Potential Implications of Providing Tax Incentives for Research and Development in NZ

A Report for the Royal Society of New Zealand
February 2004
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Acknowledgment: I wish to express my gratitude to my research assistant, Nicola Gundry, for her valuable contribution in searching the literature, reading and synthesising the information, and providing me with useful summaries of many of the studies.

INTRODUCTION

The objective of this study is to assess the implications of providing tax incentives for research and development (R&D) expenditure in NZ.

Section one of the research report involves a review of taxation law in Organisation of Economic Cooperation and Development (OECD) countries (a total of 30 members) with respect to R&D, including those with common law and civil law systems. This review identifies appropriate overseas examples applicable to NZ, with key aspects of the taxation law regarding R&D expenditure in these countries reviewed in detail.

Section one also assesses accounting practice with respect to R&D expenditure, where it is ascertainable. Consideration of accounting practice is important as in countries with common law (not civil law) jurisdictions, the tax and accounting systems differ, whereas in civil law jurisdictions they are closely linked. For example, in Australia there is a 125 percent (previously 150 percent) tax incentive for R&D expenditure but it is unclear if the 25 percent (previously 50 percent) above actual expenditure is tagged and thus could be spent on things other than R&D.

Furthermore, section one provides information, where ascertainable, on the history of tax incentives for R&D and how these have changed, including the motivation behind these changes, as this may reveal the context of the change and thus its potential effectiveness.

Section two provides some detail on the impact of tax breaks on the level of research and development expenditure. While it was originally envisaged that information for this section could be obtained partly through examination of selected case studies of R&D regimes, including analysing selected company accounts to assess the expenditure on R&D over time and how changes in taxation rules have influenced this, such information was not readily ascertainable from a small sample of company accounts that were examined – R&D is not usually a separate item that is required to be identified (the exception being the United States) and in fact it may comprise a number of different types of expenses. Hence it also has not been possible to review New Zealand data to assess the change in R&D expenditure over time alongside the taxation rules.

Section two does provide some analysis of the effectiveness of changes in research and development expenditure on output from international experience, using summaries of overseas studies. While this study was not able to examine directly whether tax breaks encouraging links between private sector and public sector organisations (the private sector obtaining a tax break and the public sector organisation (including universities) receiving

additional resources), has been effective in increasing the level of research expenditure, several jurisdictions have mechanisms in place to encourage such partnerships – some comment on specific country regimes is made in section one.
Section three sets out key findings, concluding comments and recommendations.

SECTION 1. OVERVIEW OF COUNTRY TREATMENT BY OECD MEMBER COUNTRIES

The OECD currently comprises 30 member countries and as the first part of this study, a brief overview is provided primarily of the tax treatment of research and development (R&D) expenditure for those countries where information was able to be obtained from public sources, and in addition on accounting treatment of R&D, again where information was able to be obtained through the literature searches.
In civil law countries, the taxation and accounting systems are essentially integrated and hence there is no significant difference in the treatment of R&D for tax and accounting purposes. In many common law countries, this is also true, except for where tax incentives are provided, such as for accelerated deductions and accelerated depreciation of capital assets.
As an introductory observation, New Zealand's position in terms of general expenditure on R&D does not fare well in comparison to many other OECD nations, falling below the average. The following table, taken from a 2003 Department of Finance/Revenue Canada survey (prepared by Lomno and Anderson, 2003, p 28) of gross domestic expenditure on R&D as a percentage of GDP, reflects NZ's position and is set out below in Table 1:

Table 1: Composition of General Expenditures on R&D of OECD Members

Annex 1: Composition of General Expenditures on Research and Development of OECD members

Components of Gross Domestic Expenditures on Research and Development (GERD)
All OECD members, 1989 and 1999

	As a percentage of GDP				As a percent of GERD			As a percentage of GDP				As a percent of GERD		
	1989							1999						
	Total	BERD	GOVERD	HERD	BERD %	GOVERD %	HERD %	Total	BERD	GOVERD	HERD	BERD %	GOVERD %	HERD %
Australia	1.27	0.52	0.41	0.33	41	32	26	1.51	0.64	0.35	0.44	42	23	29
Austria	1.35	0.79	0.10	0.44	59	7	33	1.83	1.14	0.12	0.53	62	7	29
Belgium	1.64	1.10	0.10	0.42	67	6	26	1.96	1.40	0.06	0.47	71	3	24
Canada	1.47	0.74	0.28	0.44	50	19	30	1.80	1.02	0.22	0.54	57	12	30
Czech Republic	..	..	..	..	..	..	..	1.25	0.79	0.30	0.15	63	24	12
Denmark	1.51	0.83	0.29	0.37	55	19	25	2.09	1.32	0.32	0.42	63	15	20
Finland	1.80	1.11	0.33	0.35	62	18	19	3.22	2.19	0.37	0.63	68	11	20
France	2.29	1.38	0.55	0.34	60	24	15	2.19	1.38	0.40	0.38	63	18	17
Germany	2.86	2.07	0.37	0.41	72	13	14	2.44	1.70	0.34	0.40	70	14	16
Greece	0.37	0.08	0.16	0.13	22	43	35	0.67	0.19	0.15	0.33	28	22	49
Hungary	..	..	..	..	..	..	..	0.69	0.28	0.22	0.15	41	32	22
Iceland	1.01	0.20	0.50	0.25	20	50	25	2.33	1.09	0.70	0.49	47	30	21
Ireland	0.80	0.47	0.14	0.18	59	18	23	1.21	0.88	0.07	0.26	73	6	21
Italy	1.24	0.73	0.27	0.24	59	22	19	1.04	0.51	0.20	0.33	49	19	32
Japan	2.70	2.01	0.23	0.34	74	9	13	2.94	2.08	0.29	0.44	71	10	15
Korea	..	..	..	..	..	..	..	2.47	1.76	0.36	0.30	71	15	12
Mexico	..	..	..	..	..	..	..	0.40	0.11	0.13	0.16	28	33	40
Netherlands	2.04	1.21	0.35	0.44	59	17	22	2.02	1.14	0.33	0.53	56	16	26
New Zealand	0.87	0.28	0.42	0.17	32	48	20	1.11	0.31	0.37	0.48	28	33	43
Norway	1.69	0.96	0.33	0.41	57	20	24	1.70	0.95	0.26	0.49	56	15	29
Poland	..	..	..	..	..	..	..	0.75	0.31	0.23	0.21	41	31	28
Portugal	0.46	0.12	0.13	0.16	25	28	35	0.75	0.17	0.21	0.29	23	28	39
Slovak Republic	..	..	..	..	..	..	..	0.68	0.43	0.19	0.07	63	28	10
Spain	0.72	0.41	0.16	0.15	57	22	21	0.88	0.46	0.15	0.27	52	17	31
Sweden	2.83	1.85	0.11	0.87	65	4	31	3.78	2.84	0.13	0.81	75	3	21
Switzerland	2.83	2.12	0.12	0.56	75	4	20	2.64	1.95	0.03	0.62	74	1	23
Turkey	..	..	..	..	..	..	..	0.63	0.24	0.04	0.35	38	6	56
United Kingdom	2.15	1.49	0.30	0.33	69	14	15	1.88	1.25	0.23	0.37	66	12	20
United States	2.62	1.88	0.29	0.38	72	11	15	2.66	1.99	0.21	0.37	75	8	14
Total OECD	2.26	1.56	0.29	0.36	69	13	16	2.21	1.53	0.24	0.38	69	11	17

Source: OECD, Main Science and Technology Indicators (MSTI) database, July 2002

BERD – Business Expenditures on R&D
GOVERD – Government Expenditures on R&D
HERD – Higher Education Expenditures on R&D (includes R&D activities in research hospitals)
Private Non-profit Expenditures on R&D are only included in the total R&D figure

Source: Lomno and Anderson (2003)

A brief summary is now provided for each of the 30 members of the OECD plus Singapore, where information is available on the tax treatment of R&D expenditure.

AUSTRALIA

Currently Australia offers a deduction equal to 125 percent of R&D current expenditures (previously this was 150 percent until June 1996); that is, an extra 25 percent deduction over and above the actual expenditure. The scheme commenced in 1985 with the aim of improving Australia's investment in R&D. It was intended to be temporary only, originally due to expire in 1991. In summary, in order to qualify for the 125 percent deduction, annual R&D current or capital expenditures must generally exceed A$20,000. Subject to the same minimum expenditure threshold applicable to R&D current expenditures, Australia allows 125 percent of the amount of R&D capital expenditures to be written off over three years on a straight-line basis. R&D is generally defined as core technology/ part of core activity. There is no restriction or limit placed on how the tax benefit of the R&D expenditure may be utilised, although it is anticipated that some of it at least will be utilised for further R&D. "The objective of the [125] percent tax concession is to encourage Australian companies to be more innovative and internationally competitive by:

- increasing companies' investment in R&D;
- encouraging better use of Australia's existing research infrastructure;
- improving conditions for the commercialisation of new process and product technologies developed by Australian companies; and
- developing a greater capacity for the adoption of foreign technology." (Industrial R&D Board, 1995, p 43).

The tax concession provides a concessional deduction for all eligible R&D expenditures of 125 percent (150 percent up to June 1996). It currently has the following features:

- Current expenditure may be deducted at a rate of 125 percent of costs in the year in which it is incurred. Current costs include wages, salaries and other labour costs directly related to R&D activity, and contracted R&D with registered research agencies. Interest on debt and non-consumed feedstock in pilot plants were allowable elements in current expenditure up until June 1996, but have now been barred as deductions at the concessional rate.
- Equipment used for R&D may be depreciated over three years and deducted at a rate equal to 125 percent of the deduction that would otherwise apply.
- Pilot plant will be written off over its useful life to a maximum of 125 percent of its cost (whereas prior to the 1996 amendments, pilot plant was written off over three years at 150 percent);
- Any company wishing to make an R&D claim to the Australian Taxation Office (ATO) must be registered with the Industrial R&D Board. Application for registration with the Industrial R&D Board must be made within six months of the end of the financial year in which the R&D expenditure was incurred.
- Deductions for core technology expenditure are to be limited to one-third of the expenditure per annum on eligible R&D relating to that core technology. Amounts not deducted in the year of income will be available for deduction in later years if there is further related eligible R&D expenditure (whereas prior to the amendments in 1996, core technology purchases were immediately expensed at 100 percent).
- Buildings used for R&D may be depreciated over the standard period of 40 years, but with no other concessional treatment (although prior to 1987 buildings dedicated to R&D could be depreciated over 3 years at 150 percent).

- The expenditure threshold for qualification for the full 150 percent tax deduction is A$ 20,000 (A$ 50,000 prior to May 1994).
- There must be a high degree of technical risk – that is, there must be some uncertainty over what the results of the R&D will be.
- It must be innovation – with an appropriate level of novelty.
- It must, in main, be carried out in Australia, with adequate Australian content. For example, the key personnel and the major items of plant and equipment must be Australian.
- The results must be exploited on normal commercial terms and for the benefit of the Australian economy. This excludes arrangements such as umbrella technology agreements in which the results of R&D carried out in Australia are provided free to an overseas parent company.

The requirement that taxpayers must register for R&D activities with the Industrial R&D Board to qualify for the R&D deduction is set out in ss 73B to 73Z of the ITAA 1936, which deal with the R&D deduction. Special rules by way of an exception to the general rule apply if the company does not have money at risk, whereby the deduction is limited (NZ has just introduced similar rules for expenditures of all types, not R&D specifically).
From 30 June 2001 a taxpayer can deduct an extra 50 percent on top of the bonus deduction if the incremental levels of R&D are greater than the three year average. This feature was introduced to encourage companies to look at R&D as a long term strategy, as a critical and ongoing part of business strategy. This would support successful management of R&D.
The definition of R&D eligible for the concession is similar to that given in the OECD's Frascati Manual. There is also a need for detailed records of all expenditure and the plan for R&D expenditure and investment needs to be approved to claim the deduction. There is also a claw back provision in the case that the company receives a government grant. A company is not eligible for the credit if it is carrying out R&D on behalf of another company, thereby restricting double deductions. The entity that is permitted to claim the deduction is determined by who bears the financial risk. Small companies are allowed a R&D tax offset equivalent to the above concessions.
Recommendation: The Australian system is worth considering further for New Zealand.

AUSTRIA
Expenditure related to the development or improvement of inventions useful to the economy is deductible at a rate of 125 percent if it is an amount below the three year previous average and 135 percent if it is above.
A typical silent partnership can be considered as the investment model for Hi-tech companies. The advantages of such investments are obvious – the State waives part of its right to income tax if this money is invested in Hi-tech companies. This lower taxation advantage for the private person has a positive effect on the economy in that it increases the R&D quotient (1.95 percent of the Gross National Product; Planned to be 2.5 percent for 2005, per a 2002 study) and thus strengthens the degree of innovation in the country. Overall, the effect is that Hi-tech in Austria is stimulated through tax- breaks.

BELGIUM
Belgium is not at the top of the OECD table for R&D investment. However, it uses a somewhat unique system of an exemption for staff members conducting scientific research of 11,510 Euros. This amount is increased if highly qualified (10 years experience and doctorate degree) to 23,590 Euros. The amount is indexed every year. Belgium also has an

investment allowance which allows newly acquired assets to be deducted from the tax base at an accelerated rate.
Furthermore, for an entity to make a claim, it has to prove that the researcher has been involved in R&D activities **on a full time basis**. In addition, activities for the development of the technological potential of the company are also allowed for this allowance. In any case for each year the tax allowance is granted it is important to note that this relief is never permanently secured by the company. For each subsequent year, the company has to deliver an attestation that the researcher in question is still working on a full time basis in the research department of the same company. Failure to comply with the regulation results in the loss of the previously obtained exemption. This causes the taxable income of the company to increase proportionally so that the company is liable to pay taxes on the previously obtained exemption in the year that the researcher leaves.

CANADA
The Canadian system was established in 1986. The amount of R&D expenditure is fully deductible and there are also tax credits. Claimants can apply for Scientific Research and Experimental Development (SR&ED) investment tax credits for expenditures such as wages, materials, machinery, equipment, some overhead, and SR&ED contracts. To qualify for the SR&ED program, work must advance the understanding of scientific relations or technologies, address scientific or technological uncertainty, and incorporate a systematic investigation by qualified personnel.
Work that qualifies for SR&ED tax credits includes:

- **experimental development** to achieve technological advancement to create new materials, devices, products, or processes, or improve existing ones;
- **applied research** to advance scientific knowledge with a specific practical application in view;
- **basic research** to advance scientific knowledge without a specific practical application in view; and
- **support work** in engineering, design, operations research, mathematical analysis, computer programming, data collection, testing, or psychological research, but only if the work is commensurate with, and directly supports, the eligible experimental development, or applied or basic research.

The following activities are **not** eligible for benefits under the program:

- social science and humanities research;
- commercial production of a new or improved material, device, or product, or the commercial use of a new or improved process;
- style changes;
- market research or sales promotion;
- quality control or routine testing of materials, devices, products, or processes;
- routine data collection;
- prospecting, exploring, or drilling for or producing minerals, petroleum, or natural gas; and
- development based solely on design or routine engineering practice.

For a detailed evaluation of the Canadian tax credit system, see Department of Finance Canada and Revenue Canada (1998a) *Evaluation Report: The Federal System of Income Tax Incentives for Scientific Research and Experimental Development*. The Report describes the various SR&ED incentives, the administration of the system, issues for evaluation, methodologies employed, and the overall performance of the incentives.
Science Access is the suite of advisory services available to taxpayers before they make SR&ED claims. Science Access includes outreach, public seminars, individual taxpayer

education, first-time claimant service, and the Preclaim Project Review (PCPR) service. The objective of Science Access is to help taxpayers make successful SR&ED claims without hassle.
The tax credit in Canada is 20 percent for all R&D (increased to 35 percent for Small and Medium Enterprises (SMEs)). This 35 percent refundable tax credit that is available to smaller Canadian-controlled private corporations has no equivalent in the United States.
Recommendation: The Canadian system, particularly the investment tax credits portion, is worth considering further for New Zealand.

CZECH REPUBLIC
Provision for 10 percent of a newly purchased asset is made which can be deducted from the tax base. A new law was introduced in 2000 to provide tax incentives for existing companies planning expansion. R&D tax incentives in accession countries (like former communist countries and new entrants to the European Union) are generally of low priority.

DENMARK
A 150 percent deduction is permitted for investments of an R&D nature financed by public universities or research institutes and industry, according to a 2002 OECD study. This is a new concession and is operating under a test period, and is to be reviewed.

FINLAND
As at 2002 there have been no incentives for R&D (including subsidies) according to a 2002 OECD study.

FRANCE
Certain expenditure directly and indirectly related to research and development is subject to a tax investment credit which totals 50 percent of the amount by which the research expenditure exceeds the research expenditure in the previous years after taking into account the average rate of inflation (calculated bi-annually) and with a maximum investment credit of 40 million French Francs per annum (US$ 16 million). This concession, which commenced in 1983, applies until the year 2003.

GERMANY
Germany does not have a national R&D incentive, which is somewhat surprising as the country is commonly perceived to have an innovative and technology driven economy. There are some regional incentives for hi-tech industries with a strong R&D orientation. However, Germany had offered a tax credit on fixed R&D asset up to December 1989.

GREECE
No information available.

HUNGARY
R&D expenses can be depreciated over a five year period. This provision is apparently quite good for Hungary as many normal items that can be expenses are not allowed in Hungary as a deduction for tax purposes.

ICELAND
R&D items may be deducted in year that they accrue or else depreciated over a five year basis.

IRELAND
Section 34 of the Finance Act 1973 provided a total exemption from income tax and corporation tax for "income from a qualifying patent". The basis of assessment is the company's accounting profits.
Full relief from corporation tax is allowed in respect of royalties derived by an Irish resident company in respect of a patent if the work leading to the grant of the patent was carried out in the State. The royalties must be paid in connection with a manufacturing process or by a party unconnected to the company to qualify for relief. Relief from income tax is, in certain circumstances, available to shareholders in respect of all or part of any distribution made by a company out of its royalty income.

ITALY
There is an incentive for SMEs only, whereby an enhanced deduction of 130 percent is permitted on current expenditure.

JAPAN
For the financial year 2003, reforms to the R&D tax credit and IT investment incentives will occur to improve the competitiveness of the Japanese industry. Japan wishes to introduce a proportional credit rather than the existing incremental credit. A range of 8–12 percent is proposed, depending on such things as SME status, and joint public and private ventures. In addition an accelerated depreciation rate of 50 percent is proposed for the 2003-2005 years. Currently there is a credit of 20 percent is given for the excess of the R&D expenses over those of the previous years. In any event, the credit is limited to 10 percent of the corporation tax. There is no carry-forward provision if the company is making a loss.
Japan also has a 5 percent basic technology tax credit for depreciable assets used in connection with the R&D of advanced technologies, and a credit for R&D carried out by SMEs of 6 percent which may be claimed instead of the incremental credit. To encourage R&D, Japan has recently introduced a new tax credit for special R&D expenditure. The 6 percent tax credit is allowed on total expenditure incurred in collaborative research undertaken in co-operation with a national research institution, foreign research institution or with a university.
Recommendation: Aspects of the Japanese system are worth considering further for New Zealand, particularly the 2003 changes.

KOREA
The tax incentives provided to SMEs are intended to reduce the concentration of economic wealth by conglomerates and to strengthen the economy. Enterprises are objectively classified based on the number of employees or the amount of capital or turnovers, and all SMEs satisfying the criteria can receive tax benefits.
Tax incentives are granted to SMEs that meet the following criteria:
(1) Reserves for investment (due to expire on December 31, 2003):

Where a manufacturing, mining, construction, transportation, fishery, wholesale & retail, value-added network (VAN) or value-added communication service business, R&D business, broadcasting business, data processing and computer related business, engineering, auto-repair business, waste management business, sewage disposal business, medical business, seed or nursery production business, and livestock business have set aside investment reserves for losses; the reserves are treated as losses in calculating income for the respective business year within the limit of 20 percent of the value of business assets as of the end of the business year.

These reserves used as expenses for investment by the third year after the business year in which the reserves were appropriated as losses shall be added back as gains in each taxable year in 36-month instalments from the business year to which the third year belongs.

Where the reserves counted in losses exceed the amount to be added back into gains, the amount equivalent to the excess part of the reserves shall be included in gains in the calculation of the income amount for the business year to which the third year belongs.

(2) Tax credit for investment (due to expire on December 31, 2003):

If SMEs acquire business assets such as machinery and equipment or installation of information management system at the point of sales and information protection system, 3 percent of the acquisition amount is deducted from income tax or corporation tax.

(3) Tax incentives for newly established SMEs (due to expire on December 31, 2003):

(a) Reduction of income tax or corporation tax

When new SMEs are established in areas other than Seoul Metropolitan or its adjacent areas in order to operate businesses such as manufacturing, mining, VAN, R&D, broadcasting, data processing and computer related business, engineering science, transportation and warehousing, design institute, or when new venture capital enterprises certified by authorities concerned are established, the income tax or the corporation tax for such businesses is reduced by 50 percent for the first six years including the year during which such income accrues for the first time.

(b) Reduction of local taxes

The property tax on business assets belonging to new SMEs is reduced by 50 percent for five years after establishment. In addition, the acquisition tax and the registration tax are reduced by 100 percent for two years.

(4) Special tax incentive for SMEs (due to expire on December 31, 2003):

Small and medium-sized manufacturing enterprises engaged in manufacturing, data processing and computer related business, VAN or telecommunication service business, R&D business, broadcasting business, engineering service, transportation, mining, waste management business, sewage disposal business, construction business, fishery, passenger transportation, seed and seedling production, stock raising, science and technology service, packaging and gas filling, film industry, performance industry, professional designing, news providing service, tourism industry, and operation of welfare facilities for the elderly are eligible for a 30 percent reduction in corporation tax or income tax if located in non-metropolitan areas (small sized enterprises located in metropolitan areas are eligible for 20 percent reduction). SMEs located in non-metropolitan areas or small businesses located in metropolitan areas engaged in wholesale or retail businesses, medical services, or auto- repair businesses are eligible for a 10 percent reduction in corporation tax or income tax.

Korea grants domestic corporations a major incentive - a tax credit for the development of technology and human resources. The credit is 5 percent of current expenditures for large firms and 15 percent for small firms.

There is also a 50 percent incremental tax credit available for companies whose current-year R&D expenditures exceed the average of the two preceding years. Neither credit reduces the deductible base for R&D expenditures. However, under the current law only one of the tax credits can be claimed. The more beneficial credit is the incremental tax credit.

In addition to the two credits applicable to current expenses, there is a tax credit for capital investment in R&D facilities. Its general rate of 5 percent of the expenditure on machinery and equipment is applied in the study. (A 10 percent rate applies for investment in domestic

machinery and equipment, applicable to current expenses, there is a tax credit for capital investment in R&D facilities).

LUXEMBOURG
No information available.

MEXICO
Mexico introduced an incremental tax credit in 1997. It is 20 percent, based on any increase over the average of R&D expenditures for the three previous years.

NETHERLANDS
Fiscal measures are utilised to reduce the wage tax and national insurance contributions. It is applied to wages paid and workers conducting R&D, reducing wage tax and national insurance contributions rather than corporate income tax. R&D projects must be approved by the government and this form of support account for about 70 percent of that provided by the government.
The deduction is equivalent to 40 percent of the remuneration of the relevant employees for the first part of their remuneration and 13 percent for the second part. New companies receive a 70 percent deduction instead of the 40 percent. However, the total deduction is capped.
The company has to apply in advance, giving a description of the R&D project. The Revenue Authority/Government not responsible for this, rather an independent agency is. The R&D expenditure must be new for the applicant.
The new Act covers contracting of R&D to (semi-) public research institutes and foundations, with the explicit intention that the benefits of the R&D allowance enjoyed should be passed on to the customer.
The Netherlands has a specific organisation in place responsible for the execution of the R&D policy - SENTER. SENTER states that the disclosure of projects to them for approval does not create any concerns regarding confidentiality. The part of SENTER which covers the R&D is divided into four clusters involving different subject areas.
SENTER states the reason for having only wages eligible for the credit is because it is easier to control who did what. In addition, human capital is more mobile and durable, and if a company disappears it is more likely that the people will stay in the Netherlands. It is very simple to administer, and wages are a large part of the total R&D costs, especially for SMEs. The reasons for reducing the wage and social security contributions is that this involves less complications when the company is not making a profit, is easy to administer, the amount is less able to be manipulated than corporate profits. Wage costs are perceived as high in the Netherlands.
R&D only needs to be technically new from the applicant's point of view. It is too difficult to define this in societal terms. Thus one only needs to keep track of what the company has done in the past. This also spreads the risks of bankruptcy among companies and the difficulties in picking one entity. Redoing research originally conducted by another company can still provide improvements.
The need for pre-approval of R&D eliminates uncertainty regarding eligibility. It also has an educational effect. A company is allowed to apply twice in a year to increase flexibility in regard to the budget for R&D spending, and can submit projects even if it is unsure of whether it will take them up.
Recommendation: Aspects of the Netherlands system is worth considering further for New Zealand, especially the operations of SENTER.
NEW ZEALAND

Current Position. Under rules introduced in 2001, businesses are allowed a full (100 percent) deduction for most expenditure on research and development, except to the extent that an asset is created. To maximise the deductibility of R&D costs, businesses must be applying Financial Reporting Standard (FRS) 13 as the basis for reporting on research and development work. These rules allow for R&D costs to be expensed until an asset recognition test is met.

Deductibility for research and development expenditure is governed by section DJ 9A of the Income Tax Act 1994 (ITA 1994) (with the meaning of research and development for tax purposes able to be modified by Order in Council – see s DJ 9B of the ITA 1994), while deductibility for scientific research expenditure is covered by section DJ 9 of the ITA 1994. While there is separate legislative treatment of this expenditure, which is attributable to the differences in expenditure that falls within the definition of each term, the tax characteristics are similar (albeit the definition for scientific expenditure is more straightforward).

The five asset recognition criteria impose a relatively high threshold before a cost needs to be capitalised. Practically, a research and development project will be well down the track before the criteria can be met. One of the criteria requires the developers of the product or process to demonstrate its technical feasibility. This is a more rigorous test than having confidence in the future of the idea. For many new ideas, the product or process development will be well-progressed before technical feasibility can be established.

Some business expenditure will not fall within the accounting standard definition of "research and development". These business expenses must be considered in the light of the normal tax deduction rules to decide whether the costs incurred are capital or revenue in nature.

Issues Raised by Liaison Group: The Liaison Group has asked the Government to consider a number of areas including:

- The lack of guidance from the IRD about the interface between the tax and accounting rules.
- The inability to depreciate capitalised R&D expenditure unless it falls under the depreciation rules or is "fixed life intangible property".
- The non-deductibility of "black hole" expenditure. Black hole expenditure occurs when a business incurs R&D costs which are capitalised, but the project is subsequently abandoned or scaled back because it is less successful than originally anticipated.
- The denial of a tax deduction for taxpayers who choose, for non-tax reasons, to capitalise R&D costs. The decision to capitalise may be made in response to requests from a bank, a parent company. Alternatively, the business owners may want to present a strong asset position to potential investors. Unless R&D costs are recognised as a business expense in the financial statements, no tax deduction is available.
- Smaller companies that do not use the accounting standards to report on R&D are unable to get a tax deduction under the special R&D rules. For these businesses, the R&D costs must meet the general tax deductibility criteria for a deduction to be claimed.
- The current tax rules interface with the financial reporting standards, particularly FRS 13 which is the basis for the R&D definitions. As New Zealand moves to align its financial reporting standards with the International Reporting Code, changes may be required. Alterations to FRS 13 may impact on the definitions and, as a consequence, the tax treatment of R&D expenditure.

The NZ Government has been working with a Private Sector R&D Liaison Group to look at the workability of the current research and development (R&D) rules and to identify areas of concern. Overall, there is a general lack of definitions in the R&D area. This omission,

together with the varying treatment for taxpayers using different reporting regimes, has created uncertainty.

NORWAY
A tax credits system is used which is restricted to SMEs, based on a 2002 OECD study. For other entities there is only a full deduction for R&D expenditure.

POLAND
A new investment tax relief system was introduced across the board in 1994. Economic entities whose pre-tax profits in 1993 were equal to at least 8 percent of their takings and which have no tax arrears or other liabilities such as contributions to the Social Insurance Fund are able to subtract from the tax base any sum invested up to 25 percent of profits earned. Should at least 60 percent of receipts come from exports for an entity, then the tax relief will rise to 50 percent of earnings.
Since the beginning of 1995, Polish law has allowed for creation of Special Economic Zones (SEZ). The main purposes of the zones are: creating new employment, protection of the environment, application of new technology, management of natural resources and taking advantage of unused assets and infrastructure. In order to qualify for tax breaks in any of the zones, the investor must obtain a permit for conducting business there. The minister of the economy issues permits, but the minister may transfer this right to the administrator of a particular zone.

PORTUGAL
Companies can deduct between 108-130 percent of their R&D expenditure from taxable profits. The effect of this allowance is to reduce taxable income.

SINGAPORE (NOT AN OECD MEMBER)
Certain "qualifying" R&D expenses can be deducted twice from profits for corporate income tax purposes; that is, a 200 percent deduction, which is by far the most generous of those surveyed. The incentive generally covers computer software, agro-technology, information industries and medical research and laboratory testing.

SLOVAK REPUBLIC
No information available.

SPAIN
Up to and including 1989, Spain applied the same rules for R&D as for any new assets. These included investment tax credits for all new fixed assets at 10 percent (1983, 1988-1989), 12 percent (1984), and 15 (1985-1987). From 1990 the following rules apply for investment tax credits in R&D: 15 percent on intangibles, and 30 percent on new fixed assets. In 1995 depreciation rates were increased to 10 percent straight line for buildings and 100 percent for plant and machinery and current expenditure on R&D. A tax credit of 20 percent based on this amount and a further 40 percent incremental over the two year previous base was also given. The statutory tax rate on retained earnings in Spain was 55 percent from 1979-1983 and 35 percent thereafter.

SWEDEN
Sweden does not provide any tax incentives, although there was a quite generous regime operating until 1982. However, company tax rate is relatively low at 28 percent. Furthermore, Sweden does not provide subsidies or credits; see OECD 2002 report.

SWITZERLAND
The system in Switzerland is based mainly on the provision of grants and not on taxation, either by way of deductions or credits.

TURKEY
No information available.

UNITED KINGDOM
Before 2000 virtually all scientific research and development was able to be expensed, there was a Research and Development Allowance for all firms, allowing plant machinery and buildings to be immediately written off against profits. However, capital expenditure is usually about 10 percent of R&D, so it was not considered to be that significant. Wages, salaries and current expenditure have no special tax treatment.
In the 2000 UK Budget the Government introduced special tax relief (R&D tax credits) for SMEs. The legislation is in Schedule 20 of the Finance Act 2000. After consultation, similar relief was introduced for large companies (those which are not SMEs) in the 2002 UK Budget 2002. The legislation is in Schedule 12 of the Finance Act 2002.
With the new developments, a SME can claim an extra 50 percent and large businesses 25 percent, but if the entity makes a loss this can be surrendered for cash. The company can surrender its qualifying R&D losses to the Exchequer in exchange for a cash payment worth 24 percent of the spending on R&D. The R&D expenditure must be at least £25,000 a year and the project cannot have received any other government funding, such as Smart or Link funding. The R&D can be carried out either in the UK or overseas. An additional restriction is that a claim for the payable R&D tax credit cannot exceed the PAYE / National Insurance liabilities of the company for that accounting period.
There is an additional 50 percent reduction for research on medicine for "killer diseases". However, as of November 2002 it had not been approved by the European Commission as a State aid and therefore was not in force. If and when it is approved the Inland Revenue will announce the date that it comes into force, which will be specified in a Treasury Order.
For SMEs the R&D tax credit is targeted on the firm that takes the risk and commissions the work. Any capital spending only qualifies for the 100 percent deduction. Relief is not due unless a company spends more than £25,000 on qualifying R&D expenditure in a 12 month accounting period. Non qualifying expenditure such as the purchase of capital assets is ignored when calculating whether the £25,000 limit has been reached.
For large companies the tax credit is targeted on those who actually undertake the R&D. Any capital spending only qualifies for the 100 percent deduction. Relief is only incurred after £25,000 has been spent on qualifying R&D in a 12 month accounting period. Provision is made for expenditure on direct research and development, expenditure on research and development sub-contracted to certain organisations that cannot claim the credit in their own right and contributions to certain independent research and development organisations.
A new definition of R&D for tax purposes was introduced by Section 68 and Schedule 19 of the Finance Act 2000 and has effect from 1 April 2000. An activity will qualify as R&D for tax purposes if it would be treated as R&D under normal accounting practice for companies in the UK (Statement of Standard Accountancy Practice 13, SSAP13), as qualified by the *Guidelines on the Meaning of Research and Development for Tax Purposes* ("the Guidelines"), issued by the Secretary of State for Trade and Industry. This is based on the OECD's Frascati Manual definition. The Guidelines have statutory force and discuss in detail the meaning of R&D, and illustrate through explanation and examples the boundary between those activities that are, and are not R&D.

Relief is given on qualifying staff, consumable stores and payments to subcontractors for R&D (SMEs only). The Inland Revenue is in charge of R&D policy, with specialists in different R&D areas, but they do not determine the eligibility of R&D projects. It is believed that this is not the government's task; even if scientists were employed the government is not in a place to understand its commercial objectives and specialist area of technology.
Taxpayers value the neutrality of the tax credit when compared to a subsidy.
Inland Revenue staff stated that the volume system was introduced rather than the incremental system because it was simpler. When undertaking consultation it was found that the incremental system did not provide enough certainty in the amount of the final credit. Incremental systems are especially complex in the terms of calculating this for groups, which would require extra legislation. It should be noted that R&D does not have to be carried out in the UK to qualify for these concessions.
Recommendation: The United Kingdom's new system is worth considering further for New Zealand.

UNITED STATES
The expenditures of R&D are generally capital expenses. However, an entity can choose to deduct these expenditures as current business expenses.
An entity may use one of the two following methods of accounting for R&D expenditures:

- Deduct its R&D expenditures in the tax year, in which it was paid or incurred, or
- Amortise such expenditures over a period of not less than 60 months.

An entity must charge to a capital account any R&D expenditures that it does not deduct currently, nor defer and amortise. The entity may claim the R&D credit against tax for certain qualified R&D expenditures, and combine the credit as one of the components of the general business credit. The R&D credit is a non-refundable tax credit. A qualified research expense only if incurred in carrying out the taxpayer's trade or business. Furthermore, in order to make a deduction the entity needs to retain substantial rights to the research to deduct.
The R&D credit for increasing research activities provides a credit against tax, which is intended to serve as an incentive to conduct certain types of product development research activities and certain basic research (§ 41 Internal Revenue Code (IRC)). The credit has been extended through to June 30, 2004. The credit is an incremental credit equal to the sum of:

- 20 percent of the excess of the qualified research expenditures for the taxable year over a base amount, and
- 20 percent of the basic research payments.

Qualified research expenses include in-house expenses for wages paid and supplies used in the conduct of qualified research, and 65 percent (75 percent in certain instances) of any contract expenses for qualified research. However, an alternate three-tiered research tax credit is available to generate higher research credits for companies with dramatically increasing sales figures or otherwise stagnant research expenditures.
Before taking the credit it is important to determine that the entity is performing qualified research and claiming expenses only for qualified research.
The IRC in § 41 provides a tax credit of 20 percent of certain increases in qualified research expenses (see IRS Form 6765). The IRC in § 174 provides that the R&D deduction is reduced by the R&D credit taken under IRC § 280C(c). Alternatively, the taxpayer may elect to take the full R&D deduction but reduce the credit by 35 percent (the maximum corporate tax rate).
To qualify for the credit, eligible research must first meet four requirements provided by IRC § 41(d):

- Research outlays must qualify for treatment as expenses under IRC § 174;
- The research must be undertaken to discover information that is technological in nature. The taxpayer must be attempting to obtain knowledge that exceeds, expands, or refines the common knowledge of skilled professionals in a particular field of science or engineering [Treasury Regulations § 1.41-4(a)(3)]. The process must rely on principles of physical or biological sciences, engineering, or computer science;
- The findings are intended to be useful in developing a new or improved business component of the taxpayer; and
- Substantially all of the research activities are part of an experimentation process. Under Treasury Regulations § 1.41-4(a)(5) and (6), at least 80 percent of the research costs are due to developing hypotheses, designing experiments to test and analyze those hypotheses, conducting experiments, and refining or discarding the hypotheses. Before or during the early stages of the project, the taxpayer must document the principal questions to be answered and the information sought [Treasury Regulations § 1.41-4(d)].

It should be noted that the US first introduced tax incentives for R&D in 1981. However, these incentives were tightened in 1986 with the Tax Reform Act 1986 the result being that less expenditure could be classified as R&D.

With respect to the financial reporting of R&D expenditure in the US, SFAS 2 (Accounting for Research and Development Costs) requires that R&D generally be expensed as incurred and that each year's total R&D be disclosed in the financial statements. Overall the items that satisfy the definition of R&D for financial accounting purposes is narrower than for tax purposes and much less flexible; see Oliver (2003). Oliver refers to a study indicating that more than 50 percent of publicly held US companies reported at least some R&D in the last five years, with R&D accounting for nearly 3 percent of nonfinancial corporate GDP in the 1990s.

Recommendation: The United States system is worth considering further for New Zealand, especially the tax credit system in principle.

Section 2. THE EFFECTIVENESS OF TAX INCENTIVES FOR R&D

The impact of tax breaks on the level of R&D expenditure are discussed below, along with some analysis of the effectiveness of changes in R&D expenditure on output from international experience, using summaries of overseas studies.

In relation to economic studies examining the impact of tax breaks on R&D, the evidence has been clear in terms of direction although variable in terms of the magnitude of impact. This is presented in the first part of this section of the report. A number of important studies are now briefly discussed in chronological order.

BERNSTEIN (1986)

This study concludes that if there is no growth in the Canadian economy the R&D credits and allowances generate $0.80 additional R&D expenditure per $1 tax foregone. When the effect of the tax credit is in included in the return by virtue of expanded output, the R&D generated still exceeds the tax foregone. It was also found that indirect tax incentives aimed at increasing physical investment also increase R&D expenditures. The period studied was 1975-84, in which current and capital R&D was deductible, a credit received for all current and capital R&D (ranging from 10-25 percent), and an allowance given for incremental increases.

CORDES (1989)

The period of study is 1981-85 in the US. The study concludes that if the tax credit was made permanent, there would be $0.35-$0.93 additional company R&D spending per $1 tax foregone. Furthermore, the author was of the view that it is possible that the incentives aided growth of R&D in times of recession.

BERGER (1993)
This study analyses the American tax credit in the 1980s, and the evidence support the credit as having a positive influence, controlling for non-tax factors at the firms level only. The study estimates $1.74 extra spending on R&D for every $1 tax foregone, which is much higher than many of the other estimates. The study also discusses the implicit tax cost for those not eligible for credit, has same results as most other studies, with often a negative result for those not receiving the credit.

MCCUTCHEON (1993)
This study examines the pharmaceutical industry in relation to the United States' Tax Reform Act 1981. It concludes that the tax credit caused an increase in R&D expenditures, increased competitive R&D spending in firms in the industry. It is contended that a 1.6 percent R&D increase is attributable to the credit.

DAGENAIS ET AL. (1997)
The authors conclude that a one percent increase in the Canadian federal tax credit for R&D yields an average of $0.98 additional R&D expenditure per $1 of tax revenues foregone.

DEPARTMENT OF FINANCE CANADA AND REVENUE CANADA (1998a)
This study concludes, amongst other observations, that the cost efficiency was found to be $1.38 for every $1 tax foregone.

BLOOM ET AL. (2000)
This econometric analysis of data on tax changes and R&D spending involves Australia, Canada, France, Germany, Italy, Japan, Spain, United Kingdom and United States. It is estimated that a 10 percent fall in the cost of R&D (such as through tax breaks and/or credits) stimulates just over a 1 percent rise in the level of R&D in the short-run, and just under a 10 percent rise in R&D in the long-run.

GUELLEC AND VAN POTTELSBERGHE (2000)
In their working paper, the authors conclude:

- Direct government funding results in $1.70 of research on average for every $1 financed.
- Tax incentives have a positive, but short-lived effect.
- Incentives are better if they remain stable over time.
- Direct government funding and incentives are substitutes in regard to effectiveness.
- The stimulating effect of government funding increases with generosity up to a certain level, (about 13 percent). Too much or too less funding is not as effective as being in the middle.
-

HALL AND VAN REENEN (2000)
The authors describe the effect of the tax system in OECD countries on the user cost of R&D, and conclude (with many disclaimers) that $1 of tax credit for R&D stimulates an extra $1 of R&D.

LACH (2000)
This study evaluates the effect of R&D incentives through ascertaining what would have been spent on R&D without the incentives. The evidence from manufacturing firms in Israel suggests that incentives do have a long-run effect. The study also concludes that $1 of subsidies increases long-run company financed expenditures by $0.41 (that is, total R&D expenditures increase by $1.41).

MULKAY AND MAIRESSE (2003)
The authors analyse the system in France, which has an incremental credit of 50 percent with a maximum limit, expiring in 2003. The credit has been in place since 1983, therefore a study was conducted in regard to its effectiveness. During this time there were changes to the statutory rate and the floor and the ceiling, the effects of which can also be evaluated.
It was shown that if the rate of the current tax credit is raised by 10 percent the optimal stock of R&D capital will increase by 4.6 percent to 6 percent. The long run increase in R&D expenditure is 3 to 4 times larger than the budgetary cost for the government, an increase of 1.8 to 2.3 billion francs of private R&D expenditure comes with a budgetary cost of 570 million francs.
The second part to section two of the report provides some comment on the public/private interaction and effectiveness of R&D partnerships. This analysis includes a review of tax breaks encouraging links between private sector and public sector organisations with the private sector obtaining the tax break but the public sector organisation (including universities) the increase in research expenditure. In relation to the interaction between public and private sector R&D funding, there have been several studies conducted, and these are briefly discussed below.

LATTIMORE (1997)
The overall conclusion from this study is that the objective of R&D fiscal measures is to induce substantial and worthwhile R&D at low cost to taxpayers. The R&D tax concession applies the concession to all R&D, rather than to only the additional R&D. As a consequence there is substantial dissipation of the concession as transfer payments to firms. These generate real economic costs as some of these transfers flow to foreigners, and the revenues lost from such concessions must be financed through additional distortionary taxation. This means that there must be high spillovers to other areas from the modest amount of induced R&D to generate net benefits.
Lattimore is relatively confident that the Australian tax concession does generate net social benefits – especially at its lower current rate of 125 percent. A number of possible modifications and elaborations of innovation policy could be further explored, particularly aimed at increasing inducement. He notes that none of his modifications may be feasible, but they should be considered further.

DAVID AND HALL (1999)
The authors attempt to explain inconsistencies in the empirical literature regarding the response of company financed R&D to changes in the level and nature of public R&D expenditure. They conclude that increasing the share of public R&D research devoted to basic research increases the private share of R&D.

GUELLEC AND VAN POTTELSBERGHE (2001)
In their 2001 study, the authors investigate the long-term effects of various types of R&D on multifactor productivity growth, which represents the spillover effect of R&D. Econometric estimates used on a panel of 16 OECD countries. They conclude:

- An increase of 1 percent in business R&D generates 0.13 percent in productivity growth.
- The effect is larger in countries which are intensive in business R&D.
- The effect is larger in countries where the share of defence-related government funding is lower.
- 1 percent increase in foreign R&D provides a 0.44 percent productivity growth.
- 1 percent increase in public R&D provides a 0.17 percent productivity growth.
- **The effect is larger where there is more university R&D as opposed to government laboratories.**

In relation to the preference for the various types of R&D incentives that may be provided, a number of key studies are summarised below, in chronological order, in the third part of this section of the report.

SWENSON (1992)

Since there have been numerous different conclusions regarding the effect of the United States tax credit in the 1980s, the study attempt to control for other non-tax factors that would reduce these anomalies**. The study concludes that the R&D tax credit is effective in stimulating R&D expenditures for high growth firms and only for some normal growth firms**. There were difficulties involved because the credit was frequently extended on a year by year basis, causing distortion in analysis as firms accelerate R&D in the year the credit is due to expire.

DEPARTMENT OF FINANCE CANADA AND REVENUE CANADA (1996b)

The study involved surveying firms that have claimed deductions or credits for SR&ED, with a companion survey of accounting firms and consultants that specialise in assisting these claims. The study concludes:

- The incentive has a large impact on SR & ED activity, higher expenditures on R&D, the effect was also incremental.
- The incentive was found to be cost-effective.
- Competitive advantage was important reason for conducting R&D.
- Most work is in applied research and experimental development.
- More spending on new products than new processes.
- IT and manufacturing accounted for most of the claimants.
- R&D found to be important part of firm's strategy.
- **The tax credit is the most influential of all forms of government support.**
- There did not seem to be a problem with imitation.

GUNZ ET AL. (1996)

The authors attempt to measure the compliance cost of R&D tax incentives. Although there is extensive technical and financial record keeping, the compliance costs of the R&D tax credit are only 0.7 percent of the credits claimed. (However, firms with claims of $200 or less face 15 percent costs). Firms with small claims have high costs, regardless of size of firm. These costs are incurred mainly by scientific and technical staff, rather than accounting staff. **Overall, the tax credit was preferred to government grants in terms of compliance costs**.

KAUKO (1996)

Grants are shown to have weak effects in interview studies, which is inconsistent with econometric studies. The problem is that grants are not randomly chosen, but sometimes

treated like they are. The study concludes that **public subsidies are a more inefficient stimulus than the research portrays**.

DEPARTMENT OF FINANCE CANADA AND REVENUE CANADA (1998a)
In a subsequent study, the researchers used various methods to assess the Canadian R&D credit, including interviews, focus groups, income tax information, and two surveys. **The federal SR&ED tax credit was rated as the most important component in the system of government support followed by refundability of the federal credit, while government grants and contracts received the lowest rating.**
More than half of the firms reported employment growth for the period 1992 to 1994, with medium-sized firms in the area of information technology SR&ED most likely to report employment increases. Furthermore, current and capital expenditures eligible for the federal SR&ED tax incentives (that is, allowable expenditures) increased in the case of:

- all corporations, by 50 percent from $C4.5 billion in 1988 to $C6.9 billion in 1992; and
- smaller corporations, by 100 percent from $C0.7 billion in 1988 to $C1.4 billion in 1992.
-

LACH (2000)
Israel has experienced a boom in the technology area. In Israel there is a subsidy program whereby firms commit to matching dollar for dollar the subsidy given by the Office of the Chief Scientist. If the project is commercially successful the firm pays back the subsidy in the form of royalties.

EUROPEAN COMMISSION (2003)
This comprehensive and recent study sought to offer suggestions and guidelines on the design and implementation of fiscal measures to stimulate private investment in R&D. **It concludes that fiscal incentives stimulate business R&D and that the design of these fiscal incentives is crucial to the effectiveness of these schemes**. Existing evaluations of fiscal R&D incentive schemes in different countries cannot be compared in the EU due to the use of different methodologies, incommensurable data sets and dissimilar time periods. More research is therefore needed on the micro level and at the higher macro level. Other conclusions made in this study include:

- Volume-based schemes (rather than incremental schemes) for determining R&D tax credits are easier to administer for both firms and public authorities. They are arguably better for raising overall R&D expenditure levels. The principles for good policy design require:
    - simplicity, low administration costs, low compliance costs, reliability and long-term stability;
- Assured refundability;
- Good visibility and transparency; and
- Use of the OECD's Frascati definition for R&D.
-

VAN POTTELSBERGHE ET AL. (2003)
Amongst the plethora of findings from this recent study, the authors conclude that some countries also have incentives for the collaboration between industry and qualified research organisations. The United States provides a special tax credit for payments to qualified organisations to conduct research, and increases the amount of research expense eligible for the credit to 75 percent if subcontracted to a qualified organisation. In Australia only contracted work with registered research agency eligible for tax incentive, but also the cost of acquiring patent eligible.

Denmark looks to promote public and private co-operation in R&D by having a 150 percent deduction of investments co-financed by a public university or research institute and the industry. This is a new development currently in a test period scheduled to run for two years; see Danish Ministry of Science, Technology and Innovation.
The authors also recommend for the European Union:

- Volume-based tax incentives over incremental tax incentives to stimulate R&D.
- Assured refundability.
- Visible incentives so as to influence business decisions, such as in Canada.
- Personal income tax breaks may be used to attract researchers from abroad but this is an area for future research.

SECTION 3. KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This final section reviews the previous phases of the study through setting out key findings, and provides a summary of the main conclusions and recommendations relating to improving the NZ tax incentives for research and development.
In section one six OECD member nations' taxation regimes for R&D were considered worthy of further examination, namely Australia, Canada, Japan, Netherlands, United Kingdom and United States. Investigation is warranted for both consideration of R&D allowances, such as accelerated depreciation and deductions in excess of one hundred percent of qualifying expenditure (ranging from just over 100 percent up to 200 percent in Singapore, with most in the range of 125-150 percent), and for R&D credits, including refundability and carryforwards, etc. Targeting of SMEs is also worthy of consideration, given New Zealand's preponderance of such entities.
Section two's analysis of the effectiveness of tax credits for stimulating R&D indicates clearly that additional tax credits will produce additional R&D expenditure and will generally be cost effective.
In terms of the preference between tax credits and government subsidies through grants, the research is clear that the tax credit is the most influential of all forms of government support. For instance, in Canada, the federal SR&ED tax credit was rated as the most important component in the system of government support followed by refundability of the federal credit, while government grants and contracts received the lowest rating. The tax credit is also preferable in terms of incurring the lowest level of compliance costs.
The OECD's (2002a, p 25) study summarises the major findings of the economic analysis studies on the effectiveness of R&D tax credits, where the negative sign of the estimated elasticity of the R&D tax credit indicates greater levels of R&D expenditure through provision of the tax credit (which serves to reduce the cost of carrying out the R&D). It is acknowledged that a potential limitation of this analysis is that the vast majority of the studies are from Canada and the United States. Table 2 reproduces Table 5 from this report and is set out on the next page:

Table 2: Effectiveness of R&D Tax Credits

Table 5. Effectiveness of R&D Tax Credits

Study	Estimated elasticity of R&D to tax credit	Period of analysis	Country
Australian Bureau of Industry Economics (1993)	–1.0	1984 - 94	Australia
McFetridge and Warda (1983)	–0.6	1962 - 82	Canada
Mansfield and Switzer (1985)	–0.04 to –0.18	1980 - 83	Canada
Bernstein (1986)	–0.13	1981 - 88	Canada
Bernstein (1988)	–0.14 (short-run) –0.3 (long-run)	1964 - 92	Canada
Mansfield (1986)	–0.35	1981 - 83	United States
Berger (1993)	–1.0 to –1.5	1981 - 88	United States
Bally and Lawrence (1987, 1992)	–0.75	1981 - 89	United States
Hall (1993)	–1.0 to –1.5	1981 - 91	United States
McCutchen (1993)	–0.28 to –107	1982 - 85	United States
Hines (1993)	–1.2 to –1.6	1984 - 89	United States
Nadiri and Mamuneas (1996)	–0.95 to –1.0	1956 - 88	United States
Bloom, Griffith and Van Reenen (1999)	–0.16 (short-run) –1.1 (long-run)	1979 - 94	G7 and Australia

Source: Hall and Van Reenen (2000).

Source: OECD (2002a), based on Hall and Van Reenan (2000)

In the OECD's (1996, pp 25-26) report, it is observed that tax incentives as a means of stimulating R&D spending offer several advantages compared to subsidies or grants assistance programmes:

- Tax incentives entail less interference in the marketplace, and thus allow private-sector decision makers to retain autonomy;
- Tax incentives require less paperwork and entail fewer layers of bureaucracy;
- Tax incentives avoid the need to set nebulous and detailed requirements for receiving assistance;
- Tax incentives have the psychological advantage of achieving a favourable industry reaction; and
- Tax incentives have a high degree of political feasibility.

However, criticisms of tax incentives are made in relation to the advantages listed, along with the following disadvantages of tax incentives compared to other assistance programmes:

- Tax incentives bring about unintended windfalls by rewarding what would have been done without the tax incentive;
- Tax incentives led to undesirable inequities;
- Tax incentives can raid the national treasury; and
- Tax incentives are an ineffective means to achieve focused results.

Van Pottelsberghe, Nysten, and Megally, (2003, p 7) provide an excellent summary of the advantages of fiscal incentives over direct financial support (R&D subsidies), which is reproduced below as Table 3 which reproduces Table 1 from this study:

Table 3: Advantages of fiscal incentives versus direct financial support

Table 1. Advantages of fiscal incentives versus direct financial support.

R&D Subisidies	Vs.	Fiscal Incentives
More targeted		More neutral
- Social return >>> Private return		- Business knows better - Avoid picking winners - Market friendly
Better budget control		More predictable for companies
		Wider reach
		Administrative cost can be very low
		More accessible

Source: Van Pottelsberghe, Nysten, and Megally (2003)

In a report prepared for the European Commission (2003, p 5), a summary of the use of R&D tax credits and allowances by a number of countries is provided, and this is appears below as Table 4, which reproduces Table 2 from this report:

Table 4: Use of corporate R&D tax incentives, 2001/02

Table 2 Use of corporate R&D tax incentives, 2001/2002

	Volume base	Incremental	Combination of Volume based and Incremental
R&D tax credits	Canada Italy Korea Netherlands	France Japan Korea Mexico United States	Portugal Spain
R&D allowances	Denmark United Kingdom	Norway Belgium	Australia Austria Hungary

Source: Adapted from Warda (2002).

Source: European Commission (2003), based upon Warda (2002).

In its 2003 report, the European Commission concludes that, in the absence of extensive evaluation studies, and taking into account the methodological difficulties attached to many of the econometric studies, one can say with some caution that:

- **Fiscal incentives stimulate business R&D.** However, it is difficult to evaluate the amount of additional R&D per unit of forgone public revenue. The few tentative evaluations show a positive, but moderate level of additionality. Nevertheless, the substantial amount of potential externalities (R&D spillovers) would strengthen the positive impact of tax credit.
- Methodological difficulties in establishing the effect of fiscal incentives leave us with a large unknown factor. There is a clear **need for more formal evaluations** that would use several alternative methods. So far, there is a preponderance of evaluations for the Canadian and US tax incentives.
- There is a need for better micro-level data sets to understand the long-term impact of fiscal incentives on business R&D.

- No evaluation has so far attempted to evaluate the **impact of alternative designs of tax incentives**. The existing evaluations for different countries cannot be compared due to the use of different types of data, methodologies, scope and time periods.

The key point is that the **specific design of a fiscal incentive seems to be the key factor underlying its effectiveness**.

There is little, if any, consistency in R&D fiscal policy internationally, which is also illustrated by Van Pottelsberghe, Nysten, and Megally (2003, p 17) in a table comparing R&D fiscal policies in European Union nations and selected OECD nations. Hall and van Reenen (1999) also provide in the appendices to their working paper a summary of R&D systems around the world, illustrating their diversity in nature.

The OECD (1996) presented the findings of a comprehensive study on fiscal incentives and R&D, concluding that with regard to best practices in designing and implementing R&D tax provisions, the following have been identified:

- R&D tax policy should be designed as part of an overall strategy to stimulate innovation in industry and should complement other science and technology policies. The R&D tax policy may be designed to further specific national goals, such as fostering basic research or the purchase of high-technology equipment.
- R&D tax policy should generally include provisions for the deduction of all qualified R&D expenses in the year in which they are incurred, which has been shown to increase the additional research undertaken by firms.
- R&D tax policy should be flexible in order to accommodate firms at different stages of development. For example, the ability to carry deductions forward allows firms without tax liabilities in a given year to take advantage of R&D tax incentives.
- The value of R&D tax credits must be assessed on a country by country basis. The design of these schemes differs broadly by country depending on whether they are volume-based or incremental, based on R&D expenditures or wage costs and vary their treatment of firm size, region or technology. Their benefits depend on overall tax systems including the corporate tax rate and the time-lag associated with firm responses.
- R&D tax policy should consider including special provisions relating to small and/or new firms in order to encourage entrepreneurship and innovative start-ups.

New Zealand was reported in OECD (1996) as the OECD member providing the least R&D tax support, although this has improved with the adoption of FRS 13 into the ITA 1994 for the tax treatment of R&D expenditure. Nevertheless, New Zealand remains near the bottom of the list.

In a more recent OECD study (OECD, 2002), the OECD observes that given the contribution of research and development (R&D) to productivity growth, economic performance and the achievement of social objectives, it is generally agreed that governments have a role in encouraging appropriate R&D levels and expenditures. With regard to business R&D, national factors largely determine whether countries prefer tax incentives, subsidies, patent rights or other instruments to increase research investments. The choice of R&D tax incentives will depend on country-level variables such as overall innovation performance, perceived market failures in R&D, industrial structure, size of firms and the nature of corporate tax systems.

Some OECD countries (e.g. Sweden, Finland) neither subsidise nor extend preferential tax treatment to business R&D although these countries have high levels of private R&D expenditures. Other countries (e.g. New Zealand) prefer R&D subsidies over taxes to steer research to particular goals and avoid jeopardising the neutrality of the tax system. Countries such as France, the United States and the United Kingdom use a combination of subsidies and tax incentives to stimulate private R&D investments. The OECD's report provides an

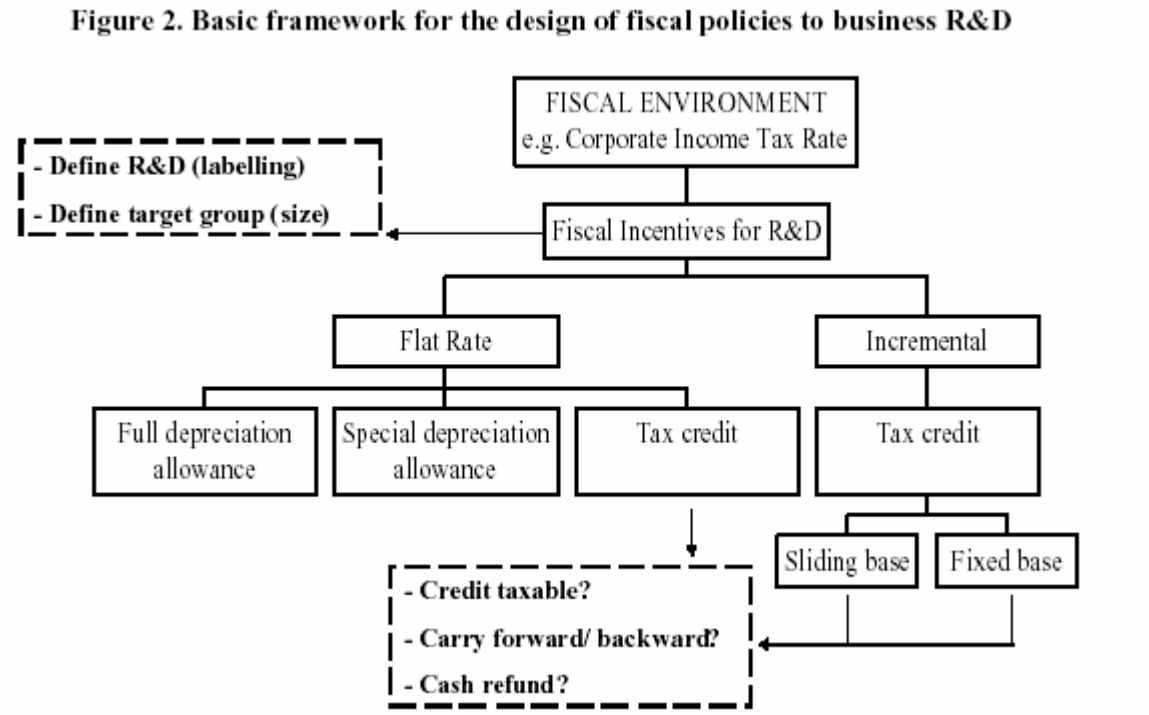
excellent discussion on the role of fiscal incentives for R&D, the issues involved in the design of such incentives, a comparison of OECD members' generosity of fiscal incentives, and the various costs and benefits.

Van Pottelsberghe, Nysten, and Megally (2003, pp 39-40) recommend that for the European Union (and possibly further a field), fiscal incentives for R&D should reflect the following principles:

- a design with simplicity, low administrative and compliance costs, reliability and long-term stability;
- a concrete checklist for assessment;
- a volume based rather than incremental systems;
- refundability of tax credits (with carryforward/carrybackwards arrangements);
- visibility and transparency;
- a clear definition of R&D;
- a formal evaluation processes;
- the creation of relevant databases;
- an optimal tax policy mix for business R&D; and
- effective coordination between government and business.

Van Pottelsberghe, Nysten, and Megally (2003, p 19) provide a diagrammatical format for the decisions involved in designing fiscal policies for R&D and this is set out as Figure 1 (reproducing Figure 2 from this study):

Figure 1: Basic Framework for the Design of Fiscal Policies to Business R&D

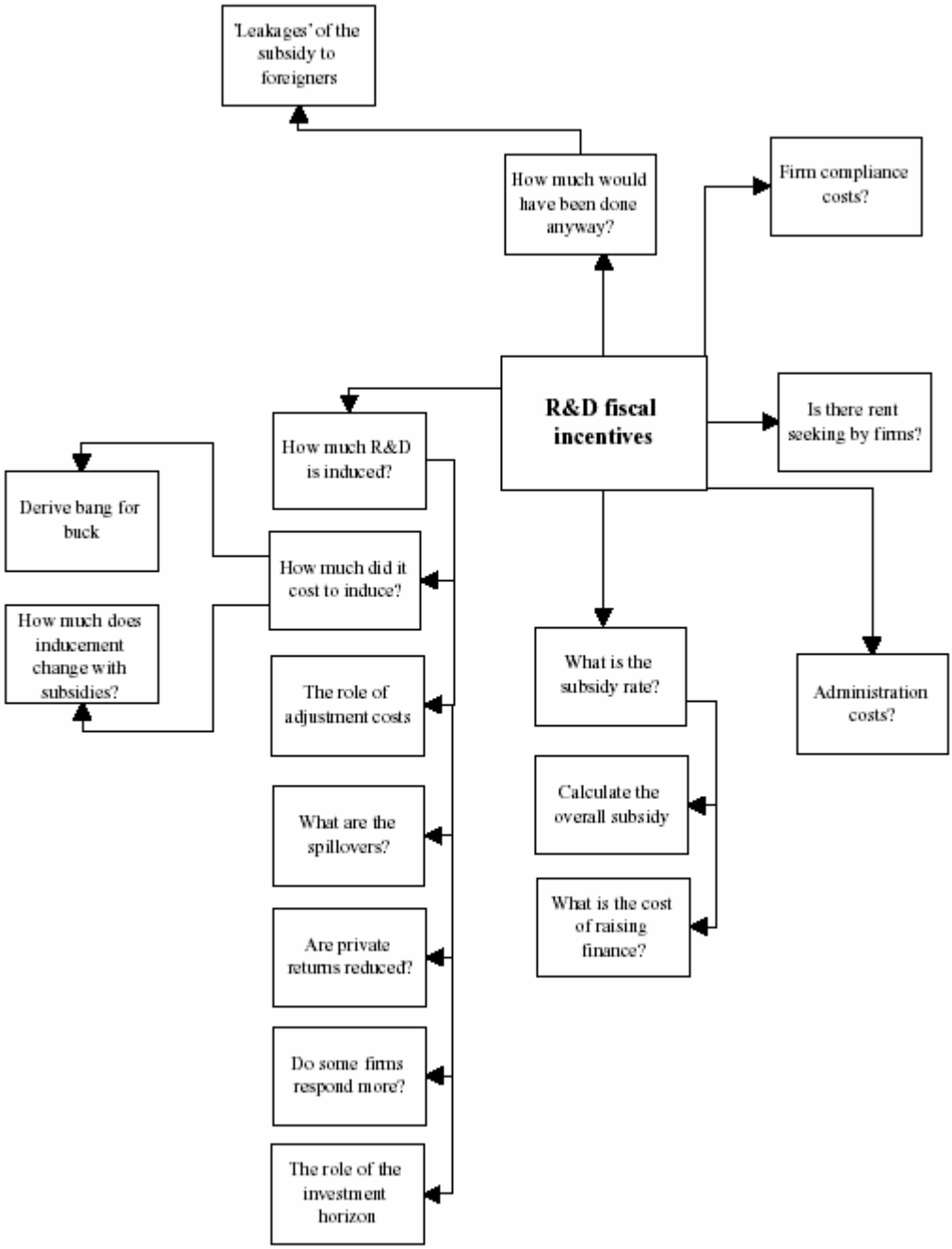


Source: Van Pottelsberghe, Nysten, and Megally (2003)

In an earlier study, Lattimore (1997, p 99), as part of an OECD study, provides a framework for evaluating R&D concessions. The following diagram, Figure 2, is taken from this study and should be given serious consideration for New Zealand:

Figure 2: The key questions when evaluating the R&D concession

Figure 2. The key questions when evaluating the R&D concession



Source: Lattimore (1997)

Lattimore (1997, 119) later provides a series of design principles or issues for developing tax policy for R&D, and these are reproduced on the next page as Table 5:

Table 5: Design principles

1.	Target the source of the problem
2.	Selection issues (adverse selection and take-up)
3.	Inducement
4.	Right scale of resources
5.	Timeliness
6.	The right duration
7.	Avoiding strategic behaviour/distortions
8.	Avoiding unforeseen government liabilities
9.	Encouraging administrative efficiency and ease
10.	Accountability and transparency
11.	Policy learning
12.	Robustness
13.	Avoiding bad interactions/encouraging good ones
14.	Cost effectiveness and net benefit
15.	Superiority (greatest net benefits)
16.	Evaluation, monitoring and reporting

Source: Lattimore (1997)

By way of a final series of observations, in the Department of Finance and Revenue Canada (1998b) study of the G7 nations plus Australia (Canada, France, Germany, Italy, Japan, United Kingdom and United States, plus Australia), the report concludes that there is theoretical and empirical evidence that R&D is subject to market failure. In response to this market failure, most countries provide assistance for R&D in the form of tax or non-tax incentives. The specific form of government support used depends on the nature of the market failure and the policy objectives being pursued. Tax and non-tax incentives possess different characteristics and may be used to achieve alternative, but complementary objectives. In terms of their effectiveness, existing evidence seems to favour the use of tax incentives over direct subsidies such as grants.

Furthermore, the report argues that many countries use income tax incentives to encourage R&D. In general, the incentives focus on R&D undertaken within national boundaries for business purposes. Definitions of R&D for tax purposes differ, sometimes significantly, from the OECD benchmark in order to meet the policy objectives of particular countries. Some R&D tax incentives are structured to deliver broadly based support, others target specific types of R&D or companies (e.g., new firms, smaller firms or non-taxpaying firms), and still others focus on regional objectives. There are also significant international differences in the design and mix of the R&D tax incentives currently being employed to foster this type of investment. Countries offer various types of accelerated deductions, bonus deductions or investment tax credits based on either total or incremental spending.

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