Collaboration for environmental adaption

The case of the Swedish pulp- and paper industry 1900-1990

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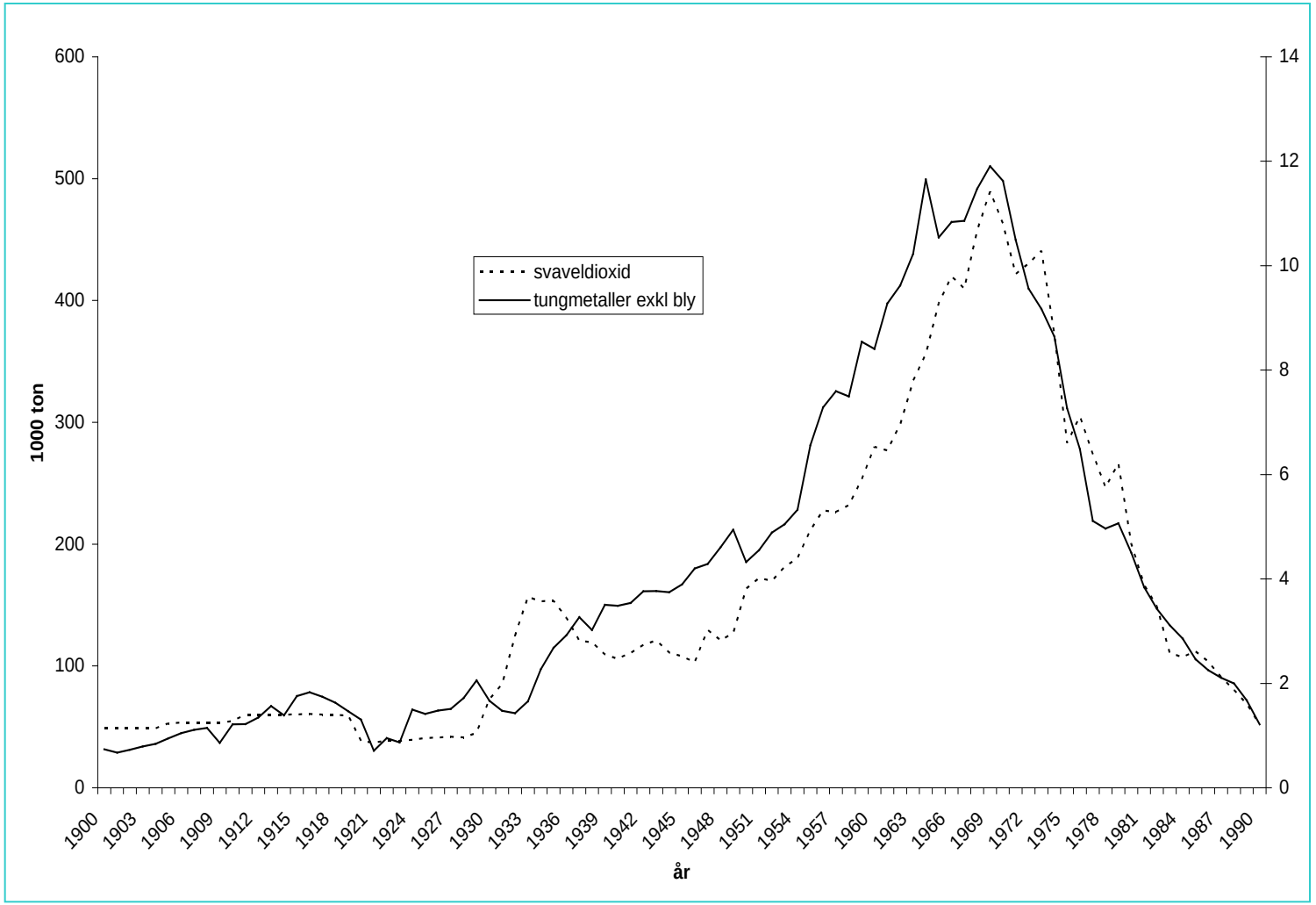
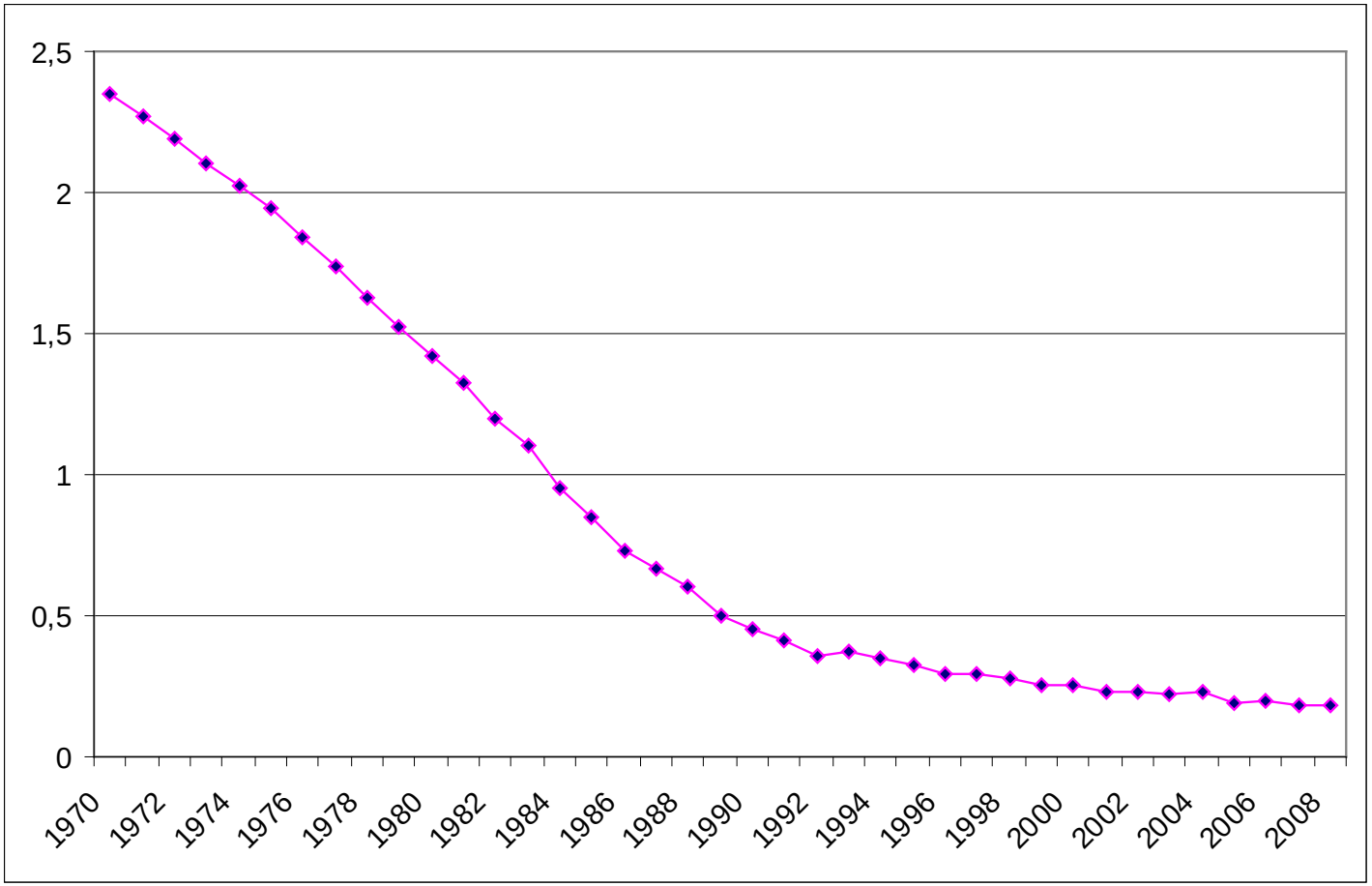
The big issue

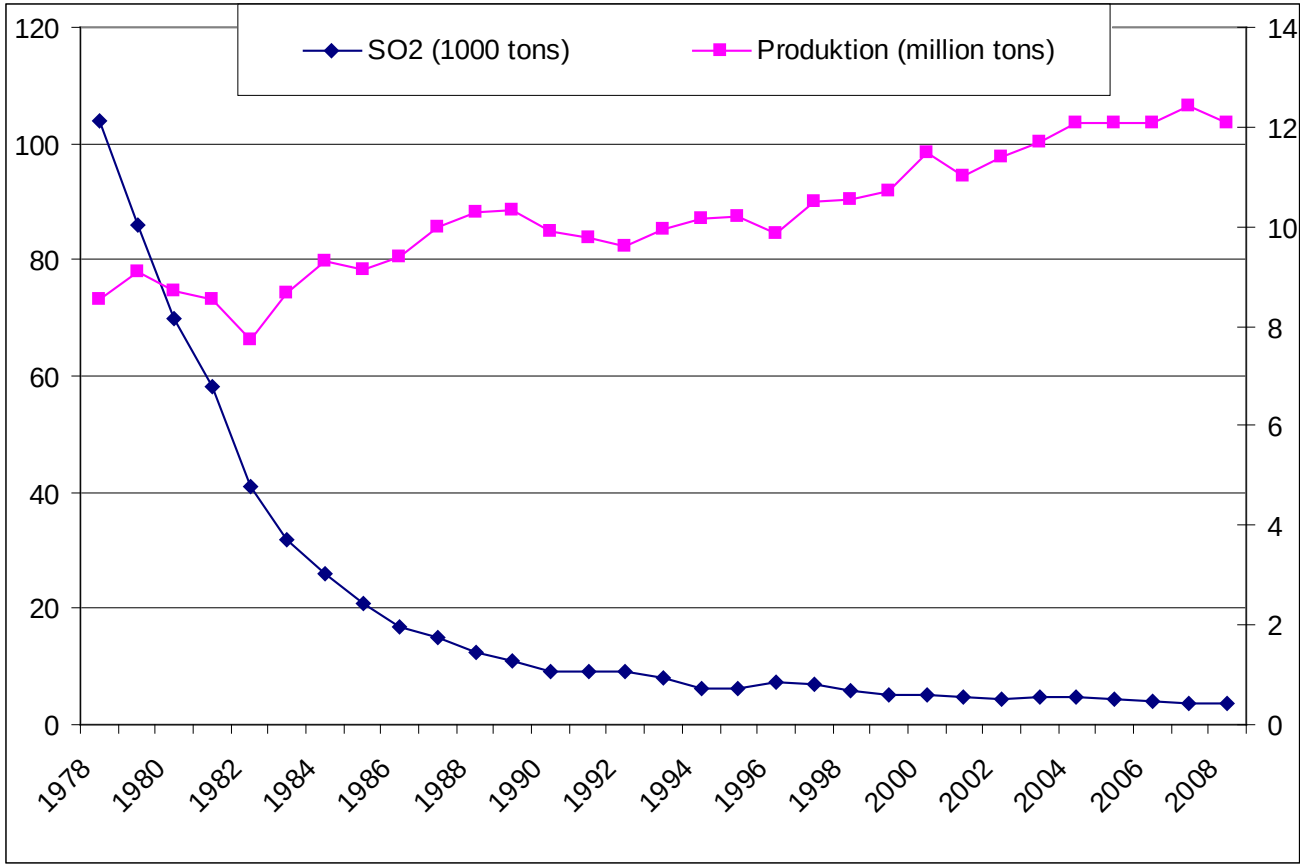


THE SMALL ISSUE

Emissions of COD in the Swedish pulp and paper industry (1970-2008)



Emissions of SO2 in the Swedish pulp and paper industry (1978-2008)



Background

- Emission reductions up to 99 percent (since the 1960s) while expanding production
- The Swedish P & P sector proves a strong collaborative tradition in environmental issues
- Swedish pulp and paper industry a leader of environmental technology in the 1970s and 1980s and among the today's leaders in environmental performance (IEA, 2007, Rennel, 2008)

What we do in this study

- Explores the development and importance of inter-firm collaboration in R&D for environmental adaptation in the Swedish pulp and paper industry
- Investigates particulary the role of collective R&D activites and its impact on clean technology development in the whole line of business
- Interplay between the development of environmental regulation (EPA 1969), collaborative R&D activities and technological progress
- Time period 1900-1990

Research design

- Adopt a long-term perspective in order to indentify and compare changes, causes, motives and organization of firm collaboration in env. R&D as well as its effects on technological change
- Qualitative approach and descriptive statistics
- Primary research sources: documents, reports form the collaborative projects, questionnaire data, business magazines and interviews

Motivation of the study

- Increase knowledge on business strategies for achieving for radical emission cuts (up to 99 percent) since the 1960s
- Contribute to a better understanding of the interplay between environmental policy instruments and firm level strategies for technological development (e.g. policy impact on firm collaboration in environmental R&D)
- Few in-depth studies on clean technology development and diffusion in general (Sterner & Turnheim, 2009)

Previous research I

- Environmental policy and innovation
  - Market based instruments (e.g., pollution taxes) are seen as better performing than command and control policies
  - Innovation as a public good: the effects on innovation becomes more ambiguous (eg. Vollebergh, 2007)
  - Empirical litterature: number of econometric studies but also case-studies (e.g. Reinstaller, 2008, Similä, 2002, Mickwitz et. al. 2008)
    - How policy instrument may stimulate innovation depends on the institutional context

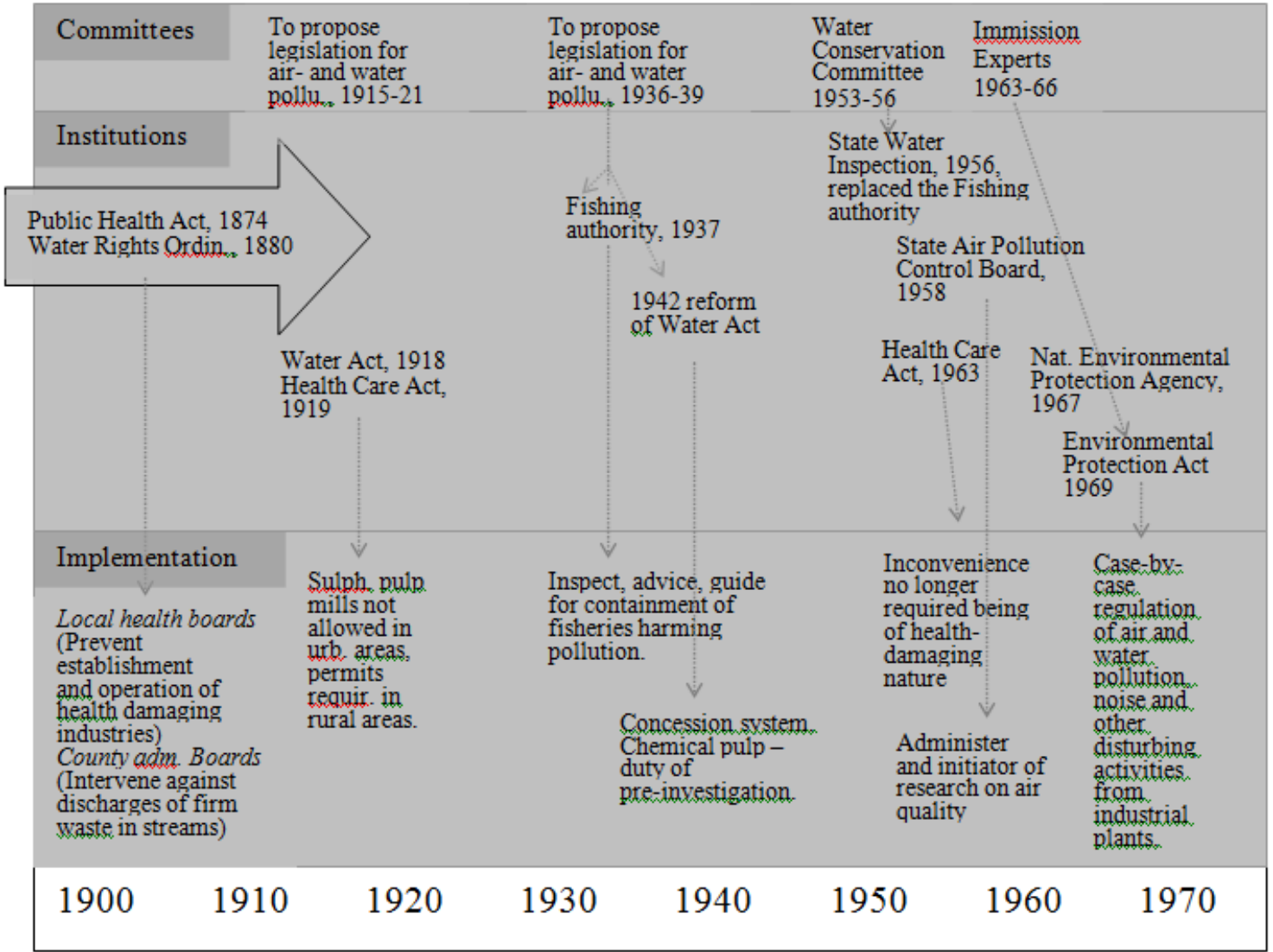
Previous reserach II

- Firm collaboration in R&D
  - Technical change is very uncertain and costly due to diverse information-aquiring activities (Rosenberg, 1994)
  - Historially, firms had to inreasingly pool their R&D efforts in order to achive technical progress (Galbraith, 1952).
  - Up to date a vast litterature on firm collaboration in R&D
    - IO litterature – economic incentives and welfare effects of R&D cooperation
    - Mangagement litterature – R&D collaboration aims at lowering transation costs by exploiting complementary know-how between partners
  - Collaboration in environmental R&D in P&P sector
    - Finnish case Mickwitz (2008), Kivimaa & Mickwitz (2004)

In sum

- Technology development and technical change is uncertain and costly
- Firms enter inte collaborative arrangements because they lack necessary resources, know-how, and/or wish to reduce the risks associated with innovation (including knowledge spillovers) (e.g. Martines-Romero, 2008)
- Suggests that collaboration in env. R&D might have been motivated by the need to share both costs and risks associated with pioneering development of clean technology

20th century development of Swedish environmental regulation (1900-1970)



Environmental Protection Act 1969

- Cooperation and consensus seeking procedures
- Case-by-case judgments
- Permits adm. by the Franchise Board of Environmental Protection (FBEP)
  - Emission level values (EVL)
  - Negotiations between industry and authorizes taking into account parameters such as local env. impact, possibilities to technological development and long-term competitiveness
- The system contrasts to
  - the US system (uniform technology based standards for comparable sources)
  - Finland: focus on end-of-pipe technolgy

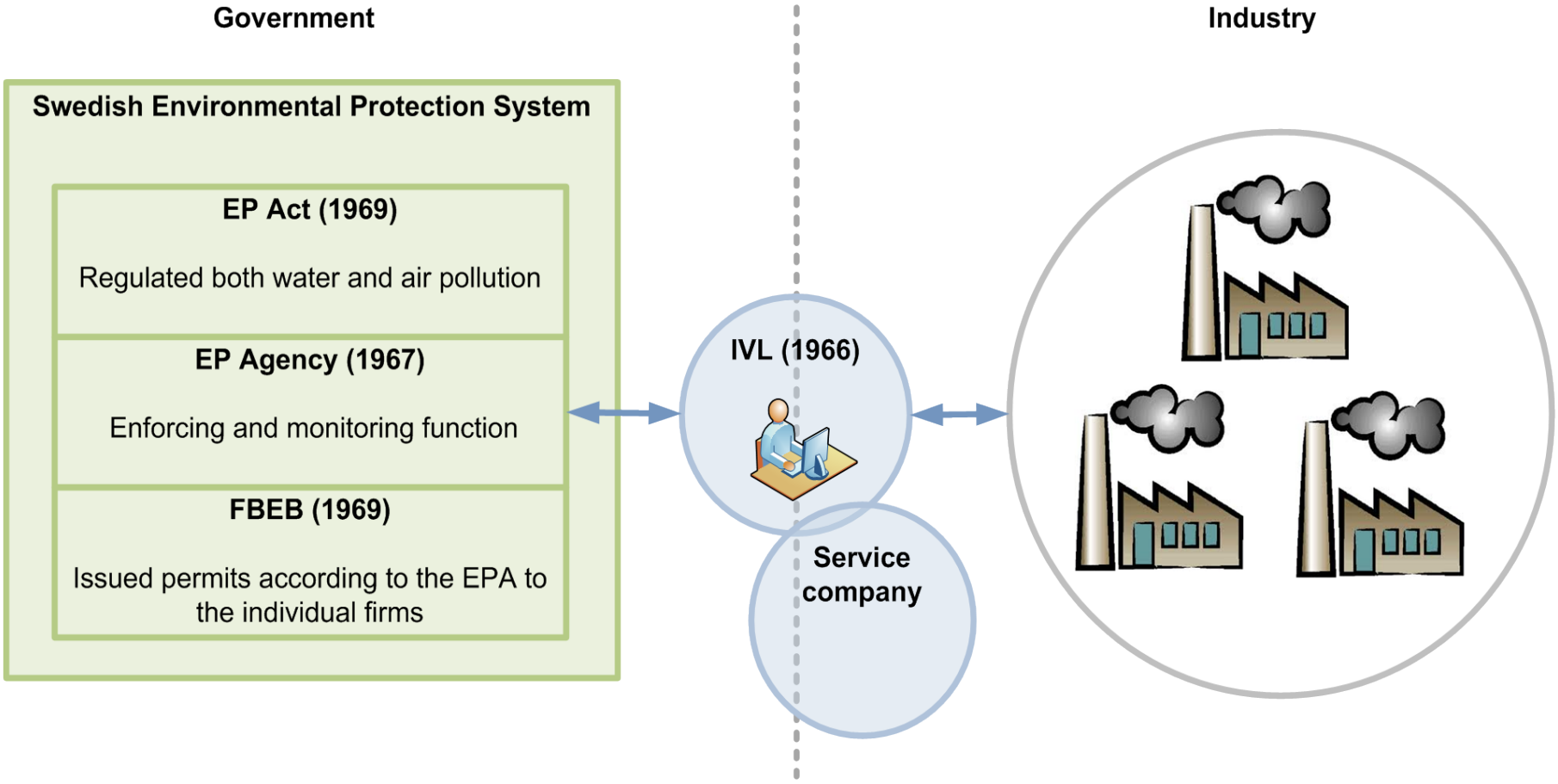
“One can say that we [the industry] did not keep any of the actual problems as secrets. Authorities, such as SEPA, in turn gave industry time to fulfil the requirements, i.e., to renew the processes and rebuild the mills. It was a very good cooperation.”

Interview with Stig Freyshuss 08.10.2009.

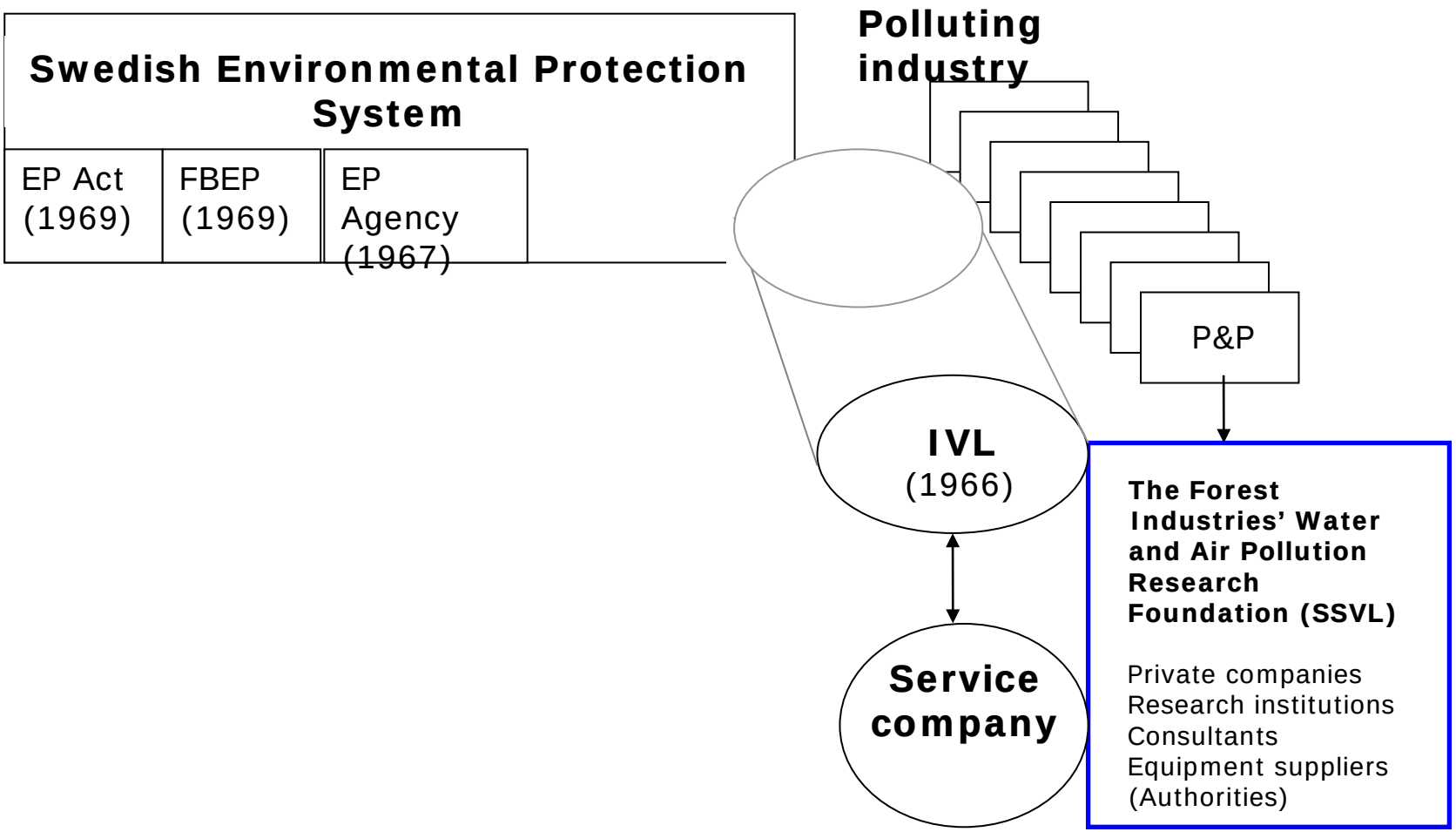
Collaborative platforms/organisations

Organization/institute	**Time period**
Sulphate Pulp Committee	1908-1909 (?)
Swedish Pulp and Paper Research Institute (STFI)	1945-
Central Laboratory of the Pulp Industry	1936 (ascended into STFI in 1968/69)
Water Pollution Committee	(1937-)1945-1953/54
Water Laboratory of the Industry (SIV)	1953/55-1964 (was first governed by the *Water Protection Committee of the Forest Industries*, but in only a few years turned into the *Forest Industries' Water Protection Council* respectively the *Forest Industries' Water Protection Research Foundation*, which in turn later became SSVL)
Industries' Water and Air Pollution Research Foundation (SSVL)	1963-
Institute for Water- and Air Protection (IVL)	1966- (today IVL Swedish Environmental Research Institute)
Service company of IVL	1966 (acquired by the Swedish Steam Boiler Association in 1982)

IVL's position in-between government and industry



Institutions and research organisations



Environmental investments in the Swedish pulp- and paper industry 1968-1988. Real prices (2000) million SEK (deflated using investment price index for the pulp and paper industry)

	68-70	71-75	76-79	80-84	85-88	TOTAL
env. inv.	930,2	4254,7 *	2372,9	2235,1	3388,9	13101,5
share of total inv.		12,15	13,67	9,9	13,5	

* Including 1194 million SEK from governmental subsidies

Distrubution of environmenal investments

Year	int. Water	ext. Water	Air	Other
76-79	41,4	23,8	19,8	15
80-84	41,5	25,4	21,5	11,6
85-88	59,9	15,1	17,5	7,5

Expenditures on industry-wide environmental R&D projects within SSVL. Real Prices (2000) million SEK (deflated using investment price index for the P&P)

Year	Project	Costs (Million SEK)
1970-73	The environmental protection project	129,7
1974-76	Chlorides in recovery system	11,5
1975-78	Nordic Environment 80	32,9
1978-81	Environmentally harmonized production of bleached pulp	83,2
1981-85	SSVL 85	49,5
1986-90	Environment 90	82,7
1989-94	Environment 93	79,9
1974-85	Other SSVL projects	36,4
1979-93	Grants for IVL	96,2
1970-93	Grants for STFI	349,9
Total		952

Source: Miljöinfo från Skogsindustrierna, Swedish Forest Industries' Water and Air Pollution Research Foundation (SSVL), report available on CD-ROM disc at The Swedish Forest Industries, Stockholm, 9.

Motives for collaboration

- Underlying motive was related to an early external pressure from local resistance against pollution
- Over time turning into an increased pressure from tightening environmental regulation
- Demand side of innovation was ultimately related to regulary pressure, and in turn a joint need among P&P firms to share costs and pool competenses.
- Collaborative environmental R&D activities increased in tandem with the development of env. policies

Outcome of the collaborative platforms (e.g. IVL, SSVL)

- Offered an appropriate institutional setting for technology development and diffusion
- Knowledge spillovers due to open arenas for knowledge sharing between competences
- Risk of faulty investments in development projects were partly dispersed but also partly reduced
- Costs for searching information (individual firms) could be kept low (due to open knowledge sharing)

Impact from environmental policy

- Flexible regulation (EPA)
  - Prohibition periods allowing for search activities and pilot installations -> flexible towards the result of collaborative R&D programs

- Inclusion of policy makers in R&D networks
  - Facilitated the strategy favoring internal process changes (the authorities had insight)

Technological achivements

- e.g.
  - Methods for measuring and evaluating discharges, e.g. “effect” research
  - Reductions of organic materials (1950s-)
    - Worked hand with methods for increased energy efficiency
  - Prolonged cooking (1970-1990)
    - Reducing the use of chemicals and chlorine in the bleaching process. Ended upin ECF and TCF bleaching

Conclusions/further reserach

- Significant environmental improvements witnessed since the 1960s can only by fully comprehended by taking account the role of collaborative activities in R&D
- Collaboration was facilitated by the environmental regulatory regime (however, hard to calculate the hypothetical costs and outcomes for R&D without collaboration).
- The environmental policy regime facilitated long-term investments in environmental R&D and encouraged internal process changes
- Forthcoming studies at the firm level (importance of in-house R&D)

Thank you – have a nice evening!