

followed by Stephan, Gurmu, Summel and Black (2004). The authors start from the hypothesis that patent can be a “logical outcome of research activity, that is designed first and foremost with an eye to publication”. Three factors can mostly encourage patenting:

- a more applied oriented scientific environment: working in engineering faculty or technical university or in biomedical research can give research results both patented and published. In this case the patent can be viewed as a by product of publication, given the low marginal cost of producing a communication for the technology transfer office;
- the interaction with industry, that can increase the interest and the opportunity to patent of public scientists;
- the economic reward accompanying the patent protection of research findings through the technology transfer, even if economic returns from patenting is highly skewed.

Other less prominent factors can also play a positive role in patenting orientation:

- the academic visibility: patents confirm the novelty of the scientific results and attract industrial firms collaborations;
- other return from the industry, such as the access to equipment.

The disclosure of invention to their public institution and TTO by the scientists is constrained mainly by opportunity cost consideration (Thursby and Thursby, 2003) such as time to take away from research for being involved in licensing and development, because the researcher involvement is asked also for institution owned patents. Some of these constraints are due to “learning costs” and experience can help future disclosures.

Given these pros and cons factors, some personal character can influence the propensity to patent of public scientists: age and cohort effect, career stage, scientific productivity.

The hypothesis made by Stephan *et al.* (2003) are that incentive to do patentable research is not different from incentive to do publishable research, therefore the rate of patenting should

decline with the age, following a trend similar to the age-publishing profile. At the same time this trend can be alleged by the career stage consideration: at the beginning of career there is the necessity of concentrating time on research activity, while late in career the scientist can allocate more time to activity that could produce additional revenue. Another factor that can alleged the life cycle effect on patenting come from the cohort effect: younger institutions could be more patent oriented, given an important recent change in academic culture.

The results from a multivariate cross section analysis (patent equation in Stephan *et al.*, 2003), including institutional and individual factor variables, are not completely congruent with these hypothesis: there is little evidence of life cycle effects on the number of patents applications that a scientist makes. A strong results is instead the positive and significant relation between patents and publications.

In another study which examined patenting activity at individual level in a Department of MIT, the authors (Agrawal and Henderson, 2002) found out that disclosures are negatively related to age and positively to career stage; but the cohort effect is opposite to the hypothesis of a “cultural change” in University, since new cohort were less oriented to invention disclosure to their institutions

Another study (Wallmark, 1997) describes the inventors profiles (age, gender, individual patent productivity) at a Sweden University of Technology. It is found out that the individual patent productivity is unevenly distributed: 75% of researchers contribute to 25% of patents while the top 10% contribute to 75% of the results. The presence of very productive individuals should influence the distribution of patents among the different schools at the technical University: in fact, instead of the different size of schools and the different patent frequency among industry branches, the patenting are evenly distributed among schools. Wallmark finds also that the patent production curve over the life cycle seems to be the same obtained for publication production: an inverse U shape over the life cycle.