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OVERVIEW

Finland as a Knowledge Economy

Elements of Success and Lessons Learned

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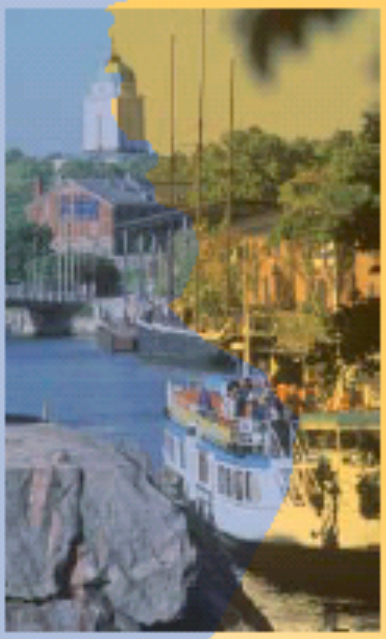

FINLAND AS A KNOWLEDGE ECONOMY

Elements of Success and Lessons Learned

Overview

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(eds.)

This is a prepublication version of the Overview of the book on *Finland as a Knowledge Economy: Elements of Success and Lessons Learned,* to be published in January 2006. This study was developed in cooperation with Finland's Ministry for Foreign Affairs, Ministry of Trade and Industry, Finpro – National Agency for Corporate Internationalization, and the World Bank Institute.

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Acronyms and Abbreviations

Finpro	National Agency for Corporate Internationalization
ETLA	The Research Institute of the Finnish Economy
EU	European Union
GDP	gross domestic product
ICT	Information and Communication Technology
IT	information technology
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment
PPP	purchasing power parity
R&D	research and development
S&T	science and technology
SITRA	Finnish National Fund for Research and Development (Suomen itsenäisyyden juhlarahasto)
TEKES	National Technology Agency (Teknologian kehittämiskeskus) of Finland
VTT	Technical Research Center of Finland (Valtion teknillinen tutkimuskeskus)
WEF	World Economic Forum

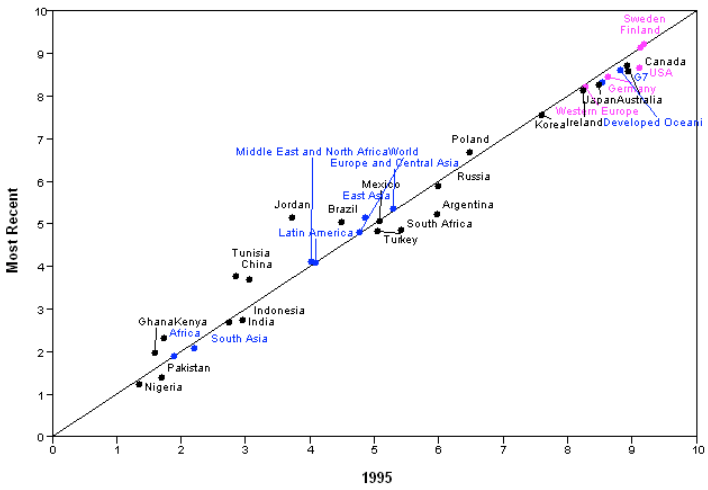
Overview

Finland: A knowledge economy driven by information and communication technologies

In the 1990s Finland became the most ICT-specialized country in the world

Finland is a country that has successfully transformed itself into a knowledge economy in a short time. The Finnish experience of the 1990s represents one of the few examples of how knowledge can become the driving force of economic growth and transformation. During that decade, the country became the most ICT- (information and communication technology) specialized economy in the world and thus completed its move from the resource-driven to knowledge- and innovation-driven development. Four times to date at the beginning of the twenty-first century, the country has ranked as number one in the World Economic Forum's (WEF) competitiveness index, and as one of the most developed IT economies. It was ranked top in the OECD's Program for International Student Assessment (PISA) studies of learning skills and educational attainment, and also achieved the highest Knowledge Economy Index in the World Bank comparisons (figure 1). The various elements pertinent to a knowledge economy –economic incentives, education, innovation, and IT infrastructure – also seem to be well balanced in Finland.

Figure 1. Global view: Knowledge Economy Index by countries and regions, 1995 and the most recent year



Source: World Bank–Knowledge Assessment Methodology. www.worldbank.org/kam.
Note: The Knowledge Economy Index (KEI) consists of 80 structural or qualitative variables that benchmark performance of more than 128 countries. KEI is an aggregate of all variables are normalized from 0 (worst) to 10 (best).

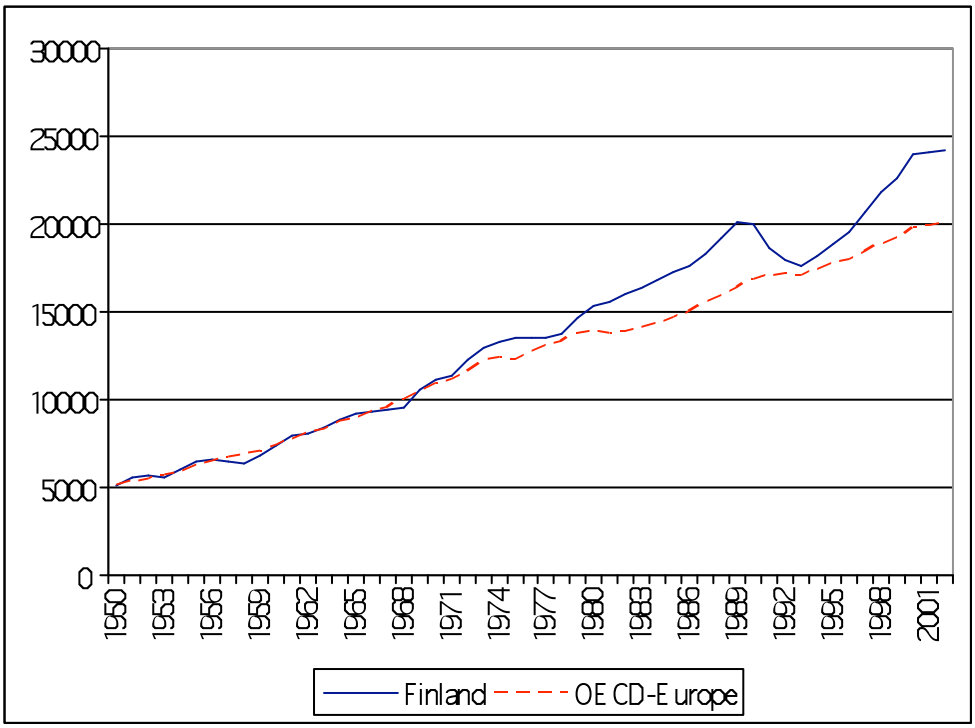
Finland ranks highest in WEF competitiveness index and PISA studies

This achievement is quite remarkable especially when considering Finland's economic situation in the early 1990s. The country went through a severe economic

recession characterized by a major banking crisis, unemployment rates rising from 2 percent–3 percent to over 15 percent, and the accumulation of government debt from modest levels to over 60 percent of GDP and approaching international lending limits. These difficulties were caused and exacerbated by uncontrolled deregulation of financial markets and a rapid increase in foreign borrowing, which led to an overheated
domestic economy. High inflation pushed up interest rates and overburdened the public sector due to smaller tax revenues and larger unemployment and welfare costs. Furthermore, the collapse of the Soviet Union wiped out 15 percent of Finnish foreign trade with attractive barter arrangements. The collapse also left some traditional Finnish industries, including clothing and footwear, with less competitive technologies and cost structures, and without market access. The resulting recession is clearly visible in a drop in Finland's real GDP of more than 10 percent from 1991 to 1993 (figure 2).

In the 1990s, the economy still was going through a deep recession

Figure 2. GDP/capita in Finland and OECD Europe, at 1995 prices and purchasing power parity (PPP) exchange rates



Source: Rouvinen and Ylä-Anttila 2003; original sources: www.sourceOECD.org, Penn World Tables.

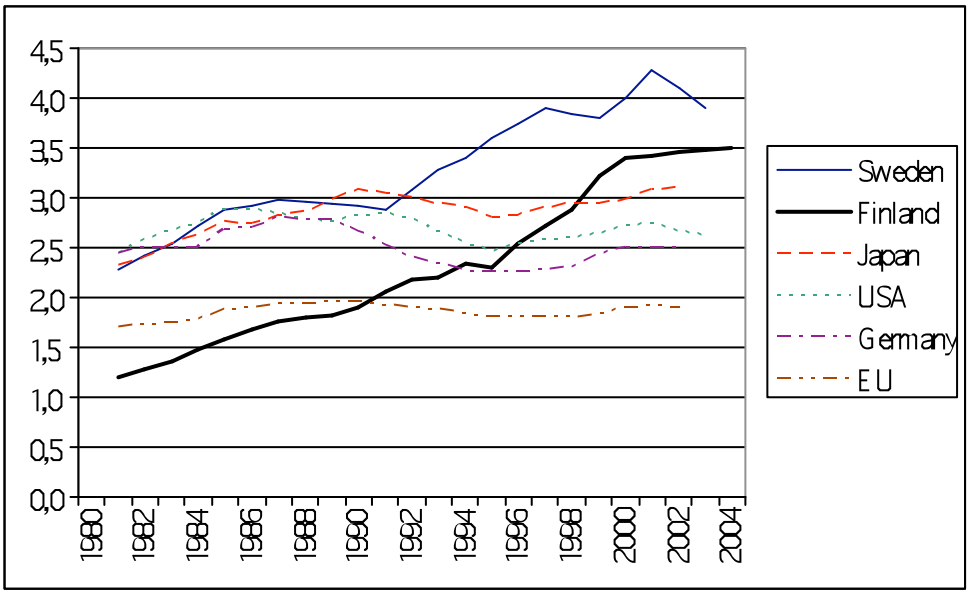
Finland's difficulties were amplified by its not being well prepared for economic integration and globalization, its membership in the European Union (EU) and Monetary Union, and its lack of export diversity. Exports were dominated by the forest-related industries, which still play an important role in the Finnish economy. Their position now is much stronger as a result of consolidation and the emergence of a few multinational companies with advanced technologies and market approaches. In earlier times, the competitiveness of the forest-related industries was secured by frequent devaluations of the currency in response to the cyclical nature of the international pulp and paper markets. In today's Euro regime, this is neither

Diversification of both technology and exports was a prerequisite for improved performance

possible nor desirable because of the ensuing inflation and increase in foreign debt that Finland would experience.

Thus, the diversification of exports has been mandatory to improve the performance of the Finnish economy. This diversification has been due largely to the persistent emphasis given to higher education, linkages and spillovers among various industries, and the emergence of new knowledge-based industries. Since 1980, research and development (R&D) investments by the government–but primarily the private sector–have more than doubled to reach levels equivalent to 3.5 percent of GDP in 2004, which is above the EU average of less than 2 percent (figure 3).

Figure 3. R&D expenditures of GDP *(%)*

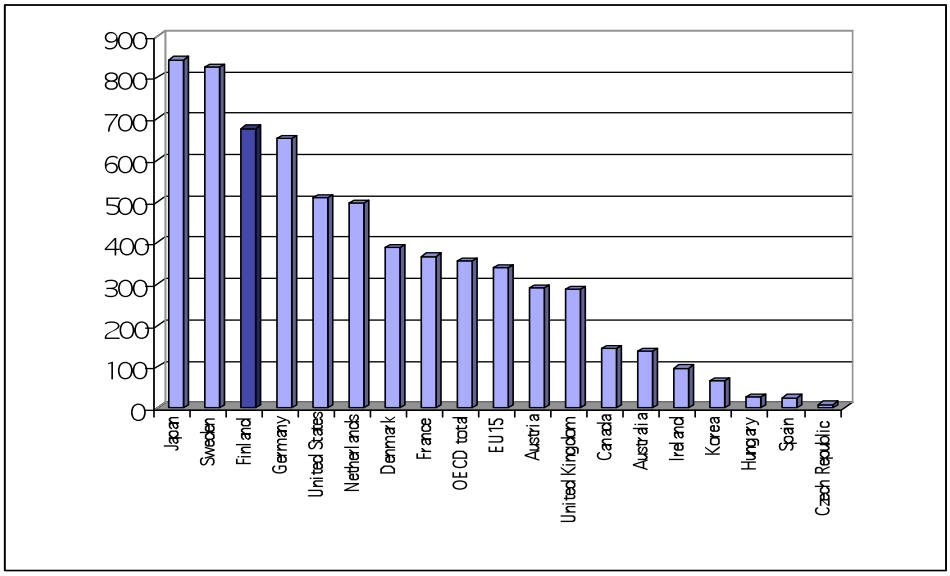


Source: OECD 2005.

Finland's innovation system successfully converted R&D and educational capacity into industrial strengths

The Finnish innovation system also has been successful in converting its R&D investments and educational capacity into industrial and export strengths in the high-technology sectors. This conversion can be illustrated by patent statistics that put Finland among the world's top performers in technological innovation (figure 4).

Figure 4. Number of triadic patent families *(per million habitants, for year 2000, patents from 1990–2000)*



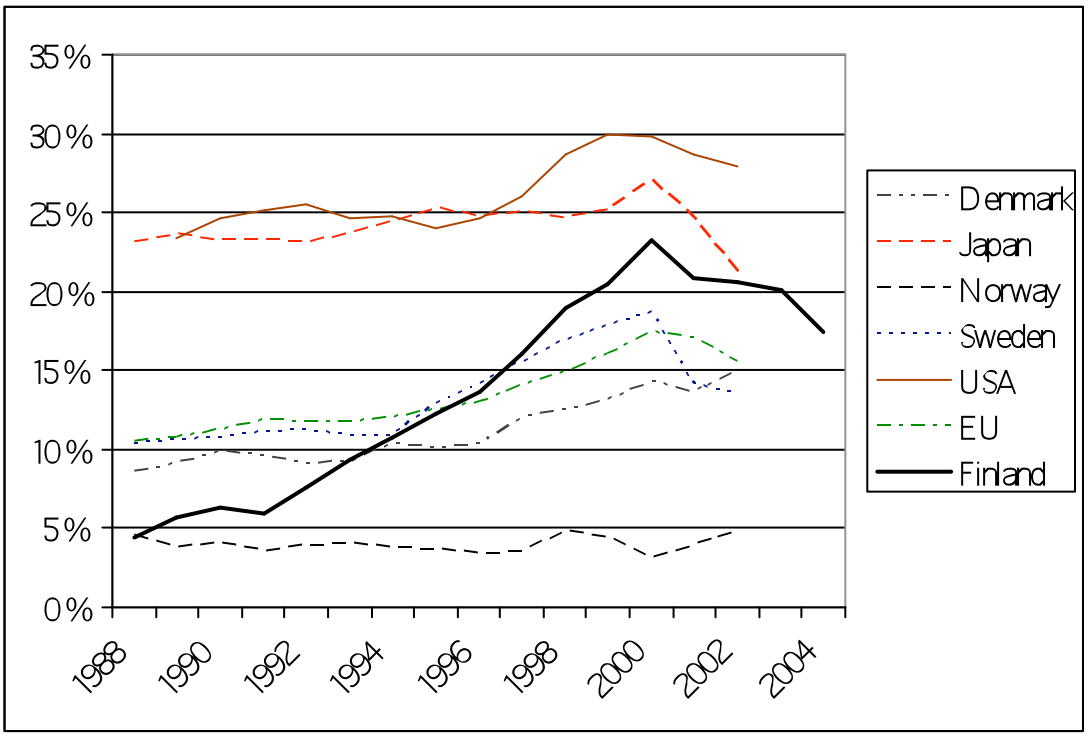
Finland is among top performers in patenting

Source: OECD Factbook 2005.

High technology's share of total exports also has grown from 5 percent in the late 1980s to approximately 20 percent in 2004, resulting in a significant trade surplus (figure 5). Today, Finland's telecommunications exports are as high as those of its forest-related industries, and the Finnish Nokia Corporation has grown into a world leader in mobile communications. Hundreds of other smaller high technology companies also have been established, and many have become world leaders in their niche markets.

Finland's success shows that a strong knowledge economy can be built in a small and comparatively peripheral country

Figure 5. Share of high technology exports of Finland's total exports of goods *(%)*



Source: Statistics Finland and OECD.

Finland's success is remarkable not only in light of its earlier economic difficulties. It also is interesting to see that a knowledge economy can be built successfully in a small and comparatively peripheral country. Finland is a relatively large country covering an area equivalent to that of the Japan or the United Kingdom. Finland is located between latitudes 60 and 70 North extending beyond the Arctic Circle. However, although more than half of the people in the world living this far north are Finnish, the total population of the country is only 5.2 million. Furthermore, the Finnish language is spoken only by Finns. While this is an asset for a strong national culture, it makes international communications difficult.

Increasing R&D intensity was facilitated through national consensus building

How did Finland become a knowledge economy?

Increasing R&D intensity was facilitated through national consensus building

As late as the late 1970s, Finland ranked at the lower end of the OECD countries in R&D intensity. Today, Finland's investment in R&D accounts for approximately 3.5 percent of GDP, which is the second highest in OECD and the third highest in the world, just after Sweden and Israel.

Increasing investments in R&D during times of high unemployment required great political wisdom and courage, when an easier path would have been to generate immediate employment rather than build up longer-term strengths. Increasing R&D was helped partially by national industrial and innovation strategies communicated by the government. These national strategies were important for consensus building, for example, by organizing economic policy programs attended by practically all members of the Finnish Parliament and other decision makers from the public and private sectors, media, and labor market organizations.

Specialization in high-tech and R&D-intensive production needs to be preceded by major structural change in economic and social structures

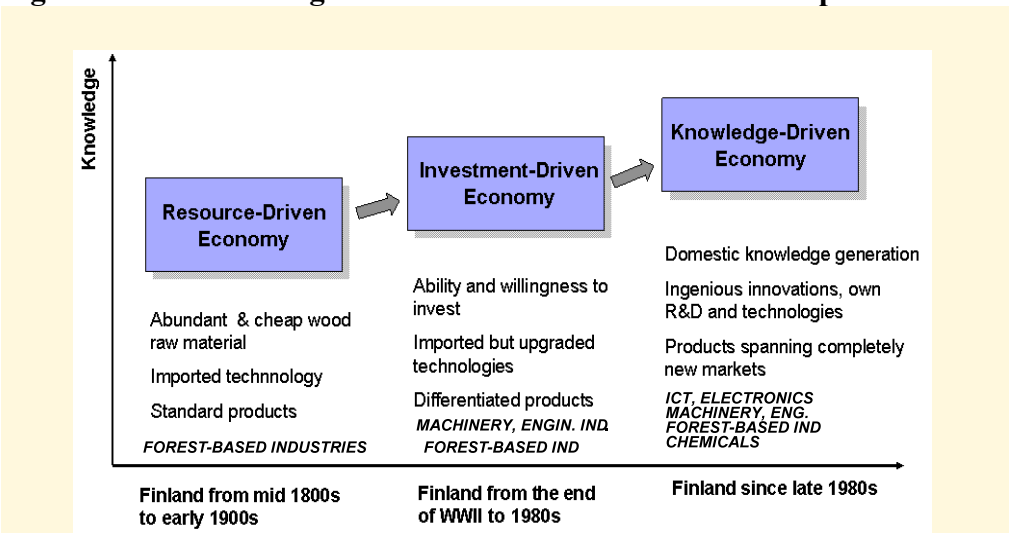
What we observe today are outcomes of longer-term transformation processes. *Specialization in high-tech and R&D-intensive production needs to be preceded by major structural change in economic and social structures.* Recent research seems to indicate consistently that while poor countries get richer with this specialization, their sectoral production and employment become more diversified or less concentrated. On the contrary, countries with high levels of income that specialize in high tech and R&D intensive production are characterized by concentrated sectoral specialization. These conclusions are supported by cross-sectional analysis of countries and apply well to the development of Finland over the past few decades.

It is important to note that *a knowledge economy is an ensemble of elements that must be in balance.* It is not necessarily the lack of technological infrastructure or skilled engineers that restrains economic growth. It might equally well be the lack of entrepreneurs or proper economic incentives and opportunities.

In Finland, the specialization of production, trade, and R&D in more knowledge-intensive goods and services coincided with the gradual opening of the economy and deregulation of capital flows. *A peculiarity of the Finnish case is the atypical pattern of industrial renewal from essentially natural-resource-based industries toward machinery, engineering, electronics, and ICT.* There are few, if any, other examples of natural-resource-abundant countries that have managed to transform their industrial structures toward higher knowledge intensity and value added so

rapidly and successfully as Finland. *The origins of the Finnish knowledge economy can be traced back to user-producer linkages between the forest-based industries as early users of high technology, and the emerging engineering, electronics and ICT industries in the 1960s and 1970s* (figure 6).

Figure 6. Finland's stages of industrial and economic development



Finland has evolved quickly from a resource driven economy to a knowledge driven economy

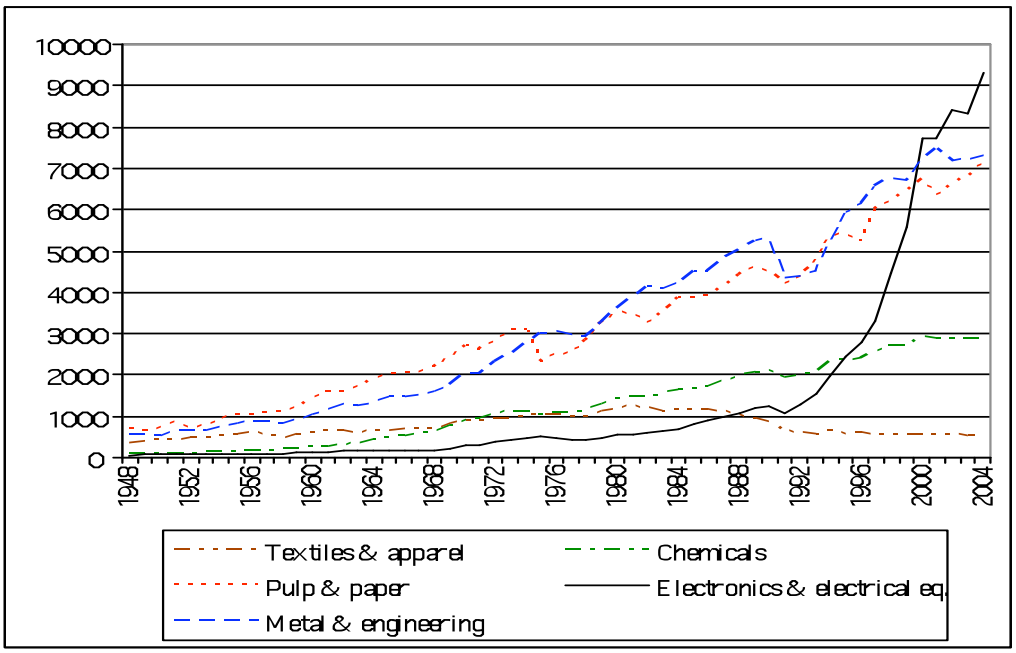
Sources: Adapted from Porter 1990 and Hernesniemi and others 1996.

Finland's industrial renewal has benefited from the government's liberalizing trade and lifting the remaining restrictions on capital flows in the 1990s, which promoted investment in general and the inflow of foreign capital in particular. It is important to note that the developments in industry were pivotal to the Finnish ICT-driven path toward the knowledge economy. These developments resulted from the increased investments in R&D. However, even though *public* funding of R&D has increased substantially during the past decades, its relative share of total R&D expenditures has decreased. Increasingly, investments in R&D have been *privately* funded. Presently, private funds account for some 70 percent of the total.

Finland's industrial renewal benefited from liberalizing trade and lifting the remaining restrictions on capital flows in the 1990s

The increase in private R&D is attributable, above all, to Nokia. Although there are also other firms, Nokia was the industrial engine for developments in the ICT industries in Finland. Nokia thereby to a significant extent influenced the rapid industrial restructuring in the 1990s toward electronics and electrical engineering (figure 7). By 2003 Nokia accounted for 25 percent of Finland's total R&D expenditures, 3.7 percent of GDP, and 20 percent of total exports.

Figure 7. Finnish manufacturing production volume by industry *(millions of € in 2000 prices)*



Source: Statistics Finland and ETLA.

Policy emphasis has shifted from macroeconomic toward microeconomic policies

In addition to Nokia, industrial and innovation policies contributed to the development of the Finnish knowledge-based economy, both indirectly and directly. *Especially noteworthy is the shift in the focus and content of industrial policies in the 1990s away from macroeconomic policies and industrial subsidies toward microeconomic "conditions-providing" policies.* The latter put R&D and innovation center stage. Public subsidies are now increasingly R&D-based, and market failure remains the main justification stated for these policies. Furthermore, science and technology (S&T) policies have been integrated under the common umbrella of innovation-oriented industrial policies. In addition, most public research funding is competitive—that is, not only companies but also research institutes and universities are put in competition for the project financing provided by various government agencies.

On a sectoral level, Finland had a long tradition of a competitive market structure in telecommunications operation, in which the state monopoly covered only the trunk networks. This tradition combined with further liberalization of the telecommunications market early on are the main explanations for the rapid diffusion of mobile telephony in Finland. At present, despite almost full trade liberalization, Finland still has some regulations and trade restrictions in the service sector as part of common European Union policies.

Specificities of Finnish industrial and innovation policies

A systems view was adopted early in industrial and technology policies

A specificity of the Finnish "model" has been the early application of a systems view of industrial policy. This systems view could be described as *an acknowledgement of the importance of interdependencies among research organizations, universities, firms, and industries due to the increasing importance of knowledge as a competitive asset,* especially in the case of small open economies with a well-developed welfare system. Furthermore, *the systemic approach to policymaking is based on the notion that the various stages of innovation process–*

from basic research to commercialization–often are simultaneous rather than sequential, and funding and services are demanded accordingly.

However, it is important to stress that a systems view of industrial policy does not imply that Finland has followed a "master plan" in which the government played a strong leading role. Rather, *the systems view was concretized through an emphasis on responsive longer-term policies to improve the general framework conditions for firms and industries, especially in knowledge development and diffusion, innovation, and clustering of industrial activities.* The systems view was formulated through various public-private partnerships involving economic research organizations, industry federations, and firms; and was anchored in broader economic policy circles.

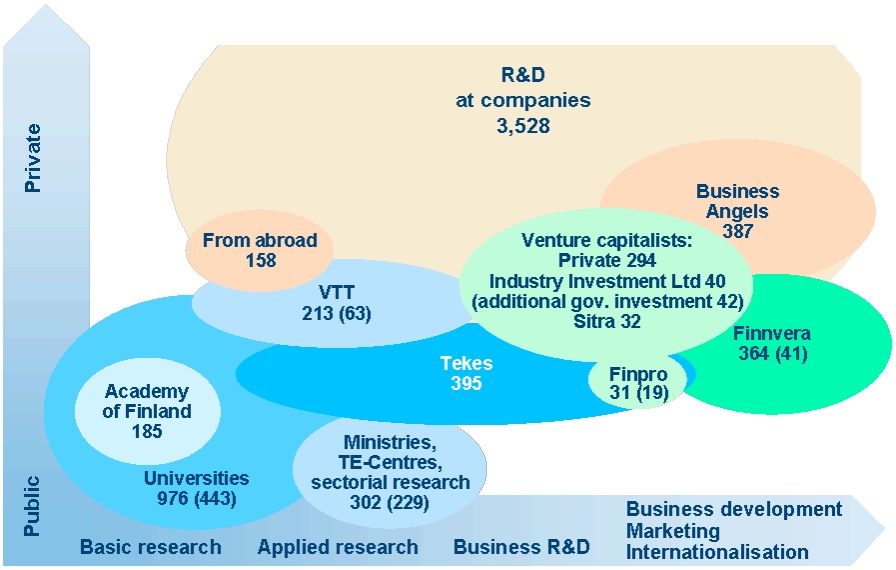
The first definition of the systems view of industrial policy is found in the 1990 Review of the Science and Technology Policy Council. The council made the concept of a national innovation system an important cornerstone for science and technology policy. However, *the more significant and concrete consequence of this new systems view was the high priority that the government gave to investments in R&D.* In hindsight, given the severe economic recession that Finland was enduring at the time, this prioritization appears a bold one. However, it again exemplifies the strong integration between technology and industrial policy in Finland.

Institutions and policy organizations have also played an important role in Finnish knowledge economy development

As just mentioned, institutions and policy organizations also have played important roles in Finnish knowledge economy development. A systemic view of policies is reflected in how different organizations in the national innovation system see their roles in promoting science and technology. Each organization has its relatively well-defined function in the national innovation system, but at the same time there are public initiatives and efforts to increase collaboration among various innovation agencies. Such collaboration extends from basic research and R&D to business development and the commercialization of innovations.

The collaboration between funding and innovation-promoting agencies is based on the systemic model of innovation defined above, as opposed to the old linear model. *The various stages of the innovation process–from basic research to commercialization–are funded simultaneously* to a greater extent than before (figure 8). This new funding logic demands closer collaboration and coordination among the various public and private sector funding organizations. The collaboration intensified in the 1990s during the ICT boom and has proved to be important in many other fields of science and technology as well.

Figure 8. Science and technology system in Finland: Resources and funding

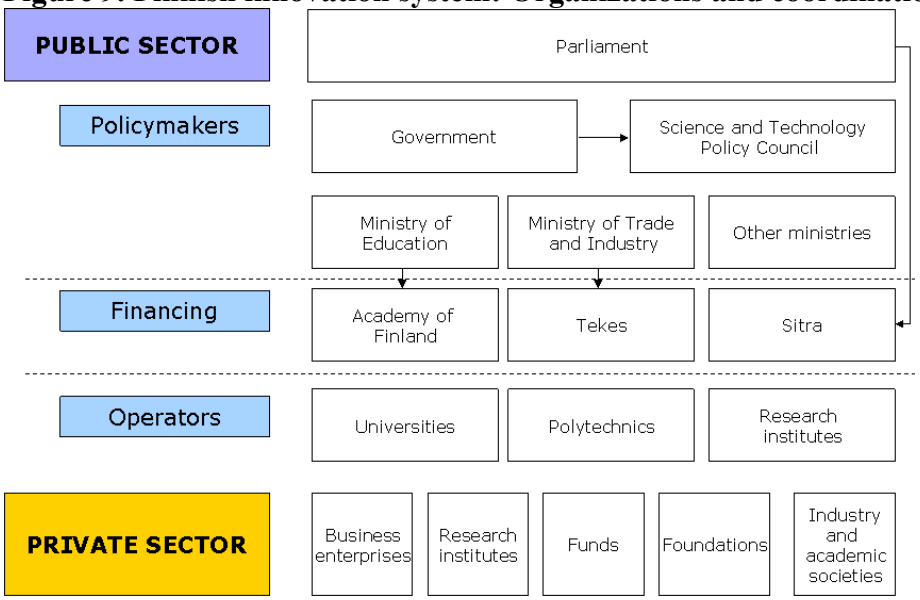


The science and technology system in Finland has many public and private institutions with specialized functions

Source: Tekes 2005.

The most important public players in the national innovation system and their positions and roles in the Finnish system of innovation are illustrated and described below (figure 9). The Science and Technology Policy Council is a relatively independent player and the most important coordinator of science and technology policies. The other public players are subordinated to either the Ministry of Education or the Ministry of Trade and Industry. Sitra is a public foundation operating under the Parliament.

Figure 9. Finnish innovation system: Organizations and coordination



There is close coordination between the public and private sectors

Source: Adapted from www.research.fi.

The Science and Technology Policy Council is chaired by the Prime Minister and is responsible for the strategic development and coordination of Finnish science and technology policy as well as of the national innovation system as a whole. The high

level of the Council is also clear from the fact that it consists of the other most important Ministers, and other major stakeholders in science and technology.

The Academy of Finland focuses on financing basic research. The Academy's objective is to promote high-level scientific research through long-term quality-based research funding, science and science policy expertise, and efforts to strengthen the position of science and scientific research. The Academy's operations cover all scientific disciplines. It operates within the administrative sector of the Ministry of Education and is funded through the state budget. Approximately 15 percent of all government research funding is channeled through the Academy.

The National Technology Agency, or Tekes, has a major role in formulating Finnish innovation and technology policy by allocating funds for research and development in private firms and research organizations as well as in universities. Approximately 30 percent of the government's total R&D budget is channelled through Tekes. The agency was established in 1983 and functions under the Ministry of Trade and Industry.

Tekes–the National Technology Agency–has a major role in building university-industry collaboration

The major financial instruments of Tekes are (1) industrial R&D grants and loans to firms and (2) grants for applied (technical or technology-related) research in public organizations. Typically, research grants are allocated via technology programs planned in collaboration with firms and research institutes. The technology programs launched by Tekes set priorities for specific sectors of technology or industry and define the allocation of money for R&D in different fields.

The Technical Research Centre of Finland, or VTT, was established in 1942. It has become the biggest polytechnic applied research organization in Northern Europe and is integral to Finland's innovation system. By developing new technological solutions and applied technologies, VTT helps its clients to improve their competitiveness. VTT also promotes technology transfer by participating in national and international research programs and collaborative networks.

The Finnish National Fund for Research and Development, or Sitra, to fill the need on the public side to have an instrument by which to experiment and start new activities without the budgetary delays and political commitments of government to carry them out immediately on a broad front. To do this requires sufficient economic means preferably as an endowment and flexibility in decision making. Sitra was established in 1967. Initially, it was subordinated under the Central Bank of Finland, but since 1991, it has operated as a public foundation under the Parliament.

Good public governance and a low level of corruption are essential to the knowledge economy

For economic success, certain social and institutional innovations are as important as technological ones. For almost two decades, good governance and a low level of corruption have been strongly connected to the notion of the knowledge economy. Good governance and political transparency play an invaluable role in the Finnish society, particularly in its knowledge economy. Institutions, both administrative and political, also do matter. One example of institutional innovation is the Committee for the Future, a standing committee of the Parliament of Finland, which has

signified the need for longer-term orientation and consensus building in politics and the development of a sustainable knowledge-based economy (box 1).

Box 1. Committee for the Future

The Committee for the Future is 1 of the Parliament of Finland's 15 standing committees. The committee has 17 members who all are Members of Parliament and represent different political parties. The committee is the only of its kind in the world. Its task is to conduct active and initiative-generating dialogue with the government on major future problems, including knowledge economy developments. The committee has been given the special task of following and using the results of research on future trends.

Parliamentary Committee for the Future is an example of an institutional innovation for creating consensus

The idea of conducting policy work on the future in Parliament came from the floor. In 1992 a large majority of Parliament Members accepted an initiative that called for the government to submit a report to Parliament on Finland's long-term prospects and options. In 1993 Parliament established a temporary Committee for the Future to prepare responses to the policies outlined in the government's report. In 2000, in connection with Finland's constitutional reform, Parliament decided to make the Committee for the Future a permanent committee.

The tasks of the committee include[1]:

- Assessing the social impact of technological development and serving as the Parliamentary body responsible for assessing technological development and its consequences for society
- Issuing statements to other committees on matters related to the future when asked
- Initiating public discussions of issues pertaining to future development factors and development models
- Analyzing research regarding the future.

Education: quest for equity and high quality

Education is the key element of a knowledge-based, innovation-driven economy. It affects both the supply of and demand for innovation. Human capital and skilled labor complement technological advances. New technologies cannot be adopted in production without a sufficiently educated and trained workforce. The demand side is also important since innovations may not take place in the absence of educated and therefore demanding customers and consumers.

Education is the key to both the supply of and demand for innovation

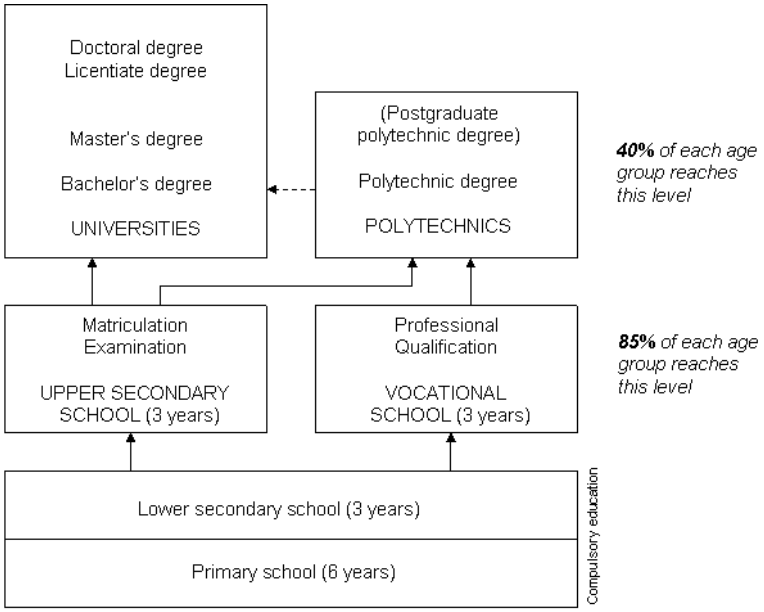
In OECD's recent Program for International Student Assessment studies (PISA 2000 and 2003), Finland emerged at the top in terms of learning skills among 15-year-olds in mathematics, science, and reading literacy. Other high performers included Asian countries: Hong-Kong China, Japan, and Korea. What is unique in the Finnish case is the low variation among schools and across students. Significantly, the low performing group did better than the average of the some 40 countries surveyed.

In the Finnish education system, the local authorities are largely responsible for organizing basic education and schooling. Equality by gender, region, and socioeconomic background are fundamental principles of the Finnish education policy. Everyone receives the same basic education, and, furthermore, it is the goal of the educational system that no one relies on basic education alone. Previously, equality was considered quantitatively, and the distribution of schools and access to

[1] See www.parliament.fi/FutureCommittee.

them were measures of equality. Nowadays, equal quality of education for everyone is the goal, and individual learning results are the measure of success. The social security system in Finland also exerts a strong incentive for young people to continue educating themselves after the lower secondary school, which is normally completed in the age of 15-16 (figure 10). One example of this is the requirement that a person must be 18 or over to qualify for unemployment benefits. Hence, there is an incentive to continue to go to school (free for everyone) after completing the lower secondary education.

Figure 10. Finland's education system



Source: Ministry of Education 2003 and Leijola 2004.

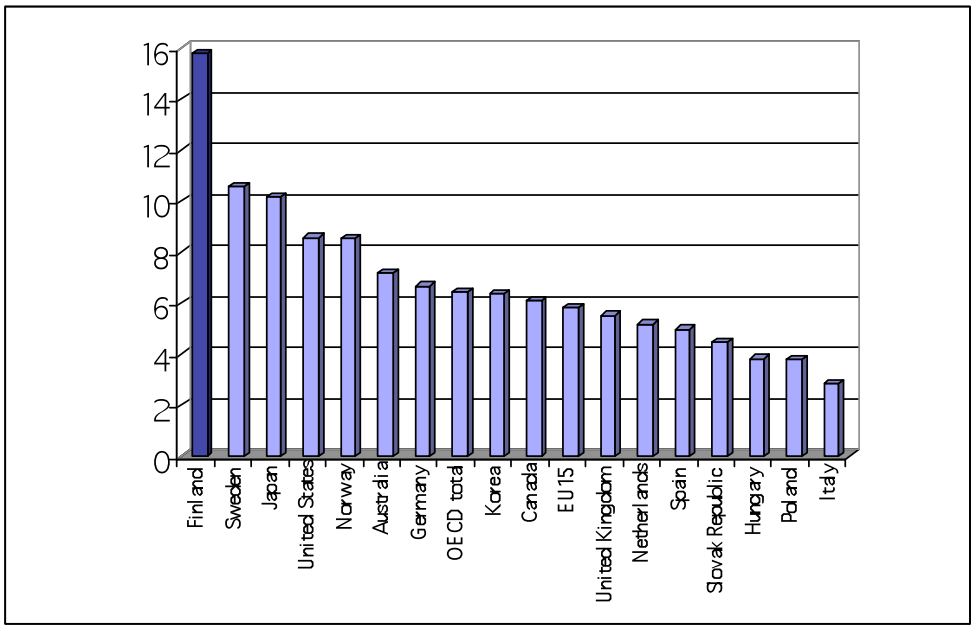
Equality by gender, region, and socio-economic background are fundamental principles of Finland's education policy

Initially, starting in the twelfth century, all education in Finland was in the hands of the Church, and classes were taught only in Latin. However, since the early nineteenth century, education policy and the development of the education system in Finland have exhibited the above-mentioned principle of equality. The country also recognized the connection between educating the populace and economic growth early on. Finally, educating the common people served as tool in nation-building prior to Finnish independence in 1917.

The expansion of the Finnish higher education system has followed and supported the course of economic development

In contrast, in higher education, economic trends and the demand for certain skills have played significant roles in education policy. The expansion of the Finnish higher education system has followed and supported the course of economic development. Since the mid-1990s, the number of researchers in both the private and public sectors has risen faster than ever before in the country's history and ranks first in the world when compared to total employment (figure 11).

Figure 11. Number of researchers *(per 000 employed)*



Source: OECD Factbook 2005.
Note: Refers to 2001 or the latest available year. See the source for additional notes.

Challenges ahead

Giving high priority to sound macroeconomic policies but gradually shifting the emphasis to microeconomic policies have proved wise choices

Clearly, the knowledge- and R&D-oriented, "high-road" strategy that Finland has pursued since the early 1990s has been one of the European and the world's success stories. *Giving high priority to sound macroeconomic policies but gradually shifting the policy emphasis to microeconomic policies have proved wise choices.* After all, the competitive edge of an economy is created at the micro level: in firms, innovation and policy organizations, and educational institutions.

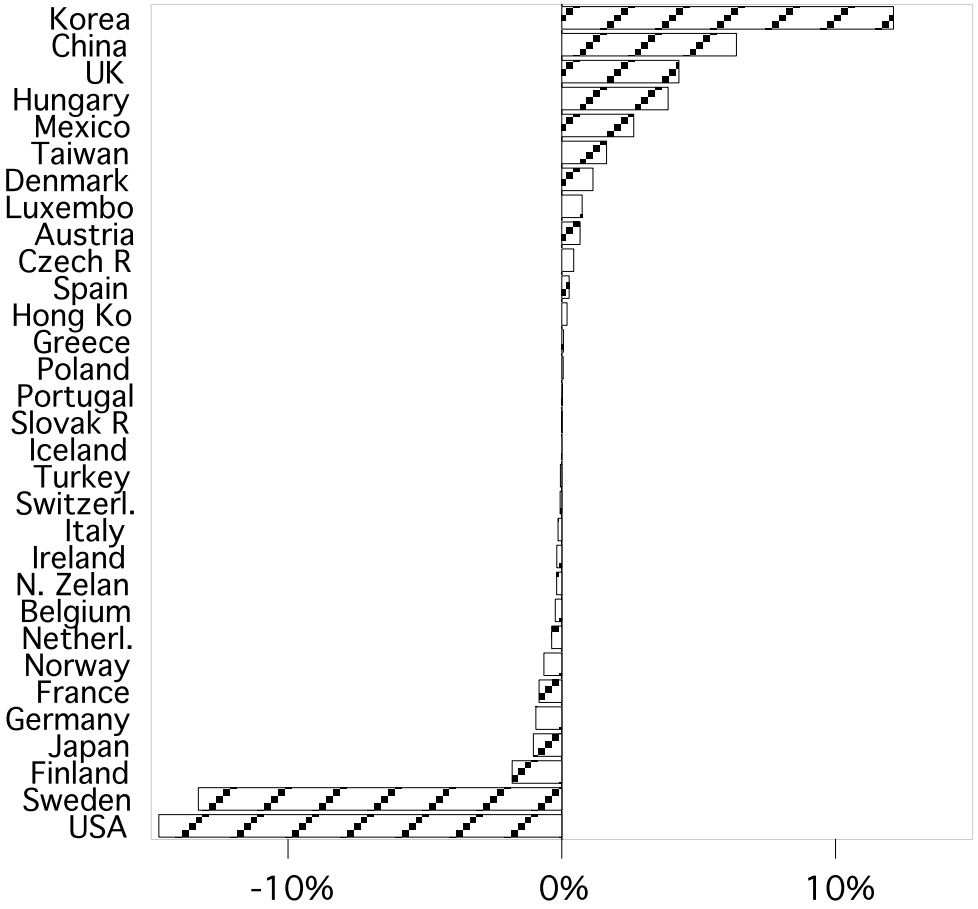
The country's stellar economic performance during the past 10 to 15 years is attributable in considerable part to developments in the ICT sector. Being one of the leading producers of a new generic technology certainly has created a strong competitive edge for the country. Consequently, many of the future challenges relate to ICT and the sustainability of competitiveness. Can the position gained be maintained?

Current competitiveness is not a guarantee of future growth

The current competitiveness is not necessarily a guarantee of future growth. Across the world, competitiveness rankings seem to predict future growth relatively poorly. Many of the Asian countries that were ranked high in the early 1990s serve as examples. *Continued success must be built on constant upgrading and renewal*.

*It is the **use** of ICT–not necessarily its production–that is decisive for long-term economic growth*. As the technology matures, the production gradually will spread to new locations. The ICT revolution is by no means over yet, but parts of both technology and service production have started to relocate. The geography of the ICT industry is reconfiguring in a similar way as previous breakthrough technologies (figure 12).

Figure 12 Changes in the countries' global mobile phone market shares in 1996–2002



Source: Rouvinen and Ylä-Anttila 2005. Calculations are based on OECD International Trade by Commodities Statistics.
Notes: Percentage points. Here "mobile phones" refers to the International Trade by Commodity Statistics (HS96) code 852520 (Transmission apparatus, for radiotelephony incorporating reception apparatus). The total global export market is defined as the sum of the above 31 countries. The difference of the shares are calculated from the nominal US$ values in 1996 and 2002. Export statistics unavoidably include some through-traffic, so they must be interpreted with caution.

The big policy issue today is whether Finland can keep its Nordic welfare model and still compete successfully in the globalized world economy

The big policy issue today is whether the country can keep its Nordic welfare model and still compete successfully in the globalized world economy. In Finland, *productivity is the key to meet the increasing financing requirements of the welfare society.* Due to Finland's relatively larger baby boom generations after the war, the aging of its population is proceeding somewhat faster than that of other European countries. The working age population (15–64) will start to decline before 2010. This decline will have several consequences for knowledge economy developments as well as for the whole society. On the one hand, the decline will provide opportunities to develop ICT-based welfare services in the public sector. On the other hand, it implies a tough challenge to keep the productivity growth fast enough. However, as the labor input of the aging population declines, keeping up this growth becomes increasingly difficult.

Can both the dynamism of the economy and social cohesion and welfare be maintained in the future?

Can both the dynamism of the economy and social cohesion and welfare be maintained in the future? To address these issues, a high-level expert group with

representatives from various expert organizations and ministries was initiated by the Prime Minister. Its report recommended, among other things, focusing on a few world-class centers of excellence in science and technology. The report also recommended further increasing public R&D funding but, basically, only for competitive research. The main idea of all of the group's recommendations was to pursue maintaining the competence base across the board, but increase it in selected focus areas by concentrating public efforts. The rationale of the policy shift would be that a small country simply cannot be competitive except on a very few sectors or industrial clusters in the global economy.

Lessons to be learned

Finland has many specific characteristics that cannot be replicated easily by many other countries.

Finland has many specific characteristics that cannot be replicated easily by many other countries. One of these characteristics encompasses two attitudes: an independent spirit of self-reliance and a "can-do" mindset that have been tempered by weather, geography, and occupations. Before national independence in 1917, long periods under the rule first of Sweden and then of Russia also contributed to the independent spirit and strong national spirit of self-reliance with the will to overcome difficult odds.

Another tempering factor is that since Finland has 60 percent of the world's population who live as far north as the Finns do, partly above the Artic Circle, over time, the very cold climate has created a very hardy population who must plan ahead to survive. For example, in the 1860s, when two summers were too short for a growing season, 5 percent of the population starved to death.

A second specific characteristic–shared with other Nordic countries–comprises a strong spirit of cohesiveness, high moral values, an emphasis on equality, and relatively equal income distribution. These traits probably result partially from Finland's historical geographic isolation and quite homogeneous gene pool. The traits also may have been strengthened by its unique language, which is distinct from the other Nordic languages and which forms an exclusive bond among the Finns and differentiates them from others.

A third characteristic is a willingness to interact with the outside world in an open but strongly nationalistic way. Perhaps because of the country's geographic isolation, Finns have a natural curiosity about the outside world that has made them very open to outside ideas and technology. In the 1800s, Finns relied heavily on timber and sawmill technologies from their Nordic neighbors and the Germans. Finns also were among the first to introduce electricity and to use the telephone. Similarly, they were very open to experimenting with different telephone technologies almost as soon as they were invented and to develop their own versions.

One characteristic encompasses a strong spirit of cohesiveness, high morals, and emphasis on equality

While several other characteristics may be somewhat unique to Finns, these three have been highlighted because they appear to be part of what has enabled Finland *to build a successful nation state* and, more recently, turn a major economic crisis into an opportunity and *to transform itself from a somewhat marginal economy in Europe to the most competitive and knowledge intensive country in the world in less than a decade.*

On another front, key policies that are partially responsible for Finland's success are quite typical of the Washington consensus. These include:

- Strong rule of law
- Strong governance and accountability
- Stable macroeconomic policy
- Strong financial sector (after the 1990s crisis)
- Openness to outside ideas and a free trade regime
- Strong focus on encouraging domestic competition.

Some of these–strong rule of law, strong governance and accountability, and strong tradition of encouraging domestic competition–are among Finland's strong cultural and historical characteristics and traditions. The strong openness to outside ideas and technology dates back to the early development of the forestry industry in the nineteenth century and has been a marked feature of the development of the ICT industry. It should be noted that, even before joining the EU, Finland undertook significant trade reform to foster stronger competitive pressure that would improve performance across many sectors of its economy.

Liberalization of financial markets in the 1990s was instrumental to developing the knowledge economy

Other policies, however, such as strong macroeconomic policy and financial sector and the free trade regime, are relatively more recent and were strengthened as part of the commitments that Finland made when it joined the European Union. Before it joined the EU and the European monetary union, Finland suffered from significant macroeconomic and exchange rate instability. In fact, its financial crisis of the early 1990s was not too dissimilar from those common in many developing countries.

After the 1990s crisis, reforming the banking system and strengthening the capital markets, including venture capital, were important to make financing available for the growth of the new knowledge-intensive sectors of the economy, particularly the ICT cluster. Moreover, the financial and economic restructuring that took place after the crisis broke the traditional banking-led relationships including with Germany and Japan and led to a more dynamic and open financial system led more by stock market capitalization. The financial restructuring also included the liberalization of capital accounts and the removal of restrictions on foreign investment. These two actions did not occur until 1993, when Finland joined the European Economic Area, and they were fundamental in transforming the economy. By 2000, 67 percent of the shares of the Helsinki stock exchange were foreign owned as were more than 90 percent of Nokia's shares.

Many of the Washington consensus policies may be considered necessary but not sufficient to explain Finland's transformation to a knowledge economy

Clearly, all of these policies have been very important for Finland's success and may be considered necessary conditions, even if not sufficient, to explain its successful transformation into a knowledge economy. However, it should be re-emphasized that Finland's very strong early focus on competition in the telecommunications sector in particular was critical in laying the basis for a very dynamic sector and strong domestic capability. These then were critical for the development of Finland's very strong ICT sector.

Other policies are less typical of the Washington consensus. These include:

- Strong welfare state, particularly the very strong focus on education
- Strong focus on coordination of policies among key government agencies and between them and the productive sector
- Strong focus on R&D and innovation
- New type of industrial policy
- Strong focus on the future.

Other policies are less typical of the Washington consensus

The Nordic welfare state with its strong social safety net and strong focus on free public education was an important element of Finland's transformation. The social safety net was particularly important in addressing the jump in unemployment during the early 1990s crisis. The focus on retraining people and linking unemployment benefits to getting additional education also were very important in restructuring the economy toward high-technology industries. A special characteristic of Finland's educational system, which differentiates it from the Anglo-Saxon Washington Consensus, is that education is free all the way up to the university level. Other notable characteristics of Finland's education system are its strong focus on equality measured by outcomes, tying welfare payments to training for young persons, tremendous openness; and focusing higher education on the needs of productive sector.

On a broader level, it is appropriate to reflect on what can be learned from the Finnish experience and what this implies for developing countries.

The first lesson is that it is possible for a country to make a dramatic recovery in GDP and undertake a major restructuring, as Finland did. An important corollary is that a crisis can be turned into an opportunity. However, for this to happen, there may need to be certain preconditions as well as great flexibility in the economy.

One key lesson is that it is possible to make a dramatic recovery in GDP, undertake a major restructuring, and turn a crisis into an opportunity

Finland is not unique in turning a crisis into an opportunity. Korea turned its major 1997 financial crisis into an opportunity to undertake a major reform of its economic incentive and institutional regimes. On the other hand, Japan did not turn its early 1990s crisis into an opportunity for major reform. This difference requires reflection.

In the case of Finland, what made this restructuring possible included the special characteristics already noted of a strong "can-do" attitude and strong social cohesiveness. These were complemented by the strong safety net of the welfare state. Without these three, it is not clear that it would have been possible for Finland to cope with unemployment that grew close to 20 percent and a wrenching restructuring process in which people were redeployed from declining sectors in the old economy to the new ICT sectors. The already high education level of the population and the very robust response of the tertiary education sector to expand and produce workers with the new ICT skills were additional facilitating elements.

Another special element was that there was a large conglomerate, Nokia, which was able to rise to the challenge. It is particularly noteworthy that, at the time of the crisis, Nokia was a large diversified conglomerate that had been growing through

mergers and acquisitions. Besides feeling the effects of the general economic crisis, it was going through its own internal identity and management crisis. However, it decided to divest most of the traditional business and focus on the ICT sector, and mobile telephones in particular. Its success in making this transformation is legendary and hard to explain and ultimately probably has to be attributed to its new management.

Nokia's success was facilitated not only by its long history of developing capabilities in the ICT sector and its acquisition of some companies in the sector but also by the government's strong vision of the potential of the sector and by the flexibility of the economy in responding to the opportunity. The opportunity included the:

- Availability of high-level manpower who had been idled by the collapse of other businesses
- Strength of the university and research infrastructure
- Quick response from the educational system in producing the needed new engineers, managers, and skilled workers
- Availability of foreign capital to fund the growth of the ICT sector
- Availability of venture capital and government seed funding to start up new high-tech enterprises that became part of the ICT cluster that grew up around Nokia.

A second lesson is that globalization is a double-edged sword and a demanding task-master

A second lesson is that globalization is a double-edged sword and a demanding task-master. Finland's crisis in the early 1990s, in part, resulted from the global downturn of the forest-related industry as well as the collapse of its trade with the former Soviet Union. Part of the solution to the crisis also resulted from globalization. The dramatic development of the ICT industry is part of globalization. Finland's rapid growth in the ICT area was possible because of globalization both in terms of (a) producing for a world market and (b) its ability to access the foreign capital and knowledge that it required to develop the industry.

On the other hand, Finland is also struggling with the impact of globalization, which is putting pressure on it to improve its technology and education system to stay competitive in a very demanding global environment. Finland still has an unemployment rate of nearly 10 percent. As noted in the Prime Ministers report on Finland's Competence, to face the challenge of globalization *"requires an economy and society that are capable of change and can make best use of their strengths*." To this end, the report proposes that "*a competence- based strategy requires continuous renewal from the economy. Reforms must apply not only to the weak points of the crucially important education and innovation systems, but also to the functioning of the markets for labor, goods, and services, and the public sector*."[2] It then sets out a series of reforms to strengthen all these areas, even though, by most international comparisons, Finland is already doing better than most countries. All of Finland's concerns above emphasize just how much pressure globalization is putting on even the most competitive player.

[2] Prime Minister's Office, 2004.

The third, and perhaps the most critical, lesson is *the importance of flexibility or elasticity of the economy to react of changing opportunities*. Finland's case aptly demonstrates the importance of this flexibility in the way that it was able to significantly restructure its economic structure as a result of the crisis of the early 1990s. Two critical aspects of that process of creative destruction were the very strong social cohesion and strong safety nets. However, *it is perhaps the educational system that has played the most critical role.* Finland already had a high level of educational attainment, which facilitated the necessary restructuring of the economy. In addition, the educational system was able to respond very quickly and flexibly to the new opportunities. Furthermore, *increasing this flexibility is seen as a key priority to respond to the continuing challenge of the constant restructuring that results from globalization*

A third lesson is the importance of flexibility for an economy to react to changing conditions, and the critical role of a responsive education system

The Finnish experience also has several implications for developing countries.

The first implication is *the continued importance of the basic elements of the Washington Consensus.* These elements are essential to give the economies the flexibility they need to constantly redeploy assets to their most productive uses

Finland's experience drives home the importance of developing vision and consensus making mechanisms

The second implication is *the imperative to develop vision and consensus-making mechanisms*. Reforms involve changing the status quo, and doing so usually does not happen unless there are major external or domestic forces pushing or demanding such changes.

The third implication is *the importance of developing appropriate knowledge strategies*, Finland had to increase higher educational attainment in general, and scientific and technical skills in particular. These challenges involved not only increasing R&D expenditure but also focusing on getting the fruits of R&D into the market. Finland's strong emphasis on the systemic approach to innovation evolved, including bridging the entrepreneurship and financing gaps to turn invention into commercial application.

Finland's experience demonstrates the importance of developing appropriate knowledge strategies However, these have to be adjusted to the developing countries' conditions

*These strategies have to be adjusted to the specifics of each country. F*or the majority of developing countries the focus needs to be somewhat different than Finland's. Because, in virtually all sectors, developing countries are still very far from the technological frontier, they still need to put priority on developing effective means of tapping the pre-existing and rapidly growing stock of global knowledge.

Developing countries need to put more weight than they do now on understanding, acquiring, adapting, diffusing, and using existing knowledge, including indigenous knowledge. This includes putting in place basic technological infrastructure such as norms and standards, metrology, testing, and quality control, as well as strong dissemination mechanisms and institutions such as technical information centers, productivity organizations, and agricultural and industrial extension agencies. In addition, developing countries need to set up public research institutes that can help them access what global technologies may be relevant and help them adapt these technologies to their circumstances.

More importantly, utilizing their existing knowledge also involves creating technological capability in their productive firms and in getting them to invest in improving and eventually creating their own technologies in their most advanced sectors.

Developing nations also will have to pay more attention to all levels of education. To the extent that many still have very low educational attainment, they will have pay more attention to strengthening universal basic and secondary education for their citizens to become effective users of technology. They also will need to improve higher level secondary education and even higher education to keep up with and make effective use of the rapidly expanding technological frontier.

Developing an effective innovation system also involves attracting FDI that can bring in relevant new technology to advance local economies. Attracting FDI also includes getting into global value chains controlled by multinational companies and trying to move up those value chains. It also includes developing linkages and networks between domestic public and private research institutes and universities and foreign ones, as well as among all of these domestic institutions.

It is important to focus not only on what can be learned from the past, but also to anticipate and prepare for the future

A final implication for all countries is *the importance of focusing not only on what can be learned from the past (their own and other countries' experience) but on anticipating and preparing for the future*. This is one of the key lessons of the Finnish example and explains to some extent why Finland not only was able to make such a dramatic transformation to a knowledge-based economy but also why it has been able to remain so competitive.

Moreover, as can be inferred from the challenges that Finland is facing as a result of the rapid advances in knowledge and the continuous challenge of globalization, the world is not standing still. What worked in the past may not work in the future, and the prerequisites for being successful seem to be rising ever higher and becoming ever more demanding. Thus derives the importance of looking forward to see to what extent it is possible be better prepared for future challenges and opportunities. Developing countries in particular need to monitor this aspect closely because there may be important new areas that can be exploited, and it will be necessary for them to be ready to move to take advantage of them.

What worked in the past may not work in the future, and the prerequisites for being successful are becoming ever more demanding

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Useful WWW Addresses:

Academy of Finland
http://www.aka.fi

www.research.fi

http://virtual.finland.fi/

CIM Creative Industries Management
http://www.cimfunds.com

ETLA, Research Institute of the Finnish Economy
http://www.etla.fi

European Union Research Programmes
http://www.cordis.lu/en/home.html
http://europa.eu.int/comm/research/

European Venture Capital Association
http://www.evca.com

Finnish Venture Capital Association
http://www.fvca.fi

Finpro, National Agency for Corporate Internationalization
http://www.finpro.fi

Institute for Strategy and Competitiveness, Harvard Business School
http://www.isc.hsb.edu

Merit, Maastricht Economic Research Institute on Innovation and Technology
http://www.merit.unimaas.nl

Sitra, Finnish National Fund for Research and Development
http://www.sitra.fi

Tekes, National Technology Agency of Finland
http://www.tekes.fi

World Bank and World Bank Institute
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Finland has been ranked number one for the fourth time since 2000 in the World Economic Forum's Global Competitiveness Index.

"...The country owes its strong showing to one of the most innovative business environments in the world, particularly critical to driving productivity in the country, given its advanced stage of development. This is coupled with a very healthy macroeconomic environment, at a time when many other industrial countries are struggling in this area. The willingness of Finnish governments to run budget surpluses, so as to be able to meet future social commitments linked to the aging of the population is particularly impressive. This approach to macroeconomic policy highlights a degree of political maturity in Finnish society worthy of emulation. Furthermore, Finland has an institutional environment that is among the world's finest: the business community operates in a climate of respect for the law, unusually low levels of corruption, and an openness and transparency which other countries would do well to study."

Dr. Augusto Lopez-Claros, Chief Economist and Director, Global Competitiveness Programme, World Economic Forum in *The Global Competitiveness Report 2005-2006*, Executive Summary pages xiv-xv. Houndmills, UK: Palgrave Macmillan.