

I am so misunderstood!
An Impartial Look at
Geoengineering

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THE LONG HAUL: NAVIGATING THE ENERGY TRANSITION TO
LIMIT CLIMATE CHANGE

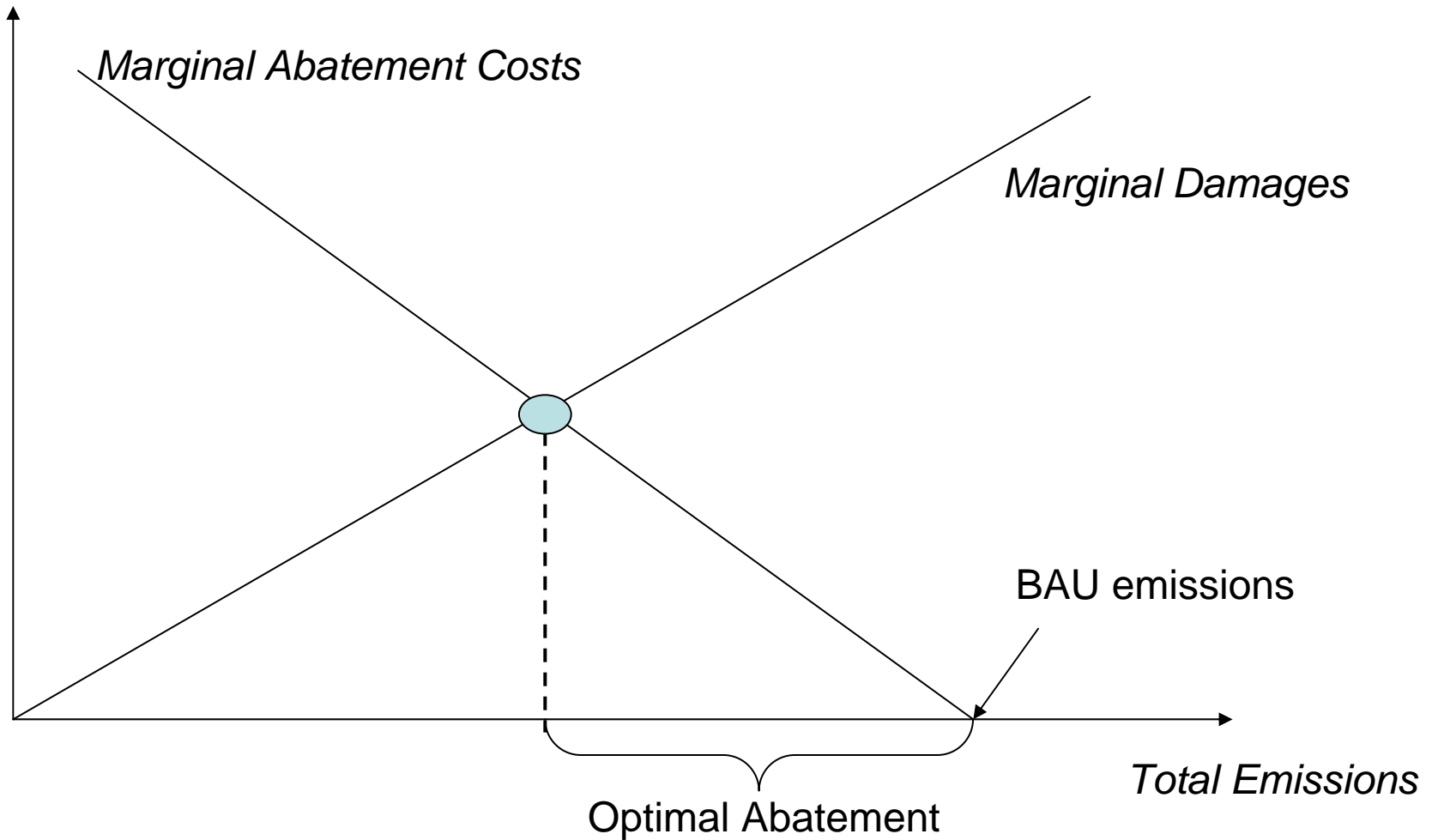
Dunsmuir Lodge (Victoria BC), August 11-13, 2008

Conventional framework for climate mitigation strategies

Cost-benefit analysis

- The objective function:
 - Minimize abatement costs + economic damages caused by net emissions
- Subject to:
 - Net emissions = BAU Emissions – **Abatement**
 - Damages are an increasing convex function of emissions
 - Abatement costs are an increasing convex function of abatement
- Results:
 - Optimal abatement is such that
 - Marginal abatement costs = Marginal damages

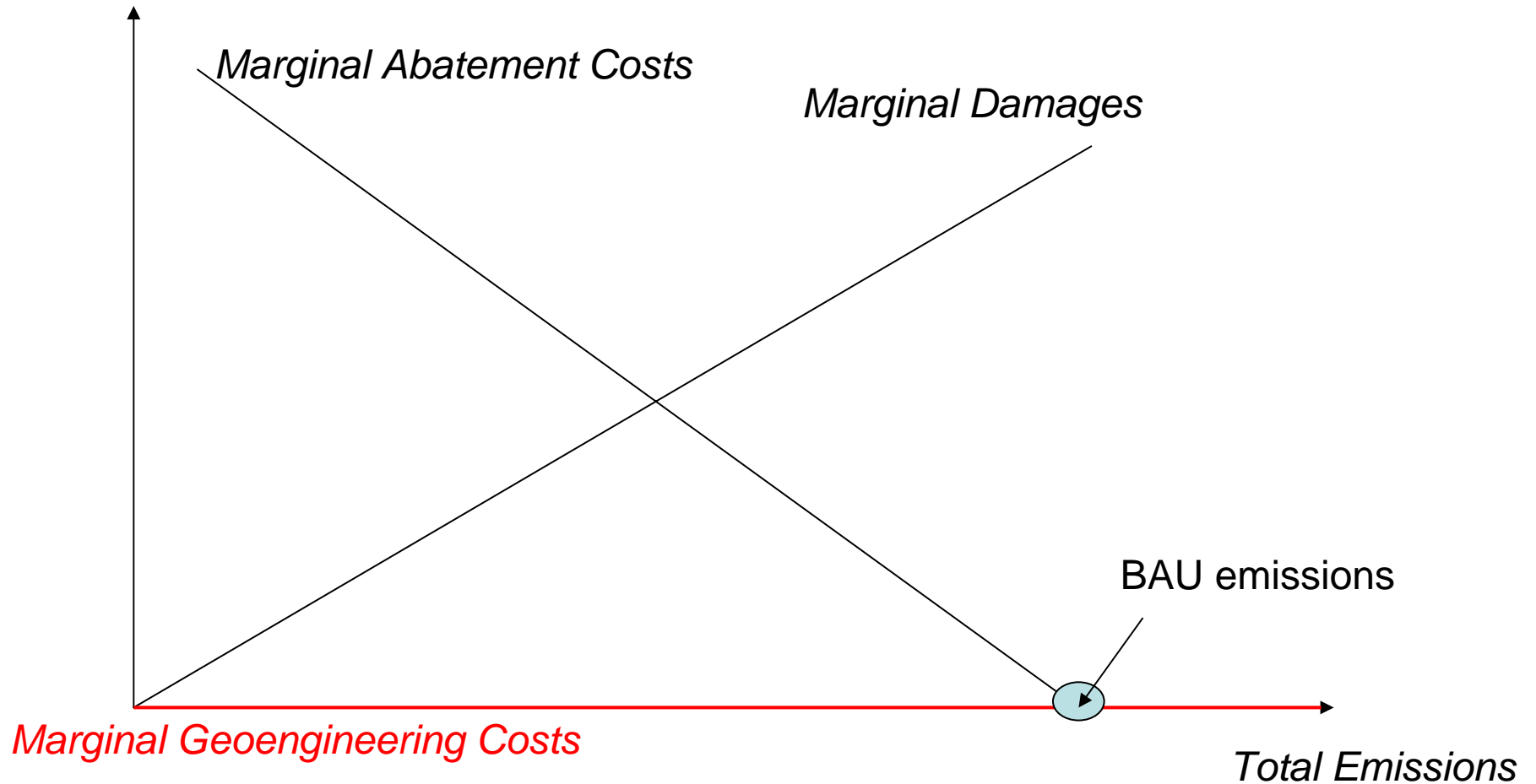
Conventional framework



Approaches to incorporate geoengineering I

- Geoengineering and abatement are **perfect substitutes** (Nordhaus 2000, 2007)
- Geoengineering is cheap while abatement has an increasing convex cost function (Keith 2000)
 - Net emissions =
BAU Emissions – (Abatement + **Geoengineering**)
- Results:
 - Geoengineering is set to its technological maximum and there is no abatement
 - There are not international coordination failures (Schelling 1996, Barrett 2007)

Approaches to incorporate geoengineering I



Approaches to incorporate geoengineering II

- Geoengineering works on the EFFECTS of GHG emissions, not the SOURCE
 - Geoengineering disentangles Global Warming from other GHG concentration effects
- There is uncertainty associated with the implementation of geoengineering (How effective? Unintended consequences?)
- Constant (zero) marginal costs are assumed. There are small fixed costs

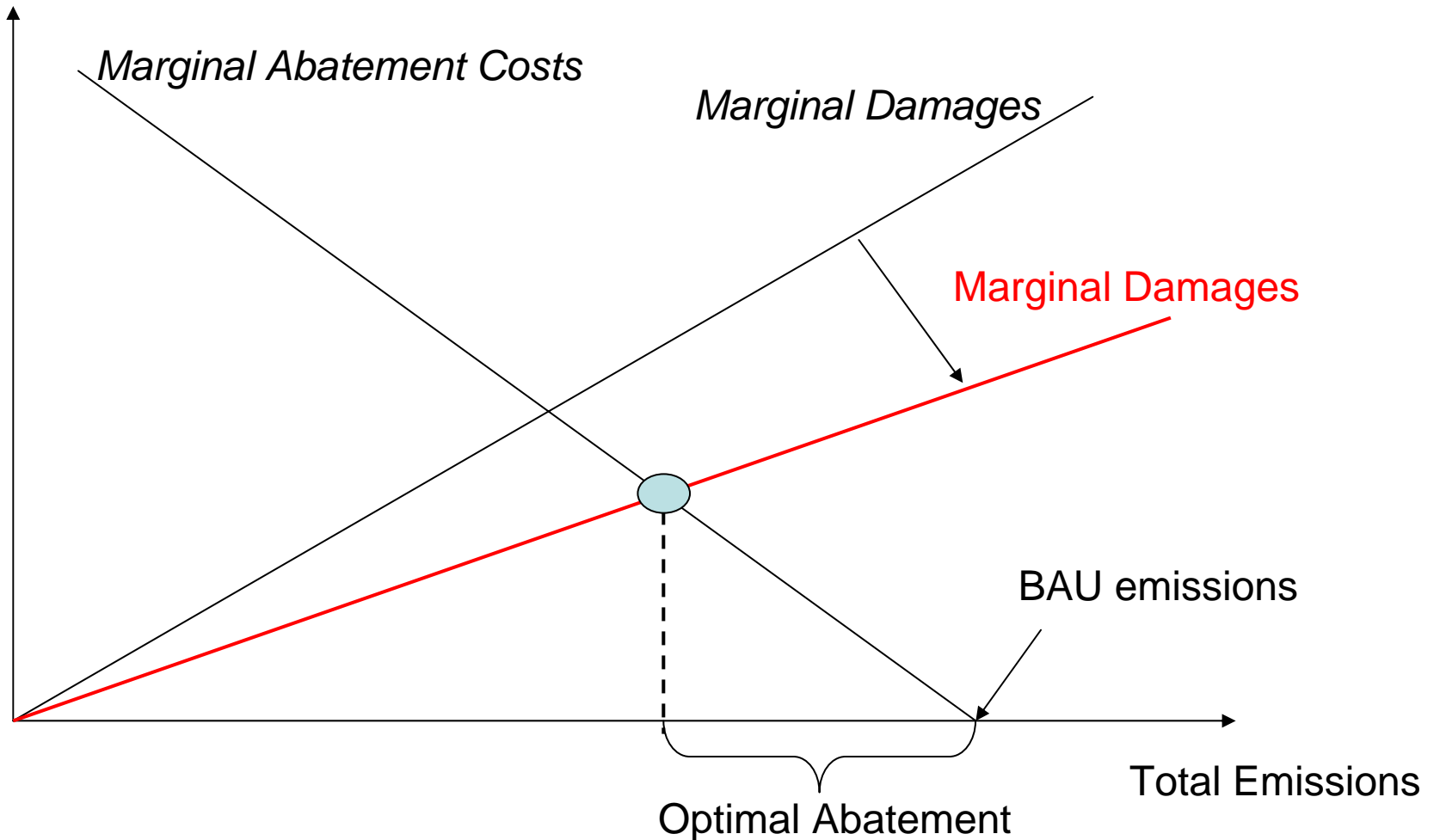
Approaches to incorporate geoengineering II

- The objective function:
 - Minimize abatement costs + total economic damages
- Subject to:
 - Emissions = BAU Emissions – Abatement
 - Total Damages = **Damages 1** (GHG)
+ **Damages 2** (Temperature)
+ **Damages 3** (Geoengineering)
 - Temperature = f (Emissions) – **Geoengineering**

Approaches to incorporate geoengineering II

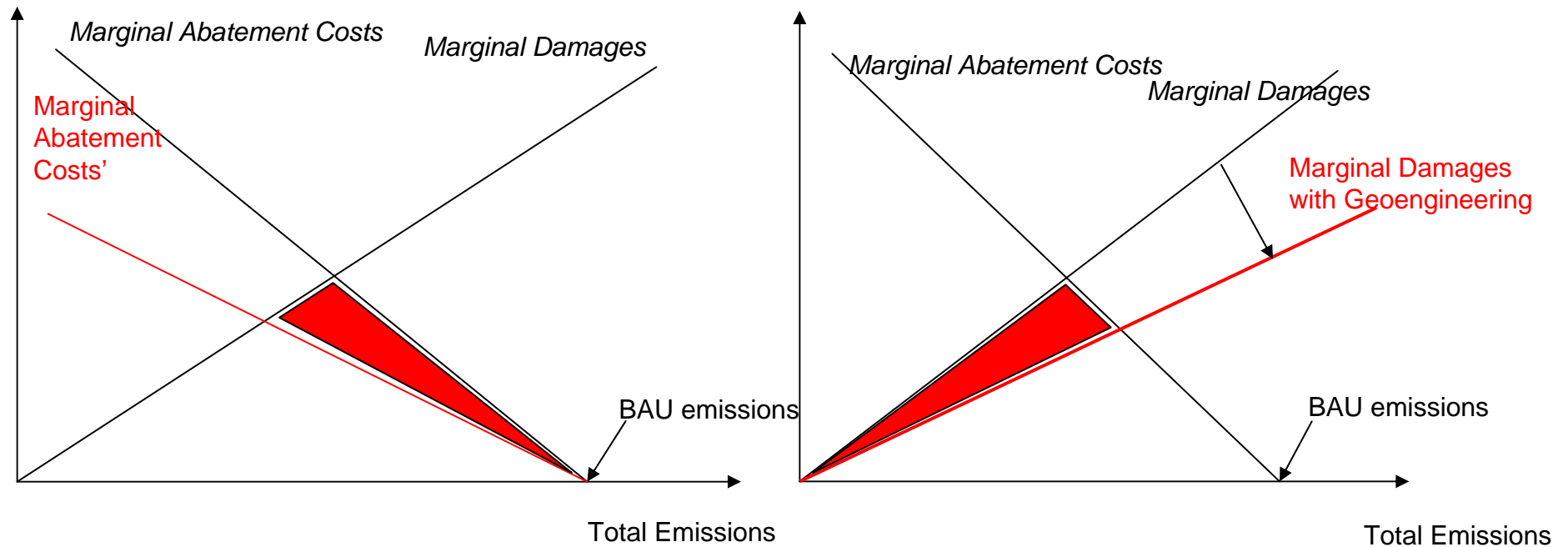
- Results:
 - Geoengineering is adopted and abatement is always active in the economy
 - There are international coordination failures
- Opposite to Schelling and Barrett's discussion about geoengineering

Approaches to incorporate geoengineering II



Approaches to incorporate geoengineering II

Fixed Costs



Pollution-saving technical change

Geoengineering

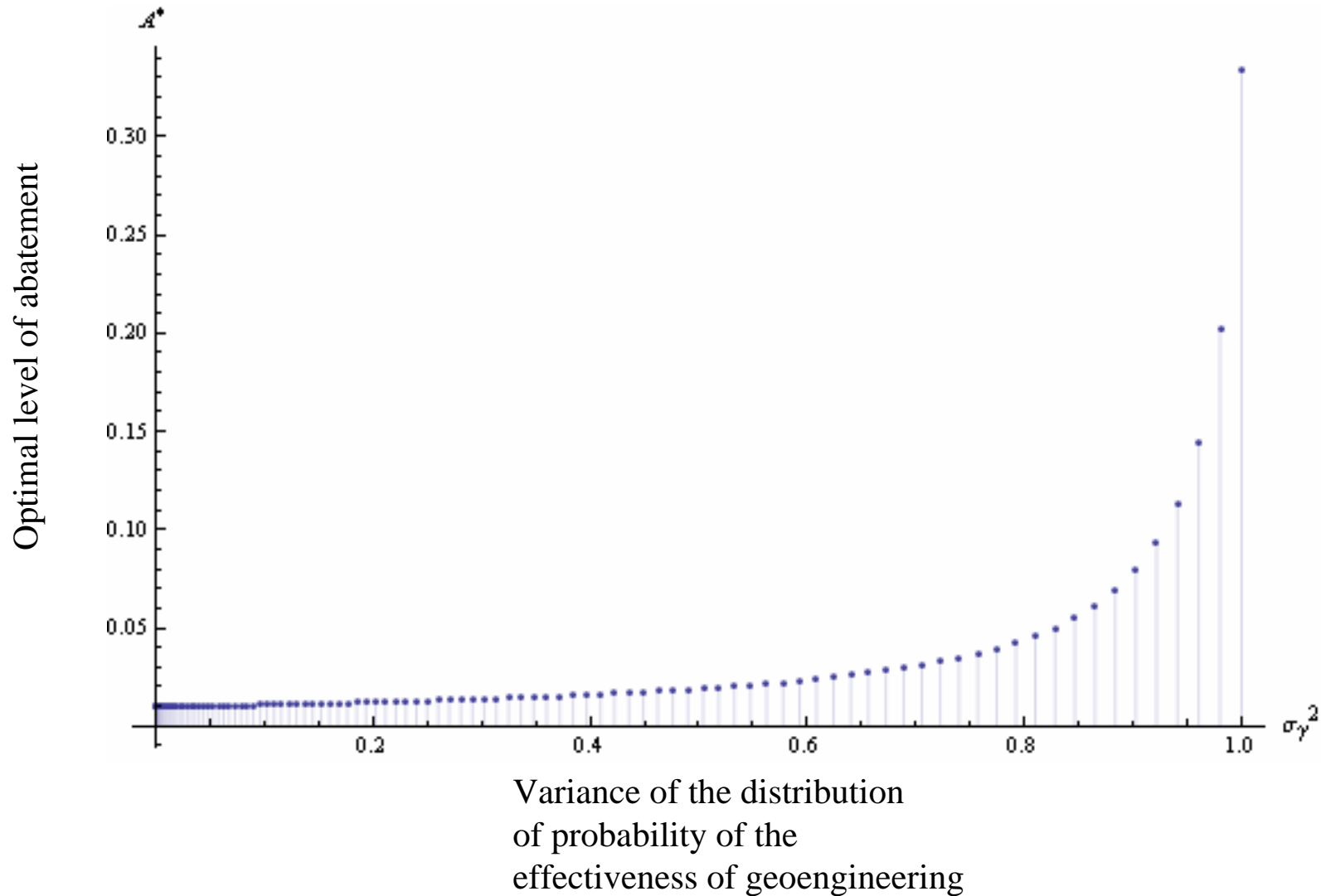
Approaches to incorporate geoengineering II

Uncertainty

- Introduce uncertainty on the effectiveness of geoengineering
- Geoengineering and abatement are risk complements
 - If the uncertainty about the effectiveness of geoengineering increases (mean preserving spread) then the optimal level of abatement increases as well

Approaches to incorporate geoengineering II

Uncertainty



Geoengineering sounds very good

- A policy in which geoengineering and abatement are included implies a lower cost for society
- Abatement and geoengineering are risk complements
- Geoengineering allows flexibility in the timing of abatement...think about developing countries

Other objectives

- Naturalism
 - Harm caused by people is worse than that caused by nature
- Undoing
 - It is better to undo the harm you caused even though welfare would be higher if the same resources are allocated in a different way
- Risk Minimization
 - Define a policy that gets the job done with the minimum risk to society

Other Frameworks

- Naturalism implies minimization of emissions
- Undoing looks like minimization of damages
 - Abatement is set to its maximum → Emissions are set to zero.
 - Geoengineering is not adopted
 - Technological costs are not an issue
- Risk minimization implies no geoengineering, and it also implies higher abatement levels (precautionary principle – act then learn)

Conclusion

- If we are willing to be impartial when thinking about geoengineering two possible outcomes arise:
 - First: Under the cost-benefit framework we should implement geoengineering
 - Second: If geoengineering is not applied, then we should set emissions to zero, no matter the costs
- It seems “contradictory” to propose **cost minimizing stabilization paths** while at the same time we leave **geoengineering out of the picture**