capital market in Germany, funds would be mobilised for financing R&D which are currently not available.

R&D AID THROUGH THE FISCAL SYSTEM C 3

R&D promotion in the fiscal system in the EU and OECD member states

Whereas German tax laws in important areas constrain innovation activities, the majority of OECD and EU member countries provide explicit fiscal stimulation for commercial R&D. These countries use tax credits or tax allowances which are coupled to the level of the R&D expenditure. SMEs often receive preferential treatment under these measures, and in some countries the support is targeted exclusively towards SMEs. Germany makes no use of this possibility.

Fiscal aid instruments for R&D were first tried in OECD member countries in the 1970s and 1980s, with mixed success. Meanwhile, 20 of 30 OECD member countries and 15 of 27 EU member states have implemented measures to aid R&D through fiscal incentives. Evaluation reports suggest that the initial difficulties encountered with the various measures are now under control.[22] Using the tax support instruments, the R&D costs in many of these countries have been considerably reduced.[23]

Options for fiscal R&D aid

The systems used by various countries differ considerably, both in terms of the level and also the nature of the support. With tax credits, the company is able to cut tax payments or claim for a refund; systems of this type are operating in the USA, Korea, France, the Netherlands and Canada. Tax allowances mean that the income before tax is reduced; this form of state aid for R&D is used by Australia, Austria, and Great Britain.

R&D promotion through the tax system - selected OECD member countries 2004/2005 TAB 01

Countries with tax credits	Countries with tax allowances
France	Australia
Ireland	Belgium
Italy	Denmark
Japan	Great Britain
Canada	Austria
Korea	Hungary
Mexico	
Netherlands	
Norway	
Portugal	
Spain	
USA	

Source: Warda, J. (2006), p.15.

In many countries, the fiscal R&D aid for SMEs and new enterprises is more attractive than for large companies. In some countries the level of tax aid is not dependent on the level of

R&D expenditure of the company, but on its growth, which has the benefit of limiting drops in tax receipts. Table 01 summarises the types of regulation in force in various countries in 2004/2005.

Advantages and disadvantages of fiscal R&D stimulation

An advantage of fiscal R&D stimulation for companies is that it is available for R&D expenditure of every sort. Furthermore the aid can be accessed without a separate application procedure. Because the fiscal aid is an entitlement, it is something that the companies can plan with. The scope of fiscal R&D support is therefore likely to far exceed any subsidy programme requiring advance registration. In addition, a form of R&D aid anchored in the tax system also sends out an important signal for companies which are not yet active in Germany and make the location more attractive. The key advantage, however, is probably the avoidance of market distortions. With a fiscal R&D support system the government does not influence the contents and direction of the R&D, but reduces the costs of carrying out any sort of R&D activity.

A disadvantage of fiscal R&D promotion is that an immediate advantage is only felt if the company has generated a profit. Tax benefits which are carried forward are only of use to the company some time later. The aid then loses part of its intended effect. In Great Britain companies can therefore opt to receive a cash payment.[24] This is popular with growing innovative companies, where income streams are restricted in the early years of business.

Comparison with promotion by subsidies

As an alternative to tax credits or some similar fiscal arrangement, state aid for R&D can also be provided to companies in the form of an equivalent subsidy. However, this has the disadvantage that it requires a separate application system, which in Germany usually involves a project organising agency. In addition, the costs for communications and for monitoring the subsidy process can be considerably higher than when tax measures are used. However, the exact administrative costs of the two systems are unknown. It would be of considerable interest to compare the costs of project organising agencies responsible for R&I promotion programmes with those of the tax administration. Both types of support are open to abuse, and in the case of fiscal R&D support this can be checked by means of company audits. In the case of subsidies, supervision is the responsibility of the project organising agency.

Encouraging results from evaluation studies

The effectiveness of R&D support through the tax system has been demonstrated in various reports. The majority of studies indicate that in the long-term a fiscal promotion system generates R&D expenditure at about the level of tax concessions.[25] Other OECD and EU member countries have demonstrated that effective promotion by fiscal measures is possible and that appropriate economic arrangements can be made. The evaluation results can also be used to estimate the approximate extent of fiscal R&D aid. In order to provide greater incentives for more R&D expenditure by companies amounting to 0.2 per cent of GDP, a financing volume would be required of about the same amount (in 2006: 4.64 billion euros). However, these are very rough estimates and more precise figures can only be obtained by taking other parameters into account. Generally, however, fiscal R&D support can represent an important contribution towards achieving the three-percent target.

Necessary arrangements

A series of economic and legal questions have to be clarified when arranging a system of fiscal R&D support. These include defining the R&D expenditure covered by the fiscal aid, deciding the form in which the fiscal aid should be offered, whether the aid should be provided to promote new R&D or support existing work, and also the level of the aid. Furthermore, there are also complex legal questions concerning the compatibility with European Union state aid rules and the judgements of the European Court of Justice regarding territorial limitations. Since the European Commission has a positive attitude to fiscal promotion measures, we expect that any legal problems can be solved.[26]

Declining innovation contributions by small and medium-sized enterprises

Analysing the available reports, we conclude that a declining proportion of R&D expenditure is attributable to SMEs. The proportion of the enterprises introducing innovations has also declined over the medium term. The R&I activities of the German economy are concentrated increasingly in the large companies. These medium-term trends are not altered by the fact that there is an observable increase in the level of R&D activities at the present time.

State aid for R&D has in the past only been used by a relatively small proportion of SMEs in Germany. Survey results show that the proportion of innovative companies drawing on one of the various forms of R&D support is the lowest of all the EU member states studied. In addition, the difference between the participation rate of SMEs and that of large companies is more pronounced in Germany than in the other EU member states.[27]

Selective support makes sense if the aim is to aid projects or R&I in areas of particular importance for the economy as a whole. However, if the policy aim is to increase the general R&D activity of German SMEs and thus indirectly boost also the innovator rate, then a high level of selectivity is not necessarily advantageous.

New research aid for small and medium-sized enterprises

The decline in the innovation contributions by SMEs is very worrying. The German government has therefore decided to increase the innovation aid for medium-sized companies (*Mittelstand*) by ten per cent every year. Many observers have criticised the fragmentation and variety of the programmes, and in response they are to be brought together in the new 'Central Innovation Programme *Mittelstand*' (ZIM). In addition, SMEs involved in R&D activities in cutting-edge technology shall be offered easier and quicker access to state aid measures within the framework of the *SME-innovative* initiative. This will initially cover fields of technology such as biotechnology, information and communications technology, optical technologies, and nanotechnology. Projects will also receive support in the fields of production technology, and resource and energy efficiency. The provision of support for cutting-edge technology in SMEs by means of such measures is in principle to be welcomed. Such state aid programmes do not represent a substitute for a system of broad fiscal support for R&D, but supplement this.

Another interesting developing introduced in 2007 as part of the Hightech Strategy is the 'Research Premium', which is intended to provide additional incentives for the increased cooperation of universities and research institutions with business, in particular with SMEs. The research premiums are paid to universities and research institutions which carry out

R&D-commissions from SMEs. They cover 25 per cent of the costs of the order. The outcome has not yet been evaluated and the measure is currently only due to continue until 2009. Increased cooperation between universities and enterprises is a positive development (cf. C6). However, care should be taken that the research premiums do not introduce distortions to the disadvantage of private institutions providing research services under market conditions.

Recommendation

We welcome the measures adopted by the German federal government to streamline and expand the promotion of SMEs. However, it is doubtful whether the existing measures alone constitute a fully-formed strategy to support R&I in medium-sized enterprises. In order to establish a simple form of R&D state aid for companies in Germany which will allow long-term planning, we advise that fiscal R&D-measures should be developed like those which have meanwhile been successfully implemented in many OECD member countries. In view of the declining innovation contributions of SMEs in Germany, preferential aid for SMEs seems advisable. This would also be appropriate for other reasons. Financing restrictions and the above-mentioned asymmetries in the treatment of equity capital and loan capital have an impact in particular on SMEs and new enterprises. If appropriately structured, broad support for R&D through the tax system could represent an important addition to the targeted R&D project aid, which should still be provided for specific cases. The two instruments could complement one another. In addition, fiscal R&D support could provide an important impulse for achieving the three-percent target.

C 4 EDUCATION, THE LABOUR MARKET AND INNOVATION

In the globally-integrated society, knowledge is being generated, distributed, used, and devalued with increasing rapidity. This brings with it the growing need for constant technological and institutional renewal and innovation. In the current knowledge society, products with shorter life-cycles are growing in significance, and knowledge-intensive services are becoming increasingly important for the economy.

Education, vocational training, and further training – in other words forms of human capital – are becoming increasingly important for innovations. The expansion of communications and information technology and the associated modern forms of organisation in companies bring with them changes which exert a considerable influence on the availability of new recruits and the demands on the labour market. Employees need to have a higher and broader qualifications profile as well as key soft skills such as team and communications abilities.

Innovation and qualifications are in a dynamic interrelationship.[28] Innovations have serious implications for the levels of qualification required, and at the same time the level of qualification plays a key role for the innovation process. Innovation and the effective use of new technologies are not possible without education.

The importance of education, vocational training and further training for the innovation process is indicated by the fact that all indicator systems (see Box 08) to determine the innovative ability of a country always includes corresponding parameters. But whereas Germany ranks highly for various criteria such as the transfer into production or networking between companies and research institutions, in the field of education, vocational training und further training Germany is way behind the leading group.