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R&D policy with layers of economic integration

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Abstract

This paper examines whether the optimal unilateral R&D policy for an open economy is a subsidy or a tax. It constructs a general equilibrium model with three successive layers of international integration: (a) trade in goods, (b) trade in technologies with international R&D spillovers and (c) internationally-coordinated R&D policy. Trade in technologies introduces the possibility that an R&D subsidy will have such strong, negative terms-of-trade effects that it harms domestic welfare. Numerical simulations of the OECD show this is a possibility for the US and Japan. With international R&D spillovers a domestic R&D subsidy may reduce domestic innovation.

JEL classification: O38; F15; D62

Keywords: R&D subsidies; International spillovers; International integration

1. Introduction

Until recently, R&D policy could usefully be viewed as a purely domestic issue, but this is changing as international markets become more integrated. This paper focuses on three "layers" of international integration that affect the analysis of R&D

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policy: (1) trade in goods, (2) trade in technologies with international R&D spillovers and (3) coordinated worldwide R&D policy.

Several papers have analyzed strategic R&D policy in the context of international spillovers, including Muniagurria and Singh (1997), Leahy and Neary (1999) and Kang (2000). This work is in the partial equilibrium, oligopoly tradition of Spencer and Brander (1983) in which the home government's policy aims to shift oligopoly rents. Leahy and Neary (1999) provide the following rationale for concentrating on these models instead of monopolistic competition:

> Most recent discussions of R&D spillovers in open economies, such as the work on endogenous growth of Grossman and Helpman (1991), have assumed they occur in industries characterized by monopolistic competition. The combination of free entry (so long-run profits are competed away) and no strategic interdependence between firms, leads to models which, while complicated in other respects, have very simple implications for policy. R&D spillovers towards other domestic firms generate an externality, which should be subsidized. (p. 40)

Our results contradict this claim. In a model of monopolistically competitive world markets we find that the optimal R&D subsidy can be negative, whether R&D spillovers are domestic or international. We show that an R&D subsidy affects the terms of trade, and it is through this mechanism that domestic welfare can be adversely affected.

Many industries exhibit a wide variety of differentiated products together with high levels of R&D and technical change. Examples include: pharmaceuticals, biotech innovations, wireless technologies, computer software, and hybrid seeds. It would be difficult to argue that the standard oligopoly model is clearly more appropriate for any of these industries than is monopolistic competition, hence the motivation to consider R&D policy in the context of monopolistic competition.

Our model demonstrates that the appropriate R&D policy may well depend on the level of international integration. We have stratified the notion of international integration into a series of layers that are superimposed on a benchmark model. Our concern in the first two layers is with unilateral domestic R&D policy. It is only in the final layer, which considers R&D policy integration, that we consider R&D policy outside the home country.

The model has free trade in goods and positive domestic R&D spillovers. R&D produces new "blueprints," each allowing production of a new differentiated intermediate good, used in the production of the single final good.[1] There is a monopolistically competitive market for intermediate goods, and so blueprints yield rents and are valuable.

In the benchmark model, trade in blueprints and spillovers are purely national, not international. An R&D subsidy is desirable because it corrects the positive R&D spillover.

[1]Equivalent results can be obtained from a model in which many goods are in the utility function and new blueprints allow production of new varieties of consumer goods.