The Modes of Industry-Science Links

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The relationship between the public and the private sector is on the agen da of many researchers and policy makers. One reason for this interest in public private collaborations is the observation that industry-science links have been shown to have a positive effect on firms' innovation success combined with the finding that private-public co-operation is at a low level in Germany and the rest of the European Union (Rammer et al., 2005; European Commission, 2002), compared to co-operation with other partners. Our paper is related to the literature looking at the motives firms have to engage in collaborative R&D with a specific focus on industry-science collaboration (see. e.g. Mohnen and Hoareau, 2003; Capron and Cincera, 2004; Veugelers and Cassiman, 2005 and Cassiman and Veugelers, 2002; Fontana et al., 2003; Belderbos et al., 2004). The determinants these authors find include size, industry, innovation activities, public funding and access to well trained employees. However, only little evidence exists on what factors influence a specific type of collaboration (formal vs. informal) with public research institutions. This is the starting point for our paper. Using data from the German Innovation Survey of 2003 ("Mannheim Innovation Panel") - a large scale survey on innovation activities of German firms with five or more employees in manufacturing and services - we are able to distinguish between the following four types of collaboration between firms and public institutions:

- "joint research": Collaboration with research institutions in the form of joint research or by exchanging of personnel.
- "buying knowledge": Collaboration in the form of contract research undertaken by a university or research institute on behalf of a private firm and buying licenses for technologies from research institutions.
- "using service": Collaboration in the form of training of firms' employees at universities and technological consulting by research institutions.
- "informal collaboration"

We find that innovators are more likely to collaborate with public research institutions than non-innovators in all four different ways. This is also the case for larger firms, firms that face obstacles to their innovation activities, publicly funded firms and firms with a high share of university graduates. In particular the finding that public support for R&D activities of firms has a positive effect on the likelihood of all four types of collaboration between firms and public institutions is a promising result. It shows that firms and universities establish ties and contacts between each other that go beyond the formal co-operative agreement that is usually required to be eligible for public R&D funding in the first place. This could be interpreted as a "behavioural additionality" effect of public funding. Not everything is equal for all four types of collaboration, however. Firms in East Germany are shown to be more likely to collaborate in informal ways with public research institutions. We also find differences between product and process innovators. Firms that only introduced process innovations favour informal collaboration and using services over the other two forms of collaboration with public institutions.