



Industriens Utredningsinstitut

THE INDUSTRIAL INSTITUTE FOR ECONOMIC AND SOCIAL RESEARCH

A list of Working Papers on the last pages

No. 340, 1992

A NOTE: ON INNOVATION AND CAPITAL MARKETS

by
Stefan Fölster

Note to appear in Day–Eliasson–Wihlborg (eds.), 1992, **The Markets for Innovation, Ownership and Control**, IUI and North-Holland, from a conference held at Saltsjöbaden, June 12–15, 1988.

September 1992

Postadress
Box 5501
114 85 Stockholm

Gatuadress
Industrihuset
Storgatan 19

Telefon
08-783 80 00
Telefax
08-661 79 69

Bankgiro
446-9995

Postgiro
19 15 92-5

**A Note
On Innovation and Capital Markets**

Stefan Fölster

Silicon valley fever has spread among the participants of this conference. Quite a few papers imply or take for granted that small firms are responsible for a disproportionate share of innovative activity.

Holmström, for example, takes the small firm's creative advantage as a stylized fact and explores how this can be explained by incentive problems in larger firms. Campbell, Chan and Marino also explore the incentive problems faced by hired managers and the short-sighted investment strategies that can arise as a consequence. Granstrand analyzes a sample of newly started firms that were acquired by large firms once the innovation had matured.

In this note I intend to raise a few problems that small firm innovation faces. Some of these problems can potentially be severe and imply that small firms' innovative advantage should not be taken as a foregone conclusion.

A first question is whether it is indeed true that small firms are responsible for a disproportionate share of innovative research. In fact, in all OECD countries large firms conduct most R&D measured in terms of R&D cost both in absolute terms and relative to sales. For basic R&D that fact is even more pronounced. At the industry level there are only a few exceptions to this result such as semiconductors and drugs in which smaller firms conduct more research relative to sales than larger ones. In both of these industries venture capital has played an important role in stimulating start-ups of research intensive firms.

In both semiconductors and high-tech drugs America originally had a large head start originating in advanced university research. In both areas, however, the competitive edge is shrinking rapidly in spite of the fact that no other country has a similar wave of venture capital financed start-ups. Such evidence is only anecdotal

but it raises the question of whether new start-ups can decrease the overall efficiency of the industry.

One efficiency problem lies in the asymmetric information between the investor and the inventor. The typical venture capitalist finds it hard to sift the ablest inventors from the average, especially since he spreads both investments and attention over a large number of projects. In contrast, a large firm that allows an employee to proceed with a project typically has much better information about the ability of the inventor and of the project. Thus it would seem that a large firm is better qualified to select good projects.

A large firm, however, also wants to pay an inventor less than the profit earned by the project. As long as many inventors value job security and other advantages of large firm employment firms can consistently pay inventors less than their ex post marginal productivity. Some inventors, however, will choose to leave the large firm and start a new firm with the help of venture capital.

Since the venture capitalist is less qualified to judge the merits of the project than the inventor, an increase in venture capital leads to more hopeless projects being conducted, draining valuable resources in the process. Even when venture capital-financed projects are successful they might have been more efficiently conducted within large firms with their greater marketing and distribution facilities. Further, an increase in venture capital supply increases the risk for large firms that they lose inventors once they are on the verge of important advances. Thus large firms find their incentives to invest in basic research diminished.

This reasoning makes clear that an increased supply of venture capital and start-ups potentially can decrease industry efficiency.

Another potential problem that is acute when small firms spread is that of externalities. It is generally accepted that R&D generates spill-overs that can not be captured by the firm itself. Clearly, larger firms can better internalize such spill-overs and have therefore greater incentives to conduct more basic research. It may be that small firms to a large extent live on such spill-overs, developing applications of results invented in larger firms and universities. More exploitation of spill-overs by small firms then decreases larger firms' incentives to conduct basic research.

A more fundamental question concerns the internal organization of large firms. The paradox is that if small firms were more efficient innovators then large firms could always reorganize themselves to simulate a group of small firms. This point has been raised for example by Sah and Stiglitz (1987). In practice R&D could be devolved to a number of more or less independent profit centers or satellite firms. Together these could still profit from economies of scale in common production, marketing and distribution.

While a large firm can simulate a collection of small firms, it is much more difficult for a small firm to simulate a large firm. It would seem therefore that large firms should win out provided they are flexible enough to decentralize. In fact this may be a good description of what is observed. Large firms in the industrialized world have decentralized on a vast scale during the eighties. The success of small firms seems to be most spectacular in areas where giants such as IBM have been slow to decentralize.

In sum, while small firms have advantages in flexibility they also face a number of innovation disadvantages. Further, it was pointed out that an increased number of small firms can potentially decrease industry efficiency. Therefore the question of which firm is the better innovator is not as clear-cut as some of the papers at this conference seem to assume.

The points raised here also have important implications for government policy towards small firms. All industrialized countries have at least one, and sometimes a plethora, of schemes for subsidizing newly started firms. In the U.S., for example, subsidized loans are given to so called SBICs (Small Business Investment Companies) that are essentially venture capital funds. In many European countries investors are allowed tax deductions for investments in venture capital funds. In Sweden a similar scheme has been proposed by the Federation of Swedish Industries.

The subsidized venture capital funds, however, tend to act similarly to many unsubsidized venture capital investors. They spread their attention thin over a large number of projects. As a result they do not select projects very well and they rarely offer help with strategic decisions, business contacts or marketing. In addition they often demand rapid growth and pay-back within 4 to 5 years. Empirical studies

suggest that these types of investors may not be the socially most desirable ones (e.g. Amit, Glosten, and Muller, 1991; Flynn, 1991).

Furthermore, other empirical studies show that subsidies of the type mentioned tend to result in relatively few new projects that would not have been conducted anyway. Many of these studies are described in Fölster (1991).

In sum, a common form of subsidizing small firms may lead to relatively few new start-ups and in addition it may channel public funds through relatively less efficient private investors.

This argument by no means implies that subsidies given directly by public agencies are more efficient. On the contrary empirical studies (Fölster, 1991) indicate that public agencies also tend to be poor at selecting and supporting projects.

Instead a more effective public scheme for stimulating small businesses should incorporate three principles.

1. Public financing should concentrate on start-ups involving technological development. Since spill-overs from technology development create a positive externality the case for a public subsidy to technology investments is stronger than for other investments. The reason for concentrating on start-ups is that these often face an asymmetric information problem. Following the reasoning of Stiglitz and Weiss (1981) this can lead to capital rationing. For established firms this tends to be less of a problem.
2. The subsidy should be given in a way that it discourages projects that would have been conducted anyway from seeking public financing. In general this can be achieved by requiring that a subsidy be coupled to a stake in the profit. This can be done by letting the subsidy take the form of a normal investment in stocks. As a result start-ups that are attractive to private investors even without the subsidy will not seek a subsidy because that would mean giving up a part of the future profit. This self-selection effect has been shown empirically to drastically increase the effectiveness of such subsidies in terms of selecting start-ups that would not have been financed anyway.

3. A public subsidy programme should be geared primarily toward competent investors that engage themselves in the projects they invest in. Studies show that such investors, that make an effort to select good projects and help the projects with strategic decisions, marketing, business contacts and so forth, tend to succeed much more frequently.

The Swedish government is currently considering a scheme suggested by IUI (in a previous version of this note, 1988, and in Fölster, 1991) that follows these principles. Under this scheme private investment companies or individual investors that fulfill certain requirements can avail themselves of public funds to invest in projects they consider promising but too uncertain to invest their own money in. If the project succeeds the state can recoup the investment and a share of the profit. The investment company can invest own money in the project whenever it feels that the project has become certain enough to do so.

In conclusion I have argued that an understanding of the innovation problems that small firms face is important for analyzing industry efficiency and for designing effective government policies.

Bibliography

Amit, R., Glosten, L. and Muller, E., Does venture capital foster the most promising entrepreneurial firms? *California Management Review*, 1991, vol. 32, nr.3.

Flynn, D. The critical relationship between venture capitalists and entrepreneurs. *Small Business Economics*, 1991, vol.3, nr.3.

Fölster, S., *The Art of Encouraging Invention: A New Approach to Government Innovation Policy*, The Industrial Institute for Economic and Social Research, 1991.

Sah, R.K. and Stiglitz, J.E., The invariance of market innovation to the number of firms. *Rand Journal*, 1987, 18, 98-108.

Stiglitz, J. and Weiss, A. Credit rationing in markets with imperfect information. *American Economic Review*, 1981, 71, 393-410.