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SHOULD FINLAND INTRODUCE AN R&D TAX CREDIT? REFLECTIONS BASED ON EXPERIENCE WITH NORWEGIAN R&D POLICY

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ABSTRACT: Subsidies to commercial R&D can be given as R&D tax credits or through direct grants. Tax incentives have become an increasingly popular policy tool over the last decades. In this note I discuss the pros and cons of the two forms of subsidies in light of Norway's experience with R&D policy. I review an ongoing evaluation of the Norwegian R&D tax credit introduced in 2002 and reflect on whether it is desirable for Finland to introduce a similar scheme. I suggest that this is not desirable. If Finland introduces an R&D tax credit, I argue that it should be limited to small and medium sized companies.

KEY WORDS: R&D policy, R&D subsidy, R&D tax credit, Finland, Norway.
JEL: H25, O38.

MØEN, Jarle, **PITÄISIKÖ SUOMEN OTTAA KÄYTTÖÖN T&K:N VEROKANNUSTIMET? POHDINTAA NORJAN TEKNOLOGIAPOLITIIKASTA SAATUIHIN KOKEMUKSIIN PERUSTUEN**. Helsinki: ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 2007, 14 s. (Keskusteluaiheita, Discussion Papers, ISSN 0781-6847; No. 1097).

TIIVISTELMÄ: Yritysten t&k-toimintaa voidaan kannustaa valtion toimesta joko suorin tuin tai verotuksellisin keinoin. Verokannustimet ovat tulleet viime vuosikymmenten aikana yhä suositummiksi. Tässä raportissa analysoidaan näiden kahden kannustinmuodon etuja ja haittoja Norjan teknologiapolitiikasta saatujen kokemusten valossa. Raportissa luodaan katsaus meneillään olevaan arviointiin Norjan t&k:n verohyvitysjärjestelmästä ja pohditaan, olisiko Suomessa tarvetta ottaa käyttöön samankaltainen järjestelmä. Tuloksena todetaan, että t&k:n verokannustimet eivät ole tarpeellisia Suomessa. Jos Suomessa kuitenkin otetaan käyttöön t&k:n verokannustimet, niin ne pitäisi rajata pieniin ja keskisuuriin yrityksiin.

AVAINSANAT: Teknologiapolitiikka, t&k-tuet, verokannustin, Suomi, Norja.

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1 R&D policy tools

Policies to stimulate innovation and economic growth are high on the policy agenda in all OECD-countries. A strong link between research investments and growth is often taken for granted, and many countries have explicit and ambitious goals regarding the economy's R&D intensity.

Setting a goal suggests there is a role for government intervention, and there are many potential market failures in the marked for research and development. In theory these could lead to overinvestment as well as underinvestment, but based on empirical research there is a fairly broad consensus that a free market underinvests in R&D.[1]

There are many policy tools available to improve on the market outcome. First, governments may produce R&D themselves. In my mind, a high quality university sector is the most important of all R&D policy tool. Second, intellectual property right laws are very important. However, the policy of a small, open economy is rather constrained by international treaties in this respect. Third, there are several important links between competition policies and innovation. Fourth, well regulated capital markets are crucial, and there may also be a role for public money in order to secure funding of new ventures. Finally, the government may subsidize R&D investments made by private firms. OECD countries use large sums on R&D subsidies, and it receives much attention in the public debate. However, there is no strong consensus regarding the effectiveness of such policies. Given this uncertainty, the strong emphasis put on R&D subsidies by policy makers is somewhat remarkable.

2 R&D tax credits vs direct R&D subsidies[2]

R&D subsidies can be given as R&D tax credits or through direct grants. Tax incentives have become a popular policy tool over the last decades, and it is a very important supplement to direct R&D subsidies. In both cases the government wants to subsidize private R&D project that would not be undertaken without a subsidy, and where the social rate of return is above the risk adjusted required rate of return on public investments.

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[1] See Griliches (1999) for a broad survey and Wieser (2005) for a recent meta-analysis.

[2] See Hall and van Reenen (2000), David, Hall and Toole (2000) and Garcia-Quevedo (2004) for useful surveys. See also Bloom, Griffith and van Reenen (2002) for an authoritative empirical analysis of R&D tax credits.

If public servants had perfect information, direct subsidies would be the preferred tool. An R&D tax credit would be less efficient as firms then rank projects according to their private returns. Substantial subsidies will be paid to projects that would be undertaken without a subsidy, and where the spillover to other firms or consumers may be small. However, public servants do not have perfect information, and acquiring information is costly. Submitting detailed information is also costly for firms. Administering subsidies through R&D tax credits may be cheaper for both the government and the firms. This is one main advantage. Another main advantage is that R&D tax credits reduce the price on R&D investments. Hence, there is a strong theoretical case for thinking that the R&D investments will increase. With direct R&D grants, firms' first priority will be to get subsidies for projects they would undertake in any case. The degree of "additionality" will depend on the quality of the public servants and the honesty of the firms. Since R&D subsidies are awarded through a discretionary process, it is also more vulnerable to lobbying. This can be a serious drawback. Furthermore, grants are far more vulnerable to politicians' year to year budget constraints and short term priorities. Lack of stability in R&D grants is very unfortunate as firms' R&D investments are strategic and long term decisions with high adjustment costs.

3 Direct R&D subsidies in Norway

Traditionally, Norwegian R&D subsidies have been given as direct grants to firms. The main rule has been programs with "matching grants", where firms are supposed to finance 50 percent of the project they apply for. Research by Klette and Møen (1998) suggest that this own risk money is taken from the ordinary R&D budget and hence would have been spent on R&D anyway. However, firms do not seem to reduce their private R&D budget when they receive subsidies. This makes the "additionality" about one, i.e. one Euro in subsidy makes the firms invest one Euro more in R&D.

Earlier research based on surveys from the 1970s, 1980s and 1990s is summarised in the mimeo by Klette and Møen. A weighted average suggests that 34 percent of subsidized projects would not be done without the subsidy, 48 percent would be scaled down or delayed and 18 percent would be performed in full without a subsidy.

Klette and Møen (1999) and Møen (2004) have evaluated a large Norwegian R&D subsidy program directed towards the IT industry running from 1987 to 1990. Their conclusions are negative. Klette and Møen (1999) use firm level data only. Comparing subsidized and non-

subsidized firms within the high tech industries, they find little evidence in favour of the subsidized firms being more successful. Next, looking at these industries relative to aggregate Norwegian manufacturing, their importance did not increase. Finally, comparing the development of the Norwegian IT industry to the IT industry of other OECD countries, the Norwegian industry did not perform particularly well. Klette and Møen concluded that "the IT-programs were largely unsuccessful". The IT-programs seemed, however, well justified according to economic principles, and Klette and Møen related the lack of success largely to governmental failure such as informational problems and institutional inertia in the agencies heading the implementation of the programs. They note that

> "information is a serious obstacle … exactly which firms and what activities should be coordinated and in what way? These serious questions are very hard to answer in a rapidly developing field such as information technology and might be particularly hard to solve in a small open economy where a large majority of the innovations take place abroad. We believe that industrial innovation is an activity where coordination problems and 'market failure' often are pervasive, but it is probably also an activity where policy makers and bureaucrats often lack the information needed to improve on the market solution.

They also note that

> "coordination problems created by complementary innovative activities across different firms seem in many cases to be at least partly resolved by private institutions such as industry associations, privately funded research joint ventures and other cooperative research agreements."

The program period analysed coincided with a sever recession, and also a technology shift from mini-computers to PCs and open standards. This could be exogenous reasons why the program looked like a failure. Claims have been made that the growth of the Norwegian IT-industry in the late 1990s was stimulated by knowledge built up in formerly subsidized firms. In particular, employees of the fallen industry leader, Norsk Data, have been pointed to as key contributors in a new generation of successful firms.[3] In this case, the evaluation by Klette and Møen may have underestimated the effect. Following up on this, Møen (2004) uses matched employer-employee data and trace workers out of the subsidized firms in order to investigate possible spillovers through labour mobility. The analysis show that scientists and engineers with experience from subsidized IT-firms to a much larger extent than other scientists and engineers in high-tech industries migrated to the rapidly growing IT service industry. They have not performed badly, but there is no evidence indicating that these

[3] Norsk Data was the last IT company in a series of 'national champions' actively promoted by the Norwegian government.

scientists and engineers played a particularly prominent role in the growth process, either. Nor do spin-off firms from the subsidized firms perform particularly well. In fact, they seem to have performed below, rather than above, average. One possible explanation for these discouraging results is that the technology shift in the late 1980s rendered much of the intellectual human capital built up under the programs obsolete.

Another Norwegian evaluation project has been run by professor Arild Hervik at Møre Research. Hervik's group has for many years collected data from so-called user oriented research projects subsidized by the Research Council of Norway. Basically they have been asking firms what they would have done in absence of subsidies, what profits have been realized and what they expect from the subsidized projects in terms of future profits. Hervik, Bræin, Bremnes and Bergem (2006) report that for the year 1997 to 2005, 45 percent of the firms say that their R&D project would have been abandoned without the R&D subsidy. 2 percent say the project would have been carried through without any changes, and 52 percent say the project would have been carried out at a smaller scale or with a delay.

Hervik et al summarize their main results as follows:

> A principal finding is that a few projects have the potential to generate private sector returns greater than the cost of all projects surveyed. Actual development of competence, new technologies and networking are often more important to the companies than private sector returns in the long run. The projects contribute to the creation of new knowledge; publication of scientific articles, PhD theses and co-operation between universities and research institutes, showing that there are positive external effects. Half of the projects would not have been realized without support and more than 140 projects (with full additionality) started in the period 1995-2002 are reported to achieve a net present value of NOK 2.4 billion. The private sector returns are much higher (NOK 8.4 billion) if we include projects with low additionality. However, without support the projects would be reduced and the potential for external effects would be diminished. The Research Council's project evaluation system (Provis) appears to be a well functioning tool for selecting good quality projects for support.

Obviously, a key identifying assumption behind this research is that the firms are both able and willing to reveal the profitability of the individual projects, and what they would have done in absence of a subsidy.

4 The introduction of an R&D tax credit in Norway

Introducing an R&D tax credit in Norway was proposed by the Hervik Committee in a green paper for the Ministry of Trade and Industry (NOU 2000:7). The committee was appointed to

suggest policy measures aimed at encouraging industry to invest more in R&D. The Norwegian Parliament had earlier in 2000 agreed to make increased R&D investments a national priority, and decided that R&D relative to GDP should at least reach the OECD average by 2005. This illustrates a general point. Generous R&D tax credit schemes are often introduced in countries with low R&D investments by international standards, and where the sentiment is that "something needs to be done".

The Hervik committee suggested using R&D tax credit as one of several policy tools to stimulate R&D investments. They emphasized that the R&D tax credit they proposed would be administratively simpler and more robust to informational problems than direct subsidies. It was meant to be the main policy tool towards small and medium sized firms (SMEs). The Research Council should in the committee's opinion focus on R&D of strategic importance and spend their resources evaluating large project. They also emphasized that an R&D tax credit would give more stable conditions for the business community than direct subsidies. The total subsidy would not be subject to annual budget debates, and the detailed regulations would be embedded in the general tax code.

The tax credit scheme, called SkatteFUNN, was introduced in 2002.[4] When it was introduced, some grant-based incentives were scaled back. SkatteFUNN implies that firms can deduct from tax payable a certain amount of their R&D expenditures. Firms are entitled to the tax credit as long as the R&D-project has been approved by the Research Council of Norway.

Originally, only SMEs were eligible, but already in 2003 large enterprises were included as well. Large enterprises may deduct 18 percent of expenses related to an approved R&D project in taxes owed. For smaller enterprises, 20 percent deduction is possible if the following conditions are fulfilled: (i) Fewer than 250 employees, (ii) an annual turnover not exceeding Euro 40 million or an annual balance sheet total not exceeding Euro 27 million and (iii) less than 25 per cent of the company is owned by a large enterprise. The distinction between large and small enterprises is due to EU/EEA state aid rules. The maximum allowable sum for R&D projects conducted by the enterprise itself, is NOK 4 millions per year (about Euro 500 000). In cases where enterprises collaborate with an approved R&D

[4] The following description borrows at some places directly from OECD (2007, p. 112), Cappelen, Raknerud and Rybalka (2007, Appendix A) and http://web.skattefunn.no/index.php?kat=English.

institution (universities and institutes), the maximum sum is NOK 8 millions. Stimulating cooperation between academia and commerce is considered an important objective.

In order to qualify under the scheme, a project must be limited and focused, and it must be aimed at generating new knowledge, information or experience which is presumed to be of use for the enterprise in developing new or improved products, services or manufacturing/processing methods.

There are no regional or sectoral constraints. Enterprises that are not currently liable for taxation also are eligible. If the tax credit exceeds the tax payable by the firm, the difference is paid to the firm like a negative tax or a grant. If the firm is not in a tax position at all, the whole amount of the credit is paid to the firm as a grant. In practice this has turned out to be a very important feature. The payment is done when the tax authorities have completed their tax assessment, and takes place the year after the actual R&D expenses have occurred. The R&D tax credit is thus neutral as between qualifying projects, regions, sectors and the tax position of qualifying firms, but lowers the marginal cost of R&D in small enterprises or low R&D spenders more than in larger ones.

As from the fiscal year 2007, a maximum hourly rate and a maximum number of hours per year for in-house R&D personnel has been introduced. The ceiling for payroll and indirect expenses has been set at NOK 500 per hour. Up to 1850 hours per year may be approved per person associated with the project. This has made the scheme slightly less generous.

The Norwegian Parliament has decided to include financial support to unpaid labour in R&D activities in the tax credit scheme as well. This way they hope to reach high tech entrepreneurs that do not draw wages from their firms. The amendment needs to be approved by the EFTA Surveillance Authority (ESA), and a decision is expected by September 2007.

When the Norwegian parliament decided to introduce the R&D tax credit, it also decided that the scheme should be evaluated. This evaluation is carried out by Statistics Norway and includes the following aspects:

- The scheme’s ability to stimulate extra R&D effort and change firms’ R&D behaviour
- The scheme’s effects on innovation and value creation in firms
- The scheme’s user friendliness

- The scheme's administrative costs for users, tax authorities, the Research Council and other public agencies
- The scheme's effect on R&D cooperation between firms and research institutes
- The relation between the R&D tax credit scheme and other R&D incentives
- How the Norwegian scheme compares to R&D tax credit schemes in other countries, and the experience other countries have with such schemes[5]
- The quality of the projects supported under the scheme and the extent to which they are tax motivated (including reclassification of other costs)

The final report is due at the end of 2007.

5 Preliminary assessments[6]

The Norwegian R&D tax credit has been very popular in the business community. This is perhaps not surprising – tax deductions usually are.

The number of applications received by the R&D tax credit secretariat has varied. In the first year, 2002, there were 3300 applications. When the scheme was made universal in 2003 the number increased to 4700 applications, but thereafter it has gradually fallen. In 2006 there were 2600 applications. About 30 percent of the applications are either rejected or withdrawn. Some of the applications are for projects that last for several years, and the number of projects has varied between 5000 and 6000. The total R&D expenses under the scheme have also been fairly stable. The total budget for approved applications has been about 1.1 billion Euro per year. Around two thirds of the R&D expenses are personnel costs. Very few projects are designed as cooperation projects between firms or between firms and a research institute.

In 2005, the total tax deduction was 135 million Euros. Out of this as much as 100 million Euros was paid out as a grant from the tax authorities to firms that were not in a tax position or would have paid less in taxes than their R&D tax relief. This illustrate that the scheme is particularly popular with small and newly established firms. Roughly 85 percent of all approved projects are undertaken by firms with less than 50 employees. 50-60 percent of the applications are from firms with less than 10 employees. In 2005, these firms performed 45 percent of the total R&D expenses under the scheme. The high R&D activity in this segment

[5] A report on this is already published, see Cappelen and Soland (2006). The report is in Norwegian.
[6] See Cappene et al (2005, 2006 and 2007) for a summary of the research performed by the evaluation team in Statistics Norway. If no explicit reference is given, the numbers in this subsection is collected from these reports.

is interesting as the annual R&D statistics from Statistics Norway has not included firms with less than 10 employees. This implies that we lack historical data for an important user group, and obviously this complicates the evaluation.

For all firms receiving subsidies through the R&D tax credit scheme, the average subsidy is about 1000 Euros per employee. Average tax per employee for the same firms in absence of the subsidy would have been 2300 Euros. Hence, in these terms, the subsidy is rather substantial.

13 percent of all manufacturing firms used the R&D tax credit in 2004, but only 1 percent in construction and most service sectors. Within the service sector, firms using the tax credit are concentrated in two industries, computing (NACE 72) and consulting (NACE 74.1-74.4).

Cappelen et al (2007) report results from an analysis of the probability that a firm will apply for the R&D tax credit. Not surprisingly, they find that the share of highly educated employees is a very important predictor. They also find that young firms are overrepresented, and that firm size is important. Firms with 50-100 or above 100 employees have the highest probability of applying for the tax credit, depending on the industry. Labour productivity is not significant. Interestingly, whether or not the firm is in position to pay a revenue tax seem to affect the decision to apply for SkatteFUNN. The scheme seems particularly attractive to firms that will receive the tax credit as a grant.

In a recent survey, OECD (2007, p. 112) describes the Norwegian R&D tax credit scheme as rather generous by international standards. The OECD's "B-index" calculations averaged about 22 percent in 2006. This is well above the OECD average and exceeded only by Canada, the Czech Republic, Portugal, Mexico and Spain. Direct government funding of private R&D in 2004 was 0.11 percent of GDP in Norway. This is close to the OECD average, but well above the median.

The OECD survey makes some normative comment about the scheme:

> The broadly neutral construction of the Skattefunn is a point in its favour, especially in Norway where there is a long tradition of including regional, social and sectoral goals in industrial policy. Of course, lower taxes on firms have to be compensated by higher taxes elsewhere. It is also possible that firms now claim tax credits against spending that they

> would not previously have classified as R&D. There is also the question of additionality, to what extent the tax credit generates genuine additional R&D that would not have taken place in its absence. The effectiveness of the Skattefunn in stimulating additional private R&D is currently under evaluation. It is relevant, although by no means conclusive, that the tax expenditure over the 2002-2004 period amounted to NOK 3.4 billion, equivalent to more than € 400 million, while recorded business R&D spending, which is erratic, did not rise. Preliminary data shows that nominal spending on private R&D recovered some what in 2005, but remained slightly below 2003 levels. Finally, there is the possibility that even if the tax credit stimulates genuine additional R&D, the tax expenditures could have been better used in other areas.

As noted by OECD, the effectiveness of SkatteFUNN in stimulating additional private R&D is under evaluation. A preliminary report on the additionality issue has been published by Statistics Norway. Among firms that previously have reported R&D investments, Hægeland, Kjesbu and Møen (2006) find that firms receiving an R&D tax credit in 2003 have stronger growth in their R&D investments from 2001 to 2003 than firms not receiving an R&D tax credit in 2003. Obviously, this can be driven by selection. Since the scheme is universal it is very challenging to construct a valid control group. The most promising identification strategy is to compare applicants that previously have invested less than the NOK 8 million threshold with firm that previously have invested more than this threshold. Since R&D investments are fairly stable, the latter group should not have a strong incentive to increase their R&D investments because of the R&D tax credit. An increase in their R&D investments will not affect their total subsidy. Only firms that would invest less than the 8 million threshold in absence of the tax credit have their marginal R&D cost affected.

Hægeland, Kjesbu and Møen find that firms that previously invested less than the threshold increase their R&D investments from 2001 to 2003 more than firms that previously had investments above the threshold. They also find that firms that previously did not invest in R&D are more likely to start investing in R&D after the tax credit was introduced. In sum, the empirical evidence is consistent with the Norwegian R&D tax credit being effective in stimulating private R&D investments, but making causal inference is problematic. Furthermore, the report does not attempt to quantify the effect. A more extensive econometric analysis will be undertaken in the fall of 2007.

The econometric analysis has been complimented by a questionnaire survey. Foyn and Kjesbu (2006) report that 22 percent of firms with projects that were rejected, completely abandoned their projects. 24 percent of the firms went through with the project without any changes. The

remaining 54 percent were carried through, but at a smaller scale or with a delay. 30 percent of firms with rejected projects agree that SkatteFUNN has made them more focused on R&D. For firms that had their projects accepted, the question of additionality is more hypothetical. 15 percent say that the project would have been abandoned without the tax subsidy. 13 percent say the project would have been carried through without any changes. The remaining 72 percent say the project would have been carried out at a smaller scale or with a delay. The response is consistent with the econometric analysis, and in line with the results from similar questionnaires regarding direct R&D subsidies summarized in Klette and Møen (1998). The reported additionality in SkatteFUNN is, however, far below what Hervik et al (2006) report based on their survey of firms that have received user oriented direct R&D subsidies in the years 1997-2005.

Cappelen, Raknerud and Rybalka (2007) analyse the effects of SkatteFUNN on firm performance. They use two different econometric approaches. The first is the standard approach, where a measure of productivity or innovative activity is regressed on firm specific variables including R&D. Their results are generally in line with the international literature. "R&D spending stimulates productivity growth at the firm level even after controlling for a number of possible effects relating to industries, types of innovation, common shocks etc." The effect of the tax credit is generally not significant. Their interpretation is that the productivity effect of SkatteFUNN is similar to that of ordinary R&D and captured by the total R&D variable. This is a somewhat promising finding, as SkatteFUNN offers a subsidy for marginal R&D projects. Hence one would expect that the return on a tax financed project on average should be less than the return on an ordinary R&D project.

When measuring productivity, and in particular total factor productivity, a number of assumptions have to be made in order to convert a latent productivity variable into an observable entity. Using a more structural model for firm performance, where the productivity process is considered as an unobservable process that depends on the tax credit, Cappelen, Raknerud and Rybalka find that the tax credit *do* lead to an increase in productivity, but that the rate of returns to the tax credit, considered as a marginal investment in these firms, is small — about 4 percent in 2004. They emphasize that the results are highly preliminary and based on a very short panel.

6 If it ain't broken, don't fix it?

The Norwegian R&D tax credit was introduced with the goal to increase innovation and creation of values in trade and industry, and to improve R&D efforts. It has been, and still is, somewhat controversial. It is embraced by the business community and the Research Council of Norway, but less so by the Ministry of Finance. The Ministry dislike a subsidy scheme where the annual costs are unknown in advance. The governing Social Democratic Party has also been sceptical, as its members tend to favour "hands on" industrial policies.[7]

The evaluation of the five year old scheme is not completed. I have an open mind regarding its overall efficiency. As I read the preliminary results, there is so far nothing to indicate that the scheme is more, nor less efficient than direct subsidies. It seems clear, however, that its appeal to small firms is far stronger, and the scheme has also revealed that there exist a fairly large segment of very small, R&D performing firms. I doubt that the empirical evidence building up will be conclusive in the short run. When concluding the evaluation it seems reasonable also to draw on theoretical considerations, the experience from other countries and to put some weight on continuity in the R&D policy in order to enhance a stable business environment. With respect to Finland, this reasoning probably suggests that one should not introduce a tax credit. The R&D intensity in the Finnish economy is high by international standards and there is little to indicate serious flaws in the current policy regime. See e.g. the evaluation report by Georghiou, Smith, Toivanen and Ylä-Anttila (2003) and the survey by Toivanen (2006). In my view, there is not much evidence to suggest that an R&D tax credit would perform significantly better.

Even tough I hesitate to advocate a reform it may be worthwhile to think through what arguments there may be in favour of introducing an R&D tax credit in Finland. If asked to build a case for introducing a tax credit, I would question whether the current regime is functioning as well as previous evaluations suggest. There is likely to be a lot of vested interest and political economy in a regimen with direct R&D subsidies. The bureaucrats administering the grants and the firms receiving the grants are both likely to agree that the current state of affairs is good. With the transformation of the Finnish economy over the last decades generally considered to be an international success story, it is hard to argue against such a view. However, a high R&D intensity and the success of Nokia do not imply that the

[7] See the weekly business newsletter Mandag morgen April 24th 2006 pp. 6-8 "SkatteFUNN-bedrifter øker forskningen mest".

current policy cannot be improved upon. It could well be that small firms and firms not yet established receive less support than what is optimal, and that more support to small high-tech firms could make the Finnish economy grow faster and be less vulnerable in the long run. Obviously small and newly established firms – in particularly "unborn" firms – do not constitute a powerful pressure group, and I think the Norwegian experience with large scale R&D subsidy programs illustrates that a policy with direct grants easily creates political economy processes. I also think that the Norwegian experience with the R&D tax credit illustrates that this scheme has a better potential if one aim to target small firms.

All this being said, I think the importance of both direct R&D subsidies and R&D tax credits is somewhat overemphasised in the policy debate. While well justified according to economic principles there is little empirical evidence suggesting that these policy tools matter a lot in practise. Clearly there are severe methodological challenges when trying to evaluate the effects, but on the other hand significant resources has been devoted to resolve the question.[8] I think subsidies to commercial R&D have its mission, but it is of second order importance. What we do know as economists is that the quality of the education system, the general tax system, competition policy, intellectual property rights and capital markets all are very important drivers of growth. Those who believe firmly in the importance of specific R&D policies may point to Finland as a success story, but I suspect that the success of Finland is mostly a combination of a good education system, a good general business climate and, in the case of Nokia, a large portion of good luck. After all, most countries have tried to achieve what Finland has achieved in its high-tech sector, but there are only a handful of companies like Nokia in the world. Good policies by itself can hardly make this happen, although bad policies obviously can make it *not* happen.

If Finland decides to introduce and R&D tax credit, my recommendation would be to introduce a scheme limited to small and medium sized firms. There are two important arguments against introducing a universal scheme. First, for small firms, one wants a scheme that is administratively simple and robust in terms of what information it demands. For large firms, the market failure in terms of liquidity restrictions and lack of competence is likely to be smaller, and one should be more concerned with targeting projects that combines a low private return with large externalities. This can only be done by an individual assessment of

[8] See David, Hall and Toole (2000), Hall and van Reenen (2000), Klette, Møen and Grilliches (2000), Jaffe (2002) for surveys.

the project descriptions by experts. Second, it is very hard to evaluate the effect of a universal scheme. The way the Norwegian tax scheme worked in 2002, the year it was introduced, was ideal from an evaluation perspective. If this regime had continued long enough to generate usable data, one could have constructed a control group of firms just above the size threshold in terms of employees, turnover or total balance. Whether one has a system with direct grants or a tax credit, I firmly believe it is necessary to build the evaluation perspective into the design of the scheme.[9] That way, even a policy that do not work will have some value as it becomes possible to learn from the failure and introduce better polices in the future. This is an aspect of R&D policies that is largely ignored by policy makers.

[9] See Jaffe (2002).

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