

An Evaluation of the Research Activities of the Bank of Finland

Report of the external evaluation panel

30 September 1999

LIST OF PANEL MEMBERS

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1 Introduction

1.1 The purpose of the evaluation

The Bank of Finland aims to be an influential partner within the European System of Central Banks (ECBS); and developing a high-quality research function is seen as essential for the purpose. To provide an objective basis for developing the research function of the Bank, its Executive Board has commissioned this evaluation of the Bank of Finland's research activities to assess:

- “– the scientific quality of the Banks' output as a whole, and
- the relevance of the research activities from the point of view of the strategic goals of the Bank.”

The full Terms of Reference for the evaluation are attached as Annex 1.

A four-month period, later extended to five, was given to the evaluation panel to write the report. John Flemming and Marcus Miller made a total of four visits to the Bank, on three separate occasions (25–30 May, 9–11 August and 20–27 September), and Mika Widgrén was present on each occasion. The panel decided to submit a joint report.

The evaluation is based on examination of the research output, as well as interviews with Bank staff conducted by panel members on these visits. The list of Bank staff consulted is attached in Annex 4.

1.2 Historical background

The child is father of the man: and the best biographies begin at the beginning. An outline of developments over half a century shows how the Bank of Finland has gained its reputation for doing good economic research, and for training its staff to high level in the process.

Economics Research Institute, 1944–1972

The Bank of Finland established an Economic Research Institute in 1944, on the basis of the previous Statistical Department and the Department for Conjunctural Research. All economic intelligence and information functions of the Bank were eventually concentrated in the Institute, including policy advice, the production of balance of payments statistics, and the writing and publication of the Bank of Finland annual report (the Yearbook).

In the 1950's and 1960's, the Economic Research Institute developed into the leading economic policy think-tank in the country and also the most important economic research centre in an academic sense: a large share (if not the majority) of dissertations in economics in Finland was produced by the staff of the Institute. It was, indeed, the only pool of expertise in monetary affairs in the country. (By way of comparison, the Economics Department of the Ministry of Finance, which was also established in 1944, did not develop a research profile and remained

exclusively an operational unit until the 1970s when some modelling and long-term planning activities were initiated there.)

Despite its national importance, the Economic Research Institute remained small until the beginning of the 1970s, when it began to grow rather rapidly. At that time, regular (semi-annual) macroeconomic forecasting exercises and an econometric model-building project were started. The first version of the Bank of Finland Quarterly model "BOF1" was published in 1972, and the model joined the international Project Link directed by Lawrence Klein in 1973.

ERI dissolved and training cut back in the 1970s

In 1972, the Economic Research Institute was dissolved into several small departments, which were integrated to the regular organisation of the Bank. A small research department was retained, to do special studies commissioned by the top management of the bank. Eventually, the econometric modelling group was also located in the *Research Department*. A new, separate *Economics Department* was given the responsibility of forecasting and monitoring, and two new policy departments were also created. At the time of this reorganisation of research activities, the Bank cut back its support for academic research. Though some thesis projects were again started in the Research Department towards the end of the 1970s, no doctoral dissertations were completed by the Bank staff between 1969 and 1979.

Increased role for research in the 1980s

In the 1980s, however, the emphasis on research increased. A more positive attitude was also taken by the Bank to postgraduate studies of the staff, which was reflected in the number of reports published by the Research Department. One reason for this was that in the 1970s the Bank's employment of economists had increased rapidly, mainly with young people possessing no more than a master's degree, and it became evident that keeping up their skills and motivation required that postgraduate studies be supported. More research was now done not only in the Research Department, but also in the Economics, Monetary Policy, and Exchange Policy Departments, which all started to produce their own mimeographed discussion paper series (with very small circulation however).

In 1988, after the liberalisation of financial markets, the Bank's economic analysis functions were reorganised again. Monetary Policy and Exchange Policy Departments were merged and a new *Financial Markets Department* was created to monitor the developments in banking and securities markets and to develop regulatory policies for these markets. The econometric model was transferred from the Research Department to the Economics Department which adopted the BOF model as its main forecasting vehicle (version BOF4 with a complete open economy financial sector and long-run neoclassical supply-side properties was operative by then). The number of fixed term secondments of the staff to the Research Department was increased and the Research Department was given a co-ordinating role over the research activities in the Bank. The research priorities were clarified and instructions were given to concentrate research on monetary

and financial problems relevant to the Bank's tasks. An interdepartmental Bank of Finland Discussion Paper series was established.

Unit for transition studies created in the 1991

With the collapse of the Soviet Union, bilateral trade arrangements between Finland and Soviet Union were terminated in 1991. A new Unit for East European Economies (later to be renamed BOFIT) was created mainly on the basis of the previous Bilateral Trade Department (as the Bank had been responsible for the management of this trade in terms of settlements and credits on the bilateral clearing accounts). In 1993, in place of the Bank Inspection Office which had been subordinated to the Ministry of Finance, a Financial Supervision Authority was organised "in connection with the Bank of Finland" which, despite its autonomy in decision-making, shared much of its infrastructure (including training) with the Bank. In 1994, an International Secretariat was created to manage relations with the EMI (later ECB) and the IMF.

Current research framework adopted

From the beginning of 1998, the present research policy was adopted, giving a central place to research in developing the Bank's role in the EMU environment. This policy included two research programmes managed by the Research Department (namely modelling of the monetary policy and the future of the financial services), and a framework for "6-month visits" from other departments and from outside of the bank to the Research Department. The Unit for East European Economies was turned into the research Institute for Economies in Transition (BOFIT). The Bank joined the CEPR as an institutional member with the participation of Bank staff at CEPR events actively encouraged.

In 1999, the Economics and Monetary Policy departments have been merged into one Economics department. The Bank made a 3-year co-operation agreement with the RUESG (research unit for economic structures and growth) of the Economics Department of the University of Helsinki. The aim of the exercise, which will involve RUESG researchers working in the Bank's Research Department, is both to support research by the RUESG in monetary economics and econometrics and to secure further development of skills and expertise for the Bank.

2 The structure of research

2.1 The nature of economic research at the Bank of Finland

In surveying ancient Gaul, Julius Caesar divided it into three broad regions. So it is for economic research at a central bank, according to a recent research evaluation of the IMF. The three areas distinguished there are: policy analysis, policy development and the study of policy fundamentals, IMF (1999, pp 15–17). We begin by illustrating these various levels of research as conducted at the Bank of Finland.

A primary function of research at the Central Bank is to illuminate current policy problems. One example of such **policy analysis** at the Bank of Finland is the paper on "Divergences in the Euro Area: a Cause for Concern?" A second is the forecast report produced semi-annually in the Economics Department using the Bank's model (an earlier version of which is analysed in Whitley, 1992).

While these papers focus directly on current policy issues, others aim rather to provide a framework for discussion or to summarise results in an area. An example of this **policy-development** research is the paper on "The Non-linearity of Phillips Curve and Monetary Policy" written by Ilmo Pyyhtia while on six months release from economics department. Using econometric techniques he finds significant evidence of nonlinearity, so the effect of a one-point increase in unemployment in checking inflation is weaker the higher the level of unemployment. This means that a given average level of unemployment in Europe will be more inflationary the wider is the dispersion around that mean, an important policy implication.

Another example of policy-development work is the research on the Scandinavian financial crises of the early 1990s and their lessons for policy. With the expressed objective of promoting improved banking supervision throughout Europe, David Mayes is producing a book drawing upon half a dozen or so Bank of Finland discussion papers written on the subject and also upon the successful experience of New Zealand and other countries in reforming banking supervision during the second half of the 1990s. He finds that Finland had seven characteristics making it crisis prone, including weak financial supervision, an asset boom, unsustainable macro-policies and the shock of the collapse of the former Soviet Union. This was, of course, very tough luck for Finland: but it does carry the implication that economists at the Bank are in a good position to discuss and analyse these issues as they might affect partner countries in the future.

Consider, finally, research which involves **policy-foundations**. A fine example is the thesis "Demand for money in inflation-targeting monetary policy" written in the Research Department by Antti Ripatti, where a stochastic dynamic general equilibrium model is developed to compare interest rates and money as policy instruments; and tests for parameter stability are conducted using Finnish data. Another is a thesis by Eelis Hein on "Deposit Insurance: Pricing and Incentives" which uses option pricing theory as the basic tool of analysis. A topical example of work in progress is the study of liquidity crises currently being pursued in the Research Department. (See for instance the paper by Mikko Niskanen "On Moral Hazard in Emergency Lending by Central Banks" which

provides a comprehensive survey of the literature on bank runs with discussion of the role of institutional design, taking account of incentive effects. Whether the examination of moral-hazard issues should be restricted to those caused by central bank lending or broadened to include the effects financial regulation in general – including deposit insurance and bankruptcy – is an interesting question. The responsibilities of the ECB under the Maastricht Treaty might support a narrow view while recent work by Hellmann, Murdock and Stiglitz (1998) suggests a broader approach.)

2.2 The purposes of economics research at the Bank of Finland

A Central Bank needs to be able to respond to rapidly changing situations – in politics, in markets, and in policy debates with counterparts in government ministries or international institutions. It is for these operational purposes that the Bank requires, recruits and retains people with analytical skills or potential. They are also needed to generate regular publications such as the Bank's Bulletin and to perform the Bank's forecasting function. The Bank's need for high level analytical capacity is clear enough: but why support the production of economic research per se?

There are several reasons why economic research needs to be carried out within the Bank. We list five:

- (1) to develop and maintain the skills of economists on the staff;
- (2) to attract and retain economists with the relevant skills;
- (3) to produce research helping the Bank fulfil its functions which cannot be contracted out, or can only be contracted out at greater cost;
- (4) to give credibility to the Bank in its contacts with other institutions at home and abroad.
- (5) to create a culture where new ideas can be discussed and tested against data.

Research input

3.1 Organisation of research

A key feature of the operational demand for analytical skills in a central bank is that it is neither steady nor predictable. Irregular operational demands for the services of such skilled people could be met by leaving them in operational departments, where they could use their spare time to do quasi-academic research, i.e. research which can be published. This is in fact the approach taken in BOFIT, discussed further below.

A feature of this "multiple-tasking" solution is that the operational work is normally closely monitored in the line departments, but research less so. As a consequence there may not be adequate incentives and opportunities to conduct research. If it is felt that the line managers are likely to erode the time available for research, it may be appropriate to concentrate economic analytical resources in an Economics Department responsible for both operational and research activities where the management is expected to value research sufficiently highly to protect it despite high priority operational demands. This was the approach adopted by the Bank of England in the 1980s.

An alternative is to conduct all research in a dedicated Research Department to which people are posted for fixed periods of time. This protects research but at the risk of undermining the operational capacity of the organisation.

The solution currently adopted at the Bank of Finland is a compromise. Economists can do research in line departments (Economics or Financial Markets) either ad hoc or by obtaining a two-month research time for a specific project. Most scheduled research, however, is undertaken in the Research Department either by people working on agreed projects as degree dissertations or by people seconded for 2 or 6 months from operational departments, or by visitors from universities or abroad.

The various time-frames within which this research is conducted, in the Research Department and elsewhere, are summarised in the box.

The research framework

- . "2 month projects" – applied studies carried out at various departments
- . "6 month projects" – fixed term postings to the Research Department;
- . Dissertations – written in the Research Department by researchers posted ad hoc
- . Studies in the BOFIT (Institute for Economics in Transition) according to its independent programme

3.2 A snapshot of resources involved in research input in 1999

Before investigating the research output of economists at the Bank over the past decade, we thought it would be useful to look at the inputs in terms of person-years of research time available and its allocation across the Bank. Here we present a snapshot of the current situation. (Later, in Section 4.2, the allocation of resources to the Research Department and their productivity over the 1990s is illustrated in comparison with that of a neighbouring central bank, used as a benchmark.)

Table 1.

The Bank of Finland research input in 1999

Department (1)	Total personnel (2)	Economists (3)	of which PhDs	Research input (4)
Research	19	12	6	9
Institute of Transition				
Economies	15	10	3	7
Economics	28	17	4	6
Monetary policy	23	14	4	3
Financial markets	25	16	2	5
<i>Total above</i>	<i>110</i>	<i>69</i>	<i>19</i>	<i>30</i>

Notes:

- (1) As of June 1, 1999, Monetary Policy Department was merged with the Economics Department. Some personnel (about 5) working in the compilation of banking statistics were transferred to the Statistics Dept.
- (2) Approved size of the department as of beginning of 1999. The number of personnel actually present was slightly smaller due to unfilled vacancies.
- (3) Number of practising economists in May 1999, including management (i.e. Heads of Departments and Heads of Offices)
- (4) Research person-years excluding monitoring, forecasting, policy preparation and administration. Estimate of the research dept. prepared for the national R&D inquiry in May, 1999. Excludes those working on dissertations.
- (5) Additionally, some analytical work is done by economists in the Statistics and Market Operations Departments and in the International Secretariat.

Of a total complement of over a hundred personnel in the relevant departments, about seventy are classified as economists, with just over a quarter having a PhD. The allocation of resources to economic research was estimated to be thirty person-years in total, with only nine of these in the Research Department.

The issue of whether research should be conducted in a separate department or institute or within the functional departments has already been raised above, the principle argument in favour of separation being to protect research activity from other, more insistent operational demands on time. Currently the Research Department has 12 economists, compared with Economics Department's 31 and Financial Market Department's 16. Does relative size provide a counter-argument – in favour of large battalions who may be better able to achieve critical mass? Not when correction is made for the fact that people in functional departments have much greater calls on their time: the relevant figures given in the table show 9 person-years are available in Research against 9 in Economics Department and 5 in Financial Market Department, so the score looks even on this aspect.

Note that only four economists in the Research Department are there on a long-term basis: up to four others are "on loan" from the functional departments (and the remainder are invited from outside). The short-term release of staff to do research not only yields research papers but also helps to maintain and develop the human capital of economists in the Bank. The training element is much more explicit in the PhD programme, which has long been an important element in the research programme of the Bank of Finland. In the last decade, however, the

Universities have created and strengthened their own national PhD programme¹ which now makes the major contribution to economists' training and has significantly improved students' opportunities (both financially and in terms of supervision) to carry on with their studies full time. Some, at the Bank, express a new view: *"The time has come for the Bank to cut back on the training of PhDs and to concentrate on projects with policy relevance."* It is implied that the Bank should recruit economists from the market and not train them in house.

To train in-house or to buy in

The Bank may have a choice between recruiting more or less fully trained researchers. Its tradition has been to recruit relatively few PhDs and to allow or encourage doctoral research on topics relevant to the Bank by economists who have already been employed for several years (sometimes as many as ten). This programme allows for:

- (i) the development of the Bank's analytical capability while the individual stays with the Bank in related functions,
- (ii) the realisation of the individual's potential,
- (iii) the production of research relevant to the Bank,
- (iv) the development of publicly available material relevant to Finnish economic and policy discussion, and
- (v) even if the individuals leave the Bank, this still contributes to the pool of qualified talent available in Finland or the pool of Finns exerting influence on international debate.

These benefits need to be evaluated and compared with the considerable cost to the Bank of the programme on its present scale. The scope for cutting back the programme depends on the scope for shifting recruitment to externally trained PhDs – who are likely to have worked on topics less directly relevant to the Bank's concerns.

How and when skilled economists are hired and used contrasts with British practice. The Bank of England might recruit a 25 year old PhD who, if he was still with the Bank at 40, might well be running an operational or support function – managing the reserves, the budget or even supervising financial institutions. In the BOF

- (i) until recently PhDs, whenever needed, have been acquired relatively late whether as part of an academic career or after recruitment to the Bank. Several years may elapse before someone recruited for economic work embarks on doctoral research;
- (ii) economists stick to their specialism for virtually the whole of their career;

¹ The Finnish Post-graduate Programme for Economics (FPPE) was founded in 1989. Before that post-graduate studies were mainly financed by Yrjö Jahnesson Foundation, which also organised courses for Finnish post-graduate students. In the first five years FPPE students were mainly financed by the Foundation but more recently the Government has increased its share with the special Graduate School Programme. Basically the new programme provides funding for graduate students for four years.

- (iii) the recruitment of economists by Departments increases the latter's sense of ownership and militates against much rotation of staff despite the internal advertising procedure.

In our view, most of the doctoral dissertations that are written in the Bank during the 1990s seemed highly relevant from the viewpoint of the Bank's aims. We also find that the in-house training has contributed successfully to the development of the Bank's analytical capability and to the production of research relevant to the Bank. In our view the Bank still needs its in-house training. The recent co-operation agreement with the Research Unit for Economic Structure and Growth is likely to stimulate the Bank's research contacts with the academia and strengthen the role of in-house PhD programme. It might also be worth encouraging promising graduate students to carry out their PhDs in themes that are relevant to BOFIT.

In addition to the relevance of the themes of PhD dissertations from the Bank's point of view, their scientific quality should be emphasised. A criterion often used in deciding to award a PhD is that two refereed journal articles could be published from the dissertation. In the Bank this might be more difficult to achieve due to a more limited number of topics than at the universities but with the current research input of the BOF, we believe its PhD programme has a potential to 2-4 international journal articles published per year.

Improved dissemination

While operational work is by its nature confined within the Bank, many of the other research activities produce a more academic type of output. At present, as shown below, heavy reliance is placed on Bank publications distributed free. This procedure removes two possible sources of feedback: namely from referees, and from the market. The latter could be achieved in several ways. e.g. by an automatic distribution of postcards (possibly by e-mail) to a comprehensive "mailing list" (as is done by the Bank of Canada). This elicits a response which may be based on a topic as indicated by the title/abstract rather than the detailed content or treatment. Charging would also reveal something about perceived quality though only in ways very loosely associated with the quality of individual research papers.

A much more explicit feedback would be provided by referees of academic journals to which discussion papers and papers extracted from dissertations could be submitted. Adopting this procedure would not preclude publication of theses or dissertations where required, or of other papers as DPs. What would be required would be the recognition that further time would be needed to extract several (two or three) possible journal articles from a dissertation and to revise these and other submissions in the light of referees comments if editors are sufficiently encouraging. In addition to the feedback thus elicited, the quality of the Bank's research would be more clearly and widely established and some additional satisfaction conferred on the individuals undertaking it.

4 Research output

4.1 Research publications

The bulk of research effort at the Bank of Finland has been allocated to producing papers and articles distributed by the Bank itself. Table 2 lists six current publication series. These include the Bank's Bulletin, Review of Economies in Transition, Markka & Talous (started in 1993 to promote policy discussion and recently renamed Euro & Talous), together with research series A and E (the latter consisting mostly of doctoral dissertations carried out in the Bank) and the red discussion paper series widely circulated in Finland and abroad. The number articles published in the Bank of Finland Bulletin is rather stable around an average of 25 per year throughout the decade, while the number of articles published in Markka & Talous each year since 1993 has risen from 12 to an average of 20 towards the end of the decade. About 3 studies per year were produced in series A, non-analytical research of economic and financial developments in Scandinavia (in several languages). Analytical research of good scientific quality is published in series E, where the annual average of slightly over 3 is largely a reflection the annual completion rate 2.3 of PhDs in the Bank. Using the figures in Table 2 we conclude that in terms of internal publications a healthy overall flow of research output has been maintained over the 1990s.

Table 2. **Internal publications in the Bank of Finland**

Type of Publication	1990	1991	1992	1993	1994
Research series A (salmon)	5	4	3	3	4
Research series E (blue)	4	1	4	4	3
Discussion papers (red)	28	26	43	16	25
Rev. of Econ. in Transition	–	–	7	10	11
Unpubl. working papers	46	51	80	57	32
Articles in the <i>Bulletin</i>	21	27	19	24	21
Articles in <i>Markka & Talous</i>	–	–	–	12	15

Type of Publication	1995	1996	1997	1998	Average
Research series A (salmon)	2	5	–	2	3.1
Research series E (blue)	3	3	2	6	3.3
Discussion papers (red)	37	31	20	31	28.6
Rev. of Econ. in Transition	9	6	7	6	8.0
Unpubl. working papers	33	33	30	38	–
Articles in the <i>Bulletin</i>	19	36	22	27	24.0
Articles in <i>Markka & Talous</i>	17	28	22	22	19.3

Notes to the Table

- 1 The averages of Markka & Talous and Review of Economies in Transition are annual averages for the period that they have been running.
- 2 Analytical research is published in E-series (usually PhD dissertations), while non-analytical research and research are published in A-series.

Turning to externally published research, the average output from the Bank of Finland economists over the period is 64 items per year, see Table 3. But, unlike the work published internally, the output of papers published outside the Bank in domestic or foreign publications has declined by one third, comparing the

averages of the first and the second half of the decade, see the top line of the table. Before turning to possible reasons for this, we briefly examine the various types of publications individually. Books and monographs (coming out at the impressive rate of more than three per year) are shown separately from articles appearing in journals both at home and abroad. There is a considerable number of articles published in Finnish external publications, some 46 per year on average over the decade: but there is a marked downward trend from over 60 in 1990 to under 30 in 1998. The internally published *Markka & Talous* appears to have substituted for external Finnish publications.

In foreign publications there were 131 articles put out by BOF economists over the period, giving an annual average of approximately 15. Somewhat less than a third of these appeared in refereed journals, however: the bottom line shows the number of articles in refereed international journals averaging just over four per year, with years of high output depending largely on productive individuals. Somewhat surprisingly given the completion rate for PhDs (and the associated flow of Series E papers shown above), only five of these refereed papers represented publications extracted from PhDs.

Table 3. **Research published externally**

Type of Publication	1990	1991	1992	1993	1994
Annual total	83	71	75	76	79
Books and monographs	2	4	2	3	3
Articles in Finnish publications*	66	57	55	52	47
Articles in foreign publications	15	10	18	21	29
Of which: in refereed journals	5	6	8	2	10

Type of Publication	1995	1996	1997	1998	Average
Annual total	42	48	63	40	64.1
Books and monographs	2	1	7	7	3.4
Articles in Finnish publications*	31	39	40	28	46.1
Articles in foreign publications	9	8	16	5	14.5
Of which: in refereed journals	2	1	2	4	4.4

* Including Finnish Economic Journal, Bank Reviews, Research Institutes Reviews, etc.

Taking the two tables together, one observes a marked decline in the rate of production of articles in international publications (refereed and otherwise), which halved when 1990–1994 is compared to 1995–1998, coincides with a relatively steady output of "intermediate products" in the form of red discussion papers, the best-known form of Bank's own research publications abroad. Is this evidence that the latter are coming to be treated more like final products towards the end of the decade? Or is there some other factor at work?

In any case, one might ask whether discussion papers are a valid substitute for external international publishing. The foreign distribution of discussion papers is approximately 600 and the most important target groups are universities and central banks. In a recent questionnaire, foreign readers found the quality of discussion papers mainly good. Nearly 90 per cent of the respondents graded the scientific quality of the Bank's publications either good (68 per cent) or excellent (21 per cent). In the same questionnaire, however, nearly 30 per cent of the answers suggested that there is a need to increase the scientific quality of the Bank's research publications.

To achieve a higher scientific quality, discussion papers should not in our view be seen as final products; and incentives for the Bank's researchers to publish their work internationally should be significantly strengthened. If, for example, one in four discussion papers produced at an the average of 30 per year were placed in international, refereed journals, together with at least one article per PhD completed, this would be sufficient to double the research output of the Bank in internationally recognised form.

Is this objective within reach? With this in mind, we briefly surveyed the discussion papers produced in 1998. In our view about a half of the 18 produced in the Research Department could well be submitted to refereed journals; and so could five of the 13 produced in the line departments. Assuming a 50 per cent success rate for 14 such submissions, this implies an output of 7 refereed articles. Together with 1 or 2 papers per year from theses, this would indeed double the rate of output from what is shown in the bottom line of the table. Before discussing various organisational steps that might help to achieve this, we explore the issue of research productivity by another route, namely benchmarking, and consider a possible reason for the apparent shift of emphasis away from external publication.

4.2 Benchmarking

4.2.1 Academic institutions

For purposes of comparison we briefly discuss the yardstick used in academic contexts. In the UK's Research Assessment Exercise (RAE), for example, full-time staff in University departments seeking a reasonable research ranking are expected to produce the equivalent of at least one refereed publication per year, in addition to their teaching and administrative responsibilities. (The last exercise was covered a four year period, and full time academic staff were asked to nominate up to four published papers, where "greatest weight will normally attach to works published by journals or publishers which apply strict peer review procedures", i.e. to refereed journals.) On this basis, a doubling of research publications looks straightforward: one article each from the nine full-time-equivalent researchers in the in the Research Department would do the job (without any need for extra efforts by PhDs to get their work into journals)!

4.2.2 The Bank of Norway

It is questionable, however, whether the performance criteria applied to university academics is the appropriate yardstick for professionals working at a central bank. By narrowing the focus to the output of the Research Department per se (and thanks to the good offices of the Bank of Finland), we were able to find a more plausible benchmark. Specifically, we obtained comparable data from the central bank in Norway, which, though not a member of the EU, is a Scandinavian neighbour with practically the same population as Finland.

Table 4 shows the numbers of researchers, discussion papers, refereed journal articles and the number of doctoral dissertations completed in the Research

Departments of the two central banks over the years 1990–1998. Note that, though the average number of researchers broadly similar (about seven), Norway did in fact invest somewhat more resources in research (67 person years, against 60 at BOF).

Table 4. **A comparison of research departments of the Bank of Norway and the Bank of Finland**

	The number of researchers,		The number of articles in refereed journals,		The number of discussion papers,		The number of PhD dissertations,	
	Bank of Norway	Bank of Finland	Bank of Norway	Bank of Finland	Bank of Norway	Bank of Finland	Bank of Norway	Bank of Finland
1990	7.1	4	1	5	8	16	1	2
1991	6.5	8	4	6	10	9	0	1
1992	7.0	7	4	8	6	19	1	3
1993	6.3	7	4	2	14	7	0	3
1994	7.3	8	5	10	12	13	1	1
1995	6.8	5.5	3	2	8	9	0	3
1996	6.3	6	6	1	9	13	2	3
1997	8.9	5	4	2	12	9	1	2
1998	8.9	9	7	4	7	16	2	3
Average 1990–1994	6.8	6.8	3.6	6.2	10	12.8	0.6	2.0
Average 1995–1998	7.7	6.4	5.0	2.2	9	11.8	1.2	2.8
Average	7.2	6.7	4.2	4.4	9.7	12.3	0.9	2.3

It may be reassuring to observe that, despite its smaller research input, the output of both discussion papers and doctoral dissertations from the Bank of Finland is larger. With an input of approximately 90 per cent that of the Bank of Norway, the output in terms of discussion papers is one fourth bigger; and the number of PhDs produced by BOF Research Department is two- to three-fold that of Bank of Norway.

This higher productivity is also true on average when it comes to articles in refereed journals. But the average conceals a substantial shift over the period. While the number of refereed journal articles published by BOF researchers exceeded those at the Bank of Norway researchers during the first half of the 1990s, this was reversed during the latter half the period. The figures show that this is partly due to the increase in the Bank of Norway's research output; but the more significant factor is the decrease at the Bank of Finland, where the number of refereed journal articles per researcher declined from 0.9 in the first half of the 1990s to 0.3 in the latter half. The respective numbers for the Bank of Norway increased from 0.5 and 0.7.

Is this further evidence of a shift away from externally refereed publication? Or is there another explanation? Could it be, for example, an "EMU-entry" effect? It has specifically been suggested to us that while economists at the Bank of Finland were heavily involved with the activities related to EMU entry, their counterparts at the Bank of Norway were free to concentrate on more academic activities! This must surely be a contributory factor.

But what of the future, with Finland in the EMU? What might this benchmark suggest about the potential productivity of research resources at the BOF? If, to correct for the EMU-entry effect, one applies the more recent Norwegian rate of production of articles in refereed journals of 0.7 to the number of full time researchers in the BOF Research Department, this gives a potential flow of 6.3 papers per year. This would not, in itself, achieve the doubling the output discussed above: for this productivity in the BOF must return to its level of the early 1990s. But it would if there was some increased publication of PhD research. On this basis, this benchmarking appears to confirm our previous conclusion, namely that the rate of output in refereed journals could be doubled given shift in emphasis towards published output but with no change in the resources involved.

4.2.3 Increasing productivity

Realising the potential of PhD research

The figures of Table 3 clearly indicate that international publishing activities of the Bank's researchers have diminished during the 1990s. This holds for both refereed international journals and other international publications and is hard to reconcile with the strategic objectives of the Bank as stated in Section 1.1.

How can these outputs be increased? One way, we believe, is to increase the output of papers per PhD. At the rate of two papers per thesis, the completion rate of 2.3 indicates a potential for almost five journal articles a year. In the data we examined, however, there were only five refereed publications extracted from 21 dissertations! These are

- Antti Ripatti (1998): "Stability of the Demand for M1 and Harmonized M3 in Finland", Empirical Economics 23, 317–339.
- Timo Tyrvaïnen (1995): "Wage Setting, Taxes and Demand for Labour: Multivariate Analysis of Cointegration Relations", Empirical Economics 20, 271–297.
- Sinikka Salo (1994): "Modelling the Finnish Housing Markets", Economic Modelling 11, 250–265.
- Markku Malkamaki (1994): "The Superiority of Time-Varying Betas in the Finnish Stock Market", Journal of Multinational Financial Management, Vol. 4:1/2. 47–65.
- Alpo Willman (1991): "Why There is a Lower Bound on the Central Bank's Foreign Reserves", Finnish Economic Papers 2:1991, 113–129.

There is an example which illustrates a sustained refereed-journal level of output achieved partly with the benefit of leave at the Research Department, with papers fulfilling the criteria of the relevance for the Bank. This is the so-called article dissertation entitled "Studies in the Theory of Balance-of-Payment Crises" by Alpo Willman. In addition to 1991 paper listed above, it consists of four other papers published in the 1980s. They are

- Willman (1988): "The Collapse of Fixed Exchange Rate Regime with Sticky Wages and Substitutability between Domestic and Foreign Bonds", European Economic Review 32, 1817–1838.
- Willman (1989): "Devaluation Expectations and Speculative Attacks on the Currency", Scandinavian Journal of Economics 91, 97–116.
- Willman (1988): "Balance-of-Payment Crises and Monetary Policy Reactions in a Model with Imperfect Substitutability between Domestic and Foreign Bonds", Economics Letters 26, 77–81.
- Willman (1987): "Speculative Attacks on the Currency with Uncertain Monetary Policy Reactions", Economics Letters 25, 75–78.

In the interviews, difficulties experienced in finding the time needed to develop parts of dissertations into articles for journal submission were often expressed. The same seems to hold for discussion papers as well. Incentives to submit are undermined because researchers felt that they do not have proper guarantees that they are able to revise their work after referees' comments. In principle, revisions could be carried out using two-month secondments; but it is uncertain whether that much time would be needed for revisions or could be arranged at short notice.

5 BOFIT

BOFIT differs from the Bank's Research Department in that it combines a broadly research function, represented by published discussion papers, with a more routine operational function: keeping abreast of developments in Russia, the Baltic States and (tentatively) in China, disseminating information about such developments throughout the Finnish public sector, and providing briefings for officials participating in both bilateral and multilateral meetings. In our view, the balance between research and operational roles is well maintained. The management is flexible, hierarchy is flat, deadlines for regular monitoring/surveillance rigid, and people know that they may have to give up their own time in a crisis.

A BOFIT paper on the unsustainability of Russia's public sector provides very well informed and timely application of the standard methodology for assessing fiscal sustainability – a useful example of policy analysis research. Another example of this type of research is provided by a recent unpublished paper on currency boards comparing the experiences of Estonia, Lithuania and drawing some comparisons to Argentina. A 1999 BOFIT discussion paper on tax evasion and economies in transition considers the pervasive tax evasion of transition economies, with particular reference to Russia and provides an interesting example of policy development research, with recommendations on reform of the tax system to achieve reasonable deterrence of evasion.

Published output of BOFIT is included into publications discussed above, thus Pekka Sutela's book "On the Road to Russian Market Economy: Selected Essays 1993–1998" is among those counted in Table 3. It has to be said, however, that the rate of articles in refereed journals is relatively low, less than one per year since 1994. This may reflect the nature of the transition process itself. We do not have even the framework for a good (inter-) disciplinary theory of transition economies, while the evolving nature of their institutions makes empirical time-

series work difficult and undermines the relevance of feasible panel studies using enterprise data. But there are other factors at work.

Visitors from Russia and the Baltic States also contribute to BOFIT research, but are often unfamiliar with the more demanding aspects of Western academic research. They are a source of information and understanding of developments in their countries and contact with Finnish economists closer to the analytical mainstream helps their own professional development and enhances the potential for fruitful communication of relevant ideas. The products of these visits are often interesting but rarely contribute pathbreaking research.

There was less evidence of interaction with other centres of transition studies except through participation in international conferences. There is quite a lot of activity in Stockholm; and BOFIT should be able to exploit Helsinki's proximity to St. Petersburg and Moscow to attract more academic visitors.

There are specialist academic journals in Transition so that any general shift in policy towards greater encouragement of such publications could appropriately be applied to BOFIT too. We were assured that technical support for this or other more technical types of research by members of BOFIT would be available from within the Research Department; and we assume that would be true of other relevant sections of the Bank.

Areas of priority and comparative advantage

Strategic guidelines

Research is conducted subject to Bank-wide strategic guidelines aimed at influencing debate in both the ECB and Finland. To influence the ECB, these guidelines encourage a focus of research on:

- 1 monetary policy analysis
- 2 new technology in financial services
- 3 banking crisis
- 4 transition economies

For Finnish domestic consumption, research is encouraged which will

- 1 explain ECB monetary policy
- 2 promote discussion of domestic policy options.

Relationship with ESCB

Membership of the ESCB has several implications

- (i) If the Bank of Finland's representatives at ECB meetings are to be as influential as is hoped, they must be able to deploy well-developed analytical arguments. This further emphasises the importance of the Bank's analytical capability highlighted above and has implications for the conduct of research.

- (ii) The need to attend ECB meetings increases the demands on those responsible for the Banks' analytical work. For example, the ESCB forecasting process increases the number of models in play from one to three (though it might be cut back to two) and also calls for intensive discussions with ECB forecasters and counterparts from other Central Banks. This demand may warrant the recruitment of additional resources or their redirection from other parts of the Bank.
- (iii) The emphasis on the national model may change. After the Markka's floating in 1992, the focus of analysis related to forecasts underlying national monetary policy decisions. With Finland's participation in the EMU, forecasting of the effects of ECB decisions on the Finnish economy will be more relevant. The policy reactions to be analysed will now be largely those of other agencies – particularly the fiscal authorities – and it may be appropriate to strengthen these parts of the model(s). There may also be scope for deploying more regulatory instruments applicable to the financial sector. If for example Frankfurt cuts interest rates while asset prices and credit supplies are booming in Finland, higher margin requirements to limit leverage may be appropriate.
- (iv) It is also the case that the ESCB is likely to rely on the Bank of Finland, the Deutsche Bundesbank and the Austrian National Bank for intelligence relating to Eastern Europe; Finland for trade and economic developments in Russia and the Baltic countries; Germany for Russian/Baltic financial issues; and Austria for former Habsburg territories outside the EU.

As far as the BOF contribution is concerned, BOFIT will obviously play a key role. Compared to the units in Austrian National Bank and the Bundesbank, BOFIT's "semi-detached" status is almost certainly out of line. Should BOFIT be brought into a more conventional situation as a constituent of the BOF? We do not think this is necessary. We learned that the role assigned by the ESCB is typically discharged simply by expecting the BOF's regular functional participants in, for instance, the Monetary Operations Committee, to be able to speak to any relevant Russian macro-economic development. This in turn is achieved by the BOF's representative having read recent BOFIT output and having been briefed by BOFIT personnel. Thus any possible anomaly in BOFIT's relation to the BOF should not be a cause of any difficulty with the ESCB.

7 Recommendations

1 Scientific quality of current research, and its relevance to the aims of the Bank

The substantial flow of papers in published form is evidence of a healthy culture of research output and training in the Bank of Finland. But there has been a decline in the output of articles in international, refereed journals. This may be partly due to the temporary diversion of resources due to an "EMU entry" effect; but it also reflects the failure to get PhDs into print in article form. There is, we believe, a tendency to treat discussion papers as final

products. If, as a consequence, light is being left hidden under a bushel, the remedy may lie in Goethe's last words: "Mehr licht"!

We looked at the scientific quality of research currently being produced and concluded that there is clear potential for increasing the output of refereed papers from it. If one in four discussion papers produced at a rate of 30 per year were successfully placed in international refereed journals, together with at least one article per PhD completed, this would be sufficient to double the output of the Bank in internationally recognised form. Benchmarking with respect to the Bank of Norway seems to confirm that this is an achievable target.

To increase the influence of the Bank of Finland on its ECB partners, we strongly recommend publications in refereed journals should be encouraged for papers based on red Discussion Papers and from Doctoral Theses. This would provide useful feedback from referees' reports as well as calibrating the Bank's internal standards against an external yardstick. To make such publication feasible, managers would have to pay sympathetic attention to the needs of authors in complying with editor's requirements for revision.

The Bank also aims to be an influential participant in domestic economic policy debate. We noted, however, a declining trend in Bank economists' publishing activity in domestic journals, with something of a shift from external to internal publications. We conclude that Finnish external publication channels should be used for dissemination more actively than in recent years.

2 PhD training

Most of the doctoral dissertations written in the Bank during the 1990s seemed to us both highly relevant from the viewpoint of the Bank's aims and of good quality. We find that the in-house training has contributed successfully to the development of the Bank's analytical capability and to the production of research relevant to the Bank. We recommend that the Bank continues with in-house training, but follows this up with deliberate efforts to get the research results published in refereed journals.

It might also be worth encouraging promising graduate students to pursue research on themes that are relevant to BOFIT.

3 Dissemination

The corollary of increased emphasis on external journal publication is that the red Discussion Papers be treated as important intermediate outputs and not the as the final product. As regards the dissemination of the Bank of Finland discussion papers, the demand for DPs should be tested by soliciting requests for them either by post or e-mail. A handling charge might be in order. The Bank's economists could also be encouraged to circulate material via CEPR either as research affiliates or by giving papers at CEPR conferences. Researchers at the Bank already have interaction with their academic counterparts both as visiting lecturers and as part time research affiliates. Staff economists could be encouraged to interact more closely with visiting

academics in steps necessary to convert red discussion papers into the form of articles in international refereed journals.

4 Research content

4a Macro-modelling

Economic forecasting with macroeconomic models has played a key role in the Bank of Finland. The macroeconomic model is now in its fifth version, which includes model consistent expectations and a key role for house prices as a measure of future income expectations. Membership in the EMU is already expanding the demands on the macro-modelling group as inputs are required for ECB's area-wide model and multi-country model. In addition, the focus of BOF macro-modelling may need to be adjusted away from monetary policy towards fiscal policy. There are important issues on how to reconcile area-wide limits on fiscal policy with the freedom required for national fiscal stabilisation which need to be explored both analytically and numerically.

Given the goal of the Bank to be the quality leader in the application of quantitative macro-modelling, we recommend that the Bank should look carefully at whether the resources allocated are adequate for the purpose (a comparison to the resources used in the Netherlands or Belgium might be worth making). Increased strategic co-ordination between Economics and Research may be required for best effect.

4b BOFIT

From its origins as an organisation primarily monitoring developments in Russia and the Baltics, BOFIT is already developing useful research capacity, as indicated by the studies of tax evasion, of fiscal (un-)sustainability and of currency boards. To carry conviction with ECB partners, however, we recommend that BOFIT's research function should be given a higher profile. Even in the short run, more advantage could be taken of Helsinki's location to attract other transition specialists as visitors and speakers (possibly in conjunction with WIDER), with their papers circulated by BOFIT and by the CEPR where possible. In the longer run, the research orientation and skills of the staff should be increased – by training courses, for example, and by increased integration with the Research Department.

Promoting the image of the Institute involves the Director of BOFIT in a lot of travel, which leaves less time for research-related activities. More administrative/professional assistance may be required to compensate.

4c Electronic Money, Financial Crises – and the "New Paradigm"

An area where Finland has a global leadership position is in electronic communications, and their use in payment services and banking. Research on network externalities, pricing, market structure and regulation in this rapidly

growing field is a focus of research at the Bank – and this is a topic which will surely be the subject of lively debate at the European level.

Another focus of research is the Scandinavian financial crises – effectively exploiting Finland's painful experience in this area! There surely are important lessons for the rest of Europe here, in particular for the sequencing of financial liberalisation. The Finnish emphasis on transparency and clarity of the rules provides a welcome contrast to the obscurity of the Maastricht Treaty on matters to do with financial supervision and control. As a means for influencing the debate in Europe, we recommend further work in these important topics.

With one telecommunication giant contributing a fifth of exports and almost half the value of the stock market, the scope for accelerations in service sector productivity are surely significant in Finland. There may be a case for exploring, and testing for evidence of, the "new economic paradigm" which is so widely discussed in the U.S. and has implications for macroeconomic management that have increasingly preoccupied Mr. Greenspan.

5 Internal organisation of research

In choosing between the dispersal of research activities in line departments and concentrating them in one place, we note that the Bank of Finland has opted for a compromise solution. There is a strong research Department which is the principle engine of publication in internationally recognised form and of research training; but people can and do pursue two month projects elsewhere. In order to benefit from economies of scale and to establish critical mass, all projects in the Research Department are currently organised under two thematic priorities (monetary modelling and financial services). While we accept that the choice of thematic priorities has helped in concentrating research in policy relevant directions, we believe the structure is too restrictive. We also believe there need to be strengthened incentives outside the research department to promote the release of personnel and the publication of papers in external journals.

We recommend that

- (a) it be in order for complementary projects to be selected outside the strict thematic priorities – analysing the "new paradigm" of faster economic growth stemming from IT innovations in the service sector (discussed above) might be an example;
- (b) more influence be given to other Departmental Heads (and advisers to the Board) at a strategic level in setting research priorities for Bank research: as they have to release the personnel to do research, it is important that they feel responsible for what is being done. Board could get comments of Department Heads on the research programme before it is endorsed annually;

- (c) that explicit recognition be given for external publication in staff appraisal, plus targeted two-month leave periods for a purpose of preparing discussion papers for publication, and also the time to respond referees' reports as and when necessary;
- (d) that there be increased incentives for departmental heads to release staff to research purposes – ideally, funding for replacement.

6 Recruitment

More centralised hiring, probably to include more externally trained PhDs, would facilitate career planning and allow the recruitment or internal provision of economists to replace those assigned temporarily to research projects.

7 External contacts

The Bank already runs a stimulating series of lectures by visiting academics. In addition, some outside academics are employed in the Research Department supervising PhDs and writing papers with staff economists. We noted that the Bank has agreed to research cooperation with RUESG, which will encourage the inflow of further visiting researchers. We support these various initiatives for the role they play in enhancing the scientific quality of the research of the Bank. In particular, the links with CEPR should be maintained and further developed.

8 Research culture

There is currently a most successful research culture at the Bank, which we believe helps to attract and retain staff and increases professional competence. Our recommendations are intended to preserve and strengthen this valuable asset.

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Annex 1

Terms of reference

Evaluation of the research activities of the Bank of Finland: Terms of reference

1. Purpose of the evaluation

The Bank of Finland aims to be an influential partner within the European System of Central Banks. Developing a high-quality research function is seen as essential for achieving this objective. The Bank defines following goals for its research activities:

- The Bank strives for high quality and effectiveness in its economic analysis function by insisting on long-term consistency in the research efforts and by emphasising monetary and economic policy problems of European and global significance.
- The research and analysis of Russian and Baltic economies is to be intensified, and its utilisation promoted, with the aim of developing a research institute of high international standard specialising in transition economics.

To facilitate the achievement of these strategic objectives, the Board of Management of the Bank of Finland has decided to ask for an external evaluation of the research activities of the Bank. The purpose of this evaluation is to provide an objective basis for developing the research function of the Bank further. In particular, the evaluation should yield an assessment of:

- The scientific quality of the Bank's research output as a whole
- The relevance of the research activities from the point of view of the strategic goals of the Bank

2 The evaluators

The bank has invited three experts, John Flemming of Oxford University, Marcus Miller of Warwick University and Mika Widgren of Yrjo Jahnssoon Foundation, Helsinki, to conduct the evaluation.

3 The scope of the evaluation

The evaluation will cover all of the economic research activities of the Bank of Finland, irrespective of the department or unit in which the work takes place. Hence, the evaluators should consider the scientific quality and relevance of research done at the following departments:

- The Research Department
- The Bank of Finland Institute for Economies in Transition
- The Economics Department
- The Monetary Policy Department
- The Financial Markets Department

4 Information base for the evaluation

The evaluation should be based on a broad examination of the research output, as well as interviews with Bank staff. As the Bank has not especially emphasised submission of research for outside publication, and has only recently paid more systematic attention to circulation of its own research publications, citation records will not be a reliable source for the evaluation of research quality.

In addition to all published research reports, which are mostly in English, the evaluators will have free access to internal reports which are relevant to the evaluation of research quality. The evaluators are requested to visit the Bank of Finland in order to obtain the information needed for the evaluation. During the visits, the officials of the Bank of Finland will introduce the evaluators to unpublished research in their respective departments, as well as to research which is originally reported in Finnish.

5 The evaluation report

The evaluation reports should be presented to the Board of Management of the Bank of Finland by the end of August, 1999. The reports will be property of the Bank of Finland and the evaluators undertake not to disclose any part of their reports without the permission of the Bank of Finland. The Bank of Finland will have the right to publish the reports, or parts of them, as it sees appropriate. The evaluators may choose to submit a joint report if they wish.

Additional note

On July 2, 1999 the deadline for the report was extended by the Board of Management until the end of september, 1999.

Annex 2

Organisation of research activities in the Bank of Finland

Organization from June 1,1999

(parts of the organization relevant to the research evaluation exercise)

Matti Vanhala, Governor

Economics Department (*Pentti Pikkarainen*)
(Kari Puumanen, advisor to the board)
(*Antti Suvanto*, advisor to the board)
Forecasting Office (Jarmo Kontulainen)
Economic Policy Office (Anne Brunila)
Monitoring Office (*Veli-Matti Mattila*)
Information Management (Ilkka Lyytikäinen)

Esko Ollila, Deputy Governor

International Relations (incl. EFC and IMF matters)

Matti Louekoski, Member of the Board

Financial Markets Department (Heikki *Koskenkylä*)
(Harry Leinonen, advisor to the board)
(*Ralf Pauli*, advisor to the board)
Market Structures Office (Kimmo Virolainen)
Payment Systems Office (Marianne Palva)

Matti Korhonen, Member of the Board

Research Department (Juha Tarkka)
(David *Mayes*, advisor to the board)
Institute for Economies in Transition (Pekka Sutela)
Statistics Department (*Martti Lehtonen*)
Balance of Payments Office (Harri Kuussaari)
Information Management (Jorma *Hilpinen*)
Banking Statistics Office (Laura Vajanne)

Organization until May 31,1999

(parts of the organization relevant to the research evaluation exercise)

Matti Vanhala, Governor

Monetary Policy Department (*Pentti Pikkarainen*)
(*Kari Puumanen*, advisor to the board)
Planning Office (*Jarmo Kontulainen*)
Monitoring Office (*Laura Vajanne*)

Esko Ollila, Deputy Governor

Financial Markets Department (*Heikki Koskenkylä*)
(*Ralf Pauli*, advisor to the board)
Market Structures Office (*Kimmo Virolainen*)
Payment Systems Office (*Harry Leinonen*)

Matti Louekoski, Member of the Board

Research Department (*Juha Tarkka*)
(*David Mayes*, advisor to the board)
Institute for Economies in Transition (*Pekka Sutela*)

Matti Korhonen, Member of the Board

Economics Department (*Antti Suvanto*)
Forecasting Office (*Hanna-Leena Mannisto*)
Project Office (*Anne Brunila*)
Information Management (*Ilkka Lyytikainen*)
Information Services Department (*Martti Lehtonen*)
Balance of Payments Office (*Harri Kuussaari*)
Information Management (*Jorma Hilpinen*)

Annex 3

Research areas and responsibilities

Research Department

Research programme 1: *Modelling of monetary policy*

Developing techniques for analyzing monetary policy, in particular improving macroeconomic modelling practice and its applicability in monetary policy. The treatment of credibility issues in quantitative analyses being emphasized

Research Programme 2: *The Future of the Financial Services Sector*

Understanding structural changes in the financial services industry and the implications for public policy; technological change (electrification), globalization and competition emphasized. Implications for stability are a central consideration.

Economics training

The Bank library

Institute for Economies in Transition

Russia and the Baltic countries; China being started

- a) Russian economic developments and economic policy
- b) Analysis of monetary, financial and banking developments of transition economies
- c) Public finances in transition economies
- d) EU enlargement

Economics Department (and Monetary Policy Department)

Forecasting, econometric models (BOF5 model used here)

Monitoring of macroeconomic developments

Economic policy, incl. ECB strategy, fiscal issues

Financial Markets Department

Preparation of financial markets and payment systems policy (regulation and oversight)

Statistics Department (previously Information Services Department)

Balance of Payments compilation and related studies

Banking statistics incl. monetary aggregates

Annex 4

Members of staff consulted and acknowledgements

Matti Vanhala
Esko Ollila
Matti Louekoski
Anne Brunila
Jarmo Kontulainen
Mika Kortelainen
Heikki Koskenkylä
Harry Leinonen
Markku Malkamäki
David Mayes
Hanna-Leena Mannisto
Mikko Niskanen
Kaisa-Liisa Nordman
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Jukka Pirttila
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Kimmo Virolainen

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