

The problem of private under-investment in innovation: A policy mind map

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Abstract

This paper reviews the major finance-related causes of private under-investment in innovation and the consequent alternative choices for public policy. The focus is on (i) incentive-based arguments that address the problem of limited appropriability of new knowledge, and (ii) the lacking access to external sources of finance caused by imperfections in the capital market. Drawing a policy mind map, which aims to enhance the mutual awareness and coordination of policy makers at the crossroads of technology and corporate finance, the paper is organised along the following chain of thought: (i) causes and rationales, (ii) aims and targets, (iii) critical constraints, and (iv) the main finance-related instruments of innovation policy.

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1. Introduction

Innovation requires the commitment of resources, which in turn need to be financed. The decision to invest in innovation therefore depends on two critical factors, namely the initial incentive to allocate resources for innovation and the capacity to raise the necessary financial means. Policy attempts to intervene in the investment decisions of firms, because two deficiencies in the pure market-based allocation of resources may cause suboptimal private expenditures on innovation:

- First, the *limited appropriability of new knowledge* frequently causes private returns to fall short of the social returns and thus leads to under-investment in innovation (Nelson, 1959; Arrow, 1962). Since this kind of market failure stems from distorted incentives, it occurs irrespective of the actual financing capacity of the firm.
- Second, under-investment can result from *capital market imperfections*, which undermine a firm's capacity to raise

the external funds required for financing an investment, even when incentives are not distorted.

The latest data from the European Community Innovation Survey (European Commission, 2004) put these problems in rough, quantitative proportions. When asked to name the factors that hampered innovation most, 21% of all firms in the sample argued that 'innovation costs are too high' (for a meaningful interpretation one wishes to add: 'relative to the expected returns'), while 15% complained about 'excessive economic risks' and the 'lack of appropriate sources of finance' (Table 1). Among industrial sectors, business services face the biggest finance-related barriers to innovation—probably due to their stronger dependence on intangible assets. Interestingly, a breakdown according to firm size reveals relatively few differences with respect to the first two variables. Small, as well as large firms perceive the 'high cost of innovation' and 'excessive economic risks' as hampering factors of almost equal proportion. However, access to appropriate sources of finance is a much greater problem among small enterprises as compared to medium-sized enterprises, while large firms are least affected.

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Table 1
Finance-related hampering factors (percentage of firms considering them important)

	Innovation costs too high	Excessive perceived economic risks	Lack of appropriate source of finance
Total	21	15	15
Enterprises with innovation activity	24	17	19
Enterprises without innovation activity	19	14	13
Small enterprises	21	16	16
Medium-sized enterprises	19	13	13
Large enterprises	21	18	10
Industry	21	15	15
Mining and quarrying	17	10	8
Manufacturing	22	15	15
Electricity, gas, water supply	9	11	4
Services	20	15	16
Trade	16	12	13
Transport, communication, financial intermediation	20	14	13
Business services	31	24	30

Source: European Commission (2004).

In response to the perceived needs, public policy provides financial support at various levels of governance. Focusing on enterprises active in innovation during the period 1998–2000 (Table 2), the overall share of European firms that received financial support is 29%, whereby industry (35%) was clearly favoured in comparison to services (19%). This observation applies in similar proportions to regional authorities, national governments and the EU (except for its RTD Framework Programmes).

Economic theory provides good reasons for public intervention, and economic policy has applied these arguments to a growing number of initiatives. But the plethora of various rationales and new programmes, which has expanded rapidly over the past decades, increasingly becomes a source of confusion among policy makers, think tanks and (academic) consulting bodies alike. To give an example, it is sometimes argued that venture capital should become a private sector alternative to the public subsidisation of R&D, while other persons think of venture capital as a mere policy ‘hype’, which serves a very small fraction of firms and therefore has little impact on the economy at large. One function of the proposed ‘mind map’ will be to help reject the first idea, showing that the two instruments address two distinct causes of under-investment. At the same time, it will point out that in the case of venture capital we should generally endorse a narrow target more than a broad one. Overall, the mind map aims to provide a coherent general perspective on the various policy channels and endorses the importance of coordination among the various administrative units involved.

In short, this paper seeks to compile a selective summary of the major arguments in the debate, providing a brief and concise review for students of innovation research as well as for policy makers at the crossroads of technology and

corporate finance. The paper is organised along the chain of thoughts, which is displayed in the proposed mind map of Fig. 1. To begin with, the next section identifies finance-related causes of under-investment and the corresponding rationales for public intervention. Section 3 then addresses the specific targets and objectives at which policy should be aimed. Section 4 discusses critical constraints on the selection of policy tools. Section 5 elaborates the particular instruments, while Section 6 summarises and concludes.

2. Policy rationales

2.1. Missing markets for knowledge

The first of the two finance-related causes of under-investment in innovation originates in the limited saleability of new ideas. As a public good, knowledge has two critical properties which can seriously reduce its commercial value (Geroski, 1995, 92ff). First, knowledge remains in circulation no matter how many people use it (‘non-rivalry’ of consumption). Second, as soon as knowledge is disclosed, it becomes difficult to enforce any payment (‘non-excludability’). As a consequence, many innovative firms face the following dilemma: “How can they communicate to a potential buyer the value of a new idea, without disclosing the idea itself? And once they have disclosed the idea, why should a potential buyer be willing to pay for it?” Innovative firms must therefore deliberately manage their knowledge flows in a way that maximises their private returns on a given innovation. Geroski (1995) lists a number of strategic options for individual enterprises, among them intellectual property rights, secrecy, lead-time and embodied knowledge (‘sell products, not ideas’).

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