

## Do R&D tax credits work? Evidence from a panel of countries 1979–1997

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### Abstract

This paper examines the impact of fiscal incentives on the level of R&D investment. An econometric model of R&D investment is estimated using a new panel of data on tax changes and R&D spending in nine OECD countries over a 19-year period (1979–1997). We find evidence that tax incentives are effective in increasing R&D intensity. This is true even after allowing for permanent country-specific characteristics, world macro shocks and other policy influences. We estimate that a 10% fall in the cost of R&D stimulates just over a 1% rise in the level of R&D in the short-run, and just under a 10% rise in R&D in the long-run. © 2002 Elsevier Science B.V. All rights reserved.

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### 1. Introduction

US and European policy makers have been concerned about the technological performance of their countries for large parts of the Twentieth Century. These concerns were sharpened by the Post War rise of the Japanese economy which

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enjoyed very high growth rates until the 1990s based on a strong technological base and high commitment to R&D. The phenomenal growth of the Asian tiger economies over the 1980s and mid-1990s, in particular South Korea, has also been based on a high-tech strategy. These competitive threats have coincided with an intellectual movement in economic theory which emphasises the conscious accumulation of R&D and human capital in explaining economic growth (e.g. Aghion and Howitt (1992)).

In an effort to increase their level of innovation many countries have turned to fiscal incentives for R&D, often involving substantial sums of taxpayers' money. The US GAO (1989) estimated that R&D tax credits cost approximately \$7 billion in revenue during the 1981–1985 period. More recent estimates suggest that the US R&D tax credit will cost around \$2.24 billion in lost revenue over fiscal years 1997 through 2002 (Gravelle, 1999). The E.U.'s (1995) survey on state aid suggests that its members spent over \$1 billion per annum on R&D tax incentives during the early 1990s.

Economists, however, have generally been skeptical of the efficacy of tax incentives. One cause of this skepticism is the view that R&D is not very sensitive to changes in its (after tax) price.<sup>1</sup> More recently, however, several studies of the impact of the US Research and Experimentation Credit have found that there was a considerable response in US corporate R&D behaviour. In particular Hall (1993), Hines (1994), Baily and Lawrence (1992) and Mamuneas and Nadiri (1996) find R&D price elasticities of at least unity. A reason for this revisionism is the argument that the US experience provided a 'natural experiment' which enabled researchers to obtain cleaner estimates of the responsiveness of R&D to changes in its user cost. Previous studies, so the argument goes, suffered from an absence of large and truly exogenous variation over time in the R&D tax price.

Although attractive, there are at least three difficulties with concentrating upon only one country to evaluate the effectiveness of fiscal provisions. Firstly, because the variation is essentially macroeconomic it is very difficult to disentangle the true effect of the credit from other contemporaneous macro-economic events, such as world demand conditions. Secondly, the variation between firms in the effectiveness of the credit is essentially due to their different tax positions (e.g. whether they have any taxable profits) and expectations about future R&D spending. These are likely to be highly endogenous, as is recognised in the more recent work. The approach taken in this paper is to draw on cross-country data where there have been several policy experiments with the fiscal treatment of R&D. We essentially use the introduction and modification of rules governing the taxation of R&D (which vary both within and between countries over time) to

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<sup>1</sup>See, for example, Mansfield (1986). Other sources of skepticism, such as relabelling other expenses as 'R&D', are discussed in Griffith et al. (1995). See also Gravelle (1999) for a discussion of the current policy debate in the US.

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