

Asking the wrong question:

Is resource-based compensation for environmental damage restricting social welfare gains?

Scott Cole, PhD Student



Ulvön

CERE

Centre for Environmental and Resource Economics



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Environmental Compensation

- Railroad construction that damaged bird habitat
- **Loss:** habitat loss and reduced bird productivity
- **Compensation:** removed dense tree cover, repaired damage from drainage dikes, and improved vegetation for the birds



Environmental Compensation

- PCB contamination in a lake
- Some fishermen did not go fishing, others had a diminished fishing experience
- **Loss:** recreational value to fisherman
- **Compensation:** constructed new fishing lakes, improved public access for fishing, and stocked fish in lakes



The question is ...

... How do we get from here to there?



What do we measure?
&
How much is enough?

Road Map

- Background & key assumptions
- Conventional scaling approach
→ Equivalency Analysis (EA)
- Alternative scaling approach
→ Cost Benefit Analysis (CBA)
- Welfare implications

Key assumptions

1. Compensation mechanism restricted to "resource-based" projects (*in-kind*)
 - Financial compensation prohibited by law, but ...
 - (Sweden) Vojmån River - Vattenfall promised 40 mil SEK in infrastructure investment for Vilhelmina in return for hydropower expansion. It was voted down (Nov 2008)
 - (Spain) Hypothetical survey - found a preference for roads, hospitals, schools over r-based projects to compensate for oil spill (Lazaro-Touza & Atkinson, 2010)
2. Scaling objective: "*no net loss of (aggregate) welfare over time*"
 - Individuals should be "no worse off" after compensation

Conventional scaling approach: Equivalency Analysis (EA)

Why require compensation?

- economic argument --> provides (incremental*) incentive to undertake damage prevention measures (Polluter Pays Princ.)

* *incremental to existing criminal penalties & clean up requirements*

How to scale it?

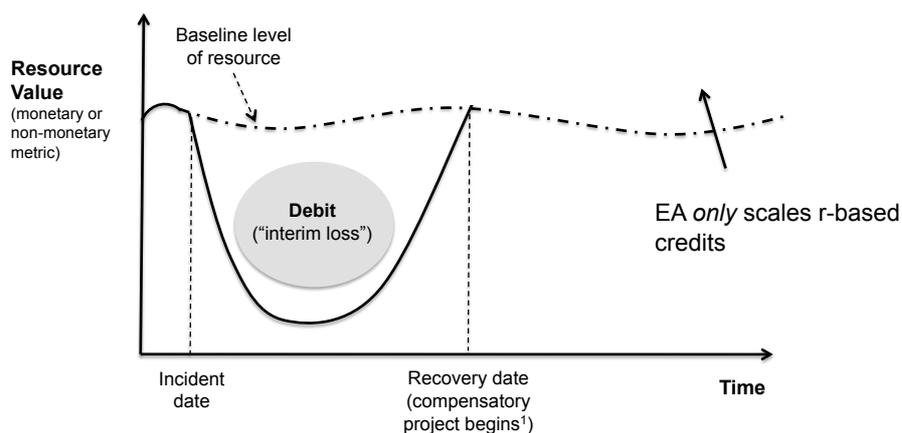
- Equivalency Analysis (EA) method used in US/Europe to scale r-based compensation
- Objective: "equivalence of **loss** and **gain** over time & space"

Key concept → **Interim Loss**

- " *the lost value to the public during the time that a resource/service is below its baseline level:* "

Conventional scaling approach: EA

Figure 1. The debit and credit in Equivalency Analysis (EA)



Previous Literature: Equivalency Analysis (EA)

- Focuses on whether an r-based compensation project scaled with EA provides *sufficient* compensation for the public's loss
- EA literature assumes a “*victim's perspective*”
 - Did the loser get compensated ? (less focus on polluter's welfare)
- General conclusion from several economic papers: EA provides a reasonable model for scaling compensation
 - Jones and Pease (1997); Flores and Thacher (2002); Dunford et al (2004); Zafonte and Hampton (2006); among others ...

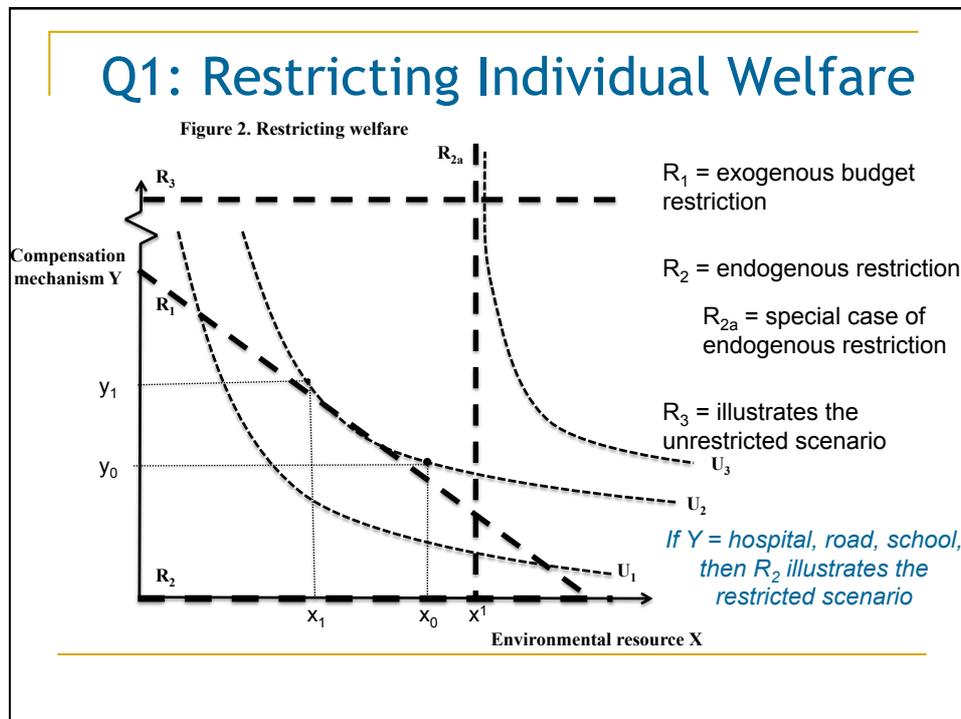
Research Questions

- I am *less* interested in the **victim's perspective**;
- I am *more* interested in the **net social welfare** outcome of a compensation project

Q1: Why restrict the compensation mechanism? what are the welfare implications? what are the economic arguments for/against r-based projects ?

Q2: How to account for net social welfare of a compensation project (r-based or otherwise)? What role could/should cost-benefit analysis (CBA) play ?

Q1: Restricting Individual Welfare



Q1: restricting compensation

Is there reason to believe that society is -- or should be -- *only* willing to accept resource loss if balanced by resource gain?

Arguments for r-based restriction on compensation

- **Transaction costs.** Avoids 'messy' measurement of society's "X for Y" trade-offs; similar units of measurement
 - **Strong sustainability.** Evidence to support this claim argues for r-based restriction (i.e., provides a unique contribution to human welfare)
 - **Public good nature of compensation (non-divisible compensation mechanism).** Undesirable from a welfare theoretic perspective ...
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- ... but perhaps attractive from a political perspective (avoids weighting of household utilities)

Q2: Asking the wrong question?

Equivalency Analysis Scaling - *what resource-based project is appropriate & what is the required scale to compensate for victim's interim loss?* From Flores and Thacher (2002):

$$u_i^0(q_d^0, q_r^0, y_i) = u_i^1(q_d^0 - \Delta_1, q_r^0 + \Delta_2, y_i) \quad (q_d \text{ \& } q_r \text{ usually assumed similar})$$

CBA Scaling - *what compensation project is appropriate & what is the required scale to ensure social profitability (given public preferences and society's scarce resources)?* Borrowed from Kriström and Johansson (2010):

$$u_i^0(q_d^0, q_r^0, y_i) = u_i^1(y_i - c_i, q_d - CV_i, q_r^0 + \Delta q_r) \quad (c > 0 \text{ and } \Delta q_r > 0)$$

Q2: CBA scaling

$$u_i^0(q_d^0, q_r^0, y_i) = u_i^1(y_i - c_i, q_d - CV_i, q_r^0 + \Delta q_r) \quad (c > 0 \text{ and } \Delta q_r > 0)$$

CV_i quantity/quality of damaged resource (q_d) the individual is willing to give up in exchange for the compensation project (Δq_r)

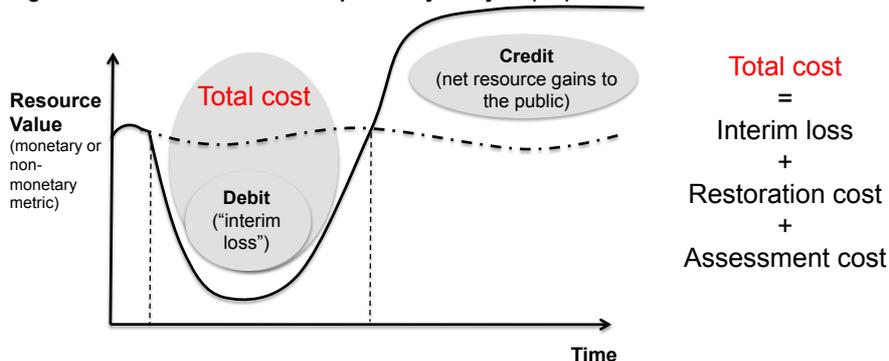
Δq_r ... gain from compensation project

- NOTE #1 --> Δq_r could be any type of compensatory project (hospital, road, school, or wetland)
- NOTE #2 --> $c > 0$ means individuals do not receive cost-free compensation in a CBA scaling model (!)

Q2: CBA scaling - decision rule

- Exclude compensatory projects if **total cost** > total credit

Figure 1. The debit and credit in Equivalency Analysis (EA)



- Implication --> EA-scaled compensation may not be pareto-improving in some cases (see e.g., Riera 2008).

Restoration/Assessment costs

- Parsons and Kang (2010) apply conventional EA scaling to compensate for a beach closure:

In our analysis, we seek compensatory restoration projects that pass a Kaldor-Hicks Test. Does the monetary value of the restoration project equal or exceed the monetary value of the loss due to the beach closure? If so, the restoration project is potentially Pareto improving (ignoring the cost of restoration itself).

- EA scaling --> does **not** consider costs incurred by "polluter"
- CBA scaling --> would account for the **social opportunity cost** of restoration/assessment costs incurred by "polluter"
 - Could the resources of the polluting firm be used for more productive purposes ?

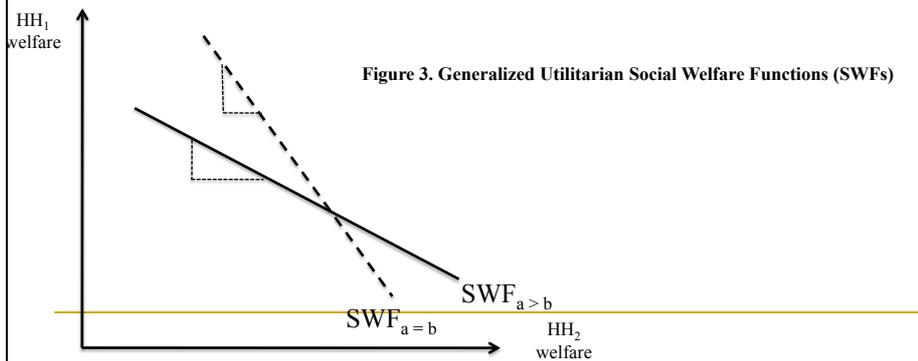
Q2: EA's implied SWF

- EA discriminates between welfare of victims & polluters
- Generalized utilitarian SWF:

$$W = \Sigma (aU_{HH1} + bU_{HH2})$$

if $a=b=1$ --> equal weights (conventional utilitarian CBA approach)

if $a > b$ --> weights HH_1 's welfare higher



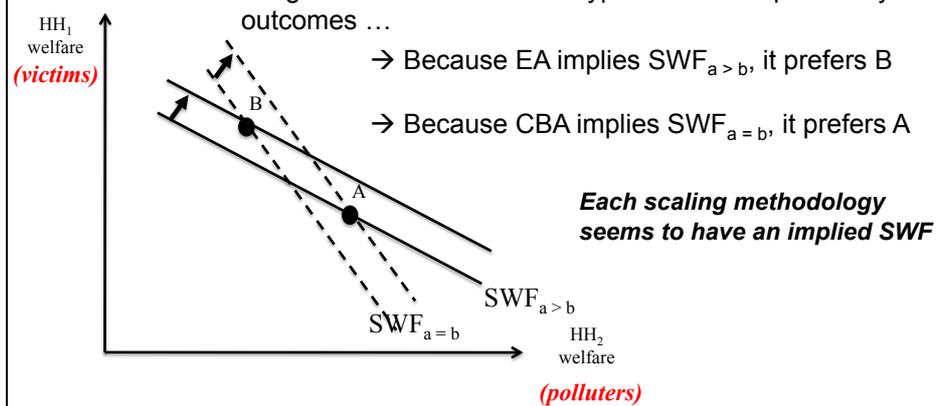
Q2: EA's implied SWF

- EA discriminates between welfare of victims vs. polluters

Imagine Points A and B are hypothetical compensatory outcomes ...

→ Because EA implies $SWF_{a > b}$, it prefers B

→ Because CBA implies $SWF_{a = b}$, it prefers A



Opportunity costs

Treatment of opportunity costs is “similar but different”

Equivalency Analysis (EA) Scaling

- targets the polluter's *private opportunity cost*:
 - **EA Objective**: Encourage polluters to invest in damage prevention/avoidance (*foregone production*) in order to avoid paying for costly compensation

Cost Benefit Analysis (CBA) Scaling

- targets *society's opportunity cost*:
 - **CBA Objective**: allocate scarce resources to socially productive projects - what are we giving up by investing in a given compensation project?

Conclusion

My objective → How to properly measure the **net social welfare outcome** of environmental compensation projects.

1. R-based compensation **does** restrict compensatory possibilities ... but perhaps it is justified ?
2. Most appropriate scaling method depends on underlying policy objective
 - Do we want to create behavioral incentives for polluters?
→ **EA scaling addresses this question**
 - Do we want to ensure society spends limited resources wisely?
Then, we are asking the wrong question ... We should be asking:
→ **Can society use the compensatory damages in a more productive manner?**

T H A N K S !

Scott Cole
scott.cole@slu.se

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