Sorted by the ratio of domestic to foreign in the rightmost column. See the survey documentation for details.

Domestic* = The proportion of Finnish companies that consider the source in Finland a *very important (or important)* input to their innovation activity.

Foreign** = The proportion of Finnish companies that consider the source abroad a *very important (or important)* input to their innovation activity.

Ratio*** = The ratio of the above proportions (domestic/foreign); this ratio defines the sort order of the table.

Source: Kotiranta et al. (2009).

	Domestic*	Foreign**	Ratio***
Suppliers	22 % (72%)	23 % (60%)	0.97 (1.20)
Competitors	15 % (62%)	13 % (48%)	1.13 (1.30)
Private research organizations	5 % (32%)	3 % (19%)	1.57 (1.66)
Consultants	7 % (33%)	4 % (19%)	1.76 (1.77)
Other businesses	59 % (89%)	33 % (61%)	1.80 (1.47)
Consumers/end users	38 % (68%)	20 % (43%)	1.86 (1.60)
Any group of customers	72 % (95%)	38 % (65%)	1.88 (1.45)
Universities	18 % (54%)	7 % (27%)	2.47 (2.00)
Public research organizations	9 % (43%)	3 % (20%)	2.81 (2.14)
Company/group employees	86 % (97%)	27 % (40%)	3.19 (2.40)
The public sector	12 % (35%)	2 % (11%)	4.89 (3.04)
Polytechnics	11 % (47%)	1 % (13%)	7.68 (3.48)

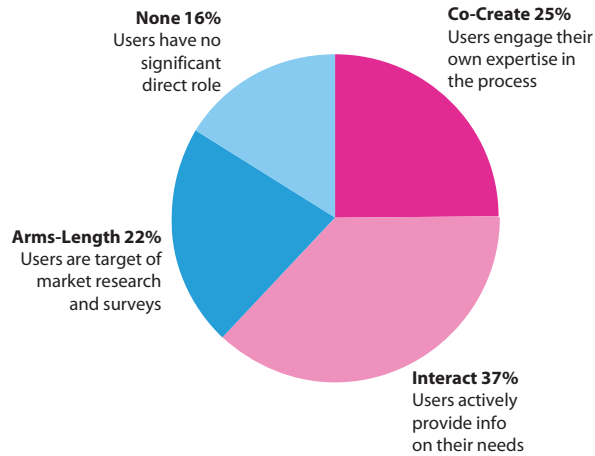
There is little need for direct supply-side intervention as far as profit-seeking innovation activity is concerned.

Exhibit 34: A quarter of companies engage users as co-creators.

Distribution of Finnish innovative companies by the highest type of exercised user interaction in innovative activity.

One quarter of Finnish companies engage their end-users in the actual innovation process as co-creators. Only one sixth of the companies report that their end users have no significant direct role.

Note: See the survey documentation for details. Source: Kotiranta et al. (2009).



that they do not understand the benefits of the orientation. A closer look suggests, however, that in many cases the context is simply so specialized that virtually all of the relevant innovation expertise resides within the organization.²⁷ These companies do attend to their customers; sometimes their business specifically rests on conducting innovative activity in domains the customers do not want to be engaged in. Indeed, one should make a distinction between demand and user orientation in *general* (always beneficial) and in *innovative activity* (conditionally beneficial).

As Exhibit 35 suggests (and our regressions confirm), there is no simple statistical association between the orientation and firm productivity. If anything, productivity is **lower** among those engaging users more deeply into their innovative activity. This may reflect the *locus of innovative expertise* within the supply chain: when more of the expertise is concentrated within the company, external interaction in innovative activity is somewhat less important and related in-house assets may earn higher returns.

Discussion

In virtually all countries, Finland included, the emphasis of innovation policy has been on the *supply side*. The *demand side* has, however, been incorporated in other policy domains, such as communications and national defense. Indeed, **competition policy** is arguably the most important form of demand- and user-orientated innovation policy.

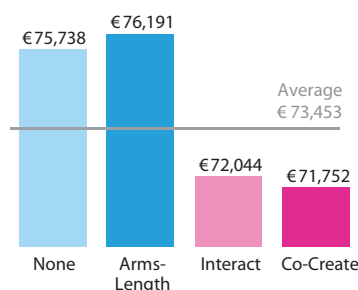
The absence of the demand-side from *innovation policy* has been interpreted as evidence of the lack of demand- and user-orientation in the *innovation system* itself. At least as far as businesses are concerned, this is **not** the case. While qualitative aspects of the orientation can be debated, there is no evidence suggesting Finnish businesses pale by international comparison as far as the depth of the orientation is concerned.

The above does not mean that there would be no need for policies promoting the orientation, quite the contrary. It is, however, not obvious what the most appropriate policies are. In the following, we exam-

Exhibit 35: No statistically significant association between labor productivity and the orientation.

Companies that do not utilize end-users in their innovation processes, perform even slightly better in terms of productivity than the average company in the sample. The difference is, however, not statistically significant.

Note: Productivity refers to value added per employer. Source: Source: Asiakastiety Oy and Kotiranta et al. (2009).



Demand and user orientation is often lacking for a reason, that is, in the specific contexts and domains engaging users serves no purpose.

ine the policy implications from four points of view (see Exhibit 36 for summary):

1. Supply side issues,
2. Demand side issues,
3. Issues when supply and demand sides coincide, and
4. Issues when either the supply or demand side does not exist.

Supply side

Engaging in active provider-user interaction is (potentially) **privately profitable** if all of the following conditions are satisfied:

- User possesses relevant information,
- User is able and willing to convey it,
- Provider learns from it,
- Provider profits from employing it, and
- Provider-user interaction is the least costly way to get to it.

These conditions lead to further questions:

1. Conditional on the prevailing operating environment (which policies can and do influence), are privately profitable possibilities of interaction exhausted?

2. Does further interaction (in the absence of intervention not privately profitable) make societal sense?

3. If so, is there a feasible scope for policy intervention (i.e., no government failure)?

Our empirical analysis suggests that the answer to the first question may well be a *Yes*. This being said, the market for information may nevertheless fail also in the provider-user link, even if it seems less likely than in the case of, say, basic science. Unless there is indeed an identifiable market failure in the provider-user link, the answer to the second question is a *No*. Noticing that in this context a direct intervention ought to be specific to the actors, content, and setting, the scope for activist policy is limited to say the least, i.e., the answer to the third question is probably a *No*. Based on the three answers, there is **no** obvious need or possibility for **direct** supply-side intervention as far as *profit-seeking* innovative activity is concerned.

Non-profit-seeking innovative activity is primarily conducted in public research organizations and in the educational sector. Unlike with profit-seeking activity, in these domains there is no direct incentive to attend to market needs. Considering the scope of

Exhibit 36: Four main points of view on demand and user orientation.

Points of view	Premises	Considerations
1. Supply (provision/conduct of innovative activity)	Profit-seeking innovative activity is necessarily demand- and user-orientated. No reason why non-profit-seeking innovative activity would have the orientation.	There is little need or possibility for direct public intervention. Analysis of what is the relevant demand and who are the users in each case.
2. Demand (desire and willingness to pay for innovative offerings)	How to have individuals, demand generators, and markets celebrating innovation? How does the public sector interact with markets?	Competition policy is among the key ways of promoting the orientation. Laws, regulations, standards infrastructure; direct public demand and supply.
3. Supply and demand coincide	Users innovating by and for themselves as individuals or communities. A user turns to a provider and makes a market entry.	Is the system equipped to support user-to-user provision? Typically takes place in early stages of an industry's evolution.
4. Neither supply nor demand	A market does not exist, even if there is scope for socially desirable exchange.	Possibilities to publicly nurture a privately sustainable market?

budgetary allocations, the current structure of PROs cannot possibly reflect the society's current and future needs. If demand- and user-orientation is to be promoted in the educational sector, it must not lead to pro-motion of an incremental and directly-fit-to-use education or research. Further exploring this issue in the context of this chapter would require a careful analysis of both *the relevant demand* as well as clearly defining *who exactly the users are* – work that is yet to be completed.

Demand side

How can individuals, demand generators, and **markets be encouraged to celebrate innovation**? This leads us to consider three aspects:

- *Quality*: How can the demand for and appreciation of novelty be fostered?
- *Quantity*: Once good new ideas are introduced in the market place, how can they be diffused and gain market share quickly? If an existing market is being expanded or an altogether new one is being opened, how can a sufficient absolute size be reached as rapidly as possible?
- *Affordability*: How can we promote users' appreciation for the economic and societal value of new offerings and thus high and widespread willingness to pay for innovative new offerings?

Individuals' and organizations' natural preference for the *status quo* is a vastly underestimated issue with respect to socially beneficial development and adaption of innovations. Furthermore, potential users have difficulty in perceiving a need for something that does not exist; after all, nobody wanted an *iPod* before they saw one.²⁸ Multinational companies partly circumvent the problem by being present in the most advanced and demanding markets worldwide.

At least in developed market environments such as Finland, the primary way to promote the orientation on the demand side is to have *maximum competition* among the current (private) providers and *minimum entry barriers*.

How does the public sector interact with markets? How can that interaction be geared toward celebrating innovation, without sacrificing other objectives? These questions lead to consideration of three domains:

1. Laws, regulations, standards, and infrastructure,
2. Direct demand by the public sector (public procurement), and
3. Direct supply by the public sector (public goods and services).

Each of the above are almost solely in the policy-makers' control, even if traditionally not considered a part of *innovation* policy. The Ministry's forthcoming new framework changes this: to our knowledge these topics are its main emphasis as far as the *entirety* of demand- and user-orientation is concerned, which we consider both appropriate and commendable.

With regard to laws, regulations, standards, the evidence suggests that they are equally likely to promote or to hinder innovation. Aspects of intellectual property are particularly difficult; while generally perceived worthwhile and necessary, at times they are antithetical to innovation and particularly difficult in the domain of demand and user orientation (Heller, 2008). It is further noteworthy that many regulations and standards of societal significance are not set by domestic actors but internationally.

It is clear, however, that for example tightening environmental regulation promotes innovation, although the reality does not necessarily coincide with the intuition: McKinsey and Vattenfall analysis (Enkvist *et al.*, 2007) suggests that the most cost-efficient way to reach the global 2030 targets for greenhouse gas emissions primarily involves already existing solutions, not new innovation.

To be sure, standards have in the past contributed to Finnish success. The successes of the analog *Nordisk Mobil Telefon* (NMT) and the digital *Groupe Spécial Mobile* (GSM) mobile telephony standards have had stellar economic implications for Finland (Hyytinen, Pajja, Rouvinen, & Ylä-Anttila, 2006).

The second topic on the list, public procurement, accounts for about one-sixth of EU-15 GDP, so harnessing it to promote innovation is a great opportunity. It should be noted that **only** procurement's novel aspects – perhaps only demand for something *globally* new – promote innovation. Ideally procurement does not to take a stance on technology or the provider, but rather sets desired characteristics and chooses the alternative that meets them the best.

The empirical findings by Aschhoff and Sofka (2009) suggest that it is **not** that the public sector

would be such an advanced or demanding customer but rather that it provides **volume** to the market.²⁹ Their findings also suggest that public procurement may primarily benefit relatively *disadvantaged* firms. If the government primarily provides volume, the timing with respect to the evolution of the industry or the product/service life cycle ought to be very exacting in order to be relevant for innovation policy. If procurement promotes relatively weaker businesses, it might hinder necessary re-structuring, which in turn can lead to considerable hidden costs.

As the (potential) innovative step increases, so does the likelihood of a failure, which translates to the possibility of non-delivery despite significant public spending. Furthermore, the ratio of development to total costs (including the actual delivery) increases with the innovation ambitions of the procurement. Thus, a new question arises: what is the willingness to stomach, say, twice the cost and a considerable probability of a complete loss in innovative – as opposed to standard – procurement? Even if elevated costs and the possibility of non-delivery are tolerated, how do we compare yet-to-be-delivered innovations in competitive tendering? While there are solutions to all of these challenges, they are not easily introduced to the standard procurement machinery.

Once public procurement is thrown into the innovation policy toolbox, one has to separate innovative and standard procurement parts as well as compare the effectiveness of this instrument in conjunction with and *vis-à-vis* others.

Our impression is that innovative public procurement has *shrunk* in Finland since Finland's EU membership (which might relate to the Finnish interpretation of the relevant EU legislation) but this might be about to change:³⁰ the European Commission is now actively engaged in using public procurement to promote innovation. As a case in point, pre-commercial procurement (EC, 2007b, p. 10) has been introduced to *shorten time to market and encourage market acceptance of new technologies*. The EU lead market initiative (EC, 2007a) harnesses, in addition to procurement, regulation and standards to *foster the emergence of lead markets' with high economic and societal value*.

Most private markets naturally promote providers' user orientation. This is not the case when the user does not directly compensate the provider, which

remains the norm in publicly provided services.³¹ Most work in promoting demand and user orientation, with respect to innovation or otherwise, remains to be done **within** the public sector itself. A further difficult issue is that public supply easily suffocates private markets. As noted by the Ministry, *Demand innovations can be promoted... by opening previously closed sectors to private [providers]*.³²

Besides interacting with *broader* markets, the government has a profound and lengthy interaction with each *individual* (and user in various markets – at the time or later) as they go through the educational system. With regards to education, promoting user- and demand-driven innovation might be as simple and generic as fueling active and open minds, supplying the conditions necessary for them to experiment with new technologies, to articulate needs, as well as to be willing in actively turning their ideas into reality.

Supply and demand sides coincide

Supply and demand coincide in situations where users, individually or collectively,

- innovate *by* themselves and *for* themselves, or
- when a user, out of necessity or out of fascination and building on his/her ideas and views, enters the market by becoming a provider.

The latter is, of course, called entrepreneurship, which is extensively covered in Chapter 7.

In the early stages of an industry's development, the role of users is often paramount. If one or more dedicated individuals perceive a need for something that does not yet exist, they are often able to come up with the first, at least rudimentary, solutions. Consequently, some users may turn into providers. As more and more users perceive the need and the market grows, it might attract incumbents from other markets. As an industry matures, users typically mostly influence it via the normal market mechanism.

In some cases the user-to-user provision may be sustainable in mature markets as well. *Open source software* is a good example. While important, in considering economic significance and policy, there is a tendency to overstate the significance of user-to-user innovation. Innovative activity is further often confused with new ways of *facilitating and organizing* innovative activity. Crowd-sourcing and open innova-

tion are important organizational concepts, but hardly innovations *per se*. Furthermore, 99% of what is going on in *Facebook*, *MySpace*, *Twitter*, or the Internet in general has little to do with innovation.

Community-based generation and (free) utilization of novel ideas is sustainable, if the following conditions are met:

- Participation cost is low in terms of direct expenses and the opportunity cost of one's time,
- The overall provision can be partitioned into independent contributions,
- Individual contributions can easily be aggregated,
- Variation in quality can be tolerated (or low quality contributions identified and removed),
- The cost of provision (including replication and delivery) is minimal,
- Contributors do not require direct monetary compensation,
- There are no strong monetary or other incentives to keep one's work proprietary, and
- There are some non-monetary incentives (such as reputation building) for sharing.

It is also good to note that the embraced idea of *democratized innovation* (von Hippel, 2005) does not organize itself: some users must be willing and able to assume coordinating and managing roles; deficiencies in these respects easily lead to poor outcomes.

Despite the limiting conditions for community-based provision and our suspicion that we are lured by intriguing and fun-to-talk-about stories (e.g., *Linux*, kite-surfing, and *Wikipedia*), empowerment of users is clearly shifting the locus of innovation.

While users effortlessly innovating for themselves remain an exception rather than the rule, there are important and expanding domains of community-based provision. It is therefore, important to ask: *Is the Finnish innovation system able to accommodate such activity?* Our suspicion is that the answer is likely a *No*.

For instance, the related intellectual property rights are a formidable and largely ignored challenge. Currently they are forced upon, undefined, unclear, ill-suited, and/or unenforceable in Finland.

As for direct public support, the system has a hard time dealing with activity that is not organized around well-defined and scheduled projects or is not conducted under clear legal entities or jurisdictions. As we have not had time to consider the issue, we are

not necessarily calling for any action yet, although at the least going through some test cases with current organizations and instruments would be worthwhile. At this point it is difficult to discuss policy implications of user-to-user innovation: more empirical and theoretical insight is needed, both in terms of test cases as well as broader research.³³

Supply or demand side does not exist

A private market may fail to the extent that it does not exist at all, even if there is scope for socially desirable exchange. In the context of demand- and user-orientation, the cause for such a drastic market failure may lie in the difficulty of uncovering user needs and desires. Another plausible explanation is the chicken-and-egg dilemma: due to extreme uncertainties or risks, or absence of network effects or scale economies, an industry simply does not form.

It may be the case that a socially desirable market is not privately profitable. Interest of private actors and the society are not always aligned, so we have a number of 'public' markets and new ones may be needed. As for initiating privately sustainable markets with an initial public push, one has to be skeptical.

Could the public sector have a role in uncovering needs and thus in nurturing new private markets? In certain cases, e.g., in the context of health and social issues, this may indeed be called for, as private parties may have a tendency to align with the *demand generators* – municipal and governmental administrators (e.g., *Kela*, *The Social Insurance Institution of Finland*) and professional gate-keepers (e.g., medical doctors) – rather than with ultimate users. For companies this is rational, as in this domain (virtually) no innovation can take place without *Kela's* approval (at least implicitly), yet the society's interest (hopefully) lies in citizens' current and future well-being.

How about 'publicly' uncovering user needs in other domains? If the fruits of comparable private activity spill over to others, or private parties cannot induce economies of scale via information sharing (e.g., due to transaction costs), there might be some scope for intervention. Given the afore-mentioned caveats, it nevertheless seems unlikely that a government failure would not occur in this case. A better scope for public policy may relate to the education sector.

As for the direct public promotion of private innovation activity, the best advice is to be impartial to the initial source, type, and application domain of innovations.

In the context of this evaluation we also studied the case of Denmark, which is perceived to be the leader in demand- and user-orientated innovation policy. While Danish businesses may well define the global frontier in embedding the orientation to their practices, we hesitate to assign any of this to related (direct) policies. The orientation of the Danish educational system should, however, be hailed in this context; it has minted anthropologists and ethnographers that have been in high demand. The University of Copenhagen's web site (<http://antropologi.ku.dk> notes) notes that *particularly within the past couple of decades, the private business sector has recognized the usefulness of anthropological perspectives on product and market development and intercultural communication, as well as management and organizational development. In this field, anthropological skills in analyzing complex data and drawing on comparative insights help shed new light on problems and challenges in a changing world, thus contributing to creative and innovative solutions.*

Conclusions³⁴

There is nothing in the logic of innovation that leads to emphasizing the *supply of or demand for* novel ideas. Arguing for either side is misguided. The two sides are highly *complementary*. We welcome the **balanced** view implied in the Strategy (Aho *et al.*, 2008), even if we disagree with some of its policy premises and recommendations. On the basis of an early

sketch we have studied, our thinking is nevertheless in line with the Ministry's new framework.

The primary goal of demand- and user-orientated innovation policy is to have (private) input and output markets that *celebrate innovation*. The tools to achieve this are mostly *indirect*. Intense **competition** is the key. Laws, regulations, and standards are important. The role is direct when there is demand (generation) by the public sector (including public procurement) and/or supply by it (public goods and services). Otherwise there is little sense in publicly linking supply and demand or providers and users.³⁵

There are good reasons for direct public support of private innovative activity. Good conduct in their allocation should **not** include favoritism for either the supply or demand side. Thus, in providing subsidies, our advice is to be **impartial** to the initial source, type, and application domain of innovation.³⁶ To the extent this is not the case and a bias exists,³⁷ we recommend adjusting towards impartiality.

Listening to one's customers is always worthwhile and companies have incentives to do so. At least when relying on traditional marketing research methods, it may induce incrementalism in innovative activity (Christensen, 1997). This does in no way imply that demand- and user-orientated innovation policy should do the same – quite the contrary; many of the points we have made in this chapter suggest that often the orientation is better promoted by market **entrants** and **radical/disruptive** innovation rather than by incumbents and incremental improvement.

Exhibit 37: Summary and recommendations.

The emphasis of Finnish innovation policy has been on the supply side. Thus, adding the demand side consideration is a good extension of policy scope.

Demand- and user-orientation is nearly completely penetrated among Finnish businesses engaged in innovative activity. Qualitatively the depth of the orientation in Finland corresponds favorably to other developed countries. Thus, promoting the orientation via direct public intervention should not be the main course of action.

Demand- and user-orientated innovation policy is *neither* about linking supply and demand *nor* providers and users via direct public effort. It is rather mostly about having dynamic

and functioning input and output markets celebrating innovation. Regulations, standards, public procurement, as well as intense end-market competition are the public sector's main tools in achieving this.

Most of the work in promoting the orientation remains to be done within the public sector itself – in public research organizations, in the educational sector, as well as in the provision of public goods and services.

Good demand- and user-orientated innovation policy is consistent with promoting radical and disruptive innovation over incremental innovation as well as with favoring market entrants over incumbents.

6. Globalization of Business Activities

On the basis of Aiginger, Okko, and Vlä-Anttila in the Full Report

The Finnish innovation system is less internationalized than conventionally thought and there are signs that it is falling further behind. Tapping deeper into the global knowledge pool should be one of the main objectives of innovation policy. The rising role of emerging economies in the global innovation system provides huge challenges but even bigger opportunities.

Innovativeness and globalization are interrelated

Innovation and globalization are closely connected – countries that show a high level of innovativeness also tend to be the most globalized ones. There is mounting evidence for societal benefits of both openness and innovation; the two are complementary.

When looking at its various dimensions (Exhibit 38), it turns out that the **social aspects** of globalization are most highly correlated with innovativeness. Thus, cross-border personal contacts, information flows, and cultural exchange are associated with the density and accessibility of new ideas within a country.

Especially small economies are increasingly dependent on global knowledge flows. This poses a specific challenge to inherently national innovation system and policies.

Recent economic growth literature shows that even in the larger countries the ideas developed elsewhere are of great and increasing importance for economic growth (Hyytinen & Rouvinen, 2005; Jones, 2002). Hence, the crucial issue is: *Are the channels and mechanisms to capture global knowledge spillovers in place and do they work frictionlessly?*

Our analyses show that the Finnish economy and society are less globalized than often thought; according to most recent assessments the country lies clearly behind the other Nordic countries.

We also conclude that in the Finnish industry there are clear signals for needs of quality upgrading of exports. The country is not specializing in the world market in education intensive industries.

Innovation policies would benefit from re-organizing public provision of internationalization servic-

es. That would include the merger of two major organizations and removing overlapping functions in the system, before adding new instruments.

Innovation in transition

There are new, and potentially huge, global drivers of innovative activity. These include open innovation and other 'less corporistic' ways of organizing innovative activity, prolific demand for solutions to environmental problems, as well as rapidly changing geography of production, and increasingly also innovation, towards developing countries. All of these have been recognized and addressed, but **not** yet fully reckoned within policymaking.

Especially important is the rising role of large emerging economies (notably China and India) in the global innovation system. They already appear as significant providers of high-tech products (goods and services) in the world market, increasingly in the *same domains* as Finland. China is already the third largest R&D spender globally, and its R&D investment is increasing rapidly. This provides a huge challenge, but even bigger opportunities.

Areas where global R&D is probably increasing the fastest in the near future are clean-tech and other environmental technologies. In most countries the *stimulus packages* counteracting the global economic crisis include considerable public investment to promote these technologies and related innovative activity. These expenditures will induce new demand and give an extra boost to innovation in resource and energy-saving technologies and cross-disciplinary applications.

A borderless world does not mean that the borders between regions and countries have disappeared altogether. There are regions that seem to stand out as specifically attractive locations (or hubs) for innovation, science, and knowledge-intensive businesses. Knowledge and technology are not evenly distributed across the globe – quite the opposite. But the key is inter-connectedness: linkages between individuals and organizations, the accelerating growth of which modern ICTs have made possible.

All countries and regions are both senders and receivers of spillovers. Finland produces at best less

Cross-border personal contacts, information flows, and cultural exchange are associated with the density and accessibility of new ideas within a country.

than one per cent of the global knowledge (the country's share in global R&D is about 0.6%). Hence, the essential policy issue is: *How to capture the global spillovers and enhance the diffusion and transfer of knowledge, know-how and competences?*

Finland in the global economy – A nordic high performer

The Finnish economy is one of the developed countries that has benefitted the most from the *second glo-*

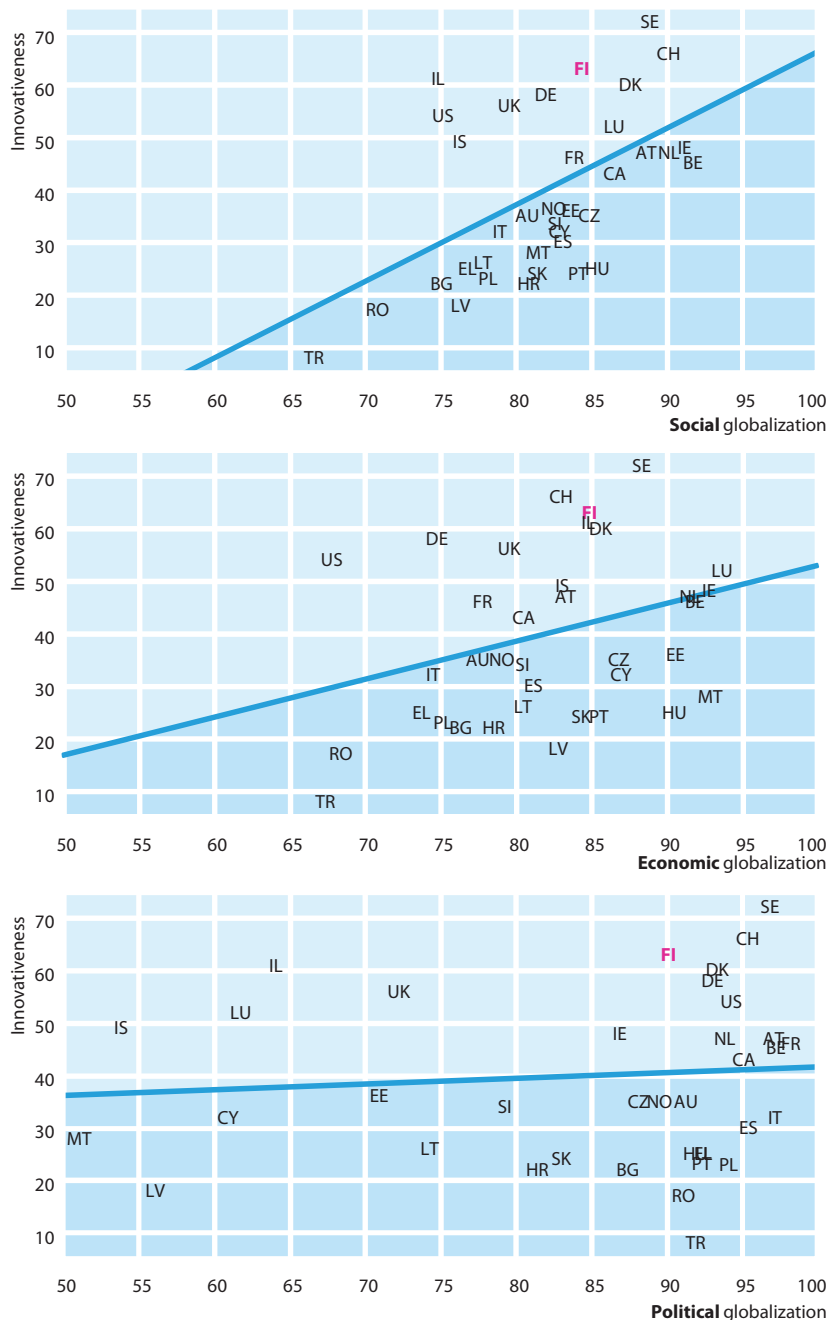
Exhibit 38: Social aspects of globalization, in particular, matter for innovativeness.

Correlation of the overall innovation index and globalization sub-indices regarding social (top), economic (middle), and political (bottom) aspects.

When looking at its various dimensions, it turns out that the social aspects of globalization are most highly correlated with innovativeness. Thus, cross-border personal contacts, information flows, and cultural exchange are associated with the density and accessibility of new ideas within a country.

Country codes: AT Austria, AU Australia, BE Belgium, BG Bulgaria, CA Canada, CH Switzerland, CY Cyprus, CZ Czech Republic, DE Germany, DK Denmark, EE Estonia, EL Greece, ES Spain, FI Finland, FR France, HR Croatia, HU Hungary, IE Ireland, IL Israel, IS Iceland, IT Italy, LT Lithuania, LU Luxembourg, LV Latvia, MT Malta, NL Netherlands, NO Norway, PL Poland, PT Portugal, RO Romania, SE Sweden, SI Slovenia, SK Slovakia, TR Turkey, UK United Kingdom, and US United States.

Sources: Innovation index: European innovation scoreboard 2007. Globalization indexes: Dreher (2006) with Dreher et al. (2008) updates.

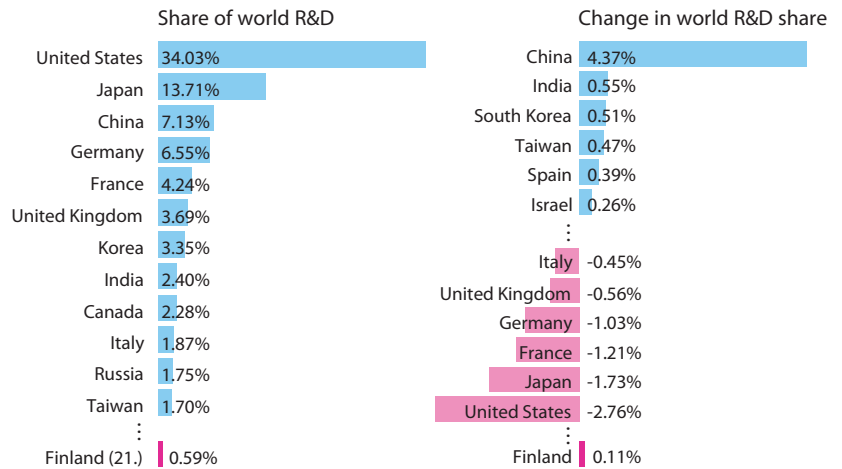


Being close to the global productivity and technology frontier calls for different growth policies from that pursued in the catching-up stage of development.

Exhibit 39: Despite its R&D intensity, in absolute terms Finland is tiny – Asia gains rapidly.

Finland and the largest countries in terms of R&D in 2005 as % of the world total (left) as well as the 1995–2005 %-point changes (right).

Sources: OECD, UN, national sources.



balization wave that started around the 1960s and accelerated in the 1990s. Finland's macroeconomic performance has been excellent especially since the mid-1990s. High growth, above average per capita income, balanced trade, and balanced budgets (until recently) are on the positive side, while low employment rate and rather high unemployment rate (specifically for the young people and low employment rate specifically for the elderly) are less favorable facts.

Structural change was strong in the 1990s, but Finland still has a relatively large low-wage sector and a high share of production in price elastic industries. The manufacturing sector is quite large and has been growing fast until recently, the agricultural sector is still rather large, and the service sector is relatively small.

Education and innovation have a very high priority in Finland, definitely higher than in other European countries. The number of researchers in relation to workforce is the highest in the world. In terms of conventional innovation inputs and also outputs, such as patents, Finland is ranked high in international comparison. The same applies to participation in the EU research programs.

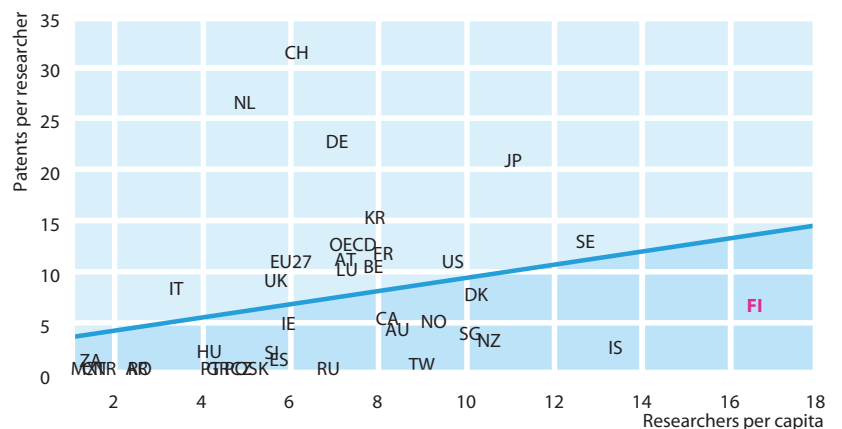
Nevertheless, the picture changes a bit when we relate, instead of size of the economy, the outputs (and participation) to R&D activity (to R&D spending or to the number of researchers). While doing this, the output turns out to be somewhat disproportionate to input (see also Chapter 4).

As far as the degree of globalization of the economy and society are concerned, recent studies in-

Exhibit 40: Finland's innovative output is proportionally less than its inputs.

The relationship between the relative innovative outputs (triadic patents per 1,000 of full-time-equivalent researchers) and inputs (full-time-equivalent researchers per capita).

Note: Data refers to 2005 or the latest available year. Country codes: AR Argentina, AT Austria, AU Australia, BE Belgium, CA Canada, CH Switzerland, CN China, CZ Czech Republic, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GR Greece, HU Hungary, IE Ireland, IS Iceland, IT Italy, JP Japan, KR Korea, LU Luxembourg, MX Mexico, NL Netherlands, NO Norway, NZ New Zealand, OECD OECD Total, PO Poland, PT Portugal, RO Romania, RU Russian Federation, SE Sweden, SG Singapore, SI Slovenia, SK Slovak Republic, TR Turkey, TW Chinese Taipei, UK United Kingdom, US United States, and ZA South Africa. Source: OECD.

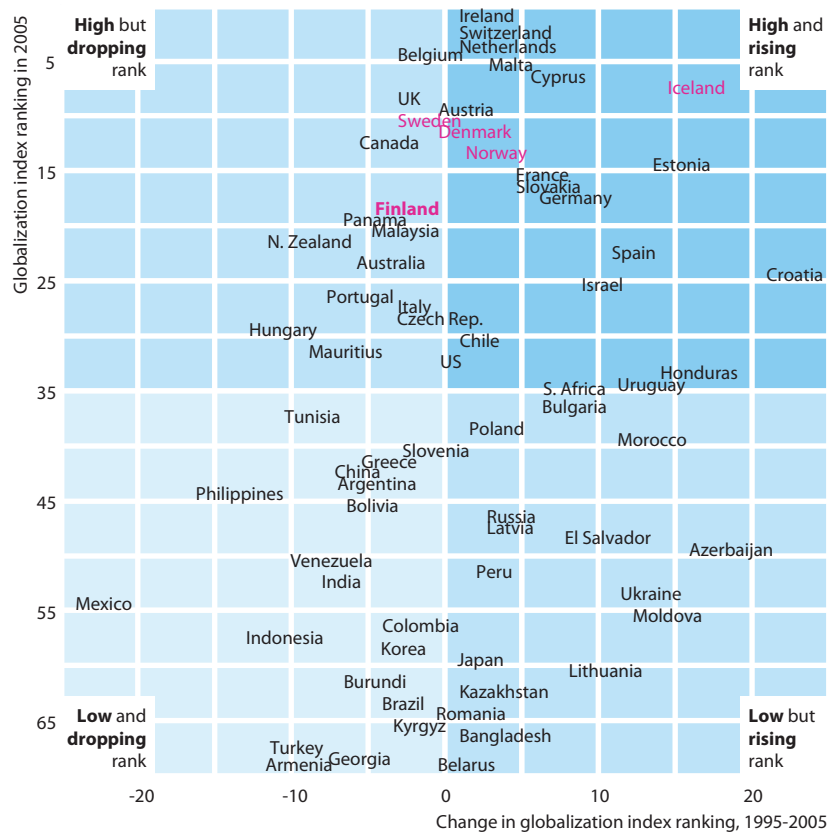


Tapping deeper into the global knowledge pool should be one of the future cornerstones of innovation and sustained well-being.

Exhibit 41: Finland lags behind other Nordic countries in globalization and continues to fall further behind.

Year 2005 rankings of countries according to a New Globalization Index as well as the 1995–2005 changes in ranking.

Source: Vujakovic (2009).



dicate that Finland is ranked below the average of small open economies, and clearly below other Nordic countries (Vujakovic, 2009). The financial integration to the rest of the world is relatively strong, but in terms of social globalization the country’s position is much lower. Yet, it is the social dimension of globalization that seems to be more important for innovativeness than the economic one.

Furthermore, there are signs of asymmetric openness in both economic and social globalization. Inward investment is lower than outward FDI, immigration is low, and the number of foreign students and researchers is relatively small. In addition, researcher mobility is decreasing from the already low level (Chapter 9).

Mobility of human resources in science and technology has become a central aspect of globalization. Global sourcing of knowledge is crucial for any national system of innovation. Most developed countries are net beneficiaries of highly skilled migration,

that is, highly skilled immigration systematically exceeds emigration; Finland is among the few countries – together with Mexico, Korea, Italy, and some central Eastern European countries – which have experienced a net loss of individuals with a tertiary education (OECD, 2008c). Thus, this important channel of knowledge flows is practically non-existent in Finland.

Close to the frontier – More experimentation and new incentives needed

Since the late 1980s Finland has been moving from an investment-driven catching-up country towards an innovation-driven and knowledge-based economy. The transformation relates to the high level of education and increasing technology inputs, but it is as much a consequence of the productivity-enhanc-

ing structural change or creative destruction. Although starting in the late 1980s, the period since the mid-1990s has been essential in this respect. Resources moved from less productive to more productive plants and firms to more productive, and from less productive to more productive industries; increased entries and exits contributed to productivity as well.

There was a radical change in firm and industrial structure in the 1990s. In less than a decade, electronics – notably telecom equipment production – grew by far the largest industrial and exports sector. By the turn of the millennium the country had become the most ICT-specialized country in the world in terms of ICT's share in production and R&D. Now, the situation has changed, although ICT still plays an important role in the economy.

As a consequence of the structural transformations over the past two decades, the economy today is close to the global productivity and technology frontier. As pointed out by modern economic growth literature, being close to the frontier calls for different growth policies from that pursued in the catching-up stage of development. The closer to the world technology frontier, the more economies pursue innovation-based strategy with younger firms, experimentation, and better selection of firms and managers. Investment in fixed capital would be lower, but exploring novel combinations with a higher failure rate and subsequent higher exit and entry rates would be more common. That calls for different institutions than in the investment-driven stage of development.

The Finnish innovation system has been performing relatively well in international comparison. There are, however, several signs for a need for change. These are, in part, due to changes in global drivers of innovation. The system is much less international than often thought. This applies especially to higher education and research. Tapping deeper into the global knowledge pool should be one of the future cornerstones of innovation and sustained well-being.

Challenges

Flip side of globalization –
Strong industrial clusters in turmoil

Finland's most important industrial clusters – ICT and forest industry – are in turmoil due to both intensifying global competition and the ongoing economic crisis. Both industries have benefited, and will continue benefit, from global markets, but there is an urgent need for renewal. Forest-related industries are in the most severe crisis in one hundred years. Inevitably, the renewal of the forest industry must be based on more intense use of multiple technologies, skills, and human capital and will take some 10–20 years.

Globalization implies that high income countries (or firms operating in those countries) should specialize in industries in which *quality* defines the competitive edge (and retreat from industries where price competition is all important) and they should upgrade production and services in each industry, supplying products in the highest quality segment of each industry.

While Finland is excellent as far as technology input and the education base are concerned, there are, according to a special study conducted for this evaluation, clear signs of the need for a broad upgrading of the quality of exports and production. Most indicators show quality upgrading for Finnish manufacturing, but most indicators also show that the structure of manufacturing is less favorable than for European countries on average, and most importantly, less quality-oriented compared to leading countries. Furthermore, the majority of indicators show that progress made up to 2000 has since leveled off, if not reversed (at least as compared to peer countries).

The business R&D is very concentrated in Finland: the top ten companies conduct about 60% of all R&D in the enterprise sector. Nokia alone is responsible for nearly half the business R&D. The significant role of Nokia in the Finnish innovation system is not, of course, any concern as such. On the contrary, there is every reason to make sure that as much of Nokia's high-end research as possible stays in Finland. It can be concluded from industry and labor market data that ICT sector and Nokia's R&D in Finland has moved towards more strategic and high-skill activities, while the adaptation-to-market and routine type

The specific Finnish challenge is the low level of inward foreign direct investment.

of development has been growing abroad or been re-located.

Rather than Nokia's dominance, the concern in Finland is a relatively small number of smaller firms engaged in (radical) innovative activity. Another concern is that currently the business sector R&D is heavily concentrated in the ICT sector. Strong specialization has been one of the strengths of the Finnish economy, but at the same time it poses a risk of missing future growth prospects in domains beyond the current technologies and competences.

According to recent studies Finland is not specializing in education-intensive sectors in production (and trade) as much as some other smaller economies. There is a heavy specialization in high-tech industries, but less so, compared to other smaller countries, in human capital -intensive production, which

is one of the structural weaknesses of the economy. Finland is probably not making full use its skills and human capital -based growth potential.

Policies promoting internationalization – Everyone's job?

Internationalization of business is, in one form or another, on the agendas of nearly all public enterprise policy agencies. Although, admittedly, internationalization is a cross-cutting issue to be addressed by most of the policy organizations, there is plenty of room for increased coordination and measures to avoid overlaps in the system.

An obvious improvement in the public promotion of internationalization would be a merger of *Finpro* and *Invest in Finland*, as proposed earlier. There

Exhibit 42: *Finpro* – Promoting internationalization of Finnish companies.

Finpro is a public-private partnership organization which supports Finnish companies in their internationalization activities. The organization was founded in 1919 as the *Finnish Export Association*, became later known as the *Finnish Foreign Trade Association*, and was named *Finpro* in 1999. *Finpro* has a network of over 50 trade centers in more than 40 countries. There are about 350 employees, of which 250 are abroad. *Finpro's* budget is about €40 million, the government direct funding is close to 60%.

Finpro has been integrating into the innovation system by offering expert services to innovation support organizations and producing market information of various technology fields. *Finpro* regards its mission to include increasingly a role of an information intermediary, providing information on global megatrends, new business models, and early signals of market opportunities. It offers both free-of-charge and invoiced services. The company clientele is about 4,500 Finnish businesses.

Finpro's deepening integration with the innovation support system shows up in increasing reliance on funding from public innovation agencies. As much as 30% of *Finpro's* invoiced revenues come from government organizations. That adds over €10 million to the direct government budget funding of €22 million. The biggest single public sector client is *Tekes*, whose share is one third (more than €3 million) of the total. *Finpro* acts overseas on behalf of *Invest in Finland* and the *Finnish Tourist Board*, which partly explains the rising share of public organizations in *Finpro's* funding. *Finpro* is also

an active player in the *Finnish Innovation Center* program (*Fin-Nodes*).

Finpro's five most important invoiced clients in 2008 were (total invoiced revenues from the clients below was about €10 million):

- *Tekes*,
- *Finnish Tourist Board* (MEK),
- *Fintra*,
- *The Federation of Finnish Technology Industries*, and
- *Invest in Finland*.

The survey conducted to support the evaluation reveals that *Finpro* is serving to a large extent the same target group as other innovation organizations – its clients are above the sample average in terms of innovativeness and international orientation. *Finpro's* corporate clients consider *Tekes*, *VTT*, and universities more important than the remainder of the sample.

The role of *Finpro* in the Finnish innovation system has obviously changed over the past ten years. At the same time promoting internationalization has become an ever more important task on the agendas of other innovation agencies, practically all of which are offering some kind of services related to internationalization activities, often overlapping each other. Therefore, the evaluation panel welcomes the ongoing project initiated by the *Ministry of Employment and the Economy* to map the service provision and streamline the system. It would be very important to separately assess the role of *Finpro* as one of key players of the innovation system and the most important organization promoting internationalization.

is already a close collaboration between the two, but the merger would most probably enhance the efforts to attract foreign investment and ensure more efficient use of resources. As discussed above, the specific Finnish challenge is the low level of inward foreign direct investment. The two-way nature of globalization should also be reflected in how public agencies are organized.

The current set-up of the business support system also reflects more generally the traditional industrial society. The support organizations still carry, in spite of major changes in ways of operation, signs of traditional industrial and export-oriented economy. The emphasis is on supporting organizations (firms), exports, and other international business operations, and less on individuals, inward investment, and the social dimension of globalization. In that sense, the current system is **not** in line with the new National Innovation Strategy that stresses the importance of innovative *individuals and communities* in the borderless world.

Encouraging and incentivizing the mobility of researchers, experts, civil servants, and other professionals would most probably be as efficient innovation policy as subsidizing internationalization services targeting companies.

We welcome the ongoing consulting study on the public internationalization services. The study

should aim at finding ways to streamline the system and remove overlapping functions before moving to suggest possible new instruments.

Innovation governance and management need to be reformed

There are obvious shortcomings in the university technology and knowledge transfer. The current university management and administration do not provide proper incentives; research organizations tend to be introvert and closed to the external world. The ongoing university reform can, if properly implemented, contribute to improving the situation.

Universities are a central part of any national innovation system. University researchers play an important role in making use of international knowledge flows and adding to the global knowledge pool. From the global vantage point universities are competing for the talented researchers, professors, and students. Finnish universities, with a few possible exceptions, have not been very successful in this competition.

The open innovation model is not fully utilized in Finland – by neither firms nor policymakers. Improving the internationalization of the innovation system and, for example, researcher mobility, is the key in responding to this challenge.

Internationalization is an issue that cuts across several policy agencies. More coordination is nevertheless needed.

Exhibit 43: Summary and recommendations.

Innovation and globalization are closely connected. Openness and innovation benefit society both independently and jointly. Today's innovative activity is inherently global. Small countries, in particular, are increasingly dependent on global knowledge flows. This poses a challenge to *national* innovation policies. Furthermore, traditional innovation policies are not easy to justify in the case of a small open economy. More emphasis should be put on enhancing the diffusion of technologies and new knowledge, localizing international knowledge spillovers, as well as on promoting the development of production factors that are less mobile internationally.

The Finnish innovation system has been performing relatively well in international comparison. There are, however, a number of signs of the need for change. These are in part due to changes in the global drivers of innovation. The system, as well as the whole Finnish economy, is much less international than often thought. This applies especially to the higher education and research. Tapping deeper into the global knowledge pool should be one of the future cornerstones of innovation and sustained well-being.

In the global economy Finland is strongly specialized in two industrial sectors: ICT and the forest industry. Both are in turmoil due to shifts in global demand and relocation of production. Our analyses show that there are clear signs of even broader deficits in industrial structure and the need for a broad upgrading of the quality of exports and production.

There are new, and potentially huge, global drivers of innovation **not** yet fully utilized or taken into account in Finnish policy. These include open innovation, prolific demand for solutions to environmental problems, and rapidly changing geography of innovation towards developing countries. Particularly important is the rising role of large emerging economies (notably China and India) in the global innovation system. Both already appear as significant providers of high-tech products (goods and services) in the world market, increasingly in the same product groups as Finland. China is already the third largest R&D spender globally, and its R&D investment is increasing faster than in any other country. This provides a huge challenge, but even huger opportunities.

Policy organizations and instruments to support businesses' internationalization need streamlining. Today, practically all innovation and business support organizations provide internationalization services for firms. Although, admittedly, internationalization of business activities is a cross-cutting issue to be addressed by several policy agencies, it would be beneficial to merge the two main organizations – *Finpro* and *Invest in Finland* – and cut overlaps in the system.

Finland has not been as active as it could and should have been in European research policies. In particular, Finland should contribute more to the European Research Area, and especially to the formation of the single labor market for researchers.

7. Growth Entrepreneurship and Finance

On the basis of Murray, Hyytinen, and Maula in the Full Report

Sustained productivity growth is one of the main objectives of the Finnish innovation strategy and it has two main sources: First, productivity grows when existing firms become more productive due to internal restructuring (by, e.g., constantly adopting new innovative technologies or organizational solutions). Second, external restructuring stimulates productivity growth when higher productivity firms gain market share or when higher productivity entrants replace low productivity firms that eventually exit. Growth entrepreneurship is both directly and indirectly a key driver of these two restructuring processes.

Introduction

The focus of this chapter is on policy initiatives that aim at increasing the number of successful **High Growth Entrepreneurial Firms (HGEFs)** being created in the Finnish economy.

It is often argued that Finland does not produce enough of such growth firms when compared to competitor countries and that Finnish entrepreneurs are too modest in their ambitions. This suggests that Finland has a **structural mismatch**: despite being recognized as one of the most innovative countries in the

world with an equivalently high level of R&D intensity and business R&D spending (EIS, 2009; OECD, 2008b), these inputs do not appear to have resulted in equivalent outputs of a greater *global* supply of world-class, advanced goods and services stemming from Finnish ideas and/or from Finland originated, entrepreneurial firms.

We share the view that there is some level of structural mismatch. The returns on Finnish taxpayers' money invested in public R&D and in the public support system should be higher, if measured in terms of the number of world class HGEFs created. While the Finnish innovation system accommodates the needs of (ordinary) small businesses and entrepreneurs relatively well in an European comparison, increased emphasis on growth-oriented innovative firms is warranted.

Many recent plans and policy initiatives correctly recognize the importance of economic **incentives** at the level of individuals, and the need for an integrated and holistic public support service for growth companies. Such a public service should facilitate, not blunt, market signals.

In order to address the structural mismatch in the supply and demand for entrepreneurial opportunities, policy has to work on several separate levels. They are discussed below.

Exhibit 44: Relative to R&D inputs, the volume of Venture Capital (VC) is negligible in Finland.

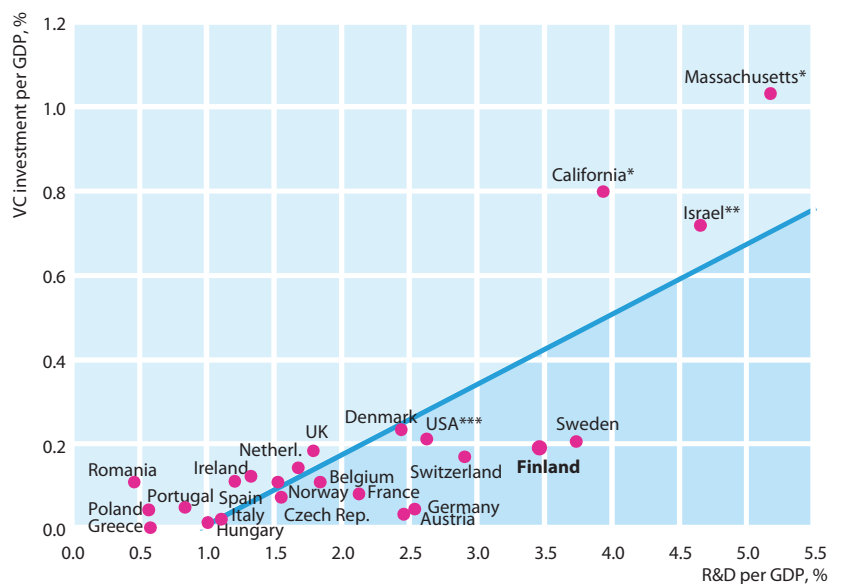
National VC investments versus R&D investments in 2006.

Relative to its investments in R&D, Finland invests disproportionately less in the commercialization of the results. Other concerns include the low number of active private earliest-stage VC investors, the small absolute size of investments and the limited competition and international experience among VCs (see Murray, Hyytinen, and Maula in the full report for details).

Note: R&D refers to gross domestic expenditure on R&D. VC investment defined according to the country of destination approach in 2007 (Italy, 2005; California, Massachusetts, Switzerland, 2004).

Sources: EVCA, PEREP Analytics, and OECD (for R&D).

* NVCA/PwC MoneyTree and Bureau of Economic Analysis (for R&D). ** IVC Research Center. *** NVCA/PwC MoneyTree.



The Finnish innovation system has insufficient financial inducements for a highly talented individual to choose a risky entrepreneurial career.

Enhancing incentives for entrepreneurship and risk taking

As we argue in our chapter in the full report, in order to create more and better HGEFs, Finland needs a continuing and increased supply of entrepreneurs characterized by their ability to accept and manage risk, as well as by the high quality of their (international) commercial experience and expertise. It is very likely that these people with high human and social capital will appreciate their market value and will demand substantial pecuniary incentives for their collaboration (for interesting recent U.S. evidence, see Hall and Woodward, 2009). The Finnish innovation system should therefore provide sufficient **financial inducements** for them to leave their current position (e.g. established private sector ca-

reers) when and where appropriate for both the risk and rewards of growth entrepreneurship and entrepreneurial ownership.

It is the **tax system** which determines the distribution of the earnings and value-added generated by a (new) firm between the state and entrepreneur. It is very hard to determine whether or not the current 'dual income tax system', as currently implemented in Finland, hinders or encourages the entry into entrepreneurship of individuals with high quality business experience and good education. The available analyses and the academic literature remain ambivalent on how Finnish dual income taxation treats entrepreneurship and risk-taking; or whether such activities can best be encouraged by providing tax incentives (Hietala & Kari, 2006; Kanninen *et al.*, 2007, Sörensen 2009 and the references used in these studies). However, to the extent that the system is not neutral, there seems to be few, if any, **upside incentives** to entrepreneurial entry and risk-taking.³⁸ If such incentives are in place, they are likely to be incidental and not systematic.³⁹ Furthermore, the design of the existing tax system pays, as far as we can determine, limited attention to the incentives required for individuals to be motivated both to build and to exit valuable businesses (perhaps over repeated iterations as serial entrepreneurs). Yet, we have increasing evidence from the academic literature that tax incentives (including capital gains taxes) are extremely important in the investment decision to create and grow a new business (Armour & Cumming, 2006; Da Rin *et al.*, 2006; Keuschnigg & Nielsen, 2004; Poterba, 1989).

Observation #1: The innovation system, including the relevant aspects of the tax system, provides little incentive for a highly talented individual to choose a risky entrepreneurial career. In fact, there seem to be few, if any, explicit upside incentives to entrepreneurial entry and risk-taking.

Challenge #1: Individuals with high human and social capital and the ability to create HGEFs have a high opportunity cost of entering entrepreneurship. Policy ought to recognize explicitly the importance of economic incentives at the level of talented and scarce individuals.

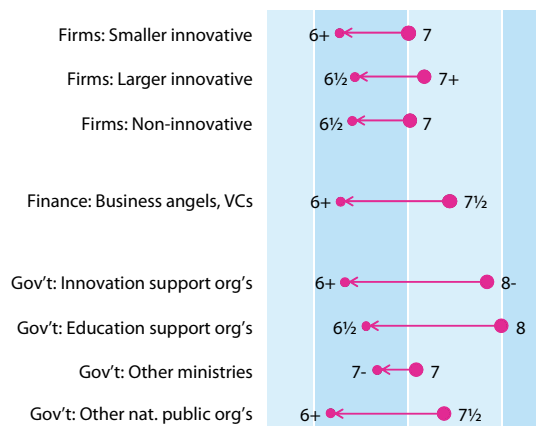
Exhibit 45: The Finnish innovation system is not focused on promoting growth entrepreneurship.

Respondents' grades for the Finnish national innovation system overall (large circle) as well as for its ability to promote growth entrepreneurship and generate rapidly growing firms (small circle).

The Finnish innovation system's ability to promote growth entrepreneurship is considered to worse than its overall performance.

Note: Respondents were asked to give grades on the 4 (failed) to 10 (excellent). See the survey documentation for further details. The reported grades correspond to rounded values; the drawing is based on the exact ones.

Source: Kotiranta *et al.* (2009).



The tax system should be viewed as an important element of any policy promoting long-term growth and competitiveness.

Accordingly, we strongly recommend that these **incentives** are explicitly taken into consideration if and when the tax system is reformed. Given the complexity of the issue,⁴⁰ it would be inappropriate for us to give detailed prescriptions of how the dual income tax system should be redesigned to better support growth entrepreneurship. Any reform should, however, consider the following issues:

- Although the economic theory of taxation does not give a clear cut prediction on whether **risk-taking** or (high-growth) entrepreneurship should be given a non-neutral treatment in the taxation, the planned reform of the Finnish tax system presents an important opportunity to positively challenge this principle. It is unlikely that the Nordic dual income tax system and the Finnish tax system in particular could not be made more favorable to individual-level risk-taking and more encouraging for growth-oriented firms.⁴¹ Taxation of equity income could, for example, explicitly recognize the extra-ordinary risks that the entrepreneurial owner-managers of a HGEF have to bear and the positive spillovers that successful HGEFs generate.⁴²
- The role of **capital gain taxes** as a means to incentivize and reward the recognition and pursuit of growth opportunities should be explored from the perspectives of both entrepreneurial owner-managers and risk capital investors (Armour & Cumming, 2006; Da Rin *et al.*, 2006; Keuschnigg & Nielsen, 2004).
- The decision to establish and grow a HGEF is a discrete and significant choice. An entrepreneurial career is not a trivial or incremental commit-

ment. Thus, entrepreneurs are more likely to be affected by the **average tax burden** and not by the *marginal* rates of taxation (see, e.g., Devereux & Griffith, 1998).⁴³

- Risky market entry may generate pecuniary returns only after a considerable delay. The tax system ought to explicitly recognize the **dynamics** of the process that leads to the creation of HGEFs. It is expected, future after-tax monetary rewards that are likely to influence the incentives of forward-looking individuals with high social and human capital to establish a growth venture today. The tax system should avoid introducing (short run) **success taxes** that undermine these incentives.

In sum, we think that to the extent possible, the tax system should be viewed as an important element of any policy promoting long-term growth and competitiveness. Currently, it seems to be an **underutilized** instrument that can be more effectively used to give individuals appropriate incentives, especially to those who have the mix of human and social capital necessary to become high-growth entrepreneurs.

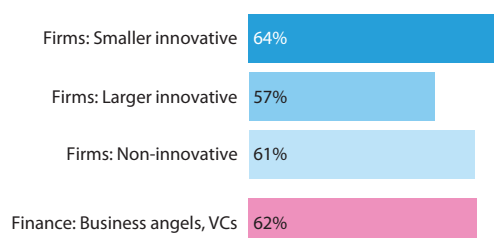
Our disproportionate emphasis on the incentives of entrepreneurial owner-managers does **not** mean that the recent policy efforts (e.g. tax incentives to business angels and venture capital investors or the tax treatment of certain fund structures to increase the *supply of private risk capital*) should be seen as misguided. Quite the contrary, these initiatives are likely to be complementary to the provision of greater incentives to entrepreneurs.

The foregoing discussion leads naturally to our next observation about the Finnish innovation system:

Exhibit 46: Tax incentives are believed to boost growth.

Shares of respondents considering tax incentives efficient in promoting growth firms in Finland.

Majority of firm representatives and financiers believe that tax incentives – regarding future earnings and profit sharing – might be an efficient tool to increase the number of growth companies in Finland.



Note: See the survey documentation for further details. Source: Kotiranta *et al.* (2009).

Observation #2: The involvement of the Ministry of Finance in the entrepreneurial and innovation policy process has been insufficient, particularly in matters of devising a tax system that unequivocally enhances incentives for entrepreneurship and risk taking.

Challenge #2: In its present form, the Ministry of Employment and the Economy and the Ministry of Finance do not assume joint responsibility for high growth enterprise policy. Forging of a joint responsibility for entrepreneurship between the two ministries must be a priority.

In common with most public administrations, the **Ministry of Finance** assumes a major role in monitoring and supervising the financing of expenditure on existing and new policy initiatives. Any suggestions that influence the taxation mechanisms of an economy must ultimately receive the agreement of the exchequer if any action is to be forthcoming. It is our impression that the Ministry of Finance has remained a shadowy but influential presence in the development of Finnish entrepreneurial and innovation policies.⁴⁴ We believe strongly that the involvement of the Ministry of Finance in these innovation policy processes must be both more public and more explicit if any future changes are to be effective.⁴⁵ Stronger linkages must be created between the Ministry of Employment and the Economy and the Ministry of Finance in order to exploit their complementary roles in the creation of HGEFs. In particular, the forg-

ing of a **joint responsibility** for entrepreneurship between the ministries should become a priority. In practice, for example, this could mean the establishment of a dedicated unit within the Ministry of Finance that is responsible for the promotion of enterprise and innovation capabilities.⁴⁶ Such a unit could take responsibility for developing appropriate taxation policy so that the Finnish tax system better supports entrepreneurship, risk taking, the creation of HGEFs and thereby long-term productivity and economic growth. It is not for the authors of this report to dictate the nature of such an inter-ministry association. However, it would be expected that *senior* staff secondments from each ministry were represented in their respective entrepreneurship policy units.

Streamlining the public support system

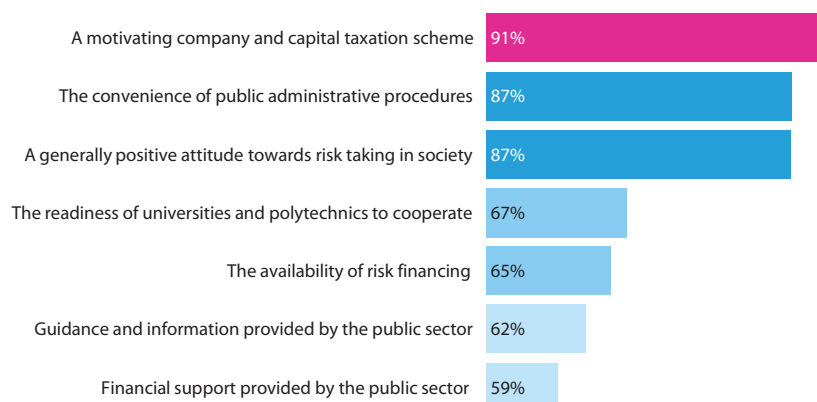
The present Finnish public support infrastructure, which seeks to address growth firms both in their pre-commercial and commercial stages, is the result of a long history of evolving policy actions and practice across a variety of governments *and* ministries. Policy makers necessarily seek to cater for the needs of a wide range of potential users under a range of circumstances. As a result, the enterprise support system has become **excessively complex** to both access and administer. From the perspective of an outside observer (e.g., a potential entrepreneur), programs often seem to overlap and on

Exhibit 47: Small innovative companies emphasize indirect measures and framework conditions over direct support.

Share of small innovative companies considering the policy measure to be important for them.

A motivating company and capital taxation scheme is considered to be an important aspect of the operating environment from small innovative companies' point of view.

Note: See the survey documentation for further details. Source: Kotiranta *et al.* (2009).



some occasions multiple public agencies appear to work broadly in the same area and/or with the same firms. One costly outcome of this complex system is that high growth entrepreneurs incurring high opportunity costs for their time and effort are not always able to locate and access appropriate sources of support efficiently, quickly, and/or at an acceptable cost. While it is hard to quantify how complex the system is, the survey conducted to support this evaluation provides evidence for this view. It shows that nearly three-quarters of young and small innovative firms think that the public support system facilitating private business and innovation activities is *quite* or *very complex* (see Appendix of our chapter in the Full Report).

Observation #3: The present public support system is the result of several years of evolving policy actions and also reflects the interests of a variety of public bodies. The system has become excessively complex to both access and administer.

Challenge #3: There is a clear and urgent need for an easy-to-access, streamlined and integrated support service available to Finnish HGEFs.

Our conjecture is that one reason for this finding is that nearly **all** agencies provide some sort of support to new ventures and growing and developing firms, or provide services with similar titles and headings. As a result, high growth entrepreneurs are not always able to locate and access **appropriate** sources of support efficiently. *Even if the ongoing initiatives and plans are taken into account*, this observation calls for efforts that would make the support system **more streamlined**, specialized, and more cost-efficient. Above all, the enterprise support system must be more accessible and relevant for Finland's highest potential young and growth-oriented firms.

Further, the provision of advice and support does not seem to take into account the trajectory of young firms as they grow and evolve over time. Until very recently, Finnish enterprise policies have largely addressed firm formation while providing little support for the critical stage of subsequent, rapid firm devel-

opment.⁴⁷ Our view is that the present structure of advice and support to Finnish entrepreneurs can be further streamlined and integrated in a fashion that can genuinely be described as *systemic*, and thereby better able to meet professionally HGEF users' changing needs over time.⁴⁸

The present need by firm clients to devote scarce time and attention in order to understand the complex support system diverts significant managerial resources away from a market orientation. This means that both support for entry and (international) growth objectives needs to be integrated if a systemic and coherent enterprise policy regime is to develop and be effective.⁴⁹

While the precise details of streamlining and integration of the system are beyond our remit, we would offer Exhibit 48 as *one potential scenario* of how the various actions of government in the enterprise support field could possibly be streamlined and more efficiently organized. We would stress that, given that these actions already come under the ambit of the Ministry of Employment and the Economy, much of the **restructuring** can be carried out within the authority of one existing ministry. We would also like to acknowledge that the proposed integration of the services is to a large degree consistent with some of the recent initiatives (e.g. the *EnterpriseFinland* initiative and the group strategy of the Ministry) and current proposals that aim to reorganizing similar and related services into common user focused categories. Ideally, some of the governmental and semi-governmental agencies, as well as some of the services of the larger governmental organizations directed at supporting growth entrepreneurship would be organizationally *merged and integrated*.

There also seems to be a clear need to reconsider the **internal** organization of the responsibilities for entrepreneurship development and growth ventures policy (including the steering of the related financing and support agencies and institutions) within the Ministry of Employment and the Economy.⁵⁰

We acknowledge that the above may be controversial propositions but, if effectively implemented, such reorganization would ease the governance of the services, lessen the risk of duplication, reduce the number of organizational boundaries and enhance the cost efficiency of the system.

No material effort to streamline the support system has actually been put in place to date.

We would also see the revised structure, an illustration of which is presented in Exhibit 48, being of an order more comprehensible and accessible to high growth entrepreneurs seeking public support or guidance in order to execute ambitious growth strategies. As such, this recommendation is largely in line with the current efforts to develop the present infrastructure, particularly the *EnterpriseFinland* system and the segmentation of the new and existing customer firms within the support system. However, with regards to these initiatives, *no material effort to*

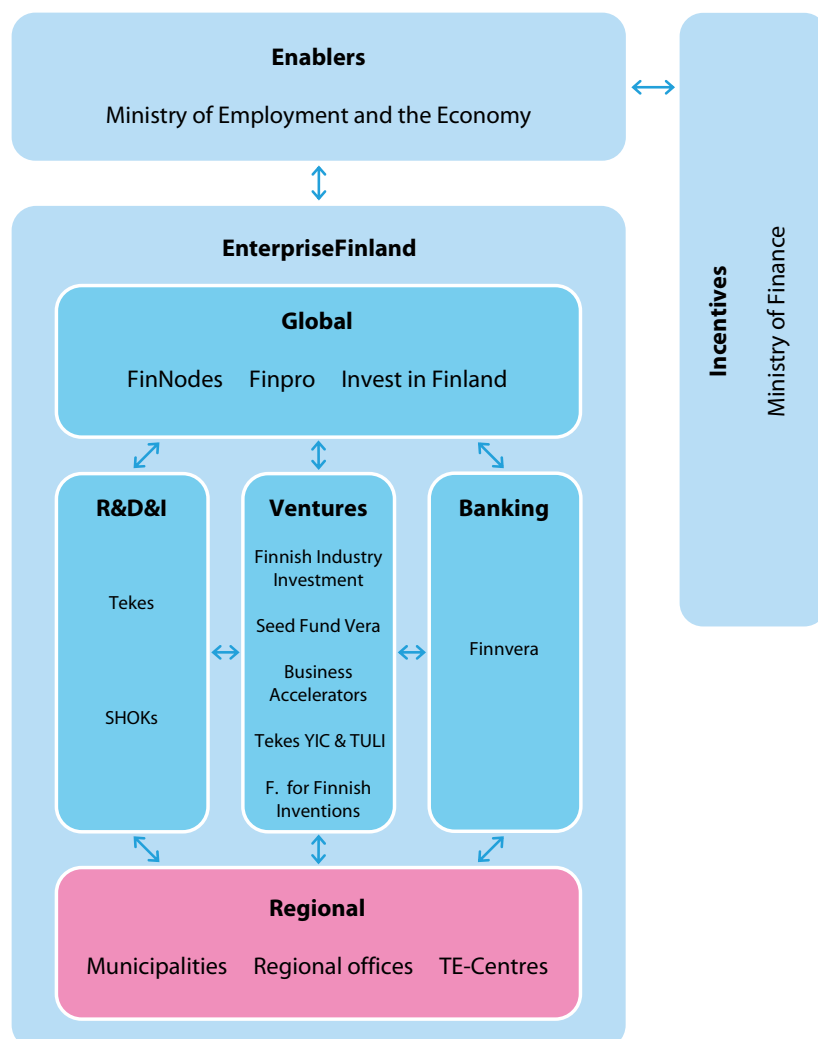
streamline the system or to make it more cost-efficient has actually been put in place to date.

Making the system more accessible to potential (high growth) entrepreneurs is of a first order importance and goes significantly beyond the current plans and efforts. There are some ‘simple fixes’ to improve collaboration and integration as has been recognized by the new initiatives. However, such easy changes will be quickly exhausted. They will not be sufficient to engender material and long-run improvements.

Exhibit 48: An outline of a streamlined public enterprise support system.

The streamlined public support system should be more comprehensible and accessible to high growth entrepreneurs and rapidly growing firms. Streamlining the system would ease the governance of enterprise support services, lessen the risk of duplication, and enhance the cost efficiency of the system.

Source: Murray, Hyytinen, and Maula.



Global linkages locally exploited

Observation #4: Finland remains one of the least racially and culturally diverse populations in the developed world and is located at a considerable geographic and cultural distance from several of the most important markets for HGEFs.

Challenge #4: There is a mismatch between the entrepreneurial demand for global insight, foreign expertise, international networks, and the supply of inward foreign spillovers from immigrant human capital, foreign R&D, and cross-border venture capital. The risk is that opportunities on global markets will not be recognized. When opportunities do arise, the danger is that they will be assessed and (mis)understood from a limited, exclusively Finnish geography and perspective.

We are not the first to stress that the information barriers and networking challenges that Finnish HGEFs face when trying to access global resources and markets are both real and severe. There is clear evidence that companies with internationally networked and experienced managers internationalize more quickly and more extensively to positive economic effect.

We do **not** want to argue that there is a lack of public support for the internationalization or export efforts of Finnish companies. Indeed, nearly **all** public agencies provide some kind of support to such activities. However, there is much *room for improvement* both in the coordination of these services and in greater understanding from policy makers and public agencies as to why the internationalization of HGEFs deserves special attention from the public support system:

- First, a major challenge to the internationalization of the Finnish HGEFs is the nearly complete absence of foreign entrepreneurial and technical talent, international investors, and foreign companies and service providers in the Finnish innovation system. They would, *by their very presence*, reduce the informational barriers and networking challenges of globalizing HGEFs. There is no single policy measure that can resolve this challenge but it should be recognized and given greater priority in the policy discussion.

- Secondly, direct public support for the internationalization of HGEFs should be concentrated on areas where the private value of producing information about global markets or building international networks falls short of its social value. For example, enhancing the visibility and networks of Finnish HGEFs is one important means to overcome the local bias of international investors (i.e., the preference of foreign investors to invest in geographically close and familiar companies rather than exploring Finnish opportunities). The costs of informing foreign investors about the supply of Finnish HGEFs is material but largely fixed (i.e. it is nearly as costly to inform a group of foreign investors about a single Finnish HGEF as it is to inform them about 30 Finnish HGEFs). This provides an economic justification for publicly supporting such activities.
- Third, the visions of policy makers (including civil servants) or established businesses should **not** be the exclusive sources of information driving the allocation of public resources that are used to support the international market entry or expansion of Finnish firms. HGEFs entering new markets with novel products and services often represent a direct and disruptive challenge to accepted market views based on historic conditions and practices. There is a need to ensure that future support and funding allocations are primarily influenced by factors that recognize the emerging global market demand.

Building an entrepreneurial culture in Finland

Despite Finland scoring high on innovation performance (EIS, 2009) and having engineered one of the most remarkable economic turnarounds in recent times (and contemporaneously created one of the most outstanding global businesses in *Nokia*), its citizens readily downplay their entrepreneurial capabilities. While accepting the caveat that it is *neither* easy to change attitudes or culture within a stable community *nor* always clear why government should engage in such activities, there are a number of areas where Finland needs to challenge what arguably are

perceived as accepted norms of economic behavior. Above all, we would argue that the *risk taking and pioneering spirit* of the entrepreneur needs to be more recognized, encouraged, and celebrated for its importance to Finland's economic future.

Observation #5: There appears to be a fairly wide-spread self-perception that Finns are not very entrepreneurial.

Challenge #5: An understanding and appreciation of the exceptional skills and determination required to build a growth venture with global market potential is still limited both among the general public and in the innovation and university system. Partly because of this unawareness, risk-tolerant and growth-oriented entrepreneurs appear to be under-valued in Finland. The present reform of the university system and the creation of Aalto University represent a timely opportunity to address this challenge.

The importance of an entrepreneurial culture should be valued because it is likely to be *complementary* to the tax and other incentives designed to enhance entrepreneurship and to change entrepreneurial risk/reward ratios.⁵¹ While systematic evidence on such complementarities is scant, we think that the proposed support measures are likely to be considerably less powerful if the central message of the key role of the entrepreneur is not much more widely communicated.

To provide precise recommendations on how an entrepreneurial culture can or should be built and promoted in Finland is beyond our remit. We nevertheless see a number of areas where there is room for additional effort:

- First, entrepreneurship appears to be an **orphan** in the Finnish policy system. While all ministries and associated organizations questioned allude to its importance, it appears to be *on the margins* of the direct policy responsibilities of each of the concerned government departments. Consistent with what we have suggested above about the need for *formalized* collaboration between the various ministries and for reorganization of the public support system, this situation needs to change and publicly be seen to change.

- Second, most policy measures in Finland and elsewhere focus on concrete assistance, and particularly finance, for companies including HGEFs. Little attention has been paid to influencing the **attitudes** and **culture** towards start-ups and new enterprise.⁵² In addition to improving the conditions for growth entrepreneurship (e.g. by increasing incentives), the cultural issues can be addressed by improving the awareness of entrepreneurial opportunities and better communicating the 'pros and cons' of entrepreneurship as a viable and exciting career choice among the general public. The provision of such information needs to be complemented by the greater availability of comprehensive and research-informed entrepreneurial training.
- Third, the creation of a greater number of better quality HGEFs is directly linked to the entrepreneurial effectiveness of the **university system**. We agree with the view put forward by the OECD (2008a) that a transformation of the activities of higher education institutions is called for if they are to play their full part in stimulating the creation of HGEFs and thereby sustaining economic growth in modern knowledge economies. While there is considerable debate as to the introduction of applied subjects such as entrepreneurship into the schools' curricula, there is a greater consensus as to its importance at university level training. In the development of a strong and pervasive entrepreneurial culture in Finland, the university sector has a particularly important status given the critical role of new knowledge based enterprises within the innovation system.⁵³ We would also suggest that the key targets are science (including medicine) and engineering students both at undergraduate and postgraduate levels. We would stress that curricula should be influenced towards teaching entrepreneurship and new ventures development from the predominant perspective of high growth and internationally focused new knowledge businesses. However, we would also argue strongly that such courses should always be *voluntary*. In order to ascertain the attractiveness of an entrepreneurial career, young men and women need information, role models and (ideally) direct experience of such activities. En-

preneurship courses can help meet these goals by addressing directly information imperfections and asymmetries. To make rational and considered choices, scientists need to appreciate what it takes to build a rapid growth venture with global market potential. Accordingly, they also need to have an understanding as to how new knowledge can be transmuted into new products and services regardless of their own future academic roles or positions in the innovation value-added chain.

- Fourth, while we believe that students from all disciplines in all universities should have access to entrepreneurial program choices, we are mindful of the scarcity of world class experience in the creation and accelerated growth of new enterprises. If Finland wishes to remain a world class innovative economy, it also needs to have world class infrastructure for entrepreneurial training, education, and research. The reform of the university system and, in particular, the formation of Aalto University represents a unique opportunity to create such an infrastructure. The infrastructure could for example take the form of an entrepreneurial center that is an accessible resource to high potential entrepreneurs and businesses regardless of their location. Such a center should have complementary remits for academic research, knowledge transfer and practitioner engagement. Critically, it should be global in purview and the center's employees, students and visitors should strongly reflect its global ambitions in their experience, culture, nationality and diversity. In order to meet such goals, the financing and incentivization of faculty is likely to have to be internationally competitive. Given the center's ambitions, its governance needs to be a matter of some deliberation. Again, it is inappropriate in this report to design in detail such an infrastructure for international entrepreneurial activity. However, it should be also seen, as with our other recommendations, as creating a very visible, public, and powerful signal that Finland is committed to a global entrepreneurial mindset across the range of its innovation activities.

Conclusions

In conclusion, we believe that the Finnish innovation system could *significantly* increase the effectiveness of the support offered to its high growth entrepreneurial firms. These changes would also stimulate the supply of such firms.

We have summarized the results of our analyses and discussions into a number of specific recommendations (see above). However, we would wish to conclude with two observations which are related to the nature of policy actions: namely, **complexity and political intent**.

First, new programs and policy initiatives are simple to introduce but can all too easily make the existing support system increasingly complex. In many respects, it is far easier to create new programs than to retire existing but no longer relevant activities. The result of this phenomenon is that there is a constant accretion of policy measures, systems, channels and programs in any modern government.

In Finland at the present time, there are too few efforts to streamline the existing support system available to young firms. Making the system more cost efficient and more accessible to potential (high growth) entrepreneurs is of a first order of importance.

Second, it remains to be seen whether or not there is enough political will to make the promotion of growth entrepreneurs and HGEFs a primary goal of the relevant ministries and the various agencies under their command. In practice, most countries have a large number of programs for start-ups and small businesses. Such programs are seldom of real relevance and help to *exceptional* HGEFs. All too often growth firms remain on the sidelines in policy discussions and actions. Their needs are quite different from the very large number of 'rank and file' small businesses. Finnish growth entrepreneurs and HGEFs require incentive and support systems that are *complementary, effective and easy to understand and access*. In the absence of such 'catalytic' resources, world class technological and scientific expertise will remain a *necessary but not sufficient* condition of Finland's future economic success.

Exhibit 49: Summary and recommendations.

Creating Entrepreneurial Incentives

Tax policy should explicitly recognize the incentives needed for talented persons to consider an entrepreneurial career choice as well as for potential High Growth Entrepreneurial Firms (HGEFs) to pursue (international) expansion. The planned reform of the Finnish tax system presents a unique opportunity to make the taxation treatment of equity and entrepreneurial income more favorable to entrepreneurial risk-taking and creation of potential HGEFs.

The Ministry of Employment and the Economy and the Ministry of Finance should publicly assume joint operational responsibility for policies that aim at promoting entrepreneurship and knowledge-based HGEFs.

Streamlining the Public Support System for Entrepreneurial Activity

The present public support system is in need of a major revision. Issues of access and relevance are particularly important for HGEFs. It is believed that both the governance and cost-effectiveness of the support system could be improved by reducing its complexity.

Ensuring Global Perspectives

As a consequence of cultural and geographic distance to major global markets, the Finnish innovation system suffers from a mismatch between

- the growing demand by Finnish HGEFs for global insight, foreign expertise, international networks, and
- the insufficient supply of inward foreign spillovers due to the scarcity of world class human capital, foreign R&D, and cross-border venture capital within Finland's borders.

Even if there is no single policy measure that can resolve this issue, it should be more urgently recognized and addressed.

Promoting an Entrepreneurial Culture and Related Skill Sets

The Finnish educational sector has a greater role to play in the creation of HGEFs. The reform of the Finnish university sector and the creation of Aalto University present an important and timely opportunity to create world class infrastructure for entrepreneurial education, training and research accessible to both Finnish and collaborative foreign interests involved in growth oriented and new knowledge based enterprise.

8. Geography of Innovative Activity

On the basis of Ottaviano, Kangasharju, and Maliranta in the Full Report

This chapter looks at the regional dimension of the Finnish national innovation system based mainly on statistical analysis of the *performance of firms receiving direct public support*. In this chapter we primarily refer to *(regional) innovation policy* from this point of view. For instance geographically distributed access to higher education is certainly a regional aspect of broad-based innovation policy, but our discussion is less on this or other aspects.

actions – innovation or non-innovation – may even have promoted regional **divergence**.

Regional imbalances should be of no concern for direct national innovation support, no matter whether promoting knowledge diffusion contributes to regional convergence or peddling creative destruction increases regional disparities. The reason is that any regional agenda may lead to slower productivity growth and cumulative losses in value added.

Introduction

We focus on **productivity**, since it is the best measure of competitiveness, and the *contribution of innovation policy to productivity growth is ultimately the best measure of its success*.

We argue that, while innovation policy is inherently national, the regional dimension is nonetheless rather important. Innovation policy and regional policy have created a complicated system across regions, in which both target similar objectives though with somewhat different emphases. Due to large similarities and overlaps, in practice it is very difficult to distinguish between innovation policy conducted across regions and regional policy focused on innovativeness and renewal *per se*.

It is concluded that this complex system of innovation-related policies has been rather **unsuccessful** in compressing the differences in competitiveness among Finnish regions. Moreover, some policy

Innovation is regionally concentrated

Innovative activity is highly concentrated regionally. The Helsinki sub-region, accounting for one-third of the Finnish gross domestic product and one-fourth of the population, conducts 40% of R&D investments in Finland.⁵⁴ The six largest sub-regions (out of a total of 77) account for 83% of the all R&D investments in 2007. R&D activity has become even more concentrated over time. In 1995 the six largest sub-regions accounted for 77% of the total R&D.

R&D activity is an input in the innovation process. Regional concentration also shows up in the innovation outputs (Valovirta *et al.*, 2009). As shown in Exhibit 50, innovations have been increasingly made in the centers than the periphery since the mid-1990s.

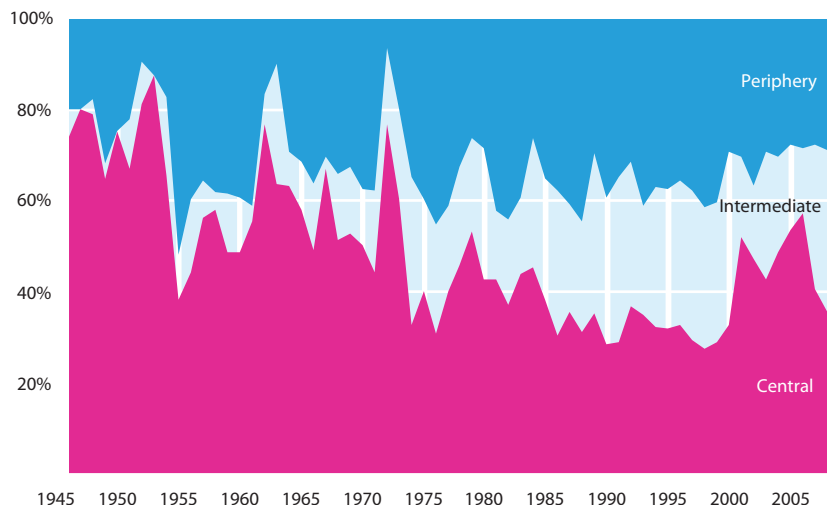
These features raise a question as to whether this regional pattern is economically and politically acceptable. Should innovation policy

Exhibit 50: Innovations have been increasingly made in the central regions since the mid-1990s.

Geographic origins of significant Finnish innovations.

The biggest share of innovations originates from the central regions. Since the mid-1990s these central regions became even more important as innovation creators whereas the periphery clearly lost ground.

Source: VTT Sfinno database of significant Finnish innovations (Hyvönen & Saarinen, 2009).



The innovation policy of Finland has an important regional dimension that is to some extent linked to regional policy.

- ignore this regional pattern and consider it only as a natural outcome in a globalised world, or
- should it take the regional dimension into account and aim at reducing regional variations?

Currently, the innovation policy of Finland is inherently national. We argue that, although it is not easily admitted, there is nevertheless an important regional dimension, to some extent linked to regional policy.

Is there any 'regional' innovation policy?

According to the *Ministry of Employment and the Economy (MEE)*, there is basically only one rationale behind 'regional' innovation policy. It aims at seeking innovative potential in all regions by reducing the information gap of the local actors. The information gap varies far more by the size than by the location of firms. Therefore, the main target group consists of the small and mid-sized enterprises (SMEs) all over Finland.

Besides information, the SMEs often lack ambition. Hence, another aim of the policy is to motivate small and medium-sized firms everywhere in Finland. The role of the national innovation policy is seen as important also in coordinating local and re-

gional actions and educating local actors in the development work (Viljamaa *et al.*, 2009).

Building networks between firms, local governments, private developers, regional councils, polytechnics, and universities is a crucial expedient for achieving these objectives. Accordingly, *regional innovation policy develops capacities and favorable environments for innovations all over Finland*. A signal of this policy is the strong presence of public ventures in peripheral regions (Exhibit 51).

Together with building capacities for innovation all over Finland, the public sector provides *direct support* to innovative firms in terms of subsidies, loans, and guarantees. Although the official statements and the EU competition legislation argue that building favorable business environments is preferred to direct subsidies, direct aid is nevertheless sizable.

Public intervention on *innovative activity across regions* (including both the regional dimension of innovation policy and the innovation dimension of regional policy) consists of two parts:

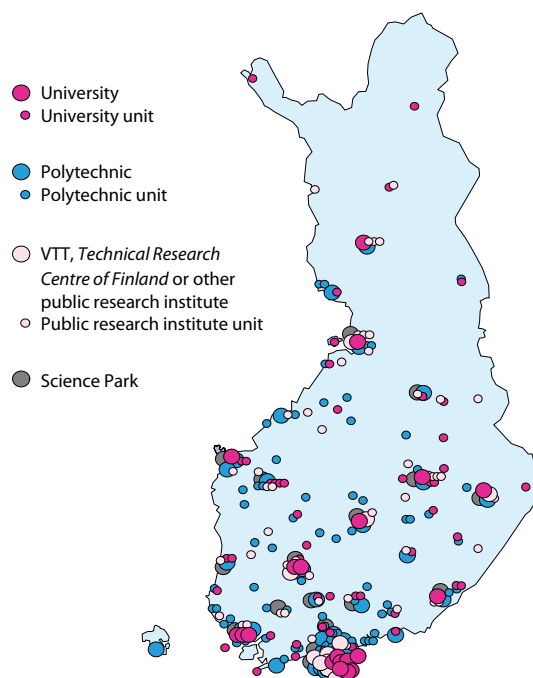
- Indirect public support aims at creating fertile regional environments for the efficient creation and diffusion of knowledge among all stakeholders. In this respect, building strong regional networks has been an integral part of the Finnish national inno-

Exhibit 51: A strong presence of public innovation support units in peripheral regions.

Geographical distribution of public R&D units.

The Finnish public R&D activities are highly dispersed indicating a strong regional dimension of broad-based innovation policy.

Source: Tekes.



vation policy instruments, especially in the *Centres of Expertise* program.

- More direct public support promotes renewal through the investment and R&D activities of recipient firms.

Our analysis has specifically checked whether this more **direct support** (through grants, loans, and guarantees) plays a role in driving **regional performance**. Nonetheless, we have also taken into account the impact of indirect support.

Although it is not easily admitted, there seems to be a regional bias in national innovation policy favoring ‘disadvantaged’ regions. This bias looks complementary to more traditional tools of regional intervention such as the EU structural funds.

National innovation policies and regional impacts – Growing disparities

For nations as well as regions, the best measure of competitiveness is **productivity** and the *contribution of innovation policy to productivity growth is ultimately the best measure of its success*. Almost by definition, productivity grows when a firm puts to use ideas not previously employed in the firm and does it in a commercially profitable manner. Thus, a comparison of productivity patterns across Finnish regions is a useful approach to evaluate the impact of the regional dimension of the Finnish innovation system. In particular, since firms’ capabilities and incentives are the key drivers of regional productivity, a promising

Exhibit 52: Multitude of programs and instruments.

Organizations – Preparing and conducting regional (innovation) policy

The responsibility for regional development rests with the State, municipalities, and Regional Councils acting as regional development authorities.

The State and Centres for business and industry, transport, and the environment (ELYs)

The common targets of regional development in Finland are based on the Regional Development Act and the *Government decision on national regional development targets*. The decision directs and coordinates regional strategic programs, the regional development targets, and the use of policy tools in different administrative sectors. In their activities, State authorities take account of the national regional development targets, promote the implementation of these targets, and evaluate the impact of their measures on regional development.

MEE is the responsible ministry preparing and conducting the innovation policy, as well as its regional dimension. The state conducts the regional policy mainly in ELYs (Centre for business and industry, transport and the environment), former TE-Centres. ELYs serve the entire economy. They provide expertise and regional services of the *Ministry of Employment and the Economy*, the *Ministry of Agriculture and Forestry*, and the *Ministry of the Interior*. In ELYs, customers also have access to the services provided by Tekes. A total of 15 ELYs’ services are designed for:

- companies’ product development, technology, internationalization, business management/development, and financing;

- entrepreneurs starting their business, company establishment counseling, and other, closely related activities;
- employment promotion, adult education and employment services, as well as the management of employment office activities;
- specialization of farms, rural industries, and fisheries and the enhancement of their operating conditions, as well as the supervision of farm subsidies.

Regional councils

Finland is divided into 19 regions, plus the autonomous province of Åland. Finland’s Regional Councils are statutory joint municipal authorities operating according to the principles of local self-government.

Regional councils are legally responsible for the planning and development of their respective areas. As regional development authorities, they are charged with responsibility for the Regional Plan, the regional program, and drafting the regional land use plan. These are formulated in cooperation with representatives of state and municipal administration, the business sphere, and other specialists. The Regional Plan sets guidelines for regional development over the long term (20–30 years). Drafting the plan involves the participation of state and local government officials, the business sector, establishments providing education and training, a variety of organizations, and individual citizens. All other development plans and programs affecting the region are based on this document. For example, the 3–5-year regional programs reconcile and direct, in accordance with guidelines laid down in the regional plan, the development programs and resources of the European Union, state, and regions.

There is a host of different measures to promote local business development and innovation.

The councils operate as regional development and regional planning authorities and are thus the units in charge of regional planning and looking after regional interests. Based on municipal democracy, they articulate common regional needs and work to promote the material and cultural well-being of their regions. In addition, the councils implement and coordinate a number of various national and EU projects.

Municipalities

Municipalities have their own (tax based) resources to promote innovation and other business activities. They also utilize the national and EU funds in development projects. Practically all municipalities provide counseling and information services for (innovative) firms. Furthermore, almost half provide educational or research services and support for businesses' internationalization. As many as one-fifth have their own innovation strategy or policy. In particular large cities have considerable resources to promote business development. There is no statistical data available of the magnitude of the financial resources municipalities use to promote innovation, but based on the survey carried out for the evaluation it can be estimated to range between €100–500 million per year. Hence, the conservative estimate is that municipalities promote innovation by a total budget equivalent to half of Tekes funding.

Local developers

Public and private developers are mainly science parks and technology centers providing networks and premises. Technology centers, for example, provide three types of support: incubation, development programs, and premises. Altogether there are at least 300–400 different public, private, or semi public 'intermediary organizations' providing business support services.

Instruments of the regional (innovation) policy

There are a host of different programs, policy initiatives, and separate instruments to promote regional and local business development and innovation. The most important are briefly described below (for a more detailed description, see the Full Report).

Centre of Expertise Programme (CoE)

The Centre of Expertise Programme plays an important role in a national growth strategy based on information and expertise. The program is designed to pool local, regional, and national resources to the exploitation of top-level expertise. The program supports regional strengths and specialization and furthers cooperation between the centers of expertise.

The Centre of Expertise Programme channels regional and national resources in order to make the best use of excellence. It supports regional strengths and specialization, as well as partnerships between Centres of Expertise. The program focuses on business development and the capitalization of selected fields of global excellence. During the 2007–2010 program period, basic funding for the Centre of Expertise Programme will be channeled in particular towards developing global excellence in a few strong fields, thus giving more weight to large urban regions as actors implementing both regional and national innovation policy.

Large urban regions development and metropolitan policies

As major generators of innovation, knowledge, and skills, large urban regions greatly influence the overall success, welfare, and economy of the country. Large urban regions compete on the world market by attracting businesses to Finland. Urban regions have the best opportunities to attract capital, businesses, and skilled labor. For the regions to succeed amongst this global competition, their special role should be taken into account in regional development measures. Supporting the globally competitive skills base is one of the most important objectives of urban policy. For the development of innovation strategies and the productivity of urban regions, the key factors include training, research, the application of research results, the development of businesses, transport and infrastructure, and securing the availability of skilled labor. The main objective of the urban development policy is to promote vitality, well-being, and cooperation and to strengthen the productivity of urban regions, which are diverse both in terms of their special characteristics and size. The development tools for urban policy are provided by the Regional Centre Programme, while implementation of the policy mix for large urban regions will be based on the Regional Centre and the Centre for Expertise Programmes.

Besides urban policy the Government is reinforcing the development of the largest urban areas by metropolitan policy. The metropolitan policy will focus on the following issues:

- strengthening the global productivity of the largest urban regions;
- strengthening the cohesion of social structures;
- preventing social and regional divisions.

Other programs

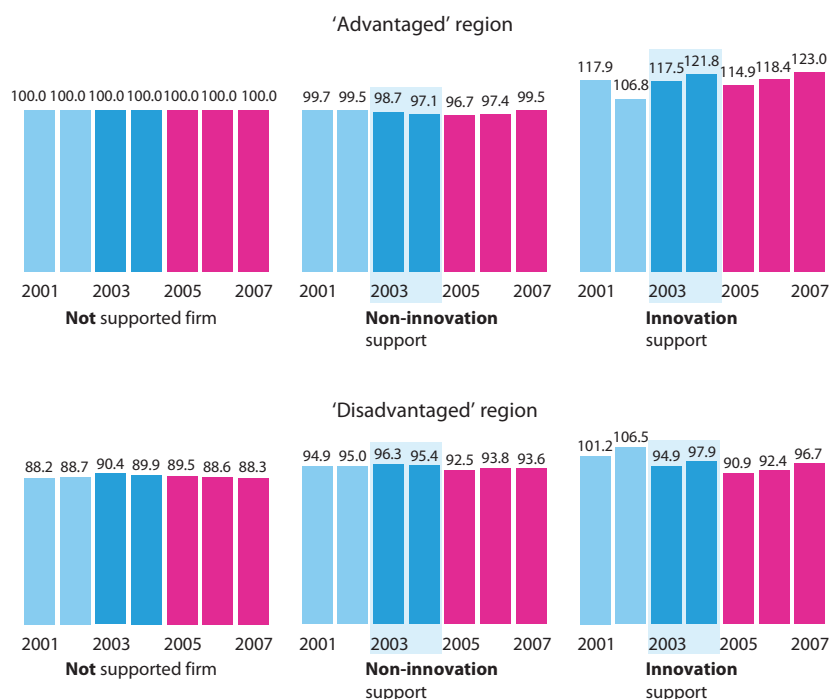
The other programs include: Regional Centre Programme (RCP), Cohesion and Productivity Programme (CoCo), and EU structural funds, which have been extremely important in providing additional funding to national innovation funding.

Exhibit 53: Public innovation policy has a negative impact on firm productivity in the disadvantaged regions and a positive impact in advantaged regions.

The effect of public innovation support on regional aggregate productivity.

Innovation support has a positive effect on productivity in advantaged regions both during and after treatment. It has, instead, a negative impact in disadvantaged regions during treatment, and the decline continues in the following years.

Note: The figures represent the productivity levels of six types of firms in two groups of regions, 'advantaged' regions who did not receive support and the 'disadvantaged' regions who did receive such support. The base case in each year being the supported firm in the advantaged region (index = 100). Firms were monitored from 2001 to 2007 with the 'treatment period' or period when received direct public support being 2003–2004. Source: Ottaviano, Kangasharju, and Maliranta in the Full Report.



strategy to identify potential problems in the innovation system is to look at the evolution of firm-level productivity. This is possible thanks to the exceptional richness of Finnish micro-level databases.

Our analytical approach has focused on the statistically measurable final outcomes of innovation. The basic idea is that successful innovation should be ultimately captured by firms' ability to create value to customers as determined by their willingness to pay for products and services. This ability materializes in value added per worker (labor productivity), whose changes are driven by firms' efficacy in introducing new successful products and services or in supplying already existing products and services at lower costs. The more productive firms are in a certain region, the higher its competitiveness in terms of value creation.

Data come from the firm-level *Structural Business Statistics* (SBS) that basically cover all firms in the Finnish business sector excluding some industries, for example, Finance and Insurance. When investigating the regional effects of innovation policies (focusing on support provided by *Tekes*, the *Finnish Funding Agency for Technology and Innovation*) the SBS data are linked to Firm Support panel for the years

2001–2006. That database, again, is constructed by linking several administrative sources of the departments of the government. All details are documented in our chapter in the Full Report.

We measure the competitiveness of a region in terms of the average labor productivity (value added per person) of its firms. Specifically:

- We start with computing labor productivity for each firm in each industry in each region.
- Then, we calculate the labor productivity of an industry in a region as the sum of its firms' labor productivities weighted by their shares of regional employment.
- Finally, we evaluate the productivity of a region as the sum of its industries' labor productivities weighted by their shares of national employment. By using national rather than regional weights, we net out the differences in regional productivities that may arise from different sectoral composition.

Our analysis shows that Finland is experiencing a *growing divergence in the competitiveness of its regions*, mainly because of the relatively smaller size of efficient firms in 'disadvantaged' regions. The relatively lower efficiency of new firms seems to be an additional problem in services. This suggests that a

potentially important source of regional divergence is to be found in the misallocation of resources in 'disadvantaged' regions between efficient and inefficient firms both in terms of incumbents and entrants. This hampers productivity growth through hindering the reallocation of resources to their most efficient uses.

The implication is that the complex system of innovation-related policies has been rather **unsuccessful** in compressing the differences in competitiveness among Finnish regions. Moreover, our results indicate that some policy actions – innovation or non-innovation – may have even *promoted* regional divergence. Though we have focused on direct support, widening regional divergence also implies that the performance of indirect support has been disappointing in dealing with regional disparities.

These negative outcomes have two alternative interpretations:

- On one hand, one could say that direct and indirect public support has not been effective *enough* to invert more general tendencies due to the rising of a knowledge-based economy and globalization. The drivers of these tendencies include various agglomeration benefits accruing from increasing returns to scale and spillover effects.
- On the other, our analysis of the effect of direct support could be read as evidence suggesting that policy actions have not been effective *at all* and have possibly been even detrimental. By distorting competition, innovation policy and regional policy actions may have disturbed industry dynamics and restructuring in disadvantaged regions. The same public support may disturb restructuring in disadvantaged regions and not in 'advantaged' counterparts, since advantaged regions (such as Helsinki, Tampere and Turku) are more agglomerated, where shorter distances lubricate the flow of new ideas and reshuffling of workers. Moreover, there are more incentives for restructuring in advantaged regions due to higher competitive pressure coming from higher presence of global firms and larger number of local firms. Indeed, our strongest piece of evidence is the negative allocation of resources both during and after two years since innovation support in disadvantaged regions. Although public support appears to disturb restructuring in disadvantaged

regions, it may still have other desired effects, such as maintained jobs or increased longevity of firms. However, these effects belong to the objectives of regional policy and may be harmful for innovation policy, due to detrimental effect on productivity.

This allows us to point out an important distinction between measuring the success of public R&D support in terms of private R&D investments (and outputs) and measuring it in terms of value added from the provision of goods and services. For example, a recent study finds that public R&D support encourages firms' own R&D spending in the Finnish Objective 1 regions (Einiö, 2009). This suggests that the innovation system functions well in promoting an *intermediate* product (i.e., private R&D), which is not incompatible with our findings that would then suggest that policy actions should be further improved in terms of promoting the *ultimate* outcome (i.e., productivity).

Our statistical approach has both pros and cons. The effectiveness of innovation policies is usually analyzed by case studies. In this respect, our approach has the advantage of allowing us to use a very large set of case studies. In doing so, it highlights the limits of current regional innovation policy, which are important to acknowledge no matter which of the two above interpretations is closer to the truth. The general tendencies we uncover undoubtedly conceal some great regional success stories, typically achieved by strict specialization in certain fields. We do not deny these cases, but focus on the overall picture instead.

An important objection to our findings could be that, although ineffective, the amount of public funds involved in the specific policies we target is negligible. However, it is worthwhile pointing out that the sheer amount of money involved is not a complete measure of 'wasted resources'. *The main negative effect of those policies is the loss in terms of foregone productivity that accumulates through time so that even small yearly losses of productivity growth may build up into large output losses as time passes.*

To some extent, our findings have nonetheless to be handled with care due to the following reasons:

- First, our analysis on direct policy effects only contains incumbent firms that continue operating all the years between 2001–2007. Thus, the role of firms' birth and death is ignored.

The main negative effect of those policies is the loss in terms of foregone productivity.

- Second, we only look at the first four years after the firms start receiving support. While all supported firms receive support for at least two years, only some of them stop being supported in the subsequent years. This is a confounding factor in assessing the impact of our targeted two-year support. However, given that we find negative support effects even during the support period, such a confounding factor should not bias our results.
- Third, we have been unable to identify whether our negative results come from inefficient support or adverse selection in the pool of supported companies. Specifically, adverse selection could be relevant if, within regions and industries, public agencies had chosen to support companies that would have performed worse than unsupported ones even without public support.
- Finally, the data analyzed only acknowledge support when recipient companies can be identified. Therefore, our analysis does not capture the possible benefits arising from forms of indirect support, such as those aimed at building networks and improving the business environment. A detailed investigation of these benefits would, how-

ever, require data on companies and other actors participating in such indirect programs that are currently unavailable to us.

Our analyses are subject to certain caveats, but the results are reinforced by other data. The survey conducted to support the evaluation reveals that most of the respondents agree (Exhibit 54) that there is a regional agenda in national innovation policies; many of the interviews confirmed the same.

Conclusions

Conditional on the caveats still remaining (see above), our analysis yields a number of conclusions and policy recommendations:

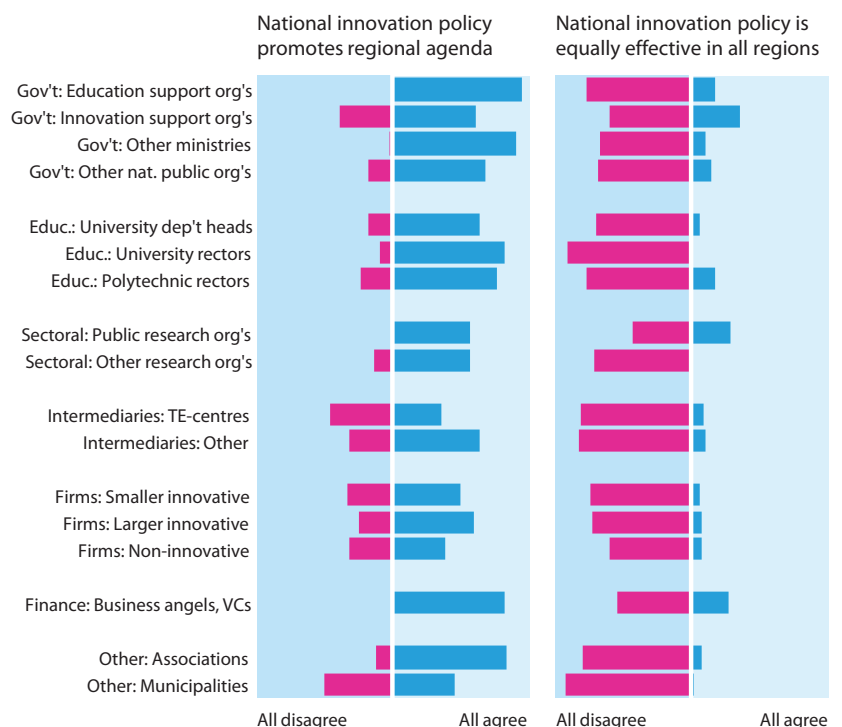
- First of all, Finland as a whole would benefit from redesigning its policy combination in order to foster the reallocation of its resources to their most productive uses. Pursuing this national strategy may lead to the reallocation of resources away from ‘disadvantaged’ regions to already ‘advantaged’ ones. However, the ensuing pattern of regional divergence would not necessarily mean rising ine-

Exhibit 54: Innovation policy seems to promote regional agendas.

Respondents’ opinion on innovation policy and regional aspects.

Most of the respondents see that national level innovation also promotes regional agendas, with exceptions being municipalities and regional TE centers. Also the innovation policy is not seen as equally effective in all regions.

Source: Kotiranta et al. (2009).



Innovation policy should celebrate firms that endeavor to move the current technology frontier forward no matter where they are actually located.

quality among people as economically challenged citizens could be helped through direct income support irrespective of where they live.

- Second, in redesigning the policy combination due attention should be paid to the two drivers of aggregate productivity: *creative accumulation* and *creative destruction*. While the former leads to productivity growth within companies, the latter generates productivity growth at the industry level when more efficient companies grow at the expense of less efficient competitors, moving workers and other resources from less to more productive uses.

Along both dimensions it is important that different policies clean up their acts. In particular:

- Innovation policy should celebrate firms that endeavor to move the current technology frontier forward no matter where they are actually located, in particular even when they happen to be concentrated in 'advantaged' regions.
- Innovation policy should also foster the diffusion of knowledge and the adoption of innovation across firms and regions by helping inefficient firms adopt more efficient production methods to catch up with the technological frontier.
- Product and labor market policies should be used to grease the wheels of creative destruction. In particular, competition policy should be used to

give stronger incentives for 'creative accumulation' as well as 'creative destruction' by promoting the entry of new innovative players. It should also stimulate the reallocation of market shares from less to more efficient competitors. In this respect, workers mobility should also be fostered.

- Regional imbalances should not be of concern for direct national innovation support, no matter whether promoting knowledge diffusion contributes to regional convergence or peddling creative destruction increases regional disparities. The reason is that any regional agenda may lead to slower productivity growth and cumulative losses.
- Social equity should be targeted through traditional redistributive tools by targeting disadvantaged individuals' rather than 'disadvantaged regions'. For example, the grants-in-aid system helps municipalities provide citizens with welfare services all over the country. National redistribution policies, in turn, provide direct welfare benefits to people in need. Unemployment insurance could be strengthened to better isolate workers from the churning associated with creative destruction.

To summarize, public intervention should follow a sound division of work. Running innovation policy and competition policy with a regional agenda may come at a high cost in terms of foregone growth at both the local and national level.

Exhibit 55: Summary and recommendations.

Finland as a whole would benefit from redesigning its policy combination in order to *foster the reallocation of its resources* to their most productive uses.

In redesigning the policy combination due attention should be paid to the two drivers of aggregate productivity: *creative accumulation* and *creative destruction*. Along both dimensions it is important that different policies clean up their acts following a sound division of labor.

Innovation policy should celebrate firms that endeavor to *move the current technology frontier forward* no matter where they are actually located, in particular even when they happen to be concentrated in 'advantaged' regions.

Innovation policy should also foster the diffusion of knowledge and the adoption of innovation across firms and regions by helping inefficient firms adopt more efficient production methods to catch up with the technological frontier.

Product and labor market policies should be used to *grease the wheels of creative destruction*. In particular, competition policy should be used to give *stronger incentives* for creative accumulation as well as creative destruction by promoting the entry of new innovative players. It should also stimulate the reallocation of market shares from less to more efficient competitors. In this respect, workers mobility should also be fostered.

Regional imbalances should be of no concern for direct national innovation support, no matter whether promoting knowledge diffusion contributes to regional convergence or peddling creative destruction increases regional disparities. The reason is that any regional agenda may lead to slower productivity growth and cumulative losses in value added.

Social equity should be targeted through traditional redistributive tools by targeting 'disadvantaged individuals' rather than 'disadvantaged regions'.

9. Education, Research and the Economy

On the basis of **Veugeliers, Toivanen, and Tanayama** in the Full Report

The most pressing and timely challenge is to increase the quality of research in Finland, which is best achieved by providing autonomous universities incentives through funding rules emphasizing it. Our proposal for the new financing system of Finnish universities emphasizes quality-adjusted research output by discipline in allocating university funding. To streamline the higher education sector we recommend a clear division of tasks between universities and polytechnics. In addition, the role and tasks of public research organizations should be critically re-assessed. We also propose a clear distinction between Bachelor's and Master's programs and stress the need to avoid top-down policy making in selecting areas for academic research.

New demands for education and research

There are new demands and pressures upon the Finnish education and (public) research sectors. More and more emphasis is put on ensuring that their capabilities contribute to the country's economic and social objectives, and reforms are taking place to ensure that they will be in a position to achieve their full potential.

While this chapter touches upon the role of research and education within the Finnish innovation system at large, the main emphasis is on universities. Given their unique blend of basic research, higher education, and diffusion of scientific knowledge, they are central to frontier innovation systems such as Finland. Furthermore, due to ongoing major reforms, they are a particularly timely issue in Finland.

The *Government's Communication on Finland's National Innovation Strategy to the Parliament* (building on the Strategy of Aho *et al.*, 2008), which we took as our starting point, sets the goal of **pioneering** in innovation activity in selected sectors of innovation. The Communication presents four *strategic choices* deemed crucial for the future of the Finnish innovation system:

- Innovation activity in a world without frontiers,
- Demand and user orientation,
- Innovative individuals and communities, and
- Systemic approach.

Our objective is to evaluate the reforms needed in education and research in order to reshape the Finnish innovation system to better match with the above choices and future challenges.

The Strategy's basic choices

In relation to *innovation activity in a world without frontiers*, the Communication stresses that the success of enterprises and regions depends on their ability to position themselves favorably in global networks. This requires active participation of Finnish experts based on their *globally* state-of-the-art competences. For universities this means that they are expected to provide society with knowledge and competence that *meets and even creates the international standards*. This challenge in itself requires mobility and extensive participation of academics in international networks.

The Communication's emphasis on *innovative individuals and communities* points out that innovativeness is based on the skills and creativity of people. In this respect the quality of Finnish university research and education in fostering and educating innovative individuals is crucial, laying the seeds for all innovative communities and organizations.

In the spirit of the Communication, *demand and user orientation* is surely something that needs to be stressed. This does **not** require universities to be engaged in pure applied research or innovations themselves. Universities have a comparative advantage in their basic research that is driven by a quest for fundamental knowledge that may well be *user-inspired*. Universities should focus on high quality, internationally excellent, long-term research that is not necessarily conducted with any practical end in mind. Given their specialized capabilities and institutional constraints, the question is, *how can universities best contribute to the formation of an organizational ecology that generates sustained demand and user driven innovation?*

Our approach is that for university research, *demand and user orientation* should rather mean more efficient and rapid exploitation of the generated knowledge and better connecting universities with firms' innovative activities, through stronger networking arrangements, collaborative funding of research pro-

grams and the like, respecting the division of labor between academia and commerce. This is different from a perspective that seeks to bring universities fully into the market for pure applied research and/or innovation services.

The Communication's *systemic approach* relates to the conduct of innovation policy that should entail broad-based and close cooperation across different political sectors. In addition, the systemic approach can be understood as calling for coordinated structures that efficiently pull together resources. The fragmentation of the Finnish education and research sectors means that they fail to be systemic in themselves, let alone with the system at large.

Exhibit 57 suggests that companies and other actors in the Finnish innovation system largely perceive the respective roles of universities, polytechnics, and public research organizations (PROs) as defined in the legislation (Exhibit 56). Universities are rated favorably in terms of *international first class research* and *experts for the international business activities*. On these,

they are clearly the main suppliers over polytechnics and PROs. Polytechnics are seen as *experts for the needs of regional business activities*. The system's actors thus see a clear division of tasks between universities and polytechnics. PROs do not seem to stand out in any dimension; they have their highest score on *research for the national needs*, but universities are rated more favorably also in this dimension.

International comparison reveals many challenges

Internationally the Finnish higher education compares favorably in many respects: Investments in higher education R&D are at a high level, and Finland produces many researchers. Available statistics suggest that Finnish firms cooperate actively with institutions of higher education, even if they do not seem to be particularly appreciated as sources of information.

Exhibit 56: The Finnish education and public research sectors.

For tertiary education, Finland has a dual model consisting of two parallel sectors: universities and polytechnics. Currently there are 20 universities and 26 polytechnics. The 20 universities are based in 11 cities and towns providing degree education in over 20 different localities with Bachelors, Masters, licentiate, and doctorate studies. Polytechnics in turn provide degree education with Bachelors studies in over 80 different localities throughout Finland.⁵⁵

According to the Act of 1997, universities have four main tasks:

- to promote free research,
- to promote scientific and artistic education,
- to provide higher education based on research and
- to educate students to serve their country and humanity.

The obligation to serve the surrounding society was added to the legislation in 2004.

According to the Act of 2003, polytechnics are professionally oriented higher education institutions:

- provide professional education,
- support professional development,
- conduct applied R&D which supports regional development, and
- offer adult education.

The main aim of the polytechnic degree programs is to provide professional competence.

Currently there are 18 public research organizations (PROs) under eight ministries. They have been established on a sectoral basis and, besides research, they have other sector- and organization-specific functions (Hyytinen, Loikkanen, Kontinen, & Nieminen, 2009). However, the nature and the extent of these other duties differ considerably across PROs. According to Rantanen (2008), research covers some 30–40% of the volume of activities in large and medium-sized PROs. Directly serving the relevant administrative sector covers another 30–40%. Education, information, and other tasks cover the rest. More information on the funding of the PROs in Exhibit 19.

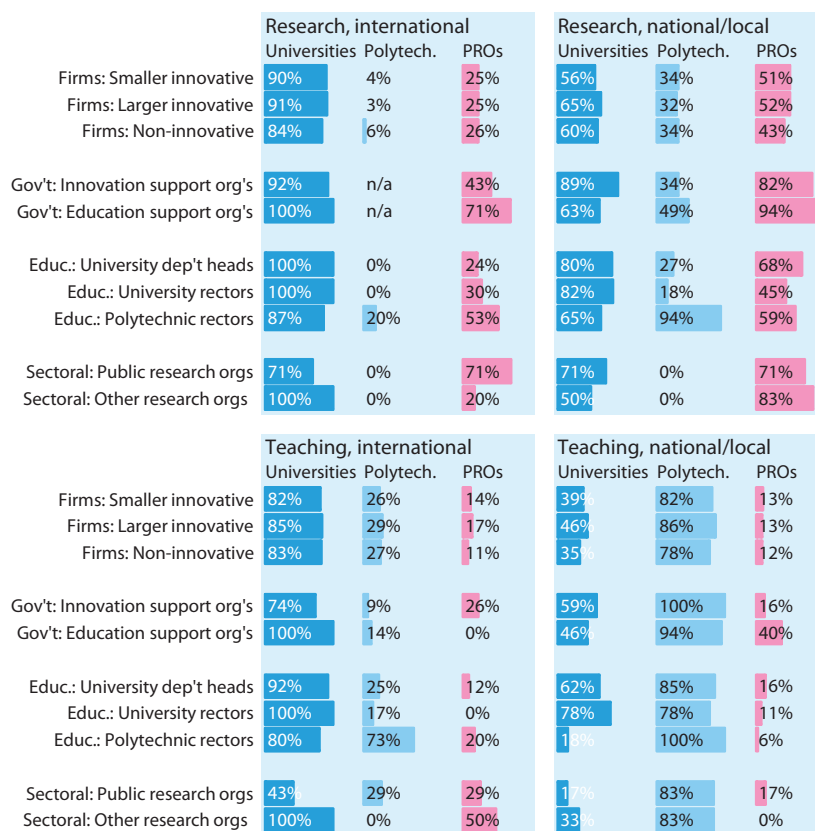
Finnish universities are maintained by the state while polytechnics are run by municipalities, joint municipal bodies, or foundations. The state nevertheless covers 57% of the polytechnics' funding. Universities are 80% publicly funded in one way or another. The *Academy of Finland* and *Tekes* funding to universities, together accounting for 21% of the total, may be considered as being allocated through competitive bidding. Funding for PROs comes from the state budget, ministries, and external domestic and foreign competitive funding. Depending on the organization, external funding is 3–70% of the total.

Exhibit 57: Universities, polytechnics, and public research organizations' strengths differ.

Shares of respondents by group considering that universities, polytechnics, and public research organizations (PROs) are *successful* in providing international first class research (upper left), research for national needs (upper right), experts for international business activities (lower left), and experts for regional business activities (lower right).

On average PROs and universities do equally well in providing research for national needs. Polytechnics are seen as the best source of experts for regional needs. Universities deliver the best scores for the international dimension as they are successful in both doing international first class research and supplying experts for international needs.

Note: n/a = not available. Note that for those in *education* and *research organizations* categories the responses are in part self-perceptions.
Source: Kotiranta et al. (2009).



Relative to other countries, the most pressing problem is that Finland tends to rank low when it comes to *research output volume* and particularly *research quality*; world-class excellence in research is rare in Finland. Another striking feature is that the Finnish higher education and public research sector is highly **fragmented** in three dimensions:

- First, the resources are scattered into three types of institutions – universities, polytechnics, and public research organizations – with partly overlapping duties.
- Second, these institutions are scattered around the country.
- Third, universities are internally fragmented with too small research and teaching units.

International comparisons also highlight *low internationalization* of the Finnish university sector. In addition, Finnish students enter higher education **later** and study **longer** than their counterparts in other countries.

We put forward the following main challenges in developing the Finnish higher education sector.

- Increasing the quality of university research.
- Streamlining the higher education sector to reduce fragmentation and overlapping activities.
- Increasing internationalization of the university sector.
- Tackling the problem of late graduation.

Of these, we argue that the most critical challenge is to increase the quality of research in Finland.

Excellence in research is vital to world class innovation activity and it is also a precondition for

- *internationalization* of the university sector,
- *industry-science* links, and
- *relevance* of research for innovation.

The best way to increase the quality of academic research is to provide autonomous universities incentives through funding rules emphasizing quality.

The golden reform opportunity

Like the majority of European countries, Finland is currently reforming its higher education and public research sector.

A key component of the Finnish reform agenda is the new **Universities Act**, which will be enacted in autumn 2009. Universities will have to comply with it starting 1 January 2010 (see our chapter in the Full Report for details).

In addition to the new university legislation there are two recent reforms in Finland that aim at improving industry–science links: the foundation of *Strategic Centres for Science, Technology and Innovation* (Finnish acronym: SHOK), and the enactment of the new *University Inventions Act* in early January 2007.

A central part of the new Finnish university legislation is the goal of giving universities more **independence**; they will have an independent legal status with full financial responsibility. In order to get the benefits of autonomy, however, it must be combined with an appropriate *steering system* providing the right incentives for universities to strive for the stated objectives. On this dimension, the new Finnish university legislation is **insufficient**.⁵⁶

We argue that research and its quality should receive considerably higher weight in the funding system of universities than is the current practice. Our proposal emphasizes the following aspects (see the Full Report for details):

- A split of funding between education, research, and strategic objectives that gives a high weight to research (35%), while still keeping education as the main task (55%).
- Few, clear, quality-weighted, and discipline-specific measures complemented with a ‘light’ peer-review.
- The *Academy of Finland’s* expertise in assessing the quality of research could be exploited to implement the new financing system.⁵⁷ The main difference to its current practices would be that this type of funding is allocated to universities and units within them, not individual researchers or projects, and the funding is allocated according to observed research quality instead of project plans.
- One of the key features of a good incentive system is **transparency**. Given that our proposal differs

considerably from the current system, a move towards it should be announced several years ahead of the actual implementation.

In addition to providing the right incentives we propose several avenues to raise the quality of basic research in Finland.

First, it seems that resources for high quality **long-term** basic research are too low. Achieving the international level in research requires systematic and long term development of potential research units. Although both the Academy of Finland and Tekes may serve their purposes well in project-based funding, neither is suitable for building long-term high-quality research agenda for potential research units.

Second, the university sector is far too **fragmented**. Not only are there many universities, but also the fields covered by each are overlapping. There are too many micro units doing the same thing. Universities should specialize in their strengths, which is best achieved by providing incentives for it. Specialization would necessarily mean closing down some activities. While difficult to implement, in this respect the Finnish university sector is facing a unique opportunity: over 40% of professors will retire during the next 5–10 years.

The fragmentation of sectoral research is *wider* than that of the university system. Furthermore, the public research organizations are operating in a way that is *overlapping* with university research. These issues should be addressed.

Third, specialization and excellence must be allowed for and supported also *in practice*. The ideological atmosphere and political tradition in Finland strongly emphasize equality between regions and universities. This approach has been beneficial in the past. Finland’s current position is, however, different. Instead of catching-up, the question is now how to move ahead, for which excellence in key fields is crucial. Unfortunately, in practice striving for equal access and equal quality seems to bypass the goal of excellence. While equal access continues to be important, the mechanisms to achieve this may have to be changed.

Fourth, increasing the attractiveness of **research careers** is important. The 4-stage research career promoted by the Ministry of Education is a good start.

The fragmented and overlapping structure does not provide a basis for tackling future challenges.

One needs to enable freshly minded PhDs to obtain a job where they can prove themselves while at the same time ensuring competition for these places, and the ability of departments and institutions to follow their chosen strategies; similarly for later stage researchers. A tenure track system has desired features but it builds upon two principles:

- there is a *small* probability of getting tenure at the *same* institution hiring a fresh PhD,
- there is a *high* probability of getting tenure at *some* institution.

Since the above requires that at each level there is sufficient number of open positions every year, it is **unlikely** that in isolation Finland could maintain such a system. Thus, the system should work internationally. This would necessitate a change in the hiring culture of Finnish universities: They should much more aggressively seek international placements for their (PhD) graduates, and similarly seek to recruit senior researchers internationally.

Streamlining the higher education and public research system

Although universities may still have important regional impacts, they should primarily be regarded as global – not regional – institutions, a perspective shared with a large majority of private and public actors (Exhibit 57). It is not realistic to assume that all Finnish regions offer a sufficient breeding ground for a world-class university.

How then to balance between global and regional needs? Here the duality of the Finnish higher education system could provide a solution. Polytech-

nic should be given the incentives to specialize for regional needs for which they, given their ownership structure, are better suited than universities, while universities should be encouraged to strive for excellence to meet the global needs society as a whole is facing.

From a systemic point of view, reconciliation of global and regional needs relates to a more general issue: The current fragmented and overlapping structure does not provide a sustainable basis for tackling future challenges. There should be a clear division of tasks between universities, polytechnics, and public research organizations combined with well functioning collaboration among them.

Universities should be globally-minded and excel in research. Polytechnics should be more applied and regionally-oriented. Pressures to give polytechnics similar duties as to universities should be resisted.

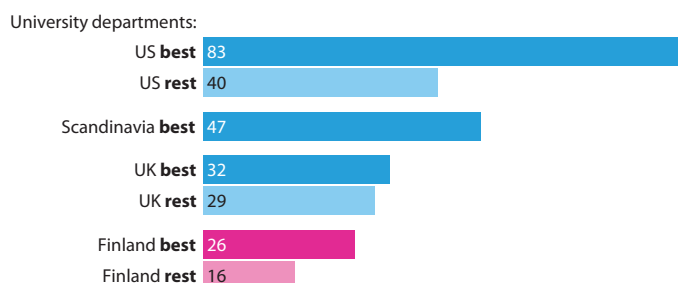
Equal access to higher education could be sustained by moving towards a system, where the study right is first granted up to a Bachelor’s (BA) degree only, while at the same time allowing students with a BA from a polytechnic to apply for Master’s programs at universities. Such a system would lead to more mobility nationally and between disciplines. At the same time, it would allow institutions to specialize.

The role of public research organizations (PROs) should be re-assessed. It should be carefully analyzed, which (administrative) tasks now performed by PROs are such that they truly necessitate the maintenance of in-house research capability. As PROs by nature lack the integration of teaching with research, one should strive to integrate as much as possible of the research functions within PROs into universities.

Exhibit 58: In terms of the number of professors, Finnish university departments are small. The best departments tend to be bigger.

University department by size differentiating between countries (Finland vs. the US, the UK, and Scandinavia) and quality (best vs. rest).

Source: Deschryvere (2009).



The quality of research is the key to attracting international talent.

To the extent that the PROs have research infrastructures that are a necessary requirement for high-quality research (such as databases), they should be made available to all, with access granted potentially through competition. In addition, it should be studied to what extent the research and evaluation duties now performed by the PROs could be outsourced, which would allow the government more degrees of freedom in allocating its short term, policy-oriented, research from one field to another. Given the unique feature of universities – their ability to bring together education and research – one should explore ways of returning basic research resources from public research organizations to universities.

Internationalizing higher education

We argue that the best way to increase the participation of Finnish academics in the international community and to attract foreign experts to Finland is to have universities of outstanding quality. At the same time, it is unlikely that excellence in research can be reached without international engagement. With research excellence and internationalization so closely aligned, providing incentives for quality research should also increase internationalization. The internationalization thus promoted would be truly *organic*. While more global exposure is needed in Finland, it should be kept in mind that it is a tool rather than

Exhibit 59: No major improvements of international mobility at Finnish universities.

Teachers and researchers from Finland (left) and to Finland (right).

International mobility at Finnish universities does not show a clear improvement. Teachers and researchers are becoming less mobile whereas students (not shown) only show a slight improvement in mobility. For students, the gap between foreign visits and visits by foreigners seems to have become smaller as more foreigners found their way to Finnish universities.⁵⁸

Source: CIMO.

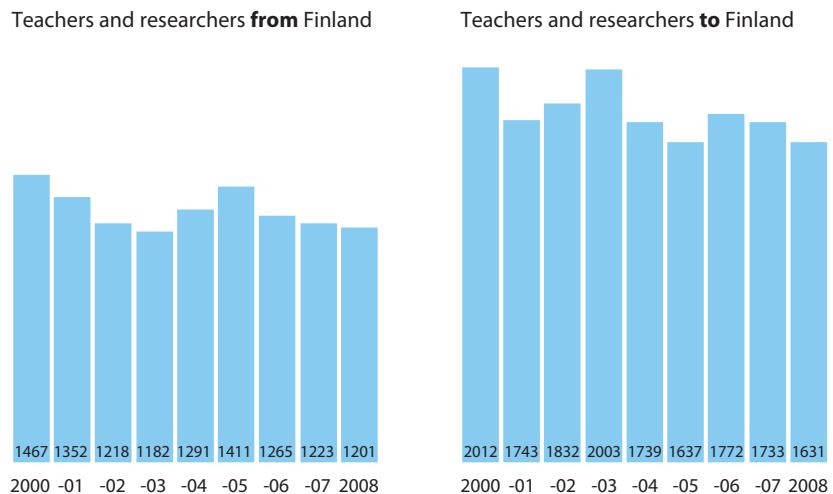
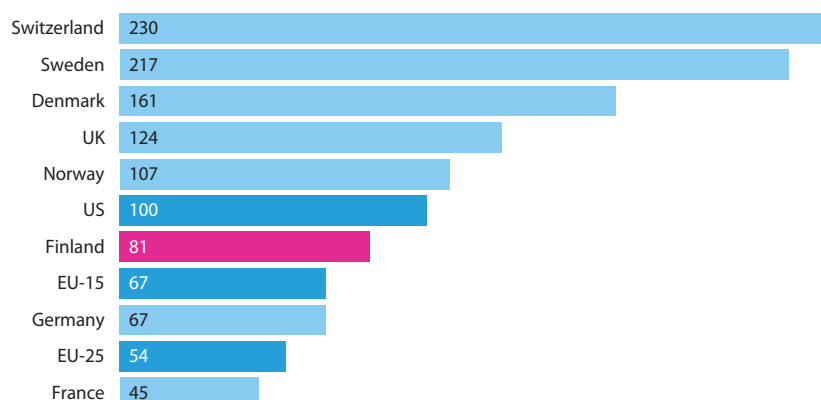


Exhibit 60: Finland outperforms the EU-15 on size-adjusted university ranking but does not belong to the global top tier.

Population-adjusted Shanghai rankings of top 500 universities relative to USA (= 100).

Looking at the global top 500 universities reveals that Finland scores better than the European average but that it lags behind Switzerland, the UK, and its Scandinavian neighbors (adjusted for size). The US outperforms all European countries in the global top 50 university ranking (not shown).⁵⁹

Source: Aghion et al. (2007).



an end to itself. Internationalization is perhaps better advanced by removing its explicit and implicit obstacles rather than by more direct measures.

Second, to attract foreign students, universities should be able to experiment with different programs and be rewarded for providing programs for foreigners (tuition fees). However, international students *per se* is not a panacea. They necessarily make the system more international and increase diversity. During and after their education they are also more likely to span international social networks with nodes in Finland regardless of where they ultimately locate. While these benefits are not to be underestimated, beyond that they only improve the system, if they are on average more talented than the student pool without them.

Third, to attract foreign experts, attractive posts with adequate compensation must be available.

University teaching

We argue that prerequisites for well-functioning high-quality university teaching are an adequate **unit size** and high quality research. In addition, the teaching staff should have appropriate incentives. The main difficulty in providing them is the “unobservability” of the quality of teaching. Observable measures, such as the number of study points students have earned, are often **dangerous**.⁶⁰ One solution is to let students ‘vote with their feet’ in various forms.

In order to reduce the problem of late entry, it would be important to move towards a system where study rights are first granted to BA only. This makes it less risky to quickly choose the first study place and program or enter other than the first-choice fields. This necessitates that the Master’s programs are ready to admit students with diverse backgrounds and thus requires that universities rethink their admission. Similarly, universities should think through what additional studies they require Master’s students to complete in order to obtain the degree. Students at polytechnics should acquire the necessary qualifications to apply for Master’s programs at universities.

Granting study rights first to BA would already help in solving the current queuing problem caused

by the admission system. Ways to streamline the application process by relying more on the matriculation examination should be assessed.

In order to reduce average study times we suggest a re-evaluation of the strong stance on ‘free’ education. **Fees**, vouchers, and other schemes should be studied without political preconditions, as they give strong incentives to study faster. Education could still be free as long as one graduates in due time.⁶¹

Improving industry–science links

There should be a match of *supply* and *demand* in industry–science links (ISLs). Collaborating with mediocre educational institutions is damaging to frontier companies and *vice versa*. Both parties not being ambitious enough or lacking the world class, would lead to smooth industry–science links, but not to sustainable long-term economic growth.

A related issue is the impression of a top-down orientation in policymaking related to ISLs, with emphasis on the needs of established companies and traditional sectors. An example of this is the *Strategic Centres for Science, Technology and Innovation* (Finnish acronym: SHOKs). If established players in the traditional sectors have difficulty seeing the relevance of basic research, have very short term research agendas, and lack real aspiration or vision for renewal, this approach may jeopardize the development of the competence bases on both sides of the ISL interaction. A more natural habitat for ISL interactions is newly created or re-created firms in new science-based markets, a habitat that risks being underrepresented in top-down programs.

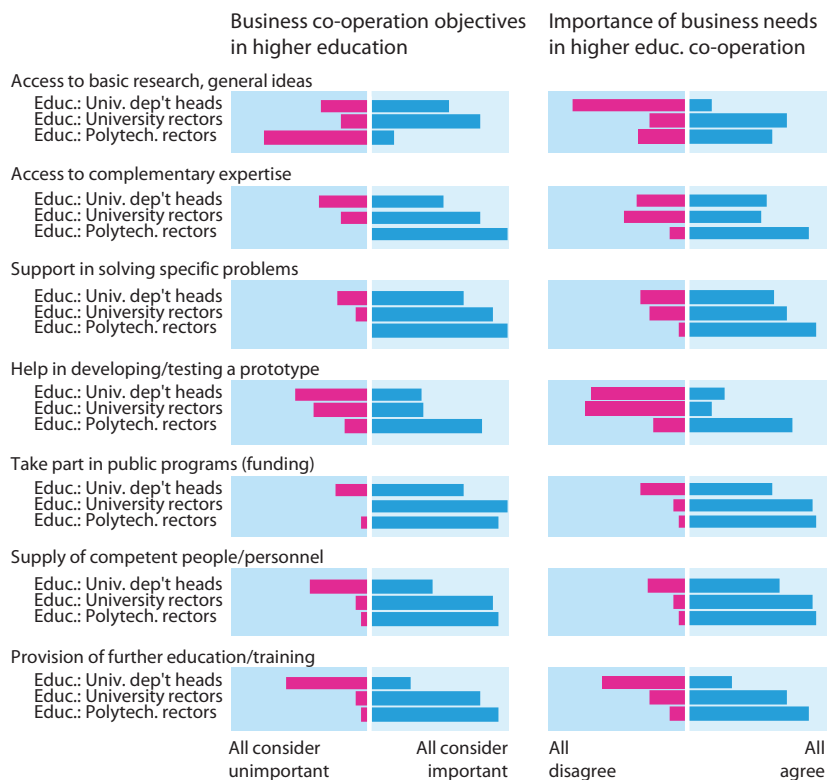
In general, we argue that the best way to guarantee a high relevance of research for society is to motivate universities to strive for world-class research and avoid top-down policy making in setting the research agendas and ISL priorities. Excellence and relevance do not contradict. Rather, for frontier countries, excellence in academic research is often a precondition for relevance. Knowledge dissemination is not a separate third activity of universities. It is something that happens in close cooperation with education and research. ISLs should materialize because universities have something that firms want. World-

Exhibit 61: Access to external public funding motivates cooperation on both sides.

Importance of the objectives of joint research projects between universities/polytechnics and companies (left) and the business needs involved (right); comparing the opinions of university department leaders, university rectors, and polytechnic rectors.

The sheer opportunity to participate in publicly funded research programs, i.e. the opportunity to access external funding, is among the primary motivations to cooperate on both sides. Access to complementary expertise and competent personnel was also deemed important. The nature of joint projects seemed to be slightly more oriented towards solving identified given problems than towards a more academic, basic research-driven search for new ideas. Overall, university department heads are least convinced of the benefits emerging from cooperation with companies, while polytechnic rectors seem to be the most positive.

Source: Kotiranta et al. (2009).



class research and excellently trained students are the best way to attract the firms that truly operate at the world technology frontier.

Much of the discussion on technology transfer offices (TTOs) in Finland centers on licensing and spin-offs (Tahvanainen, 2009a, 2009b). These money-making activities are, however, a marginal activity of TTOs. The role of a well-functioning TTO is rather a facilitator between university and industry that screens the research activities of the university and has the relevant contacts. It seems that the TTOs in Finland do not have adequate scale, resources, and expertise to stimulate ISLs effectively. Achieving critical mass is likely to require some pooling of resources across TTOs. At the same time it is essential to have on-site presence at a university. One solution to combine critical mass and proximity is to pool resources related to contacts to industry and technicalities, like legal affairs, while having on-site presence at the university to gain understanding of the competencies and forge local links.

Conclusions

We argue that the *most critical challenge is to increase the quality of research in Finland*. The best way to increase the quality of academic research is to provide autonomous universities incentives through funding rules emphasizing quality. Our proposal for the **new financing system** of Finnish universities emphasizes quality-adjusted research output by discipline in allocating university funding. We suggest a two-part measure of research quality and quantity:

- a discipline-specific quality-weighted count of publications and
- a 'light' peer-review to complement the necessarily crude quantity-based measure.

The expertise of the *Academy of Finland* could be used in implementing the quality assessment. It is important to announce the future funding principles sufficient years ahead allowing universities to react to them. General funding rules should be stable over an even longer time to allow universities both to plan ahead and execute their plans.

The most crucial challenge is to increase the quality of research.

Second, it is necessary to **streamline** the higher education and research structure. Division of tasks between institutions is needed in order to reduce the fragmentation of the research environment. *Universities* should be given incentives to excel in academic research, while *polytechnics* should maintain the more applied and regionally oriented nature of their curriculum. Within universities the *specialization* should happen through universities reacting to incentives rather than by the Ministry of Education dictating structural changes. Also the role and tasks of public research organizations (PROs) should be critically assessed and the basic research activities of PROs should be shifted to universities. Equal access to ed-

ucation can be sustained by easy access to (university) Master's programs with a BA from polytechnics.

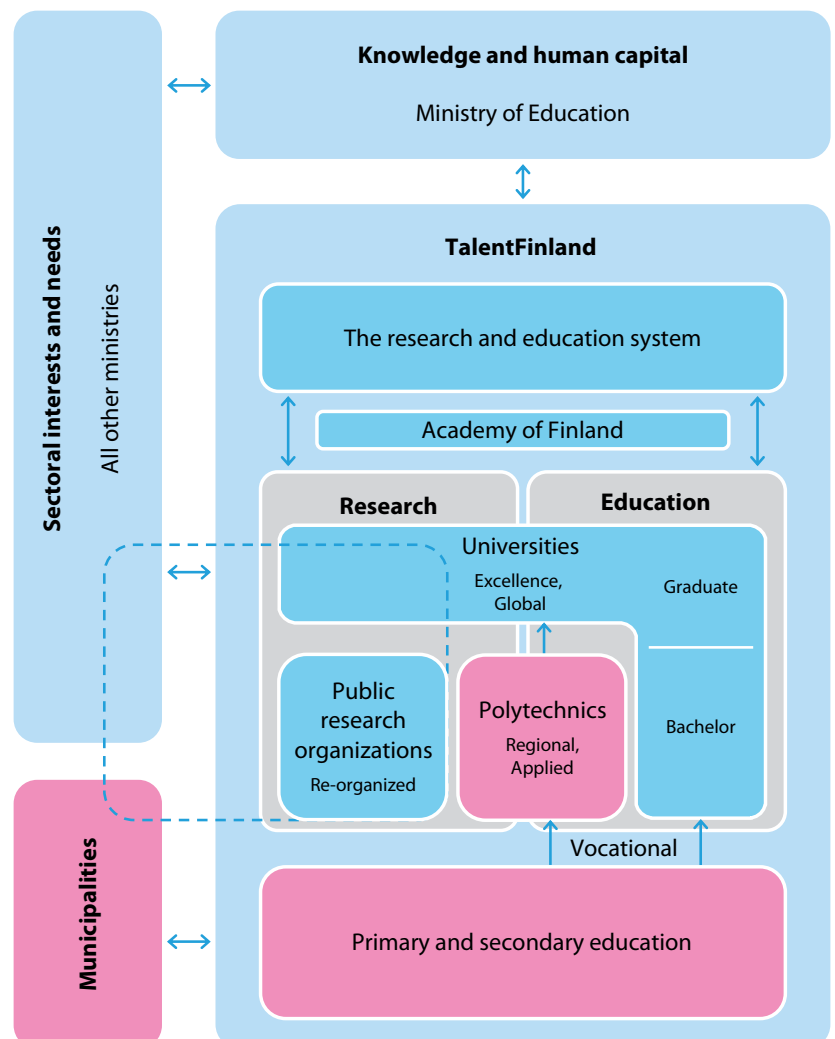
Third, we argue that the best way to *increase the participation of Finnish academics in the international community and to attract foreign experts to Finland* is to reward universities for the quality of research. Within the global economy it is unlikely that excellence in research can be reached without international engagement. In addition, there should be career opportunities for foreign experts and attractive programs for foreign students in place.

Fourth, in order to *reduce the age of graduation* we suggest limiting the **study rights** that are initially granted up to the **Bachelor degree level only**. This

Exhibit 62: An outline of a streamlined research and education structure.

Division of tasks between institutions is needed in order to reduce the fragmentation of the research environment. *Universities* should be given strong incentives to excel in academic research, while *polytechnics* should maintain the more applied and regionally oriented nature of their curriculum. Also the role and tasks of public research organizations (PROs) should be critically assessed and the basic research activities of PROs should be shifted to universities. Equal access to education can be sustained by easy access to (university) Master's programs with a BA from polytechnics.

Source: Veugelers, Toivanen, and Tanayama.



Relevance and excellence are not contradictory; they reinforce each other.

would decrease the risk of choosing the wrong field or educational establishment. To truly be helpful, measures must be taken that make it easier for students to change fields and establishments when exiting the Bachelor's and entering the Master's programs. This would also enhance the division of tasks between polytechnics and universities and allow both to specialize in the education that they offer. In addition, vouchers and other schemes should be studied without political preconditions as they provide strong incentives to study faster.

To further enhance industry–science links (ISLs), we again stress the importance of a bottom-up approach, stimulating world-class academic research. The aim of *pioneering* in innovation activity calls for *excellence*. Worthwhile ISLs materialize because universities have something that firms want. For firms

operating at the technology frontier this means world-class research and students. The limited evidence available suggests that maybe *neither* academic research *nor* the innovation paths of average Finnish firms are world-class. To change this, the quality of demand needs to be raised simultaneously with the rise in the quality of supply.

Linked to the above, we argue that the best way to achieve **relevance** of academic research is *bottom up*, where funding is based on strictly academic criteria. This will allow the build-up of areas of strength in research. Applied funding will then be allocated to those areas that have the promise of yielding commercial innovations. A top-down approach in selecting areas for academic research would be counter-productive. Relevance and excellence are not contradictory; they reinforce each other.

Exhibit 63: Summary and recommendations.

The objectives in reforming the Finnish education and (public) research sectors are as follows:

- Increasing the quality of research.
- Streamlining the sectors to reduce fragmentation and overlapping activities.
- Increasing internationalization.
- Tackling the problem of late graduation.
- Enhancing efficient knowledge dissemination from the sectors to the rest of society.

The most pressing and timely challenge is to increase the quality of research in Finland, which is best achieved by providing autonomous universities incentives through funding rules emphasizing it (see the Full Report for details).

To streamline the higher education sector we recommend a clear division of tasks between universities and polytechnics. In addition the role and tasks of public research organizations (PROs) should be critically re-assessed.

To reduce the problem of late graduation, our main policy recommendation is to make a clear distinction between Bachelor's and Master's programs and ensure that it is easier for students to change fields and establishments when exiting the Bachelor's and entering the Master's programs. To further enhance industry–science links we stress the need to avoid top-down policy making in selecting areas for academic research. In addition, technology transfer offices should have an adequate scale, expertise, and resources to truly be efficient.

10. The Way Forward

A small country advantage in sizing the opportunity

Finland, along with many other advanced countries, is updating and reforming its policies to better meet future challenges.

The unfolding global crisis may lead to a new economic and political world order, where all nations may have to redefine their roles. Shifting global patterns of production and consumption make it challenging especially for the (current) high-income countries to find sustainable sources of growth and welfare. Education, research, and innovation policies continue to be central elements in this quest both nationally and globally.

Finland has both a golden opportunity and a sense of urgency in reforming its innovation policy governance, structures, organizations, instruments, and practices. The system has an admirable track record and its current performance is still good. The evaluation reveals that Finland nevertheless has considerable upside potential that could be unleashed.

Past good performance does not guarantee future success. The panel has put forward a number of concrete proposals which – if implemented – would substantially change Finland’s innovation landscape.

Finland enjoys a small country advantage of being adaptive and flexible. There is a high acceptance of change and currently key actors of the system expect and even demand fundamental shake-ups. It is thus the panel’s belief that there is sufficient courage and political will to take the much needed steps.

Indeed, several reforms have taken and are taking place, including the university reform, the university invention act, and the introduction and ramp up of SHOKs. They will have considerable impact but the proposals of this evaluation go much further.

Finland must seek better ways to develop the innovation system as a whole. Thus, this report has extensively discussed governance and steering and proposed related adjustments and reforms. In accordance with its task, the panel does not take a strong stance regarding the size of the available public resources, e.g., research and innovation funding. The focus has rather been on getting the most out of the currently deployed (public) resources.

... by 2020

By 2020 Finland will be one of the globally leading knowledge societies. The education, research and innovation system has been streamlined to effectively provide world-class education, conduct high-quality research, nurture novel ideas and innovations, and exploit them to generate high societal value.

The *Ministry of Education*, the *Ministry of Employment and the Economy*, and the *Ministry of Finance* have assumed a joint responsibility in enhancing human capital, knowledge, and information to maximize current and future welfare and well-being. They have assumed proper roles as nurturers of *human capital and knowledge, enablers, and incentives*. Mechanisms for explicit and efficient cross-ministerial steering, governance, and decision-making are in place.

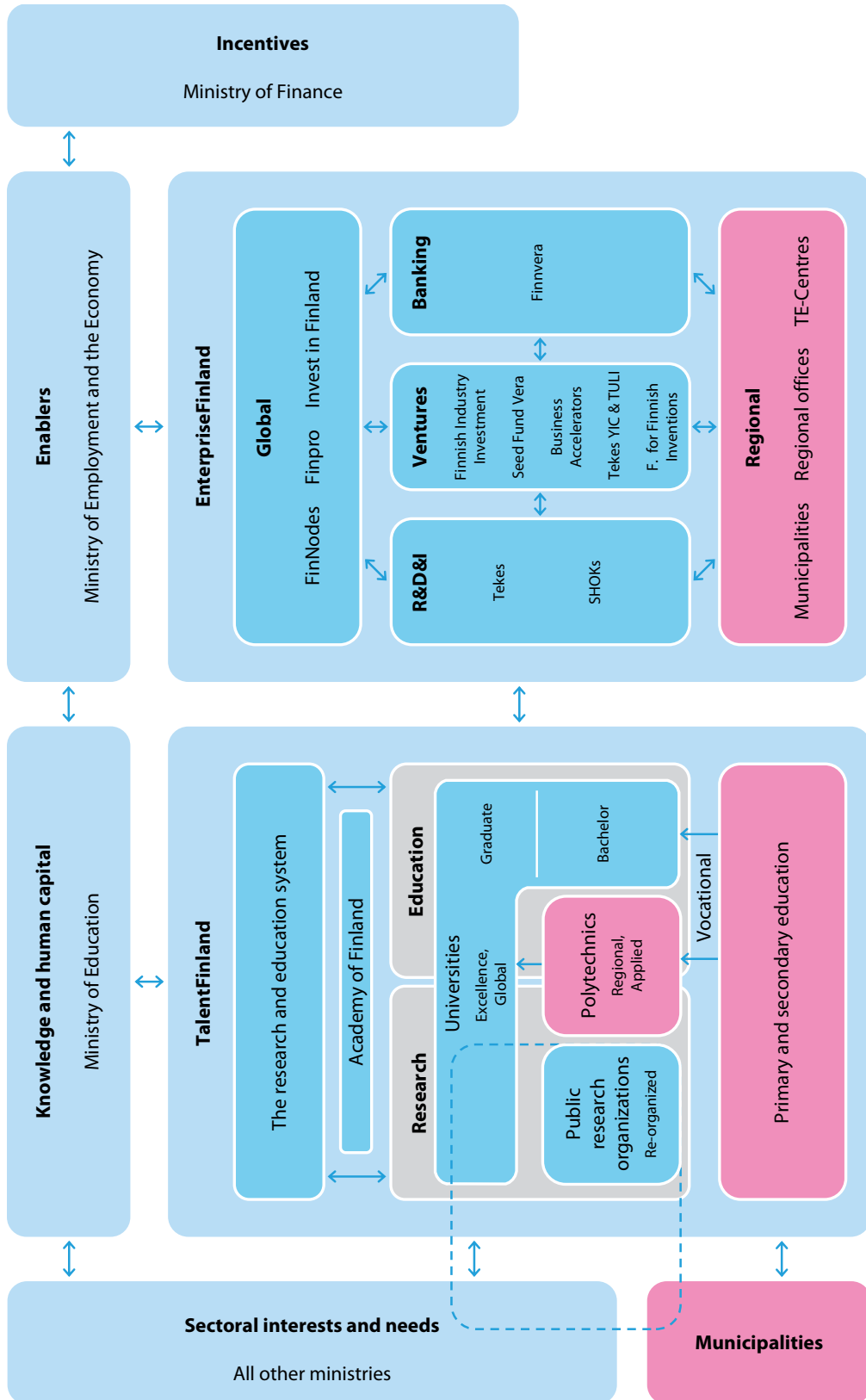
Reform of the higher education system has been completed, including the redefined division of tasks between polytechnics and universities. After a transition period in the early 2010s, the university financing system has been renewed to provide incentives for high-quality research, education, and internationalization.

The complexity of the enterprise support system has been reduced. The number of innovation policy instruments has been reduced to a tenth of those employed in the early 2000s and there are considerably fewer public innovation policy organizations.

The reform of sectoral research system has been completed. The academically-oriented research has been moved to universities and the remaining duties have been re-organized into 4–5 public research organizations. Data and information gathered by many of the public research organizations are freely accessible to all interested users. The same applies to all publicly produced information, which has generated ample new societal value creation.

There is a clear and understandable division of labor between international (particularly with respect to the EU), national, regional, and local innovation policies. There are a few science- and technology-driven centers in Finland. Overall, the number of regional/local public (or publicly supported) actors in innovation policy has been reduced.

Exhibit 64: An outline of (public) actors and responsibilities in the Finnish national innovation system.



Bibliography

- Ács, Z., Parsons, W., & Tracy, S. (2008). *High-Impact Firms: Gazelles Revisited*. SBA Office of Advocacy.
- Aiginger, K., & Landesmann, M. (2007). Loner-term Competitiveness of a Wider Europe. In B. Eichengreen, M. Landesmann, & D. Stiefel (eds.), *The European Economy in an American Mirror* (pp. 62–103). Routledge.
- Aghion, P., David, P., & Foray, D. (2009). Science, technology and Innovation for Economic Growth: Linking Policy Research and Practice in 'STIG Systems'. *Research Policy*, 38, 681–693.
- Aghion, P., & Howitt, P. (2009). *The Economics of Growth*. MIT Press.
- Aho, E., Brunila, A., Eriksson, J.-T., Harjunen, P., Heikinheimo, R., Karjalainen, S., Kekkonen, T., Neittaanmäki, P., Ormala, E., Peltonen, P., Pöysti, K., Strengell, M., Stenros, A., Temperi, J., & Toivanen, H. (2008). *The Proposal for Finland's National Innovation Strategy*. The Ministry of Employment and the Economy.
- Ali-Yrkkö, J., & Tahvanainen, A. (2009). Kiinan t&k-toiminnan sijaintimaana – Suomalaisen yritysten näkemyksiä ja kokemuksia t&k-toiminnasta Kiinassa. In J. Ali-Yrkkö (Ed.), *Yritysten tutkimustoiminta kansainvälistyvä – Mitä jää Suomeen?* (pp. 83–107). Taloustieto (ETLA B 235).
- Armour, J., & Cumming, D. (2006). The Legislative Road to Silicon Valley. *Oxford Economic Papers*, 58, 596–635.
- Arrow, K. J. (1962). Economic Welfare and the Allocation of Resources for Invention. In R. R. Nelson (Ed.), *The Rate and Direction of Inventive Activity: Economic and Social Factors* (pp. 609–626). Princeton University Press.
- Aschhoff, B., & Sofka, W. (2009). Innovation on Demand – Can Public Procurement Drive Market Success of Innovations? *Research Policy*, 38, 1235–1247.
- Autio, E. (2009). High-Growth Firms in Finland: Issues and Challenges. *ETLA Discussion Papers*, 1197.
- Autio, E., Kronlund, M., & Kovalainen, A. (2007). High-Growth SME Support Initiatives in Nine Countries: Analysis, Categorization, and Recommendations. *Ministry of Trade and Industry Publications*, 1/2007.
- Baldwin, R. (20 Sep. 2006). *Globalisation: The Great Unbundling(s)*. The Economic Council of Finland, Prime Minister's Office.
- Becker, S., Ekholm, K., & Muendler, M.-A. (2009). Offshoring and the Onshore Composition of Tasks and Skills. *CEPR Discussion Papers*, 7391.
- Breznitz, D. (2007). *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*. Yale University Press.
- Castells, M., & Himanen, P. (2002). *The Information Society and the Welfare State: The Finnish Model*. Oxford University Press.
- Chesbrough, H. (2009). Business Model Innovation: Opportunities and Barriers. *Long Range Planning*, forthcoming, doi:10.1016/j.lrp.2009.07.010.
- Christensen, C. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Harvard Business School Press.
- Coeurduroy, R., & Murray, G. (2008). Institutional Environments and the location decisions of Start-ups: Evidence from the first international market entries of new technology-based firms". *Journal of International Business Studies*, 39, 670–687.
- Commission on Growth and Development. (2008). *The Growth Report: Strategies for Sustained Growth and Inclusive Development*. Washington D.C.: The International Bank for Reconstruction and Development / The World Bank.
- Da Rin, M., Nicodano, G., & Sembenelli, A. (2006). Public Policy and the Creation of Active Venture Capital Markets. *Journal of Public Economics*, 90, 1699–1723.
- de Jong, J., & von Hippel, E. (2009). Transfers of User Process Innovations to Process Equipment Producers: A Study of Dutch High-Tech Firms. *Research Policy*, 38, 1181–1191.
- Deschryvere, M. (2009). A Comparative Survey of Structural Characteristics of Finnish University Departments. *ETLA Discussion Papers*, 1195.
- Devereux, M., & Griffith, R. (1998). The Taxation of Discrete Investment Choices. *Institute for Fiscal Studies Working Papers*, W98/16.
- Doz, Y., & Kosonen, M. (2008). *Fast Strategy: How Strategic Agility Will Help You Stay Ahead of the Game*. Wharton School Publishing.
- Dreher, A. (2006). Does Globalization Affect Growth? Evidence from a new Index of Globalization. *Applied Economics*, 38, 1091–1110.
- Dreher, A., Gaston, N., & Martens, P. (2008). *Measuring Globalization – Gauging its Consequences*. Springer.
- EC (2007a). A Lead Market Initiative for Europe. *Communication from the European Commission*, COM(2007)860.
- EC (2007b). Pre-Commercial Procurement: Driving Innovation to Ensure Sustainable High Quality Public Services in Europe. *Communication from the European Commission*, COM(2007)799.
- EC. (2009). Reviewing Community Innovation Policy in a Changing World. *Communication from the European Commission*, COM(2009) 442 final.
- Edler, J. (2007). Demand-Based Innovation Policy. *Manchester Business School Working Papers*, 529.
- Edquist, C. (2006). Systems of Innovation: Perspectives and Challenges. In J. Fagerberg, D. Mowery & R. Nelson (Eds.), *The Oxford Handbook of Innovation* (pp. 181–208). Oxford University Press.
- Edquist, C. (2008). Design of Innovation Policy through Diagnostic Analysis: Identification of Systemic Problems (or Failures). *CIRCLE Electronic Working Papers*, 2008–06.
- Einiö, E. (2009). The effect of government subsidies on private R&D: evidence from geographic variation in support program funding. *HECER Discussion Papers*, 263.
- EIS (2009). *European Innovation Scoreboard 2008: Comparative Analysis of Innovation Performance*. Office for Official Publications of the European Communities.
- Enkvist, P.-A., Nauclér, T., & Rosander, J. (2007). A Cost Curve for Greenhouse Gas Reduction. *McKinsey Quarterly*, 1, 34–45.
- Florida, R. (1997). The globalization of R&D: Results of a survey of foreign-affiliated R&D laboratories in the USA. *Research Policy*, 26, 85–103.
- Freedman, J., & Crawford, C. (2009) Small Business Taxation in Mirrlees, J., Adam, S., Besley, T., Blundell, R., Bond, S., Chote, R., Gammie, M., Johnson, P., Myles, G., Poterba, J., (eds), *Dimensions of Tax Design: The Mirrlees Review* (Forthcoming: Oxford University Press for Institute for Fiscal Studies 2009)
- Freeman, C. (1979). Determinants of Innovation. *Futures: The Journal of Forecasting and Planning*, 11, 206–215.
- Georgioui, L., Smith, K., Toivanen, O., & Ylä-Anttila, P. (2003). *Evaluation of the Finnish Innovation Support System*. Helsinki: Ministry of Trade and Industry (Publications 5/2003).
- Hall, B., & Lerner, J. (2010). The Financing of R&D and Innovation. In B. Hall & N. Rosenberg (Eds.), *Handbook of Economics of Innovation* (forthcoming, as published in *NBER Working Papers*, 15325). Elsevier–North Holland.
- Hall, R., & Woodward S. (2009). The burden of the nondiversifiable risk of entrepreneurship. *American Economic Review*, forthcoming.
- Halme, K., & Kotilainen, M. (2008). Innovative Public Procurement (in Finnish). *Tekes reports*, 225/2008.
- Hamel, G., & Välikangas, L. (2003). The Quest for Resilience. *Harvard Business Review*, 81, 52–63.
- Hautamäki, Antti (2008). *Sustainable Innovation, Innovation Policy in the Face of New Challenges* (in Finnish). Sitra reports, 76.
- Heller, M. (2008). *Gridlock economy: How too much ownership wrecks markets, stops innovation and costs lives*. Philadelphia, PA: Basic Books.
- Henrekson, M., & Sanandaji, T. (2008). Taxing Entrepreneurial Income. *IFN Working Papers*, 732.
- Hermans, R., Kamien, M., Kulvik, M., & Shalowitz, J. (eds.) (2009). *Medical Innovation and Government Intervention*. Helsinki: Taloustieto (ETLA B 236).
- Hernesniemi, H., Lammi, M., Ylä-Anttila, P., & Rouvinen, P. (Ed.). (1996). *Advantage Finland: The Future of Finnish Industries*. Helsinki: Taloustieto (ETLA B 113, Sitra 149).
- Hietala, H., & Kari, S. (2006). Investment Incentives in Closely Held Corporations and Finland's 2005 Tax Reform. *Finnish Economic Papers*, 19, 41–57.
- Hill, S., Birkinshaw, J., Maula, M., & Murray, G. (2009). Transferability of the venture capital model to the corporate context: implications for the performance of corporate venture units. *Strategic Entrepreneurship Journal*, 3, 3–27.
- Himanen, P. (2004): Välttämättä, kannustava ja luova Suomi: Katsaus tietoyhteiskuntamme syviin haasteisiin. *Eduskunnan kanslian julkaisuja*, 4/2004.
- Hyvönen, J., & Saarinen, J. (2009). Suomalaiset innovaatiot ja muuttuvat innovaatio-prosessit – empiirisiä tuloksia Sfinno-aineistosta. In E. Ahola & A.-M. Rautiainen (Eds.), *Kasvuparadigman muutos – Innovaatiotoiminnan uudet trendit*. Tekes (Tekesin katsaus 250/2009).
- Hyytinen, A., & Rouvinen, P. (Eds.). (2005). *Mistä talouskasvu syntyy?* Helsinki: Taloustieto (ETLA B 214).
- Hyytinen, A., Pajja, L., Rouvinen, P., & Ylä-Anttila, P. (2006). Finland's Emergence as a Global Information and Communications Technology Player: Lessons from the Finnish Wireless Cluster. In J. Zysman & A. Newman (Eds.), *How Revolutionary Was the Digital Revolution? National Responses, Market Transitions, and Global Technology* (pp. 55–77). Stanford University Press.
- Hyytinen, K., Loikkanen, T., Konttinen, J., & Nieminen, M. (2009). The Role of Public Research Organizations in the Change of the National Innovation System in Finland. *The Advisory Board for Sectoral Research Publications*, 6–2009.
- Hämäläinen, T.J. & Heiskala, R. (eds.). (2007). *Social Innovations, Institutional Change and Economic Performance. Making Sense of Structural Adjustment Processes in Industrial Sectors, Regions and Societies*. Edward Elgar Publishing.

- Jones, C. I. (2002). Sources of US Economic Growth in a World of Ideas. *American Economic Review*, 92, 220–239.
- Jääskeläinen, J. (2001). *The Cluster In-Between Science and Politics* (in Finnish). Taloustieto (ETLA A33).
- Kahn, S., & MacGarvie, M. (2009). How Important is U.S. Location for Research in Science? *Boston University, manuscript*.
- Kangasharju, A., Moisio, A., Reulier, E., & Rocaboy, Y. (2006). Tax competition among Municipalities in Finland. *Urban Public Economics Review*, 5, 13–24.
- Kangasharju, A., & Pekkala, S. (2004). Increasing Regional Disparities in the 1990s: The Finnish Experience. *Regional Studies*, 38, 255–267.
- Kanniainen, V., & Panteghini, P. M. (2008). Tax Neutrality: Illusion or Reality? The Case of Entrepreneurship. *University of Brescia, Department of Economics, Working Papers, 0803*.
- Kanniainen, V., Kari, S., & Ylä-Liedenpohja, J. (2007). Nordic Dual Income Taxation of Entrepreneurs. *International Tax and Public Finance*, 14, 407–426.
- Kanniainen, V. (2007). Yrittäjyyden ja yritysten verokannustimet. *Kansantaloudellinen aikakauskirja*, 103, 8–27.
- Kari, S., & Kröger, O. (2009). Osakkeiden normaaliuuton verovapaus: Norjan osakeverotuksen malli. *VATT-tutkimuksia*, 148.
- Kao, J. (2009). Tapping the World's Innovation Hot Spots. *Harvard Business Review*, 87, 109–114.
- Keil, T., Maula, M., Schildt, H., & Zahra, S. (2008). The Effect of Governance Modes and Relatedness of External Business Development Activities on Innovative Performance. *Strategic Management Journal*, 29, 895–907.
- Ketokivi, M. (2006). Elaborating the Contingency Theory of Organizations: The Case of Manufacturing Flexibility Strategies. *Production and Operations Management*, 15, 215–228.
- Ketokivi, M., & Castañer, X. (2004). Strategic Planning as an Integrative Device. *Administrative Science Quarterly*, 49, 337–365.
- Keuschnigg, C., & Dietz, M. (2007). A growth oriented dual income tax. *International Tax and Public Finance*, 14, 191–221.
- Keuschnigg, C., & Nielsen, S. (2004). Start-Ups, Venture Capitalists, and the Capital Gains Tax. *Journal of Public Economics*, 88, 1011–1042.
- Kotiranta, A., Nikulainen, T., Tahvanainen A.-J., Deschryvere, M., & Pajarinen, M. (2009). Evaluating National Innovation Systems - Key Insights from the Finnish INNOVAL Survey. *ETLA Discussion papers no. 1196*
- Krugman, Paul (1996). A country is not a company. *Harvard Business Review*, 74, 40–51.
- Kuusi, O. (1996). Innovation Systems and Competitiveness. *VATT Publications*, 22.
- Lemola, T., & Lievonen, J. (2008). The Role of Innovation Policy in Fostering Open Innovation Activities among Companies. *VISION ERA-NET, April 2008*.
- Lovio, R. (2007). The Weakening of Domestic Ties of Finnish Multinational Corporations in the 21st Century. *HSE Working Papers, W-420*.
- Luukkonen, T. (2007). A New European S&T Governance. *Science and Public Policy*, 34, 599–604.
- Luukkonen, T., & Palmberg, C. (2007). Living up to the Expectations Set by ICT? The Case of Biotechnology Commercialisation in Finland. *Technology Analysis & Strategic Management*, 19, 329–349.
- Maliranta, M., & Ylä-Anttila, P. (eds.) (2008). *Competition, Innovation & Productivity* (in Finnish). Taloustieto (ETLA B 228).
- Miettinen, R. (2008). *Rhetoric and Practice in Innovation Policy: Lessons from Finland*. An unpublished book manuscript, 12.11.2008.
- Muller, A., & Välikangas, L. (2002). Extending the boundary of corporate innovation. *Strategy & Leadership*, 30, 4–9.
- Nedis, R., & Byler, E. (2009). *Creating a National Innovation Framework: Building a Public-Private Support System to Encourage Innovation*. Washington D.C.: Center for American Progress.
- Nelson, R. (1993). A Retrospective. In R. Nelson (Ed.). *National Innovation Systems: A Comparative Analysis* (pp. 505–522). Oxford University Press.
- Nevalainen, A., & Maliranta, M. (2009). Tuottavuuden mittaaminen – Suomi kansainvälisessä vertailussa. *ETLA manuscript*.
- O'Doherty, D., & Arnold, E. (2001). Understanding Innovation: the need for a systemic approach. *IPTS Report*, 71.
- OECD, & Eurostat. (2005). *Oslo Manual: The Measurement of Scientific and Technological Activities, Guidelines for Collecting and Interpreting Innovation Data* (3 ed.). Organisation for Economic Co-operation and Development, Eurostat.
- OECD (2008a). *Entrepreneurship and Higher Education*. Organisation for Economic Co-operation and Development.
- OECD (2008b). *OECD Science, Technology and Industry Outlook*. Organisation for Economic Co-operation and Development.
- OECD (2008c). *The Global Competition for Talent: Mobility of the Highly Skilled*. Organisation for Economic Co-operation and Development.
- Okko, P. (1999) Regional development and Globalization. In Väyrynen (ed.) (1999) *Suomi avoimessa maailmassa – Globalisaatio ja sen vaikutukset. Sitra reports*, 223.
- Ottaviano, G., & Pinelli, D. (2006). Market Potential and Productivity: Evidence from Finnish Regions. *Regional Science and Urban Economics*. 36, 636–657.
- Poterba, J. (1989). Capital Gains Tax policy Toward Entrepreneurship. *National Tax Journal*, 42, 375–390.
- Rainio, E. (2009). *Enhancing the Operating Conditions and Financial Resources of Emerging Growth Companies*. Helsinki: Ministry of Finance (Publications 8/2009).
- Rantanen, J. (2008). Sektoritutkimuksen selvitysraportti. *Sektoritutkimuksen neuvottelukunnan julkaisuja*, 1–2008.
- Rouvinen, P. (2007). Yrityksen tutkimus- ja kehitystoiminnan ulkoisvaikutukset. *Tekes Teknologia katsaus 209/2007*.
- Rouvinen, P. (2009). Maailmantalouden megatrendit ja globalisaatio innovaatiotoiminnan muuttajana. In E. Ahola & A.-M. Rautiainen (Eds.), *Kasvuparadigman muutos – Innovaatiotoiminnan uudet trendit* (pp. 41–70). *Tekes katsaus 250/2009*.
- Saapunki, J., Leskinen, J. & Aarnio, M. (2004). *Suomalaiset yrityspalvelujärjestelmät asiakasnäkökulmasta tarkasteltuna*. Publications of Ministry of Trade and Industry 5/2004. Helsinki: Edita Publishing Oy.
- Sabel, C., & Saxenian, A. (2008). A Fugitive Success: Finland's Economic Future. *Sitra Reports*, 80.
- Schmookler, J. (1966). *Invention and Economic Growth*. Harvard University Press.
- Schumpeter, J. (1934). *The Theory of Economic Development*. Harvard University Press.
- Schumpeter, J. (1942). *Capitalism, Socialism, and Democracy*. Harper.
- Sotara, M., & Kautonen, M. (2007). Co-evolution of the Finnish National and Local Innovation and Science Arenas: Towards a Dynamic Understanding of Multi-Level Governance. *Regional Studies*, 41, 1085–1098.
- Sotara, M., & Srinivas, S. (2006). Co-evolutionary Policy Processes: Understanding Innovative Economies and Future Resilience. *Futures*, 38, 312–336.
- Sörensen, P. (2009). Dual Income Taxes: a Nordic Tax System. University of Copenhagen, Economic Policy Research Unit. *Manuscript, March 2009*.
- Tahvanainen, A.-J. (2009a). Finnish University Technology Transfer in a Whirl of Changes – A Brief Summary. *ETLA Discussion Papers*, 1188.
- Tahvanainen, A.-J. (2009b). Yliopistolainen teknologiansiirto muutosten pyörteissä: Näkemyksiä SHOK korkeakoulukeskintöläin ja yliopistolain vaikutuksista tutkimus- ja innovaatiotoimintaan. *ETLA Keskusteluaiheita*, 1183.
- Takalo, T. (2009). Rationales and Instruments for Public Innovation Policies. *ETLA Discussion Papers*, 1185.
- Takalo, T., & Tanayama, T. (2008). Adverse selection and financing of innovation: is there a need for R&D subsidies? *Bank of Finland Discussion Papers*, 19/2008.
- Takalo, T., Tanayama, T., & Toivanen, O. (2008). Evaluating innovation policy: a structural treatment effect model of R&D subsidies. *Bank of Finland Discussion Papers*, 7/2008.
- Toivanen, O. (2008). National Innovation Policy in an International World Perspectives from Finland. In M. Squicciarini & T. Loikkanen (Eds.), *Going Global – The Challenges for Knowledge-Based Economies* (pp. 118–122). Helsinki: The Ministry of Employment and the Economy (Innovation 20/2008).
- Uotila, J., Maula, M., Keil, T., & Zahra, S. (2009). Exploration, Exploitation and Financial Performance: Analysis of S&P 500 Corporations. *Strategic Management Journal*, 3, 221–231.
- Valovirta, V., Pesonen, P., Halonen, M., Van der Have, R., & Ahlqvist, T. (2009). *Suomalaisten innovaatioiden maantiede. Työ- ja elinkeinoministeriön julkaisuja*, 26/2009.
- Viljamaa, K., Lemola, T., Lehenkari, J., & Lahtinen, H. (2009). Innovaatiopolitiikan alueellinen ulottuvuus. *Työ- ja elinkeinoministeriön julkaisuja*, 22/2009.
- Veugelers, R. (2008). The role of SMEs in Innovation in the EU: a case for policy intervention? *Review of Business and Economics*, 53, 239–262.
- Van der Ploeg, R., & Veugelers, R. (2008). Towards Evidence based Reforms of European Universities. *CEifo Economic Studies*, 54, 99–120.
- von Hippel, E. (1988). *The Sources of Innovation*. Oxford University Press.
- von Hippel, E. (2005). *Democratizing Innovation*. MIT Press.
- Vujakovic, P. (2009). How to Measure Globalisation? A New Globalisation Index (NGI). *WIFO Working Papers*, 343/2009.

Endnotes

- ¹ Driven in part by certain perverse incentives the current system offers.
- ² Or that of polytechnics.
- ³ Page 10 of the October 2008 strategy of *Tekes* (*PEOPLE—ECONOMY—ENVIRONMENT: Priorities for the future*) implies that *SHOKs* could attract over half of the resources of *Tekes* by 2012 (primarily at the expense of non-program funding), which the panel considers excessive. Since then the expectations of both *Tekes* and the *SHOKs* have been scaled down: it is currently planned that some one-tenth of resources could be devoted to *SHOKs*, which the panel considers more appropriate.
- ⁴ While regional, TE-Centres also serve as the front-end in national innovation policy matters.
- ⁵ Other policy tools are better suited for the job.
- ⁶ http://pxweb2.stat.fi/database/StatFin/tt/tkke/tkke_fi.asp (on 9 Sep. 2009).
- ⁷ Neither of which is included in the reported percentage for 2010.
- ⁸ The original text in the survey is (in Finnish): *INNOVAATIOJÄRJESTELMÄLLÄ tarkoitetaan niiden yksityisten ja julkisten organisaatioiden muodostamaa kokonaisuutta, jotka osallistuvat tiedon ja osaamisen tuottamiseen ja soveltamiseen. Järjestelmän tavoitteena on edistää suomalaisten hyvinvointia*. For the complete original questionnaire and its translation in English, please see Kotiranta et al. (2009).
- ⁹ While subsequent policy documents have partly cured certain problems, significant work remains to be done.
- ¹⁰ The latest EU jargon (EC, 2009) also employs a conventional definition: *Innovation is the ability to take new ideas and translate them into commercial outcomes by using new processes, products or services in a way that is better and faster than the competition* (Nedis & Byler, 2009).
- ¹¹ Similar proposal was made for the first time by the *Science and Technology Policy Council* (the predecessor of the *Research and Innovation Council*) in the early 1990s. The Council discussed the idea again in 2005; it did not, however, get support.
- ¹² The one recorded participation took place when Minister Antti Kalliomäki was in transition from the *Ministry of Finance* to the *Ministry of Education*. We would have gone further back in time in studying the conduct of the Council, but the pre-2002 minutes are mysteriously missing from *The National Archives Service of Finland*.
- ¹³ One anecdote: Several proposals have been made to increase, e.g., the funding of the *National Research Institute of Legal Policy*, the budgetary funding of which is a tiny fraction of the total, *less than half a percent*. While well-justified from the knowledge-based society viewpoint, the shift in resource allocation has, nevertheless, turned out to be impossible.
- ¹⁴ On top of which comes funding channelled through ministries, support of non-ministerial public organizations (including the *Academy* and *Tekes*) as well as direct EU funding.
- ¹⁵ We wish to acknowledge that this does not imply that *Tekes* would not be fulfilling its mission. As pointed out in this Report, re-allocative aspects are not traditionally considered in the domain of innovation policy.
- ¹⁶ An instrument is defined as an institution-specific direct or indirect intervention in a given application domain, where the application domain may refer to, e.g., the group of private actors that qualify for the support or to the geography where the intervention applies).
- ¹⁷ Saapunki, Leskinen, and Aarnio (2004) report that in various public enterprise service points there are approximately 13,000–16,000 officials (conservative estimate), of which about 4,500 are directly counselling firms. Larger companies are obviously contacted more often; there are currently some 15,000 enterprises with 10 or more employees in Finland.
- ¹⁸ T&k-arviointi toiminta (2008), p. 159.
- ¹⁹ For example, the latest report issued by the predecessor of the *Research and Innovation Council*, the *Science and Technology Policy Council of Finland* (Linjaus 2008), the strategy of the *Academy of Finland* (October 2006), and the strategy of *Tekes* (2008).
- ²⁰ Source: *Monitoring progress towards the ERA*, Final Report, 6 May 2009.
- ²¹ http://cordis.europa.eu/era/concept_en.html.
- ²² The Government's Communication on the EU policy, highlights ways in which active influence on EU policies can take place (Valtioneuvoston selonteko EU-politiikasta, Valtioneuvoston kansallian julkaisu 16/2009, 8.4.2009).
- ²³ Contract notice 3688/420/2008, 27 Nov. 2008, pp. 1–2.
- ²⁴ http://www.tem.fi/files/23474/Kysynta-ja_kayttajalahtoisenn_innovaatiopolitiikan_jasentely_ja_sisallot.pdf
- ²⁵ Obviously the process is continuously re-directed (and may lead to an entirely unrelated direction), it may be halted at any stage, and there are feedback loops with the steps, but for simplicity these issues are ignored in the illustration.
- ²⁶ This also touches upon companies in business-to-business markets, as in the current operating environment they can maintain cost-effectively their core B2B orientation and still gain better understanding of the needs and desires of the ultimate users, which are not necessarily fully and reliably transmitted by the immediate customers or other participants of the supply chain.
- ²⁷ In certain cases there is no feasible way for an end-user or even the immediate customer to contribute, unless they happen to have a doctorate in, say, polymer chemistry, nanotechnology, or corporate law.
- ²⁸ Attributed to Mandell in *Business Week*.
- ²⁹ In the literature successful cases of using public procurement to promote innovation mostly relate to national defense (in this context including anti-terrorist and homeland security measures) or otherwise large-scale public projects lending support to the observation. In Finland celebrated cases include building the Loviisa nuclear plant and the Helsinki metro as well as to the early purchases of ice-breakers. Aspects of the Soviet trade, e.g., in the field of communications, arguably fall into this category as well.
- ³⁰ Our survey suggests that a tenth of the Finnish municipalities use innovativeness among the criteria used in their procurement. Three-fourths of them nevertheless see ample scope for improvement in this.
- ³¹ Rather than concentrating on customer needs, public bodies might rather focus on, e.g., maintaining and increasing their budgetary allocations.
- ³² <http://www.tem.fi/?l=en&s=2853>
- ³³ Upon commenting on the Finnish framework for the orientation on 10 June 2009, von Hippel criticized it for not including user-to-user aspect to a sufficient extent. http://www.tem.fi/files/23477/von_Hippel_-_User_Innovation.pdf
- ³⁴ We would like to clear a few seemingly common misconceptions: As discussed above, emphasizing demand- and user-orientation should not be about the old demand pull vs. tech push discussion. The orientation is not about promoting incremental closer-to-the-market innovation; in fact we argue for the contrary. The orientation does not imply that the targets of the policy should be let to determine policy objectives and instruments – while the public sector should seek efficiency and fit-to-use, it should represent the society's (not companies, even if often aligned) interests. The orientation is neither about services vs. manufacturing nor technical vs. non-technical.
- ³⁵ This could include public predictions of market demand and user needs as well as subsidies for provider-user interaction. On the one hand, a formidable challenge is the creation of mechanisms efficiently capturing possibly highly fragmented user needs and expertise. In this domain there might be some scope for public intervention in the form of, e.g., virtual forums, laboratories, user communities, or events, in which users meet and share their expertise. On the other hand, spotting a curable market failure in this context – and thus the motivation for public intervention – is not easy. Furthermore, private actors should have strong and aligned incentives to internalize any related externality, thus curing the problem without direct public intervention. Finland has a long history of vibrant clusters (Hernesniemi, Lammi, Ylä-Anttila, & Rouvinen, 1996), which may be seen as such mechanisms.
- ³⁶ Also von Hippel (2005, p. 12) echoes this by noting that *Both fairness and social welfare considerations suggest that innovation-related policies should be made neutral with respect to the sources of innovation*. Edler (2007, p. 10), another leading author in the field, notes that a comprehensive policy combines *demand-side and supply-side mechanisms*.
- ³⁷ We have not gathered empirical evidence on the existence of such biases in any of the relevant public organizations. It is nevertheless often conjectured in Finland that the system heavily favors technical innovation. Note that possibly existing biases **cannot** be directly inferred from, say, the industry distribution of an agency's funding decisions, as the pool of available resources and historical incidences might significantly skew the availability and quality of proposals seeking funding. Despite a supporting organization's announced goals and beliefs of impartially selecting the best projects, biases may be introduced, e.g., via the educational background of staff or organizational culture. Biases should not be assumed – their existence and underlying reasons should be analytically studied.
- ³⁸ We emphasize that these conclusions are based on indirect evaluation and assessment. They are not the result of any complete or conclusive quantitative analysis of the extent to which the Finnish tax system encourages or discourages, say, a seasoned private sector manager or an expert with international work experience to establish a firm and to become an entrepreneur. Nor have we found any comparative analyses of how well or badly the Finnish dual income tax system addresses this challenge, for example relative to the tax systems of the other countries that are R&D intensive.

³⁹ How the planned R&D tax credit supports the creation of HGEFs cannot easily be inferred from the memo that The Ministry of Employment and the Economy released in June 2009 ("T&k-menojen verovähennysjärjestelmää selvittäneen työryhmän (T&k-verotyöryhmä) raportti 3.6.2009") As we understand the planned new scheme, it provides firms with an incentive to use R&D *inputs*, but significantly it does not reward them for producing commercially successful innovations.

⁴⁰ See, for example, the numerous analyses and mimeos that the working group on the reform of the Finnish tax system has produced and commissioned. They are available from http://www.vm.fi/vm/fi/05_hankkeet/012_veroryhma/06_esitysaineisto/index.jsp. We acknowledge, in particular, that there are a number of desirable features that a tax system should ideally have and that guide the overall design of the system. See also Crawford and Freeman (2008) who have explored the need to reform small business taxation in the U.K.

⁴¹ See e.g., Kanninen (2007), Henrekson & Sanandaji (2008), Keuschnigg & Dietz (2007) and the mimeos produced and commissioned by the working group on the reform of the Finnish tax system. Kari and Kröger (2009) provide a number of additional references.

⁴² General principles, like the "normal return to investment" in some tax models, do not seem allow for the additional required return that exceptional entrepreneurial risk-taking may call for. We acknowledge that this is a complex issue, but argue that paying attention to the (risk-taking) incentives of the (potential) owner-managers of HGEFs is important.

⁴³ This view is similar to the argument that it is the average (not marginal) tax burden that affects the location decision of firms. For a recent analysis of the relation between tax neutrality and entrepreneurship, see Kanninen & Panteghini, (2008).

⁴⁴ The Minister of Finance is the permanent member of the Research and Innovation Council. Interestingly, the minutes of the meetings of the Council reveal that, in the past, the Minister of Finance has rarely formally participated in the formulation of the innovation policy via this forum. This is despite the Council being the premier forum for such policy-making.

⁴⁵ The need for the greater involvement of the Ministry of Finance in the design of growth-enhancing policies has already been recognized. The remit and associated work of the working group on the reform of the Finnish tax system is a concrete example of this change. Another example of the Ministry's efforts to meet this need is evidenced by the report on HGEFs that it published recently (Rainio, 2009). This report, however, pays only limited attention to the importance of tax system in creating entrepreneurial incentives. We also acknowledge that the Ministry of Finance has been involved in the design of innovation and entrepreneurship policy at many formal and informal levels. However, the point we want to emphasize is that taxation has not in the past been seen as a concrete means to enhance the effectiveness of the Finnish innovation system and the sustaining of longer-term economic growth. The recent plans to introduce a new scheme for R&D tax credits can also be interpreted as a step towards the greater involvement of the Ministry of Finance.

⁴⁶ The UK's HM Treasury has a Business and Enterprise Unit as well as a Growth and Enterprise Tax team involved in tracking and responding to entrepreneurship and small business policy developments in other ministries including the Department of Business, Innovation and Skills.

⁴⁷ In his recent assessment of the Finnish high growth entrepreneurship, Autio (2009) concludes that "high-growth entrepreneurship merits specific attention in a national innovation strategy because of the direct economic potential associated with the phenomenon".

⁴⁸ The authors of this analysis recognize that calls to streamline and segment the present public support systems may generate significant opposition as present organizational objectives and responsibilities are challenged.

⁴⁹ The creation of HGEFs calls for a range of integrated resources and incentives to be quickly made available in order to promote, accelerate and sustain exceptional firm growth. This support should not exclusively be addressed to start up and early stage firms. It needs to be recognized that accelerated firm growth can occur at different times in a firm's life cycle (Ács, Parsons, & Tracy, 2008).

⁵⁰ The distribution of responsibilities for the policies relevant to enhancing the creation of growth ventures and the control of resources available to support the policies should be evaluated critically and reconsidered. Currently, the responsibilities seem to be somewhat scattered around the Ministry. For example, the Group responsible for Entrepreneurship Development and Enterprise Support is part of the Employment and Entrepreneurship Department of the Ministry, the Group responsible for Growth Ventures is part of the Innovation Department, whereas a number of agencies and institutions providing support to new entrepreneurs and growth ventures are steered by the Ministry's Corporate Steering Unit.

⁵¹ Entrepreneurial culture and tax incentives are complementary, if the effect of the former magnifies the desired effect of the latter.

⁵² See e.g. Autio et al. (2007) for a review and categorization of entrepreneurship policy measures.

⁵³ Besides their role in enhancing entrepreneurial culture, Finnish universities have a number of other roles to play in the creation of HGEFs. One of them is technology transfer. The available evidence indicates that the university system has not been a systematic source of science- or knowledge-based HGEFs. One of the questions on which policy-makers have to take a stance is how strong an incentive universities and especially individual university researchers are given to commercialize university innovations (via e.g. licensing) and create university spin-offs.

⁵⁴ These figures are from *Regional Accounts* and *R&D-statistics* compiled by *Statistics Finland*.

⁵⁵ As part of the ongoing restructuring of the Finnish higher education sector the number of universities is planned to decline to 15 by 2020 and the number of polytechnics to 18.

⁵⁶ For successful implementation of the reform, an issue to be dealt with is the divergent views of university rectors and department heads (see Exhibit 8 in section 2.1.).

⁵⁷ This would only require a separation of the research-based funding from the base funding of universities, and an appropriate increase in the amount of competitive research funding.

⁵⁸ It is acknowledged that student mobility went up from 2007 to 2008, even if the content of this raise is currently being debated in Finland.

⁵⁹ Aghion *et al.* (2007) give the best university of the Top 500 a score of 500, the next best university a score of 499, and so on, down to a score of 1 for the lowest performing university within the Top 500. For each country, they then compute the sum of Top 500 Shanghai rankings that belong to this country, and divide the sum by the country's population. Finally, all the country scores are divided by the US score, so that each entry in the column 'Top 500' can be interpreted as a fraction of the US per capita performance for the Top 500 universities. This gives their Country Performance Index for the Top 500 universities.

⁶⁰ This particular measure would give universities an incentive to lower standards.

⁶¹ Universities (degree programs) should be allowed to experiment with maximum study times and minimum yearly study requirements (example: UK). The current law proposal makes it too easy for students to extend their study rights. Experimentation here may be important as the effects in Finland are unknown.



MINISTRY OF
EDUCATION

Evaluation of the Finnish National Innovation System

Policy Report

www.evaluation.fi

Based on the June 2008 proposal for Finland's National Innovation Strategy, the *Ministry of Education* and the *Ministry of Employment and the Economy* commissioned an international evaluation of the Finnish national innovation system. An independent panel conducted the work with the support of *Etlatieto Oy* (a subsidiary of *ETLA, The Research Institute of the Finnish Economy*). This **Policy Report** summarizes the main findings of the evaluation panel.

Finland current has a well-functioning innovation system. It is, however, not enough to sustain the desired standard of welfare. The rapid evolution of the global operating environment is inducing both qualitative and quantitative changes in the geography of innovative activity. They bring about future challenges and opportunities that are not fully realized in Finland.

The panel *welcomes* the two new elements of Finnish innovation policy – the broad-based approach (Chapter 4) and demand and user orientation (Chapter 5) – but points out risks in their adoption. The former should *not* lead to considering even minor changes as innovations or to labeling of all enterprise policies as innovation policy. The latter should be interpreted as *impartiality* to the source, type, and application domain of innovation.

The main challenges – weak internationalization (Chapter 6) and somewhat lacking growth entrepreneurship (Chapter 7) – remain *orphans* in the Finnish system. They are both side issues for a number of public organizations and not particularly forcefully

advanced by any. The panel puts forth an outline of (public) actors and responsibilities in the system, which particularly implies changes in these two domains.

The panel calls for a clarification and coordination of the roles and interrelations of international, national, regional, and local innovation and non-innovation policies. In recent years local and regional public actors have grown important also in innovation policy, even if they are largely ignored at the national level. The current national innovation support has an 'unspoken' regional bias, which may not benefit regional development and may come at the cost of foregone growth (Chapter 8).

The panel takes a strong stance for the ongoing university reform (Chapter 9). With relatively autonomous universities incentivized through appropriate funding rules, it has real potential to address the most pressing and timely challenge in Finnish higher education – the increase of research quality. Polytechnics are important actors in the Finnish system with their strong regional and applied role. To streamline the higher education sector, the panel recommends a clear division of labor between universities and polytechnics.

Due to both internal and external factors, The Finnish innovation system is at a crossroads. While some of the panel's proposals are laborious to implement, they are indeed needed to meet the Finland's future challenges.



TYÖ- JA ELINKEINOMINISTERIÖ
ARBETS- OCH NÄRINGSMINISTERIET
MINISTRY OF EMPLOYMENT AND THE ECONOMY