The contribution of Multinational Defence Firms to Dual-Use Technological Knowledge

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Abstract
This paper aims to analyze the contribution of defence industry to the generation of patented technological knowledge, and particularly to dual-use technology. The paper focuses on the major multinational firms included in the Stockholm International Peace Research Institute (SIPRI). Using microeconomic information gathered from the SIPRI, and a specialized database on patents (PATSTAT), we present some insight into the type of technology produced by multinational firms. The paper focuses on the following research questions: Is there any relationship between firm size and the type of patented technology? Is the production of dual-use technology related to the weapon sales? What is the relationship between the selling profile and technology production? Is there any difference between European and US defence firms?

Key Words: Dual-use technology, military patents, defence industry, multinationals
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1. Introduction

From a social perspective, the analysis of the defence industry is relevant because it might bring civilian benefits as additional returns to the purely defensive objectives, and this becomes a strategic factor in countries with a thriving weapon industry. From an economic perspective, it is well known that the flows of knowledge between military and civilian sectors can contribute to technological diffusion through spillovers, which is essential for economic growth. In this paper we provide some insight into the role of the worldwide defence industry in the generation of technological knowledge, and the generation of dual technology in particular. In this research, we define dual-use technology as civilian technology whose generation relies on military technology.

2. Literature Review

In this section we review several key papers on the diffusion of military technologies, and briefly discuss how to measure the diffusion of military technology using patents and patent citations. Firstly, the traditional concept to describe the diffusion of knowledge from military to civilian sector is ‘dual-use technologies’. According to the pioneer paper by Cowan and Foray (1995) “dual technologies” are those developed and used by both the military and the civilian sectors. Subsequent research has contributed to identify some of the underlying factors affecting military technological diffusion. Secondly, indicators such as citations have been widely used in the last few years to measure flows of knowledge between sectors (Jaffe et al., 1998; Jaffe y Trajtenberg, 2002; Acosta y Coronado, 2003; o Breschi y Lissoni, 2004; Acosta et al., 2011, 2013).

3. Methodology

3.1 Research Questions

We put forward the following research questions that will be answered throughout the paper:

1. Is there any relationship between firm size and type of patented technology?
2. Is the production of dual-use technology related to the weapon sales?
3. What is the relationship between the selling profile and technology production?
4. Is there any difference between European and US firms in the production of technological knowledge and dual-use technology?

3.2 Patent Citations

A technological citation is a citation to other patent included in the “state of the art” or background, which is used as support for the invention. Citations to previously patented inventions suggest that the cited patent provides technological knowledge upon which the current invention was supported. The technological citations to other patents can be interpreted as flow of knowledge between sectors, institutions or even geographical units. In this paper, if a defence company has applied for a patent and this patent includes a citation to
other patent used as support of the invention, it is assume that the cited patent has contributed to the production of the new knowledge embedded in the invention. The analysis of the origin and sectors of the citations will provide a rough picture of the flows of knowledge between military and civil technology.

3.3 Data

Our sample consists of information published by the Stockholm International Peace Research Institute (SIPRI) on the 100 major defence companies in the world. After cleaning the sample of some missing data, our final sample contains 71 firms. From the name of the companies we have retrieved the applied and granted patents over the years 1980-2011. The search of technological data has been carried out in the PATSTAT database by following the suggestion of the Leuven University that allows different names for each company.

4. Results and Discussion

Our findings show that the size of the defence company, measured by the number of employees, is linked to its technological capacity, which was proxied for the total number of patents and civil patents owned by the company. Weapon sales are not related to the technological civilian or military capacity of the company, but to a mixture of both types of technologies. Finally, the share of military sales over the total sales of the company, which is a variable of military specialization, is inversely related to the civilian technological capacity. The results surprisingly show that there is not any relationship between firm specialization in defence and military technological production.

Firms that produced dual-use patents present larger volumes of sales and weapons’ sales, have a greater number of employees, and own more patents. The only variable in which there is not any difference between producers and non-producers of dual patents is the ratio between military sales and total sales. When the size effect is removed (dividing the patent variables by the number of employees, we observe that the differences remain, and firms that generated dual-use technologies own a greater number of total patents –civil, military and mixed– than those that did not.

5. Conclusions and Recommendations

The defence worldwide industry is composed of firms whose main economic activity is not only the production of weapons. A great number of weapon companies produce civilian goods, which profits are as substantial as those stemming from the weapon sales. This paper provides some insight into the advantages of technological military activities for the civilian sector at the company level.

The data point to a great heterogeneity of military firms in the production of technology. The size is quite different and there is a high concentration of patent in a few companies. Only five firms account for more than 50% of total patents owned by the defence industry, and
this huge concentration remains for the military or mixed patents. However, there is not a correlation between the number of civilian patents and military patents.

Regarding the dual-use, it is little linked neither to the size of the company measured with the number of employees, nor to the firms with the greater number of total patents or civilian patents. It is more related with firms with greater volumes of sales, which are not necessary those more specialized in weapon sales.

When we combine firm data and technological data, a strong correlation is found between firm size and technological size of the firm for both civilian and total patents, but not for the case of military patents. At the same time, there is an inverse relationship between total technological capacity and the share of weapon sales over total sales of the company. A weak positive relationship was found between weapon sales and both mixed patents and the production of dual-use technology.

Focusing on dual-use, we cannot confirm the relationship between size and greater dual-use, but a test of mean differences points to a bigger size for companies producing dual-use technologies. As a consequence, the size effect can be related to the presence of dual-use, but not to its intensity. What seems clear is that companies with dual-use technologies present certain abilities, which are different from their size.

References


