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The trade-off between innovation and defense industrial policy: A simulation model analysis of the Norwegian defense industry

Martin Blom [a], Fulvio Castellacci [a], Arne Martin Fevolden [b,*]

[a] Norwegian Institute of International Affairs (NUPI), C.J. Hambros plass 2D, Pb 8159 Dep, 0033 Oslo, Norway
[b] Nordic Institute for Studies in Innovation, Research and Education (NIFU), PB 5183 Majorstuen, NO-0302 Oslo, Norway

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ABSTRACT

The paper investigates the trade-off between innovation and defense industrial policy. It presents an agent-based simulation model calibrated for the Norwegian defense industry that compares different policy scenarios and examines the effects of a pending EU market liberalization process. The paper points to two main results. (1) It finds that a *pure* scenario where national authorities focus on, and provide support exclusively for, either a) international competitiveness or b) national defense and security objectives, is more Pareto efficient than a corresponding *mixed* strategy where policy makers simultaneously pursue both international competitiveness *and* defense and security objectives. (2) Under the conditions of the new EU liberalization regime, it finds that a stronger and more visible trade-off will emerge between international competitiveness and national defense and security objectives. Policy makers will have to choose which to prioritize, and set a clear agenda focusing on one of the two objectives.

1. Introduction

The European Union's Defence and Security Procurement Directive (2009/81/EC) will during 2011 and 2012 be transposed into national law by EU (European Union) and EFTA (European Free Trade Association) Member States. The intention behind the Directive is to ensure free trade of defense and security equipment within the European Economic Area (EEC) and thereby increase competition, reduce duplication, lower prices and eventually strengthen the international competitiveness of the European defense sector. Although the actual impact of the Directive is still uncertain, it is likely that many Member States will find it more difficult to maintain protectionist policies such as national favoritism and offset (counter-trade) requirements. Nevertheless, the Directive might not affect each member country in the same way or to the same extent. Some authors have already begun to speculate that the Directive will impact member countries differently according to the size of their national defense markets and the strengths of their defense industrial base [1]. One concern, in this regard, is that a higher degree of market liberalization in the European defense market might lead to rationalization of production and lower costs of defense equipment for the EU as a whole, but that smaller Member States, such as Norway, might find that these benefits are offset by the impediments that the Directive creates with respect to achieving other important policy goals.

* Corresponding author. Tel.: +47 22 59 51 46, +47 97 57 26 36 (mobile).
E-mail addresses: martin.blom@nupi.no (M. Blom), fulvio.castellacci@nupi.no (F. Castellacci), arne.fevolden@nifu.no (A.M. Fevolden).

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Norway has traditionally sought to foster a strong domestic defense industry because it considered this sector vital for reaching two distinct types of policy objectives. On the one hand, national authorities have provided innovation policy support to the domestic defense industry because they believed that defense companies could foster economic growth and international competitiveness by introducing technologically advanced innovations and generating strong positive spill-over effects to related domestic industries. On the other hand, public authorities have also supported the domestic defense industry through traditional defense industrial policies because they believed that defense companies could provide the armed forces with access to high-end technological expertise and ensure that the country had a steady supply of spare parts and munitions in times of a national crisis. The Norwegian Government has pursued these two policy objectives through two different types of policy instruments: (1) innovation policies that encourage the introduction of *specialized products and components* based on high-end technological expertise; and (2) defense industrial policies that encourage the introduction of *complex weapon systems and platforms* based on integration of a broad base of technologies. The former has significantly sustained the economic performance and international competitiveness of so-called *specialized supplier* companies [2], whereas the latter has fostered technological and military capabilities of the largest firms in the Norwegian defense sector, which are those that can play the role of *system integrators*.

This policy background leads to formulate some important questions. How do these two distinct policy goals affect one another, is there a trade-off and contrast between them? Relatedly, how will the introduction of the new EU directive affect these two policy objectives and the relationship, or trade-off, between them? Motivated by these two research questions, the present article intends to:

i. Investigate the trade-off and contrasting effects of two different policy objectives in the defense industry: strengthening military capabilities through defense industrial policy versus fostering the companies' international competitiveness through innovation policy.
ii. Examine whether and the extent to which a greater degree of market liberalization in the future, as a consequence of the implementation of the new EU Directive, will affect this trade-off.

These issues represent new areas of research that relate to and further extend on several recent contributions in Technological Forecasting and Social Change that have discussed the theoretical and empirical foundations of innovation policy and its effects on private firms' competitiveness and export performance in different sectors of the economy [3–6]. To investigate these questions, the article will set up and analyze an agent-based model of the defense industry, which will simulate the dynamics of the Norwegian defense industry under different policy scenarios.

Agent-based modeling is a quite recent and increasingly popular approach in the field of innovation and industrial dynamics. The agent-based modeling approach is closely related to evolutionary economics, in the sense that the formal models are empirically grounded and aimed at reproducing stylized facts and in the sense that they can be used to play out different policy scenarios and analyze and forecast the evolution of industries and innovation systems [7,8]. Agent-based models have recently been used for the study of various industries and technologies, among others, in this journal [9–11]. This paper will extend on these contributions and for the first time apply the agent-based modeling approach for the study of innovation policy and competitiveness in the defense industry.

The model we present is based on and extends the so-called SKIN model (*Simulating Knowledge Dynamics in Innovation Networks*), which provides an analysis of private firms' interactions and knowledge dynamics in high-tech industries, developed in a number of recent articles by Gilbert et alia, Pyka et alia and Ahrweiller et alia [12–14]. Our approach is rooted in these recent models, but extends them further by applying it to the relationship between international competitiveness and military capabilities within a context of increasing market liberalization in the defense sector.

The simulation analysis carried out in this article looks at the effect of three different policy strategies – "*pure*" innovation policy, '"*pure*" defense industrial policy' & "*mixed*" innovation and defense industrial policy. Each of these is analyzed under two different institutional regimes – *before* and *after* the introduction of the new EU Directive. The simulation analysis points out three main results: (1) There is a clear trade-off between *pure* innovation and *pure* defense industrial policies – pursing innovation policies will improve international competitiveness of the firms at the expense of their military capabilities, and vice versa. (2) Pursuing a *mixed* strategy – of combining innovation and defense industrial policy support – strengthens the firms' military capabilities slightly more than *pure* defense industrial policies, but at the cost of a severe decline in their international competitiveness. (3) These trade-offs are maintained even after the introduction of the new EU Directive, but the international competitiveness of the firms increases significantly for all policy scenarios. Based on these findings, the article points out that national authorities should consider abandoning "mixed" policy strategies and instead pursue "pure" policy strategies that focus on only one of the objectives. It also points out that increasing liberalization might constitute more of an opportunity than a threat for the Norwegian defense industry, but that national authorities need to consider carefully what their most important policy goal is — strengthening the military capabilities of their firms or their international competitiveness.

Although the main topic of the paper is the trade-off between innovation and defense industrial policies, the insights gained through the analysis might be relevant for other sectors of the economy as well. We believe that the findings in this paper can be especially useful for understanding industries where there is a dynamic, complex and conflicting relationship between economically efficient production and important social externalities. In food production, for instance, some farming methods help maintain the cultural landscape and contribute to tourism and sustainable development, but they are not necessarily the most efficient; and in energy production, some means of energy production are less efficient, but they are more reliable and contribute to a higher level of energy security. We believe that this article may provide insights that can be valid for these and other sectors of the economy.