



A politico-economic analysis of the European Union's R&D policy

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ABSTRACT

This paper develops an open-economy growth model to analyze the growth and welfare effects of the European Union's R&D policy. In the case of independent countries, each national government chooses the level of government-funded research non-cooperatively and fails to internalize the spillover effects across countries. Consequently, government-funded research is underprovided. In an economic union, the central government budget causes the common-pool problem and leads to an overprovision of government-funded research. Within this framework, we find that although an economic union dominates independent countries in economic growth, the welfare domination is ambiguous. In particular, there is a critical degree of cross-country spillover above (below) which an economic union dominates (is dominated by) independent countries in social welfare.

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1. Introduction

At the European Council of 2002 in Barcelona, the European Union (EU) sets an objective of increasing the research and development (R&D) effort in Europe to 3% of the EU's GDP by 2010. Due to the externalities associated with R&D investment, the market equilibrium level of R&D spending is likely to be lower than the social optimum.¹ Therefore, government intervention may be able to correct for this market failure. For example, in a quantitative analysis, *Eaton et al. (1998)* find that increasing R&D subsidy can lead to a significant increase in the EU's per capita income.² However, because the benefits of R&D policies are largely shared across countries, an individual country has little incentive to pursue these policies on its own. This conventional policy argument suggests a role for supranational government intervention, such as the EU for the European economies, on R&D policies.

An important example is the Framework Programme (FP) for Research and Technological Development,³ which is the EU's main instrument for providing government-funded research in Europe. Two interesting features of the FP are (a) the budget of

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¹ See, for example, *Jones and Williams (1998, 2000)*.

² "It takes less than a 5% research subsidy to raise average per capita income levels in the European Union to a higher steady-state level of 10%" (*Eaton et al., 1998, p. 408*).

³ The FP7 bundles all research-related initiatives in the EU together with the common goals of growth, competitiveness and employment in Europe. The objectives of FP7 are grouped into four Specific Programmes: Cooperation, Ideas, People and Capacities. For example, Cooperation, which takes up 64% of the non-nuclear budget, has ten research priorities, such as health, transport, and information and communication technologies, with a different amount of budget allocated to each. About once a year for each priority, the European Commission publishes a Call for Proposal, requesting interested entities, such as private companies, public organizations and individual researchers, to submit proposals to be funded. Detailed information about the FP7 can be found on its website (http://cordis.europa.eu/fp7/home_en.html).

FP7 (2007–2013) has increased significantly to €50.5 billion compared to €17.5 billion for FP6 (2002–2006), and (b) research priorities of the FP are the result of political negotiations. During the Commission's initial drafting of proposals for the FP and the process of reviewing these proposals in the European Parliament and the Council, interest groups representing their national governments may influence the priorities to be chosen.⁴ For example, in a study by the European Institute of Romania, the authors argue that “[t]he current system in which the priorities of The Framework programs are the result of political negotiations in the Council. . . leads to a useless increase of the priorities number. . .” *Pre-Accession Impact Studies III* (No. 8; p. 50).

This paper provides a politico-economic analysis on the provision of government-funded research in the EU and argues that there exists a tradeoff between an economic union and independent countries in providing government-funded research. In particular, it develops a two-country research-driven growth model to analyze the growth and welfare effects. Within this framework, we derive the following results.

In the case of independent countries, each national government chooses the level of government-funded research non-cooperatively and fails to internalize the spillover effects across countries. As a result, government-funded research is underprovided, and this underprovision becomes more severe as the degree of cross-country spillover increases. In an economic union, the central government budget causes a common-pool problem in which each country tries to externalize the tax burden of its research spending to the other country. This bilateral attempt results into an overprovision of government-funded research in equilibrium, and this overprovision becomes less severe as the degree of cross-country spillover increases. Therefore, cross-country spillover has a surprisingly positive effect on welfare in an economic union. As for the growth and welfare effects, we find that although an economic union dominates independent countries in economic growth, the welfare domination is ambiguous. In particular, there is a critical degree of cross-country spillover above (below) which an economic union dominates (is dominated by) independent countries in social welfare.

Since [Tullock \(1959\)](#), the idea of fiscal centralization causing a common-pool problem has long been recognized by political economists as the “Law of $1/n$ ”, in which the tax burden of raising public spending in any one region is shared by all n regions in the fiscal union, and was formalized by [Weingast et al. \(1981\)](#) in a model of pork-barrel spending. [Persson and Tabellini \(1994\)](#) analyze the effect of fiscal centralization on the size of government budget and the provision of local public goods and find that a positive effect arises because politicians have the incentive to free-ride on the central government budget. In a cross-country empirical study, [Bradbury and Crain \(2001\)](#) provide supportive evidence for the presence of this common-pool effect. The current study incorporates this common-pool effect into a dynamic model to analyze the different growth and welfare implications of overproviding government-funded research in an economic union and allows for cross-country spillover effects. We find that the presence of cross-country spillover reduces the overprovision of government-funded research and improves welfare in an economic union.

Furthermore, given the dynamic setup, we naturally formulate the strategic interactions between agents as differential games.⁵ This approach enables an explicit consideration of the time consistency or subgame perfectness of an equilibrium rather than assuming that the governments can commit to their policies once and for all at time 0. Time consistency (subgame perfectness) requires that no agent has an incentive to deviate at any point in time along the equilibrium path (and for any off-equilibrium path).

2. The model

In this section, we firstly build a simple closed-economy research-driven growth model to illustrate two points. First, the externality associated with research spending leads to its underinvestment in equilibrium. Second, government intervention may mitigate this underprovision. Then, we extend the model into a two-country setting to show that the presence of cross-country spillover effects may stifle (improve) the governments' ability in achieving the optimal policy outcome in the case of independent countries (an economic union). In particular, we compare the optimal policy outcome under cooperative governments with the equilibrium policies under two regimes (a) independent countries and (b) an economic union.

2.1. A simple closed-economy research-driven growth model

There is a unit-continuum of identical household-producers, and their life-time utility is given by

$$U = \int_0^{\infty} e^{-\rho t} \ln C_t, \quad (1)$$

where C_t denotes consumption at time t and $\rho > 0$ is the subjective discount rate. Each household is endowed with one unit of a non-cumulative factor input (e.g. labor) at each instant of time, and this factor input is allocated between production $L_{y,t}$ and research $L_{r,t}$. The production function for output Y_t is

⁴ [Langenberg \(2005\)](#) provides a detailed case study of the decision-making process on FP6 and discusses the opportunities in which interest groups can influence the Commission and the Parliament. [Bache and George \(2006\)](#) provide a comprehensive discussion on the EU's policy process and the influences of interest groups.

⁵ A differential game is a dynamic game in which the state variables evolve according to differential equations. See [Dockner et al. \(2000\)](#) for a comprehensive discussion on differential games.

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