

# Costs and benefits of policy instruments to address trichloroethylene

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[Daniel.Slunge@gu.se](mailto:Daniel.Slunge@gu.se)

Department of Economics

University of Gothenburg

[www.fram.gu.se](http://www.fram.gu.se)

[WWW.FRAM.GU.SE](http://WWW.FRAM.GU.SE)



# FRAM

The Centre for Future Chemical Risk Assessment and Management at the University of Gothenburg



**April 21, 2016** – **Sunset date for TCE in the EU**

**1990ies** – **Germany - tough emission standards**

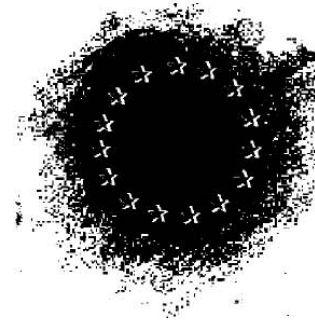
**1996** – **Swedish ban on TCE**

**2000** – **Norwegian tax on TCE**

**Lessons learned?**

# IMPLEMENTATION OF POLICY INSTRUMENTS FOR CHLORINATED SOLVENTS. A COMPARISON OF DESIGN STANDARDS, BANS AND TAXES TO PHASE OUT TRICHLOROETHYLENE

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Daniel Slunge<sup>1</sup> and Thomas Sterner<sup>2\*</sup>

<sup>1</sup> ERM Scandinavia, Göteborg, Sweden

<sup>2</sup> Resources for the Future, Washington, and University of Göteborg, Sweden

This paper studies the Swedish prohibition of trichloroethylene (TCE). TCE is a common solvent and in some uses a substitute for solvents such as the CFCs that were phased out internationally due to their ozone depleting effect. TCE is

the EU Court of Justice decided in favour of Sweden's right to have a ban. There are however clear indications that the ban was not the best possible policy. It led to considerable energy being spent on litigation, resulting in a loss of prestige for

## Trichloroethylene (TCE) in brief



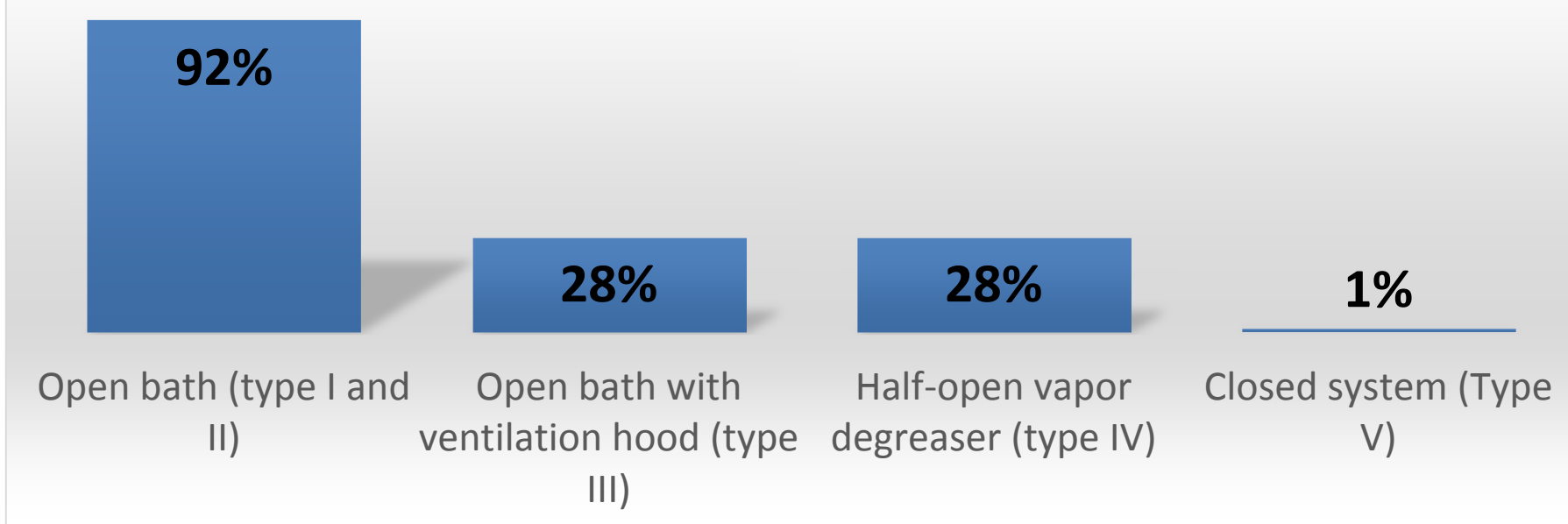
- A chlorinated solvent mainly used for degreasing in the metal industry and as an intermediate in chemical production
- Total sales in the EU > €100 million per year, used by many small and medium scale enterprises
- Neurotoxic and carcinogenic effects well documented
- Classified as Carcinogenic Category 1B
- Classified as a Substance of Very High Concern and included in Annex XIV ("Authorisation List") of REACH.

## Many alternatives to chlorinated solvents for degreasing metal

- Different combinations of chemicals and mechanical cleaning
- Water-based
- Aqueous cleaners
- Carbon dioxide cleaning
- etc



## Emission factor of different TCE systems

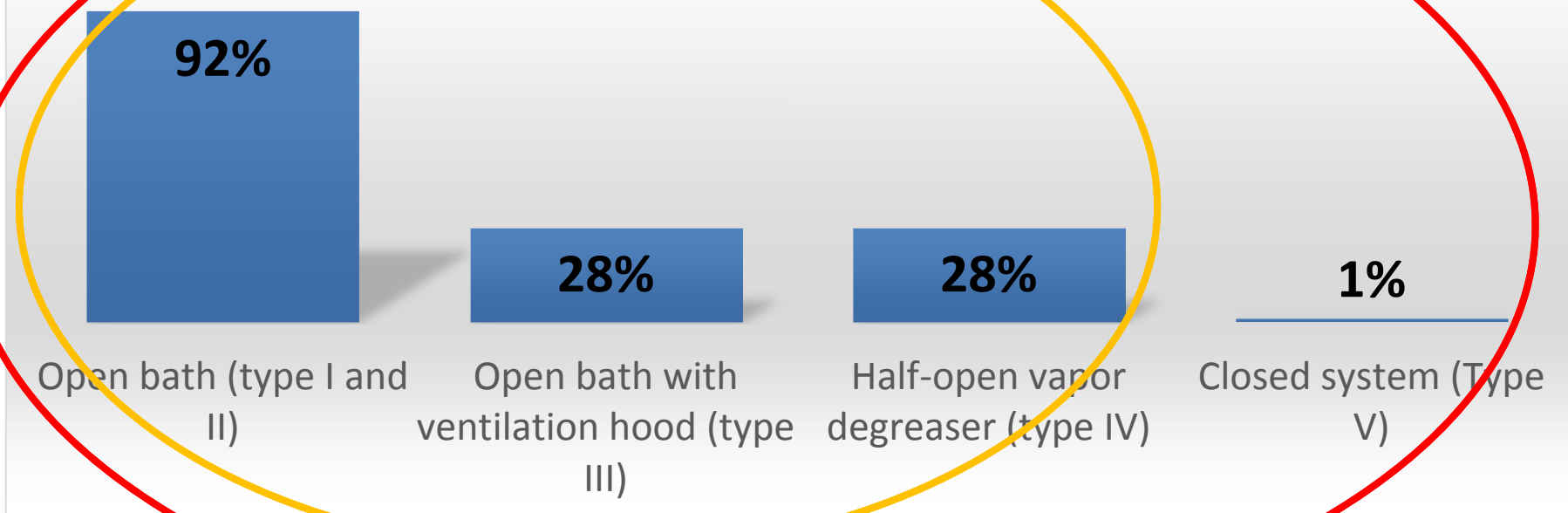


Source: Birkenfeld, 2005

Risk based approach

Hazard based approach

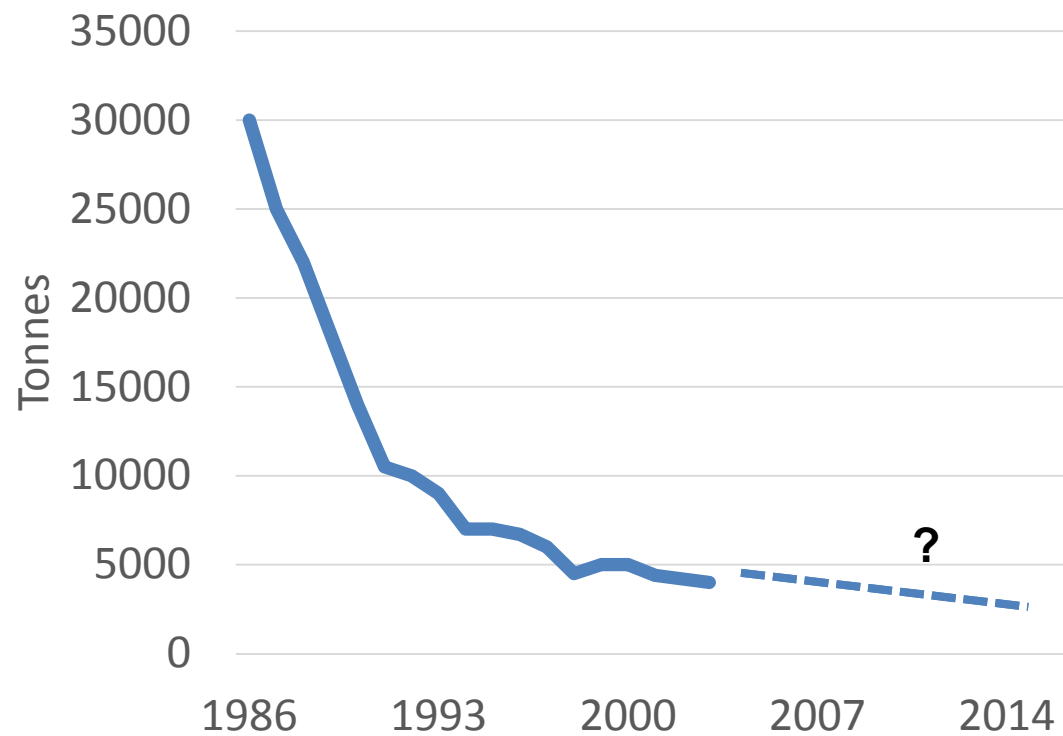
### Emission factor of different TCE systems



Source: Birkenfeld, 2005



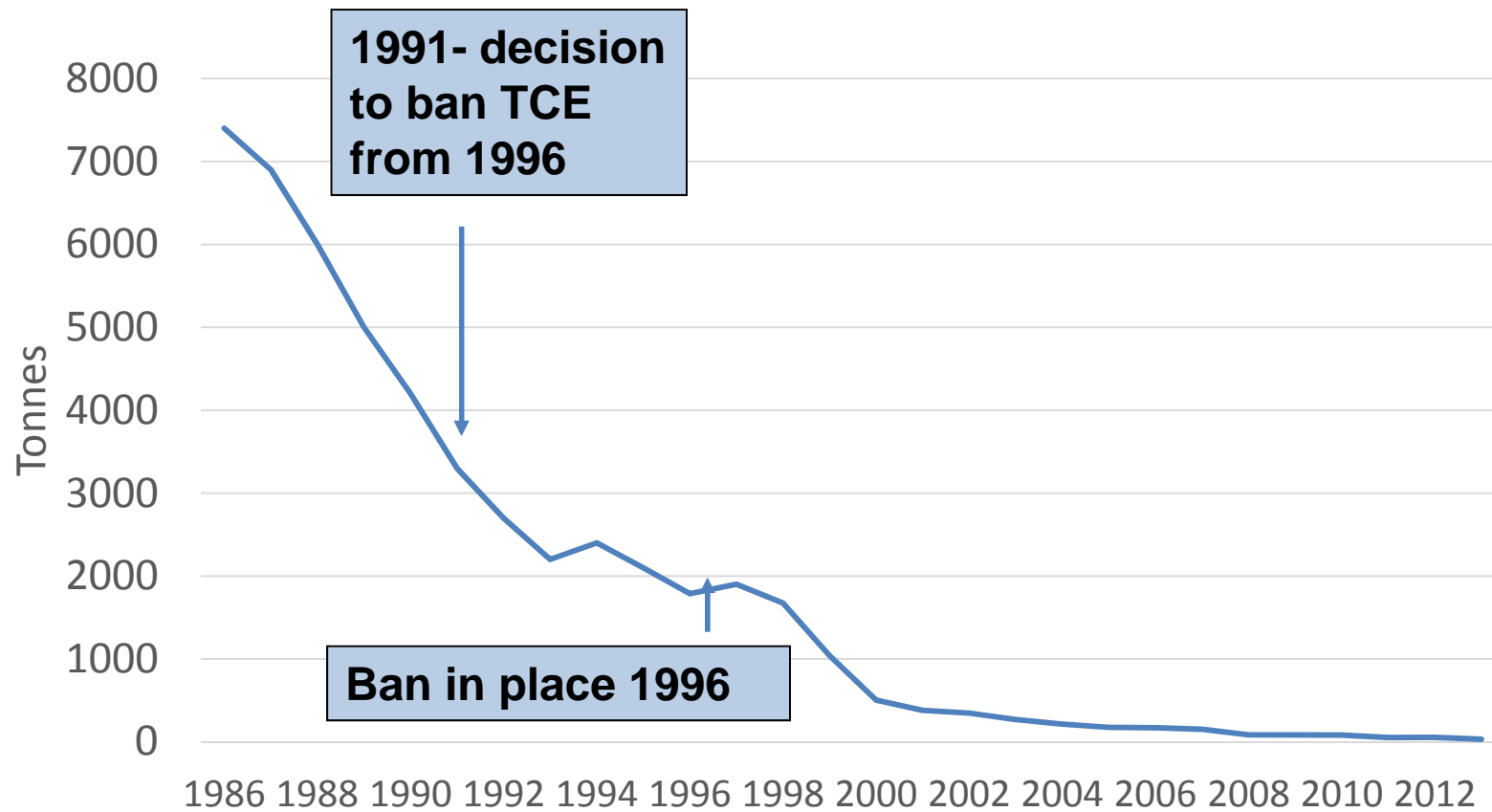
## Germany – strict emission standards



- Large reduction in use in 1990ies when strict emission standards requiring closed systems introduced
- Low damage costs from use
- Incentives for substitution?
- Continued use of TCE after 2003?

# The Swedish Ban against TCE

## Use of TCE in Sweden



Till regeringen Carlsson

# Vi protesterar!

Vi är några av flera hundra industri-företag som dagligen använder trikloretylen för att rengöra och avfetta våra produkter.

Efter en proposition av dåvarande miljöminister Birgitta Dahl beslöt riksdagen 1991 att Sverige, som enda land i världen, förbjuder användning av trikloretylen från 1 januari 1996. Detta utan att uppnå någon som helst miljövinst och trots att likvärdigt medel saknas.

Avfettning med vattenbaserade medel, som påstås vara ett alternativ, kräver miljoninvesteringar i byggnader och maskiner, förbrukar upp till sex gånger mer elenergi och medför risk för nu okända problem även med arbetsmiljön.

I regeringens förklaringen från oktober i år säger Ni att: "Det gäller att stärka Sveriges produktionsförmåga och ta tillvara vårt lands främsta tillgång, människors vilja till arbete och skapande."

Vi anser i så fall att det är jämförbart med harakiri och att det står i direkt strid med den i regeringsförklaringen uttalade ambitionen, när Ni på enbart politiska grunder förbjuder en effektiv och ekonomisk rengöringsmetod, som fungerat väl under många år.

Vi accepterar inte en näringspolitik, som medför att vi ej kan konkurrera med utländska företag på lika villkor och motsäger oss därför även att förbrukningen av trikloretylen beläggs med eventuell miljöavgift.

I en nyligen genomförd enkätundersökning, svarar över hälften av företagen, att produktionen riskerar att flyttas utomlands eller läggas ner om beslutet från 1991 fullföljs.

Mot bakgrund av ovan sagda kräver vi att beslutet rivs upp.

Vi kräver också ett besked före årets slut.

Anti-Corr AB - Assars Industri AB - Boråsverken AB - Br. Lann Metallfabrik AB - Bjärnum Stålprodukter AB - Bulten i Kalix AB - Danbolack AB - Ekets Mekaniska AB - Elenco Lighting AB - Erlandsons Metallfabrik Emab AB - EZZE AB - Fimek AB - Gnosjö Interiör AB - GS Industri AB - Hallberg-Sekrom Fabriks AB - HGL Industrier AB - AB Indexor Automatsvarvning - HT Svarv AB - Konsthantverk i Tyrlinge AB - Isaxons Industrilackering AB - Leba Industriservice AB - LG Beslag AB - AB Markaryds Metallarmatur - Mekanoverken AB - Metall Göte AB - Nikro-Galvano i Göteborg AB - AB Posto - AB Prinsfors Metallfabrik - AB Solna Pressgjuteri - Stacke AB - Söderlunds Metall AB - Tranås Skinneredning AB - Troax Axo AB - Torsten Ullman AB - Töreboda Ur AB - Ulvsunda Industrilackering AB - Witte Industrier AB - Värnamo Hård AB - AB Västsvenska Plast

Info 033-102465

To the Government Carlsson

# We protest!

We are some of several hundred companies who daily use TCE to clean and degrease our products.

Sweden has as the only country in the world decided to ban the use of TCE, despite that this will not lead to any environmental gains and that there are no alternatives available.

Comparable to harakiri.

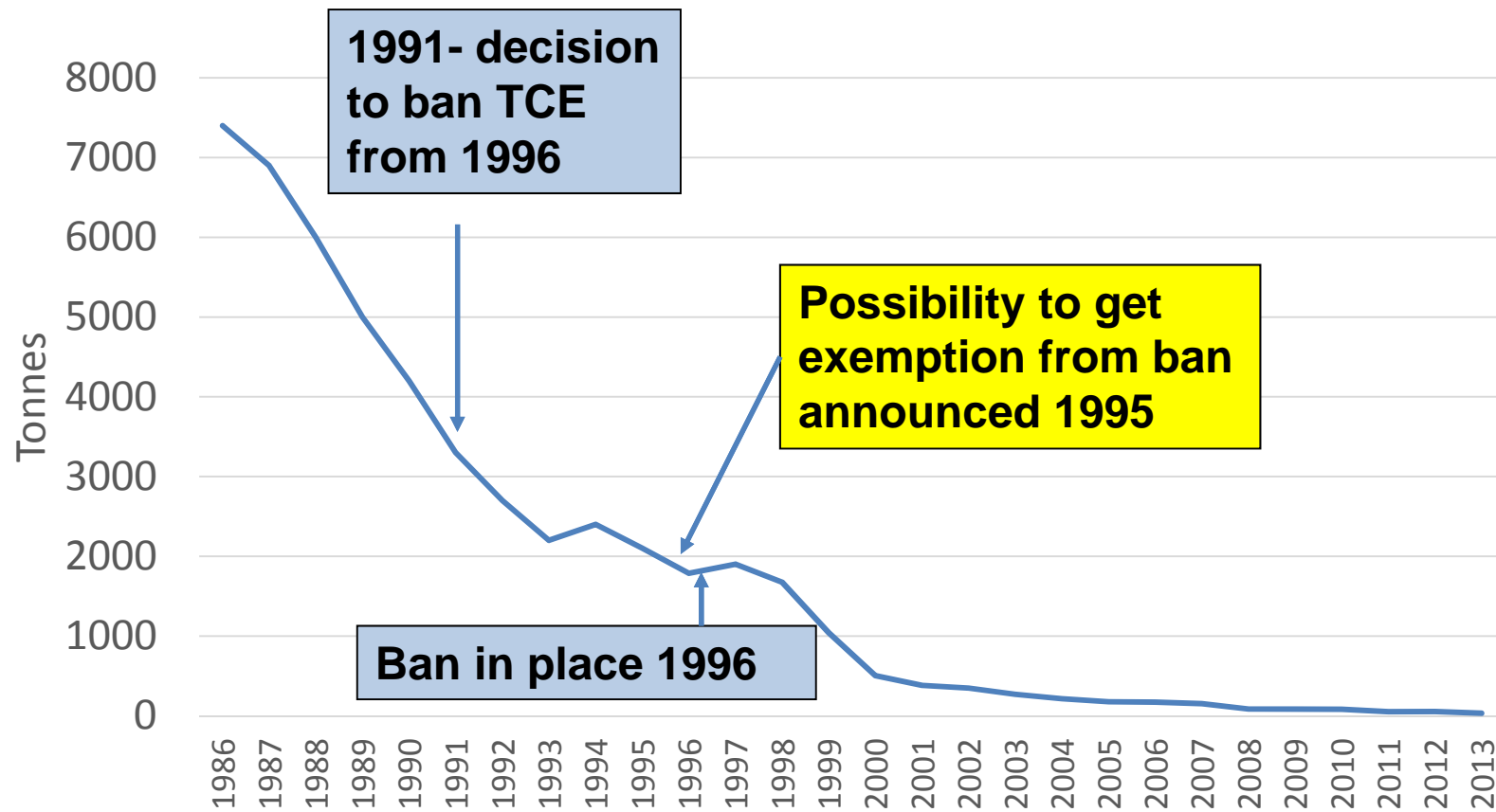
We do not accept an industrial policy which does not allow us to compete with foreign companies on equal grounds.

In a recent survey, more than half of the companies respond that **production risks moving abroad or be shut down if the decision to ban TCE is implemented.**

Against this background we demand that the **ban be lifted.**

2016-08-16

## Use of TCE in Sweden



# Requirements to get exemption from the Swedish ban on TCE

1. Actively search for alternatives
2. No suitable alternatives
3. No unacceptable exposure from use
4. A plan on how to find alternative solutions

## Alla som vill får dispens för tri

Cancerframkallande lösningsmedel kvar sju år efter förbudet  
Av: Sus Andersson  
Publicerad 26 mars 2003 00:00

**Över hundra företag har fortfarande dispens att använda det cancerframkallande lösningsmedlet trikloretylen, även kallat tri. De flesta använder fortfarande mer eller mindre öppna bad med tri, där ångorna kan komma i direktkontakt med verkstadsluften.**

### ANNONS

Visserligen har användningen av tri minskat drastiskt enligt Kemikalieinspektionens dispensregister, från över 4 000 ton i mitten av 1990-talet till några hundra ton idag.

Men enligt de senaste besluten har fortfarande 103 företag dispens. Bara något enstaka har en anläggning som räknas som helt sluten. Flertalet tritvättar har visserligen någon form av inneslutning, men lösningsmedlet kommer ändå i direktkontakt med verkstadsluften. Både den yttre miljön och arbetsmiljön påverkas, konstaterar Harald Ottertun på verkstadsforskningsinstitutet IVF.

- De som jobbar vid öppna anläggningar tar risker.

### Lediga jobb

- [Affärsområdeschef som vill bygga bredband för framtiden!](#), Norrköping
- [Erfaren konstruktör](#), Stockholm
- [Upgrade Engineer](#), Lund

[Alla jobb »](#) →

March 2003:

”Anyone who wants get an exemption from the TCE-ban”

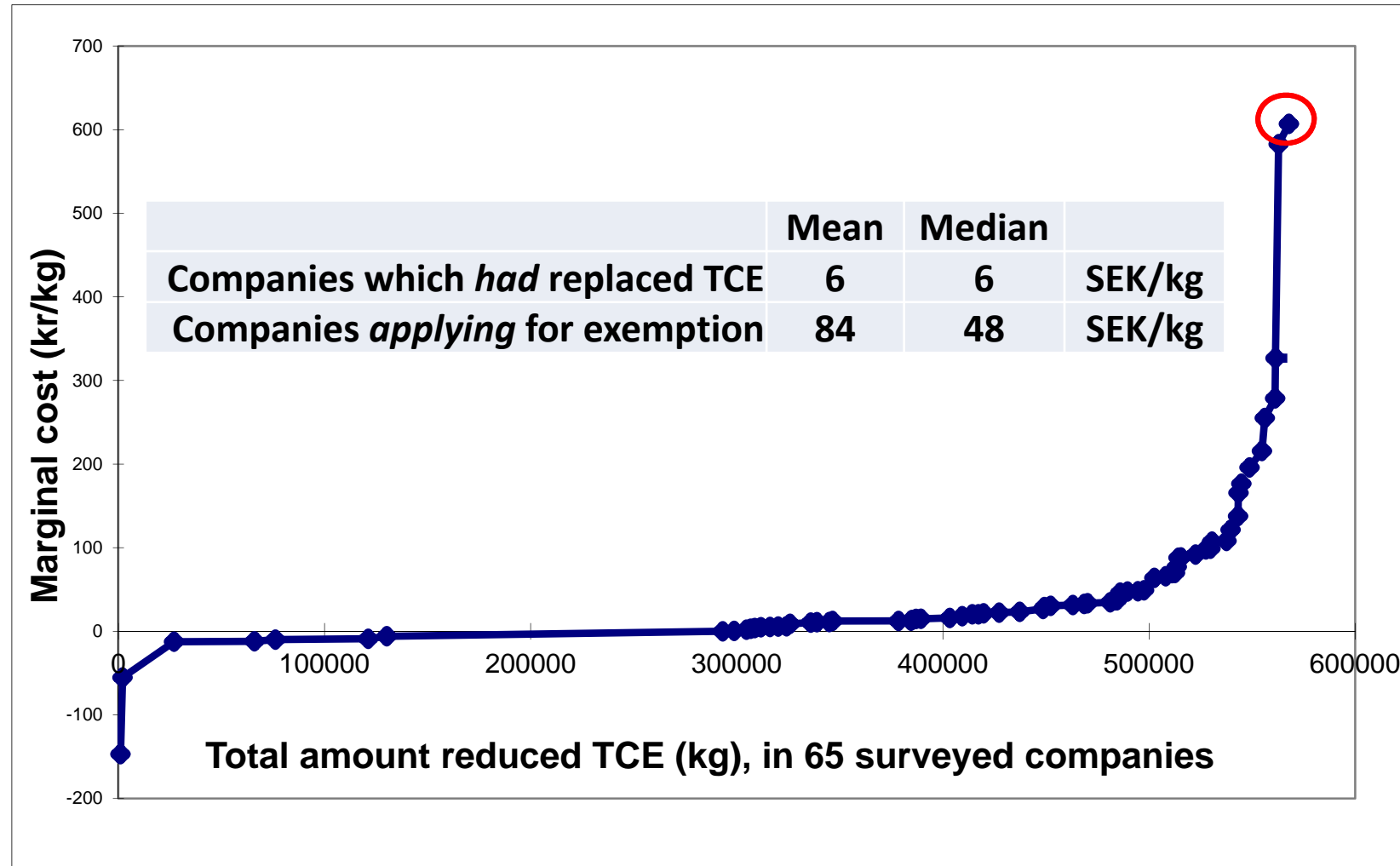
103 companies granted exemption from the TCE ban in 2003

# Swedish TCE ban – 2 Key Problems:

- **The reduction in use did not target the companies with largest damage costs**
  - Many users with old "open" equipments and high emissions could continue to use TCE several years after the ban
- **The reduction in use was not achieved at the lowest possible cost**
  - Some companies replaced "closed" equipments at substantial costs
  - Other companies challenged the ban and continued to use TCE, although their cost of reducing TCE would have been low



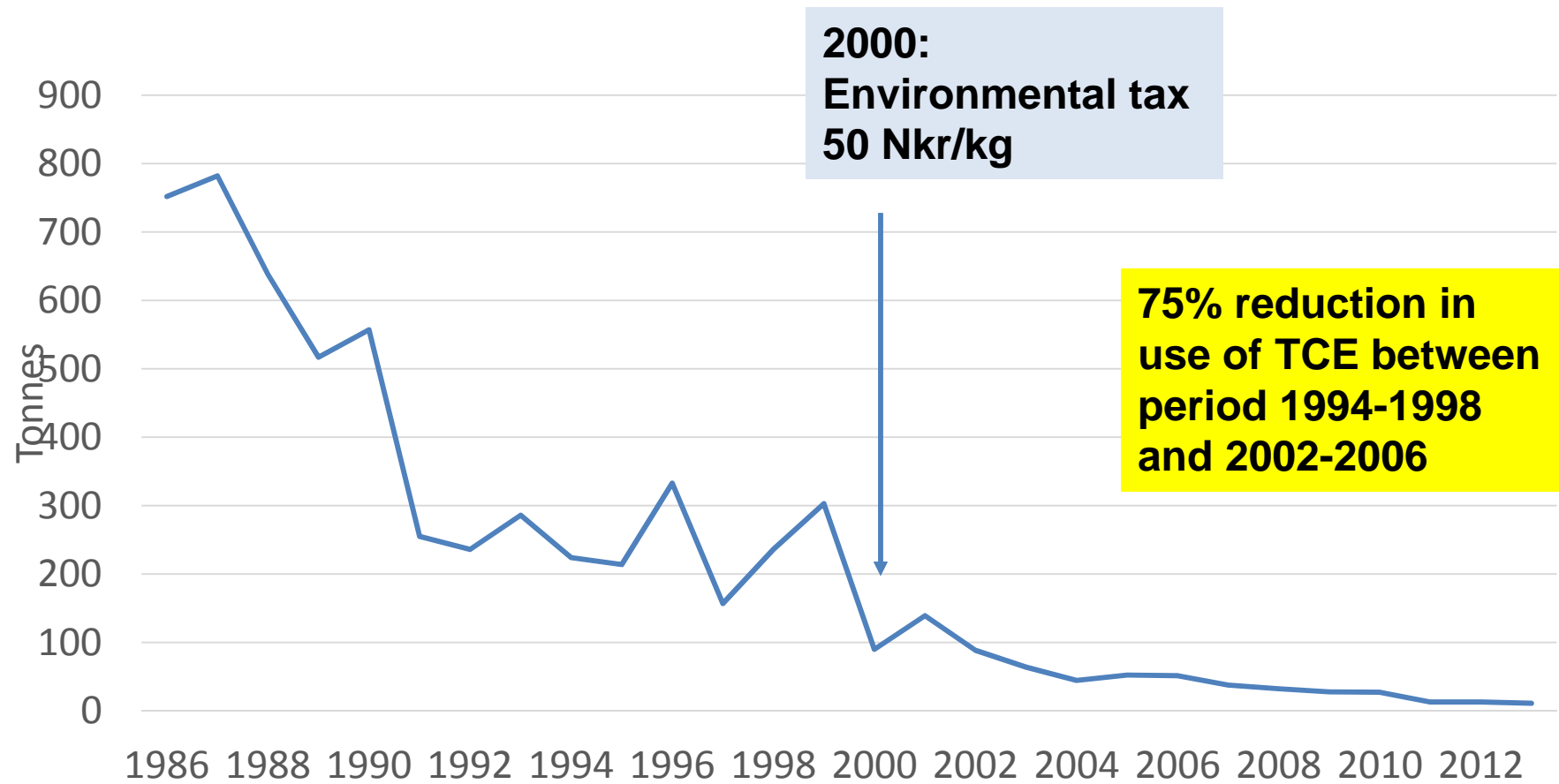
# Marginal cost of reducing the use of TCE among Swedish companies



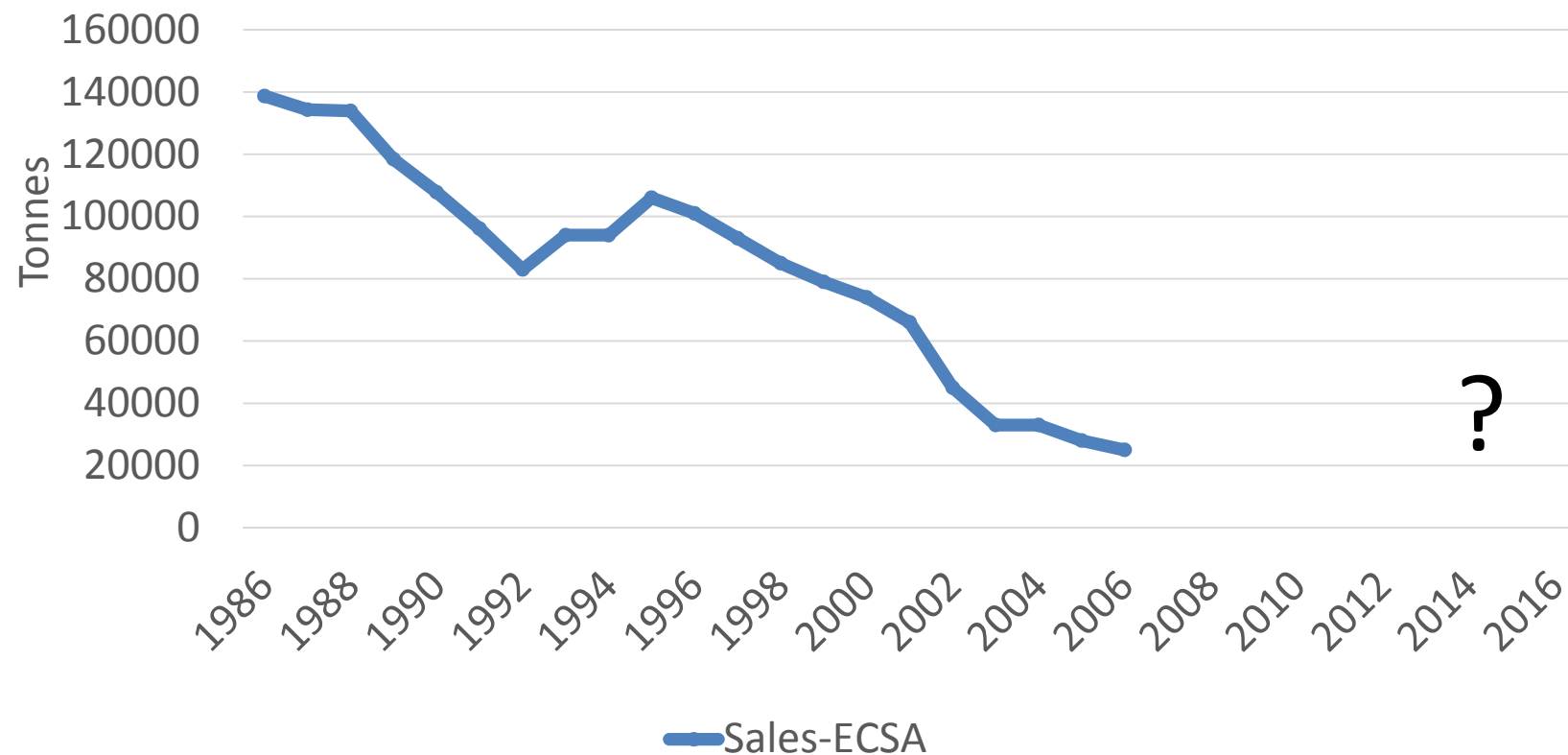
## The Swedish ban against TCE – lessons learned

- Has led to an almost complete phase out of TCE
- Phase out took longer time than expected
- Politically and administratively costly
- Not cost-effective

# The Norwegian tax on TCE

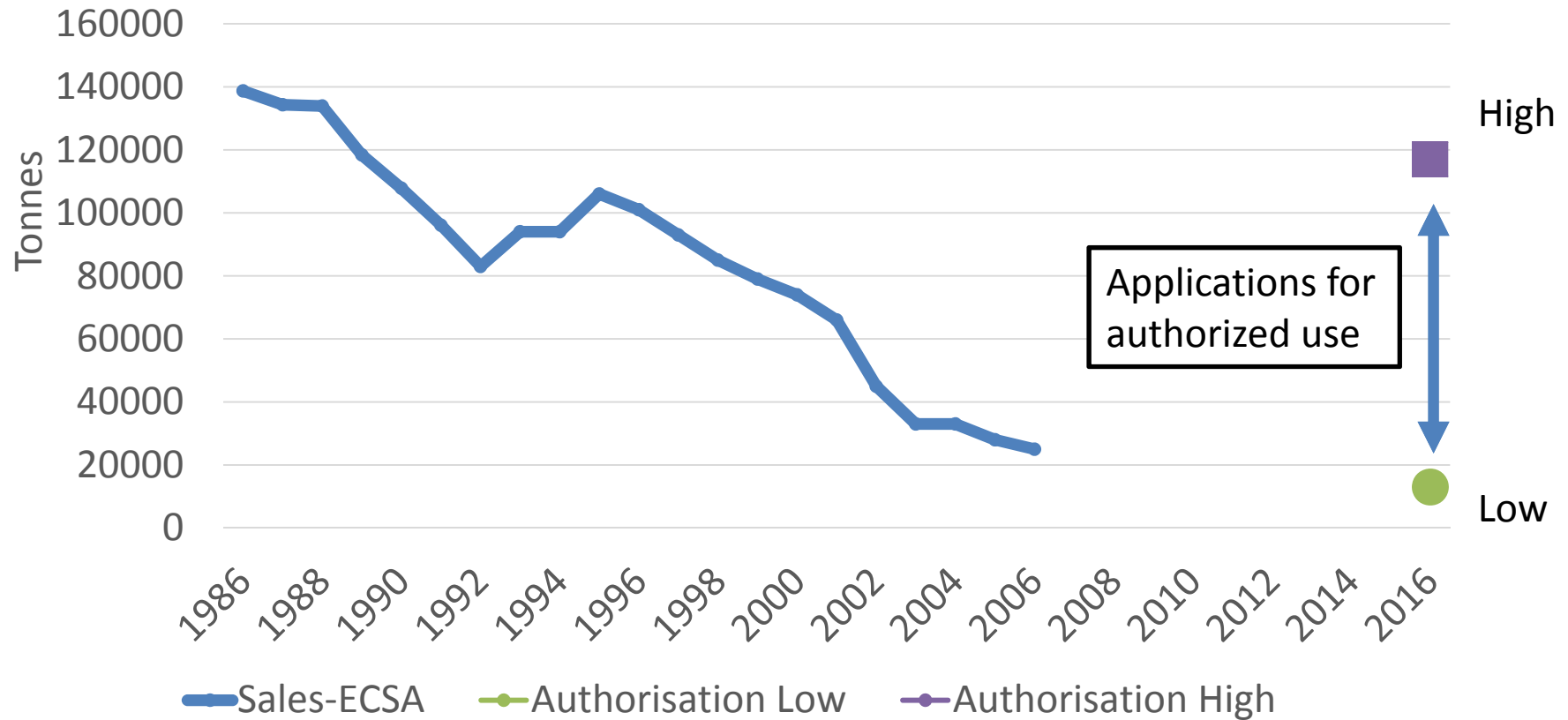


## Use of TCE in Europe 1986-2006



Source: ECSA;

# Use of TCE in Europe 1986-2016



Source: ECSC; ECHA

# TCE and REACH

- After the sunset date (21 April 2016) use only allowed with authorization
- The number of TCE using companies that decided to replace TCE and not apply for authorization is not known.
- 19 applications for use of 13 000 -117 000 ton TCE annually
- One applicant applied for authorization for 800 downstream users for 12 years
- Applications reviewed by the ECHA Risk Assessment Committee and the Socio Economic Assessment Committee
- Decisions on authorisation by the European Commission

## Adopted opinions and previous consultations on applications for authorisation

This page provides further information on the applications for authorisation that have undergone public consultation. The applications for authorisation are in the opinion development phase until the final opinions of the Committees for Risk Assessment and Socio-economic Analysis have been adopted and sent to the European Commission. The European Commission's decision-making process can be followed through the comitology register, where further information is published about the REACH Committee's past and upcoming meetings. The European Commission also publishes information about the expected timing of decisions on its website.

### Related links

- › [Comitology register](#)
- › [European Commission: Authorisation decisions](#)

- › [Current consultations](#)
- › [Applications for Authorisation](#)

Showing 19 results.

Consultation Number	Name	EC Number	CAS Number	Applicant(s)	Use name	Status	
0014-01	Trichloroethylene	201-167-4	79-01-6	Visco Netherlands BV	Use of trichloroethylene as a solvent for the removal and recovery of resin from dyed cloth	Commission decided	<a href="#">Details</a>
0014-02	Trichloroethylene	201-167-4	79-01-6	Visco Netherlands BV	Use of trichloroethylene as a solvent in a process to recover and purify resin from process water	Commission decided	<a href="#">Details</a>
0016-01	Trichloroethylene	201-167-4	79-01-6	Microporous GmbH	Trichloroethylene used as degreasing solvent in the manufacture of polyethylene separators for lead-acid batteries	Opinions adopted	<a href="#">Details</a>
0017-01	Trichloroethylene	201-167-4	79-01-6	ENTEK International Limited	Trichloroethylene as an extraction solvent for removal of process oil and formation of the porous structure in polyethylene based	Opinions adopted	<a href="#">Details</a>

# Analyzing Stated Costs and Benefits of replacing TCE in the 19 Applications for Authorization under REACH

Socioeconomic analysis from one of the applicant companies

## 6.3. Comparison of benefits and risks of continuing Use 1

The analysis finds that the estimated benefits of continuing Use 1 outweigh the associated risk to human health. The benefits of this continued use of TCE are the costs which can be avoided by Vlisco not adopting the PERC alternative. These benefits are estimated to be approximately [REDACTED]<sup>79</sup> (PV, 2016-27), and arise due to the estimated costs of the non-use scenario:

- Capital costs of building new de-waxing production lines which use PERC instead of TCE ([REDACTED]<sup>80</sup> PV);
- Higher operating costs of using PERC instead of TCE ([REDACTED]<sup>81</sup> PV); and
- Lost value-added from wax print production until the new production lines using PERC are operational ([REDACTED]<sup>82</sup> PV).

The costs of the risks to human health from continued use of TCE in Use 1 are estimated to be up to up €104k in total. A number of sensitivities were performed, with a range of benefits estimated at between €17k and €104k (PV). The range reflects assumptions in relation to worker and general population exposure levels around the Helmond site and valuation estimates for fatal cancer.

By comparing the economic benefits of continued use ([REDACTED]<sup>83</sup> PV) against the value of risks to human health (~€104k), it is evident that EU society benefits significantly in net terms from the continuation of Use 1 over the period considered. Social, environmental and macroeconomic impacts have been assessed and do not have a material bearing on this outcome. This demonstrates the benefits of the authorisation of Use 1, which would enable the use of TCE to continue past the Sunset Date, outweigh the risks by several orders of magnitude, and therefore that this authorisation is clearly justified from a societal perspective. This conclusion is strongly robust to reasonable sensitivity analysis.

Non-disclosure of "confidential information" due to competitiveness reasons makes reviews by academic researchers difficult



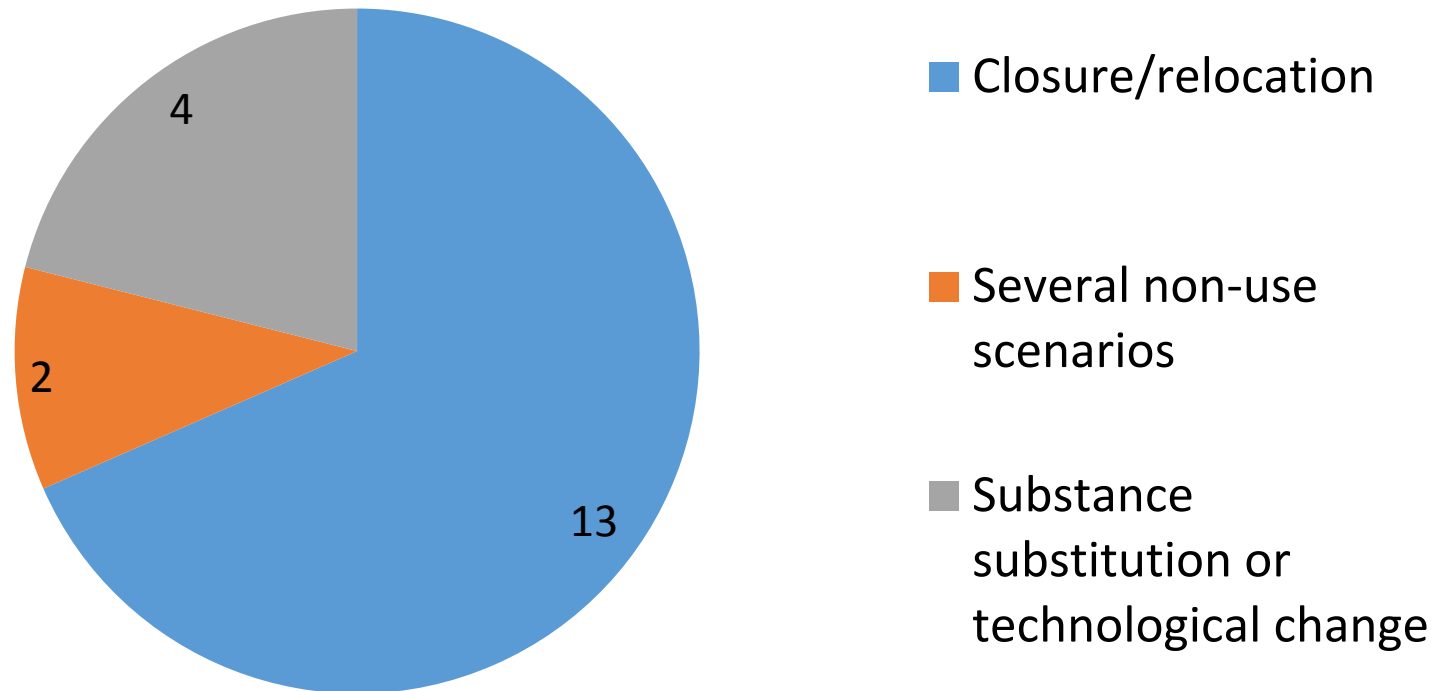
**Large variation in the estimated costs and benefits of phasing out the use of TCE  
(costs and benefits of non use)**

	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>Min.</b>	<b>Max.</b>
Benefits (Euro, thousands)	19	911	6	0,1	21 000
Costs (Euro, thousands)	10	233 549	74 500	484	1 242 000
Cost/total tonnage (EUR, thousand)	9	203	32	0,09	1 384

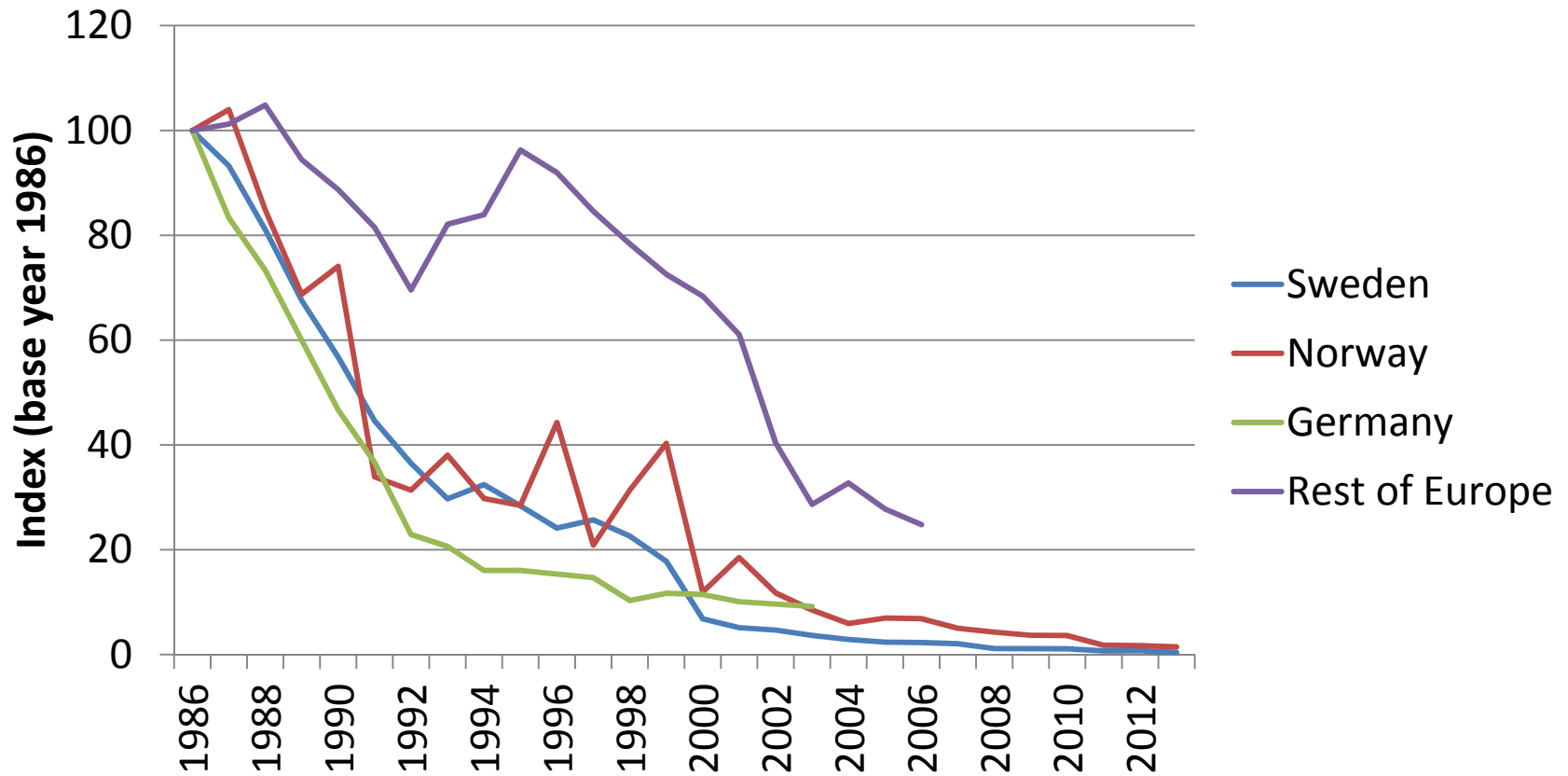
**Source:** Socioeconomic analyses presented by companies seeking authorization for continued use of TCE



# Non-use scenarios in socio-economic analyses



## Comparison of the rate of reduction of TCE in Europe



## Lessons learned / Conclusions

1. **Slow process to phase out TCE**
2. **The enforcement of strict emission standards** is crucial to minimize damage costs (negative health effects)
3. **A complete ban - the strongest policy instrument in theory – proved difficult to enforce in practice**
4. **A tax or deposit/refund system can create incentives for a gradual phase out**
  - Tax/fee
  - REACH Authorisation + Application fee?

## Lessons learned / Conclusions (2)

### 5. Access to information is a key challenge

- Difficult to access data on how much TCE is used and where
- Is it reasonable that data is not accessible for SVHC?
  
- Companies seeking authorisation have incentives to overestimate replacement costs and to underestimate benefits from reduced use
  
- Seek alternative sources of information

**Work in Progress – Comments and Suggestions Welcome!**

[Daniel.Slunge@economics.gu.se](mailto:Daniel.Slunge@economics.gu.se)