



An ex ante evaluation framework for the regional benefits of publicly supported R&D projects

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Abstract

This paper draws on the knowledge-base implicit in ex post evaluations of publicly funded R&D and other related conceptual and empirical studies to suggest a framework for the ex ante evaluation of the regional benefits from R&D projects. The framework developed comprises two main elements: an inventory of the global private and social benefits which might result from any R&D project; and, an assessment of the share of these global benefits which might accrue to a host region, taking into account the characteristics of the R&D project and the region's innovation system.

The inventory of global benefits separately identifies private and social benefits and distinguishes between increments to public and private knowledge stocks, benefits to R&D productivity and benefits from commercialisation. Potential market and 'pure' knowledge spillovers are also considered separately. The paper concludes with the application of the framework to two illustrative case studies.

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1. Introduction

This paper arose from problems faced by the UK's regional development agencies in assessing ex ante the regional benefits of publicly supported R&D. The agencies' policy objective was to address the standard market failure which leads to socially sub-optimal levels of private sector R&D investment (Nelson, 1959; Arrow, 1962; Dasgupta and David, 1994); difficulties arose, however, in justifying public support for R&D within the UK's standard public sector invest-

ment appraisal procedures.¹ These typically involve discounted cash flow calculations, raising particular problems when applied to R&D projects due to (a) the difficulty of defining ex ante the range of benefits which might stem from the project; (b) uncertainty relating to the scale and timing of such benefits; and (c) doubts about the share of these benefits which will be appropriated by the host region.²

¹ For the UK public sector, investment appraisal procedures are defined in the so-called 'Greenbook'. Investment appraisal techniques vary with project size, with full cost-benefit analyses undertaken only for larger projects.

² This uncertainty in defining ex ante the social returns of publicly supported R&D may itself be a cause of market failure, leading to socially sub-optimal levels of public R&D investment and confounding any attempt to counter private sector under-investment

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Our first attempts to identify any existing approach to ex ante evaluation of R&D centres failed. Despite an extensive literature survey, and consultation with practitioners in the UK, US, Finland and Israel, we failed to identify any existing methodology or approach to measuring ex ante the benefits of publicly supported R&D. Instead, in the countries consulted, we found various approaches have been adopted to avoid any necessity to undertake ex ante evaluations, at least at the level of the individual project. In Israel until recently, for example, subject to meeting certain eligibility criteria, all R&D projects were assisted at standard grant rates.³ Similarly, it is not clear how the potential social benefits of R&D are reflected in budget allocations for competitive R&D support initiatives, such as the UK's SMART scheme.

While our literature and practitioner surveys identified little by way of ex ante evaluation of R&D projects, they did highlight the significant and rapidly growing knowledge-base derived from ex post evaluations.⁴ This suggested an alternative approach, i.e. to use the accumulated knowledge-base derived from these ex post evaluations to develop a framework which could be used to form ex ante judgements about the potential benefits of supporting R&D projects in varying geographical, institutional and economic settings. For example, the literature now provides

in R&D. This under-investment is likely to be greatest where public spending is rationed and R&D projects are competing with other spending priorities with less uncertain outcomes. This is especially true where similar results could probably be obtained by relying solely on technological spillovers. The temptation to free-ride is therefore strong: 'why invest in R&D when similar outcomes can possibly be obtained by reaping technological spillovers?' (Rodriguez-Pose, 1999, p. 276).

³ What was less clear, however, is how the difficulties of assessing the benefits of publicly supported R&D ex ante were overcome in the setting of Israel's overall R&D support budget (see Trajtenberg, 2000).

⁴ For example, Klette et al. (2000) review five econometric ex post evaluations of government R&D subsidies. Georghiou and Roessner (2000) also review a number of ex post project and programme evaluations using different evaluation methodologies and provide a valuable review of methodological issues. Although as Georghiou and Roessner (2000) comment: 'Evaluation work has probably had less of an impact in the literature than it deserves, in part because much of the detailed work is not easily obtainable. There is a disturbing tendency for evaluation data that could form a valuable reference point for future studies to be lost in the grey literature' (p. 674).

consistent evidence on the tendency for knowledge spillovers, or Marshallian externalities, to be spatially concentrated around knowledge sources (e.g. Jacobs et al., 2002). Anselin et al. (2000), for example, also highlight the spatial concentration of spillovers from R&D, and emphasise the different spillover footprints of university and private sector R&D, and that of different industries. Similarly, Egelin et al. (2002) in their analysis of over 2000 public-research spin-outs in Germany, report that 66.5% locate within 49 km of their incubator institution and Wallsten (2001) points to the strong spatial concentration of award winners within the US small business innovation research (SBIR) programme. Previous studies have also suggested that the context in which an R&D centre is placed may also be important in determining the extent of any localised spillovers. Lagging regions, in particular, may find it difficult to appropriate spillover benefits due to limited absorption capacity or receptivity (Rodriguez-Pose, 1999). This may reflect specific limitations in the regional innovation system such as a predominance of economic activity in SMEs in old economy sectors, weak inter-firm association (e.g. Cooke and Morgan, 1998), or a weak skill base; or, it may reflect the impact of limitations in the wider national innovation system such as a lack of technology transfer and co-ordination institutions (e.g. Walker, 1993).⁵

Interest in the spatial distribution of the benefits from public R&D investment is not simply of interest to regional development agencies, however, as promoting technological development has also been seen by national and supra-national organisations (e.g. the EU) as one potential route for counteracting core-periphery disparities. Both the empirical evidence and theoretical models suggest, however, that even if technological spillovers are spatially concentrated it may still be socially sub-optimal to locate R&D activity in lagging regions. Fujita and Thisse (2002), for example, develop a core-periphery model in which the agglomeration effects from concentrating R&D activity in the core, combined with relatively low transportation costs, generate sufficient value added to more than compensate the periphery for the loss of R&D activity (see also Lacroix and Martin, 1988). On the more empirical side, Rodriguez-Pose (1999) examines the

⁵ See, for example, Young and Lan (1997) for a discussion of the absorption capacity of Chinese firms from inward investment.

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