



# Is the commercialization of European academic R&D weak?—A critical assessment of a dominant belief and associated policy responses

Staffan Jacobsson<sup>a,1</sup>, Åsa Lindholm-Dahlstrand<sup>b,\*</sup>, Lennart Elg<sup>c,2</sup>

<sup>a</sup> Environmental Systems Analysis, Chalmers University of Technology, Sweden

<sup>b</sup> CIRCLE, Lund University, Sweden

<sup>c</sup> VINNOVA, Stockholm, Sweden<sup>3</sup>

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## ABSTRACT

There is a widespread belief that EU underperforms in the commercialization of publicly funded research and that the appropriate policy response is to transfer the ownership of intellectual property rights to Universities. This paper assesses the validity of these twin beliefs. In addressing the first, we limit ourselves to Sweden which still retains its “Teacher’s Exemption” model. In spite of confident statements made in the literature and by Government, we provide evidence to the contrary, i.e. that Swedish academia performs well in terms of commercialization. We also have doubts about the usefulness of the medicine prescribed to cure the alleged problem. Largely drawing on US literature, we argue that the medicine risks harming strong university–industry networks, biasing technical change, reducing entrepreneurial activity and generating costs to Universities which may be detrimental to technology transfer. In conclusion, we seriously question the validity of both beliefs.

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## 1. Introduction

In the EU (1993) White Paper, it was argued that Europe was relatively unsuccessful in converting scientific breakthroughs and technological achievements into commercial success. The perception of a strong European science base which is not translated into economic growth was labelled the “European Paradox” in the EU Green Paper on Innovation (1995). Over time, the focus shifted to the commercialization of publicly financed R&D. Even though reports (e.g. EU, 2003) have pointed to some positive trends in, for example, efforts to encourage the creation of university spin-offs, there is a strong belief that EU underperforms in the commercialization of publicly funded science. Hence, the Commission (2007, p. 7) argued that:

*“One important problem is how to make better use of publicly funded R&D. Compared to North America, the average university in Europe generates far fewer inventions and patents.”*

A frequent policy response to this problem is to strengthen the management of knowledge and intellectual property by European Universities (European Commission, 2007, p. 7):

*“This is largely due to a less systematic and professional management of knowledge and intellectual property by European universities.”*

While many European nations have now abandoned the “Professor’s privilege” (Geuna and Rossi, 2011), some US researchers, for example Kenney and Patton (2009), criticize the university-ownership model in the US, and suggest instead an “Alternative model” with inventor ownership. Indeed, comparing the inventor ownership model of the University of Waterloo in Canada with the university ownership model of five US universities, Kenney and Patton (2011) conclude that this:

*“...examination of the entire population of technology-based spin-offs ... showed that the inventor ownership regime strikingly dominates the better funded, more highly rated, and much larger university ownership universities.”*

It is not only the university ownership model that is questioned but also the empirical foundation of the “paradox”. In particular, Dosi et al. (2006, p. 1450) suggested that the European Paradox “... mostly appears just in the flourishing business of reporting to and by the European Commission itself rather than in the data.” A thorough analysis of R&D, bibliometric, patent and industrial market share data led to the observation that (Dosi et al., 2006, p. 1461)

\* Corresponding author. Tel.: +46 46 222 0298; fax: +46 46 222 4161.

E-mail addresses: [staffan.jacobsson@chalmers.se](mailto:staffan.jacobsson@chalmers.se) (S. Jacobsson),

[Asa.Lindholm-Dahlstrand@circle.lu.se](mailto:Asa.Lindholm-Dahlstrand@circle.lu.se) (Å. Lindholm-Dahlstrand),

[Lennart.Elg@VINNOVA.se](mailto:Lennart.Elg@VINNOVA.se) (L. Elg).

<sup>1</sup> Tel.: +46 31 772 1213.

<sup>2</sup> Tel.: +46 84 733 086.

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“...the European picture shows worrying signs of weakness with respect to the generation of both scientific knowledge and technological innovation. However, no overall “European Paradox” with a leading science but weak “downstream” links can be observed”. Dosi et al. (2006, p. 1460) further argued that:

*“...the presumed feeble links between science and industry should be one of the most important aspects of the paradox conjecture. Surprisingly, the evidence here is simply non-existing.”*

Hence, serious doubts are cast on the empirical foundation of the alleged paradox. Scrutinizing the interaction between universities and industry at the European, as opposed to the national level is, however, fraught with difficulties as little cross-country comparative data exist. The phenomena in question are complex and may require detailed analyses of specific countries (EU, 2003), using “local” knowledge and a multitude of national sources.

The Swedish case can be said to be of particular value for such a detailed analysis. First, Sweden is one of the few European countries which has not abandoned the “Professor’s privilege”, and, even though it is very much debated, still uses an inventor ownership model (the “Teacher’s Exemption” model) for the commercialization of academic research. Second, for about two decades, high R&D expenditure has been the starting point for a number of analysts claiming that there is a paradoxical relationship between R&D input and output in the form of e.g. new firm formation, share of “high tech” in manufacturing output/export and growth (e.g. Edquist and McKelvey, 1998; Braunerhjelm, 1998; Henrekson and Rosenberg, 2001; Andersson et al., 2002; Goldfarb and Henrekson, 2003).<sup>4</sup>

This paradox initially focused on the relation between high aggregate R&D intensity and a perceived weakness of the “high tech” industry. It was not until after the “European Paradox” was coined in 1995, that the Swedish policy debate began to focus on the narrower “academic paradox”, i.e. how academic R&D, perceived as voluminous, is believed to be insufficiently commercialized in the form of new firms, patents and licences.<sup>5</sup>

The purpose of this paper is to (a) assess the validity of the belief in poor commercialization of academic R&D and (b) identify risks of handling that alleged problem by focusing on the ownership of intellectual property rights (IPR). In addressing the first, we limit ourselves empirically to Sweden. In Section 2, we outline the emergence of the belief while Section 3 contains a scrutiny of the empirical foundation of the belief. This includes an assessment of the “performance” of Sweden, and its “Teacher’s Exemption” model, with respect to (a) the number of university spin-offs and (b) number of academic patent applications – two indicators of commercialization. The analysis of the risks of copying US science policy solutions in Sweden, and in Europe as a whole, is undertaken in Section 4. Section 5 contains our main conclusions and some recommendations for policy.

## 2. The emergence of the belief in Sweden

At the end of the 1980s and in the early 1990s, a debate emerged on perceived problems with the relation between (high) R&D intensity, (weak) knowledge intensive industries and (poor) aggregate growth (Ohlson and Vinell, 1987; Ohlson, 1991). Edquist and McKelvey (1991) popularized this argument with the notion of a Swedish Paradox. This path was also pursued by others, with some

modifications to the arguments, forming a stream of papers on the presumed paradox between R&D intensity at the national level and an indicator of outcome, be it growth or share of the “high tech” sector in production or exports (e.g. Braunerhjelm, 1998; Edquist and McKelvey, 1998).<sup>6</sup>

This literature set the context for the discourse as to how and to what extent academic science is made socially useful, leading to the perception of an “academic paradox”. Against the background of high expectations of knowledge intensive areas (i.e. IT, biotechnology and material technology)<sup>7</sup> and a deep economic crisis in Sweden in the early 1990s, a search was started for institutional and organizational changes that could increase the industrial impact of academic R&D.<sup>8</sup> The 1992/93 Government Science Policy Bill articulated that it had two priorities; designing strategic R&D programmes and strengthening the exchange of knowledge between universities and industrial R&D. It was argued that (Swedish Government, 1993, p. 29):

*“...it is obvious that the knowledge flow between universities...and industry is insufficient. Deficiencies in the interaction means that available knowledge does not reach industrial applications to the extent that should be possible.”*

To remedy this problem would require (Swedish Government, 1992/93, p. 10) “...substantial improvements through a continued development of existing forms for interaction and the development of new forms.” Although differently phrased, this theme continues to run through later Bills. In the course of the subsequent decade, a number of science policy measures were taken, including expanding PhD programmes,<sup>9</sup> setting up Centres of Excellence and building infrastructure, e.g. holding companies, to support commercialization of research results in the form of patents and firms.

An increased emphasis by the Government was put on commercialization from about 2000. Thus, “...results from research at Universities and University colleges in the form of inventions ought to be commercialized to a greater extent” (Swedish Government, 1999, p. 24) and “Research results should lead to commercialization to a greater extent” (Swedish Government, 2001, p. 47).

The focus on commercialization was, arguably, strengthened by the aforementioned argumentation by the European Commission, but also by the work of a few academics; Henrekson and Rosenberg (2000, 2001), Goldfarb and Henrekson (2003) and the incorporation of key arguments in an influential government report (Andersson et al., 2002). A shared starting point for these studies was the larger “Swedish paradox”. As Andersson et al. (2002, p. 25) formulated it:

*“Sweden belongs to those countries that invest most in the knowledge based economy but not those that profit most. On the contrary, Sweden has lost a great deal in terms of economic prosperity during the last decades, even if a certain recovery took place in the end of the 1990s. To remedy this “Swedish paradox” is of great importance for our ability to strengthen growth and welfare.”*

These papers linked the “Paradox” to an insufficient contribution of the Universities to growth. An intermediate variable was the poor development of the ‘high tech’ sector, i.e. the starting point in the larger Paradox discourse that began at the end of the 1980s.

<sup>4</sup> The concept of a ‘Swedish Paradox’ was coined in 1991 (Edquist and McKelvey, 1991) and according to Audretsch (2009), it was later adopted as the European Paradox. According to Dosi et al. (2006), the European Paradox is quite similar to an earlier “UK paradox” fashionable about thirty years ago.

<sup>5</sup> Jacobsson and Rickne (2004) critically addressed the perception that Swedish academic R&D is believed to be voluminous.

<sup>6</sup> Ejerme et al. (2011): critically analyse this literature.

<sup>7</sup> “A large part of Sweden’s structural renewal in the next ten to fifteen years must take place by growth in research and knowledge intensive industries” (Swedish Government Bill 1992/93:170, p. 28).

<sup>8</sup> Kenney and Patton (2009) explain that, similarly, a motive for the Bayh–Dole Act in the US was that universities could be a source of innovation that would strengthen economic growth.

<sup>9</sup> A major theme was improving the absorptive capacity of industry by employing more researchers. A policy of expansion of MSc and PhD programmes in engineering and natural science was subsequently implemented.

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