MACROECONOMIC BENEFITS FROM ADVANCED PUBLIC PROCUREMENT
The Swedish Gripen Project

by

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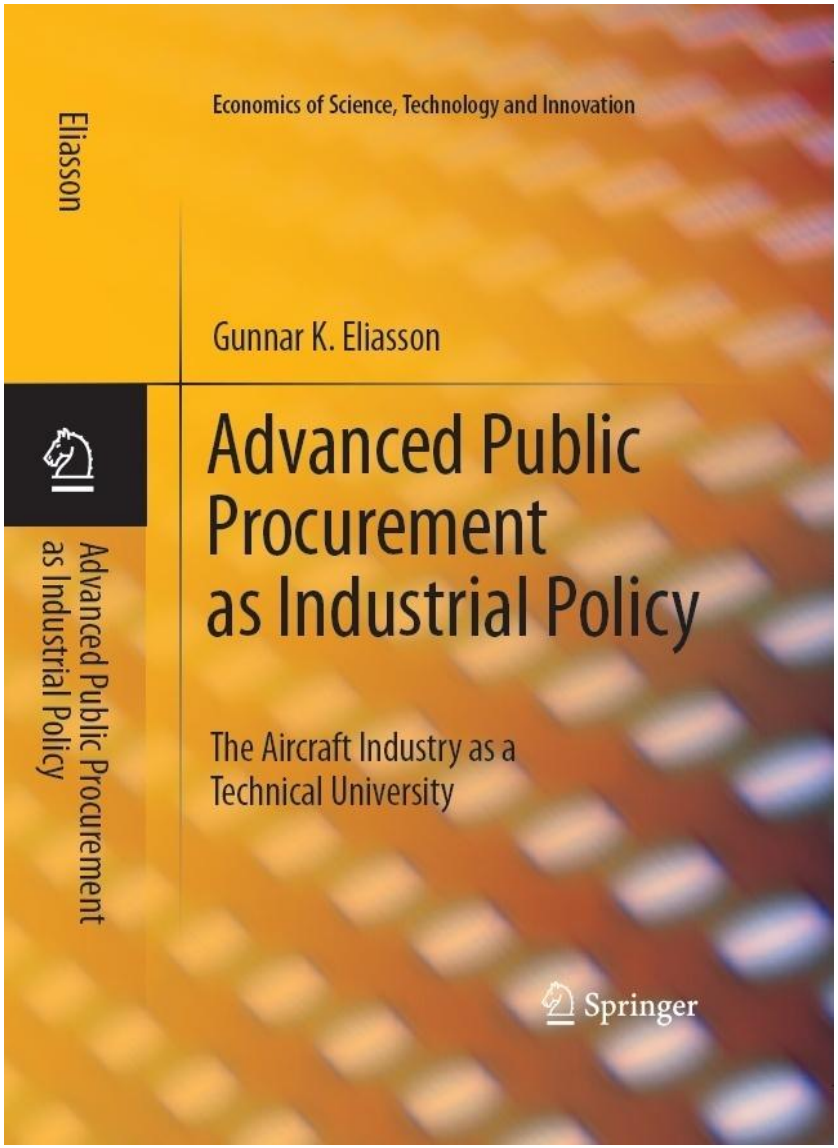
A new publication



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Title on Swedish book (short version):

VISIBLE COSTS
INVISIBLE BENEFITS

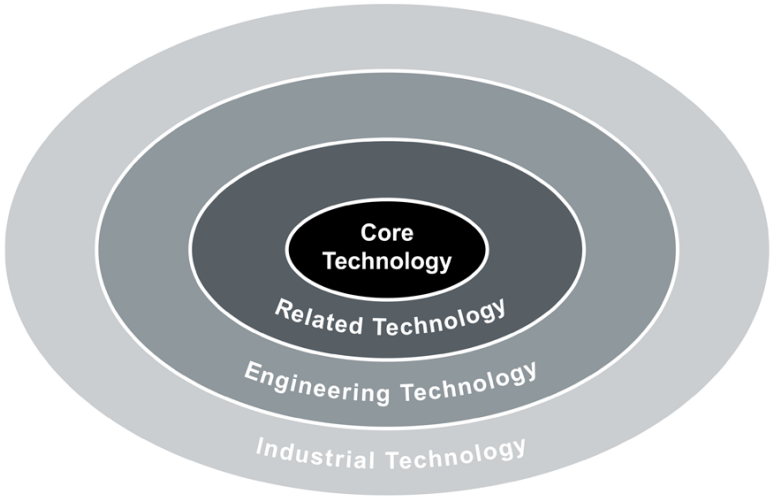
ALL ADVANCED PRODUCT DEVELOPMENT GENERATES CLOUDS OF TECHNOLOGY

We talk about **Spillovers***

- **That are available for free to other firms in proportion to their receiver capacity**

  (Commercialization)

- **Social economic value creation occurs**



Source: **Gunnar Eliasson**, 1999
Undervattensteknologi i Industriell Tillämpning – Projektet Viking som Nordisk Industriell Kompetensgenerator
(Industrial Underwater Technology – The Project Viking as a Nordic Industrial Competence Generator)
Stockholm: **KTH, TRITA-IEO-R**

* Marshallian (1890) concept of externalities, now well documented in econometric literature

- Military equipment is extremely advanced, **spillover intensive** products
- I have chosen to study the most advanced development project ever of Swedish industry;

  System JAS 39 Gripen

Organization of my Presentation

1. **The Historical role of Swedish Government as a Competent Customer Contributing to Economic Development**
2. **Spillover Measurements Around Swedish Combat Aircraft Gripen**
   - **Results and Cases**
3. **Public Purchasing as Innovation Policy**
4. **Purchasing Off-the- Shelf – Any Good?**

On **Customer Competence:**

In the Long Run

No Better Products will be Developed than there are Customers Capable of

-Understanding their Usefulness

and

-Willing to Pay

In advanced product development the customer is often directly involved

- contributes user knowledge
- which becomes a characteristic of technology supply, and
-raises spillover intensity

Sophisticated customers that are willing to pay for advanced product development therefore become a competitive advantage of the economy

History therfore tells a story about what military customer competence has meant for Swedish industrial development

16th Century: Danish naval superiority. Troops could be rapidly and flexibly moved across the Baltic

The Problem: Lack of advanced Swedish shipbuilding industry

Gustavus Wasa and his sons therefore purchased used naval ships **off - the - shelf** from Hansestadt Lübeck

17th Century: As Swedish economic historian Eli Heckscher (1936) expressed it: Swedish Government (the Military) could not accept ”deploying useless products” from its ammunitions and weapons industries*.
The Swedish Military needed superior equipment

* For civilians, on the other hand, anything will do ” because nothing serious would occur politically if products were useless”

Since Sweden lacked an inhouse industry capable of developing and manufacturing superior weapons

the King used
generous privilegies to attract foreign entrerepreneurs and industrialists to Sweden
Flemish Louis deGeer, for instance,
the ”greatest Swedish industrialist ever”,
founded several weapons factories
Many of them (i.e. Husqvarna) are now civilian businesses

The Wasa Shipwreck 1628

- Local Dutch shipbuilder

-systems integration (body, rigging,weapons) unknown concept

-The King meddled with product development

-To prevent a repeat Axel Oxentstjerna, the Swedish chancellor, founded a Royal procurement agency 1630 to keep the King out

-The Swedish tradition of independent competent military procurement had been established,

- Functional product performance being the sole criterion

The Swedish military procurment agency FMV dates its origin and traditions from 1630

The JAS 39 Gripen development project

- Results

I define

spillover intensity

as the ratio of technology content to the total development investment

-**maximized** when technical and commercial risks carried by the firm

-**Lower** spillover intensity from publicly funded R&D, carried out by firms

-**Lowest** spillover intensity from publicly funded R&D, carried out in public laboratories

I define the

Spillover Multiplier

as the ratio between

- Social value creation **net of opportunity costs** , and
- the investment (in product developement) that created it

Distinction between the spillover intensity and the spillover multiplier important

Local entreprenurial abilities to commercialize technology

come in between

Two Principally Different Measurement Methods

1. Econometric (statistical) methods

- Large literature

- Requires that you understand the assumptions of the mathematical models estimated

2. Aggregate cases to macro

(my method)

- Give the abstract numbers concrete and understandable content.

- Raises credibility

Four General Results

1. The **spillover multiplier** from project Gripen 1982-2007 is **at least 2.6** Swedish society has got the entire **development investment** back, plus at least 1.6 times more in the form of increased growth

In other words: An economy can pull itself up by the hair if its politicians make the right decisions

Critical for this result has been

2. the excellent procurement competence of the customer

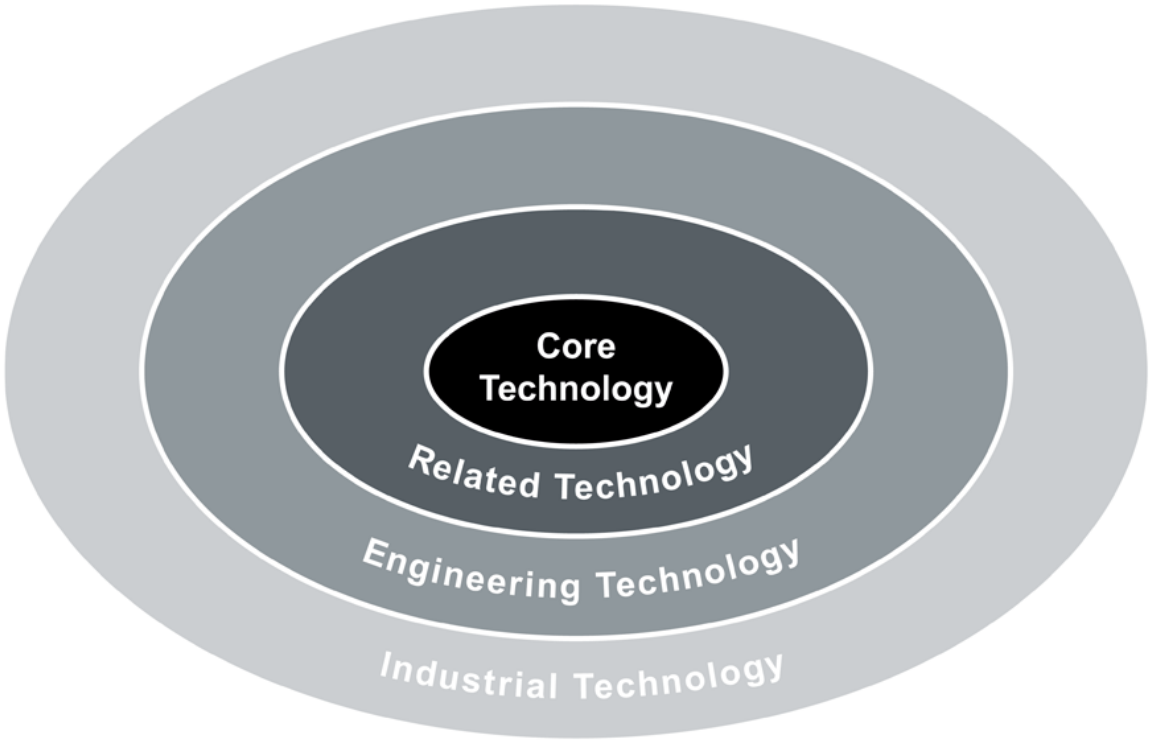
3. The entrepreneurial capabilties of the local economy

4.

Military aircraft industry, in addition, already today uses the technologies of future engineering industry

In practice it has therefore served as a **technical universi**ty for industry

CASES: The Spillover Cloud



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Spillover Cases: Short List

1. Core technologies

- Saab´s regional aircraft and subsystems for Boeing and Airbus
- Volvo Aero moving from military to civilian aircraft engine markets

2. Related technologies

- Civil security
- Space

3. General engineering technology

- Light weight technologies (Acab, Saab, Volvo Aero)
- Systems integration
- Distributed and flexible manufacturing
- High speed machining (Modig)

4. General industrial technology

Direct :

- Ericsson mobile telephony
- Kapsch Traffic Systems
- Rosemont Tank Radar

Indirect:

Engineers and skilled workers from aircraft industry move to other industries , e g the Swedish automotive safety industry and Autoliv.

4. Development of industrial**competence blocs in Linköping around** *Saab och LiTH*

- *Aircraft industry*
- *Image analysis and medical equipment*

POLICY

All advanced industrial product development (not only military) spills technology

This is particularly so for products using electronics and software intensively

Double Product

The product procured + the cloud

The cloud often more valuable for society than the procured product

But almost all of that additional value is lost to the firm that created it

- even though that firm would have been happy to charge for it

The consumers gain most, and

the spillover generating firm has a **property rights** problem

Different for Government Acts as a **Double Customer**

Government should be interested in both the product it procures, and the cloud

and be concerned, both about maximizing its economic value for society, and,therefore, paying something for it

Purchasing Off- the- Shelf

Gripen the least expensive alternative

When the decision was taken to develop the Gripen combat aircraft 1982 three alternatives were compared

1. Modify the previous generation combat aircraft Viggen
2. Buy a foreign platform, modify it to the extent possible and manufacture in Sweden
3. Develop an entirely new combat aircraft with unique specifications

At the time spillovers were a more or less unknown phenomenon. However, if the value of the spillover cloud surrounding Gripen development had been properly entered into the cost benefit analysis Gripen would have been the by far least expensive alternative for Swedish society.

General:

The advanced firm competes with innovative product qualities,

not with prices on given products

Especially for military products:

1. They should be unique and superior to those of the enemy, and
2. Uniquely protected from the weapons of the enemy
3. This means that unique and superior equipment constantly has to be developed
4. Innovative product *competition* occurs, and
5. *Spillover intensity is maximized*

Modern weapons are complex integrated systems products

-aircraft platform

- Gripen system

- networked defence

The more complex the system,
the more demanding on many specialized technologies, and
the more electronics intensive

the higher spillover intensity

- Today impossible even for a large economy to do it all
- A sophisticated product requires the best globally available technologies

Hence Gripen very import intensive.

Integration can however be achieved in a small economy by a sophisticated systems integrating firm that draws on a global industry of specialist subcontractors.

Spillovers largely related to the integration phase of product development

Sweden has had the industrial capacity to develop such superior military systems

Sweden has also (and therefore) had access to required technologies through international industrial cooperation, exports and imports.

To achieve unique product functionalities the customer and the supplier normally have to work together,
both contributing to product quality

Buying Off- the- Shelf, on the other hand, gives limited possibilities of product modifications

When customer and supplier cooperate, and together contribute to a better product conventinal thinking of competitive purchasing no longer holds. Purchasing off- the- shelf no longer maximizes customer value for the money

When the customer and the supplier develop a superior product together the business is about

agreeing how to share the extra value created together (incentives)

In the case of public procurement the value of spillovers should also be part of that negotiation

GRIPEN AS A TECHNOLOGY GENERATOR

- The payback of the Gripen project to Swedish society has been at least 2.6 times the initial investment

Gunnar Eliasson, Professor Emeritus of Industrial Economics, KTH, Stockholm

Measurement Method: Aggregation from cases to macro

1. The public procurement creates a private R&D injection in the economy
2. The annual magnitude of this R&D investment has been measured in 2007 prices and cumulated at an *assumed* real interest rate to 2007
3. This measures the asset value that would have been available (= Y) if Government had abstained from developing the Gripen up to, and including three functioning test versions of the combat aircraft, and instead invested the money in financial markets at the same assumed real rate of return.

Spillovers come in three forms;

- **civilian production**
- **military exports**
- the value of **new business formation** based on spillovers from Gripen each year

Deduct opportunity cost of the resources gone into that spillover value creation

Recompute for each year at 2007 prices and cumulate at the same assumed real interest rate (= X)

The **spillover multiplier** = X/Y

These are the numbers:

1.) The Gripen development investment, excluding weapons, in 2007 prices, cumulated per year 1982-2007 with a real interest rate of 4 percent is 132 billion SEK, or on average 0.17 percent of GNP per year

2.) Additional social value creation in the form of

- civilian production, at least 336 billion
- value of new firm start ups, at least 14 billion, or

together 350 billion, or on average 0,43 percent of GNP

The Spillover multiplier is at least 350/132= at least 2.6

Table A. The four mechanisms of Schumpeterian creative destruction and economic growth

1. **Innovative entry** (Birth) enforces (through competition)
2. **Reorganization**
3. **Rationalization**

or

4. **Exit** (Death)

Source: "Företagens, institutionernas och marknadernas roll i Sverige", Appendix 6 in A. Lindbeck (ed.), Nya villkor för ekonomi och politik (SOU 1993:16) and G. Eliasson (1996). Firm Objectives, Controls and Organization – the use of information and the transfer of knowledge within the firm. Boston/Dordrecht/London: Kluwer Academic Publishers, p. 45.

Table B. Actors in the competence bloc

1. Competent and active Customers

<u>Technology Supply</u>

2. Innovators who integrate technologies in new ways

<u>Commercialization of Technology</u>

3. Entrepreneurs who identify profitable innovations
4. Competent venture capitalists who recognize and finance the entrepreneurs
5. Exit markets that facilitate ownership change
6. Industrialists who take successful innovations to industrial scale production

Source: G. Eliasson - Å. Eliasson, 1996. The Biotechnological Competence Bloc, Revue d'Economie Industrielle, 78-40, Trimestre.

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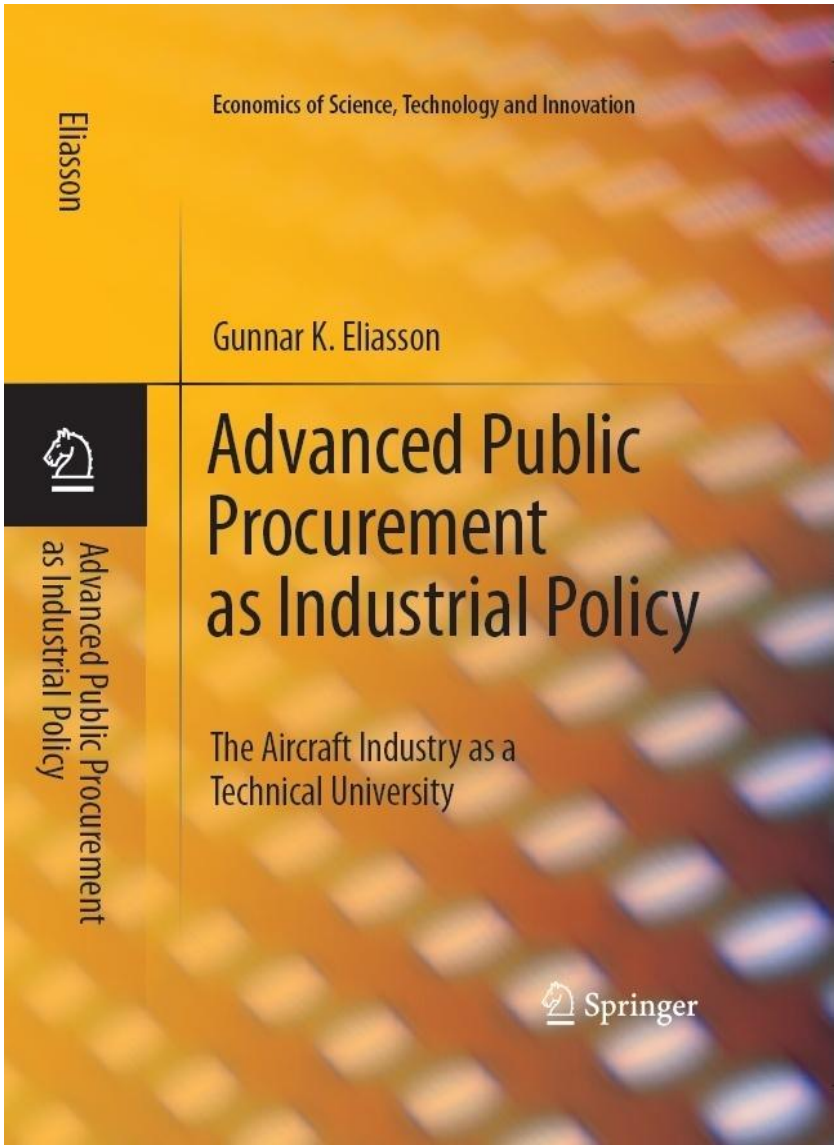

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ABOUT THIS BOOK

AUTHORS & EDITORS

The primary theme of this book is to investigate the macroeconomic significance of the "cloud" of technological spillovers that surrounds advanced industrial production: In what ways do technological innovations spread and contribute to economic growth? What policies can be developed to maximize the economic potential of innovations? These themes are particularly timely in the context of global economic crisis, government-sponsored stimulus packages, and the ongoing evolution from manufacturing-based to knowledge-based economies. To explore these issues in depth, Gunnar Eliasson focuses on a detailed case study of the development of Saab's military aircraft, the JAS 39 Gripen system—a project that involves advanced technological innovations, a complex network of suppliers, public-private sector collaboration, and both military and commercial applications. The experience in the aircraft industry is also compared with spillover effects in telephony, computers, and medical technologies. The study emphasizes the role of customer competence in raising the quality of innovation supply, and of entrepreneurship and industrially competent venture capital for commercializing spillovers. Eliasson integrates micro-econometrics and case study analysis with macroeconomics, innovation study methods, and business administration theory to measure the effects of technology spillovers and generate a solid empirical foundation for policy analysis. In particular, he considers:

the role of competent public (government) procurement as a new demand policy to support innovation supply

the emergence of the advanced firms as "technical university," where continual learning takes place and entrepreneurship among customers and other stakeholders is encouraged

issues of intellectual property rights and the social value of technological innovations

the implications for strategic business practice and public policy

The result is a book that will appeal to a broad spectrum of academics, industry leaders, and policymakers interested in the dynamics of innovation supply, commercialization of technologies and economic growth.

Content Level » Research

Keywords » Aircraft industry - Innovation - Public procurement - Research and development (R&D) - Saab - Technology commercialization - Technology policy - Technology spillover - Technology transfer

Related subjects » Industrial Organization - Innovation - Technology Management - Production & Logistics - R&D / Technology Policy