

Workshop on CO2 pricing and sectoral  
complementary policies

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**Optimal subsidy for low-carbon  
investment under adverse selection**

work in progress

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# Motivation

- Policy instruments typically generate much wind fall profit and inefficiencies
  - Leakage issue with EU-ETS and free allocations
  - Technology transfer with CDM and too generous subsidies
- This context: transportation (new techno, new modes...)
  - Investments require a 10 to 20 year horizon for business strategies
  - Many externalities such as LBD and networking
  - Carbon pricing is a not the solution
  - Call for a multi-instrument approach
  - bonus, tax exemptions, subsidies for infrastructure, free parking..
  - What about wind fall profit and inefficiencies...

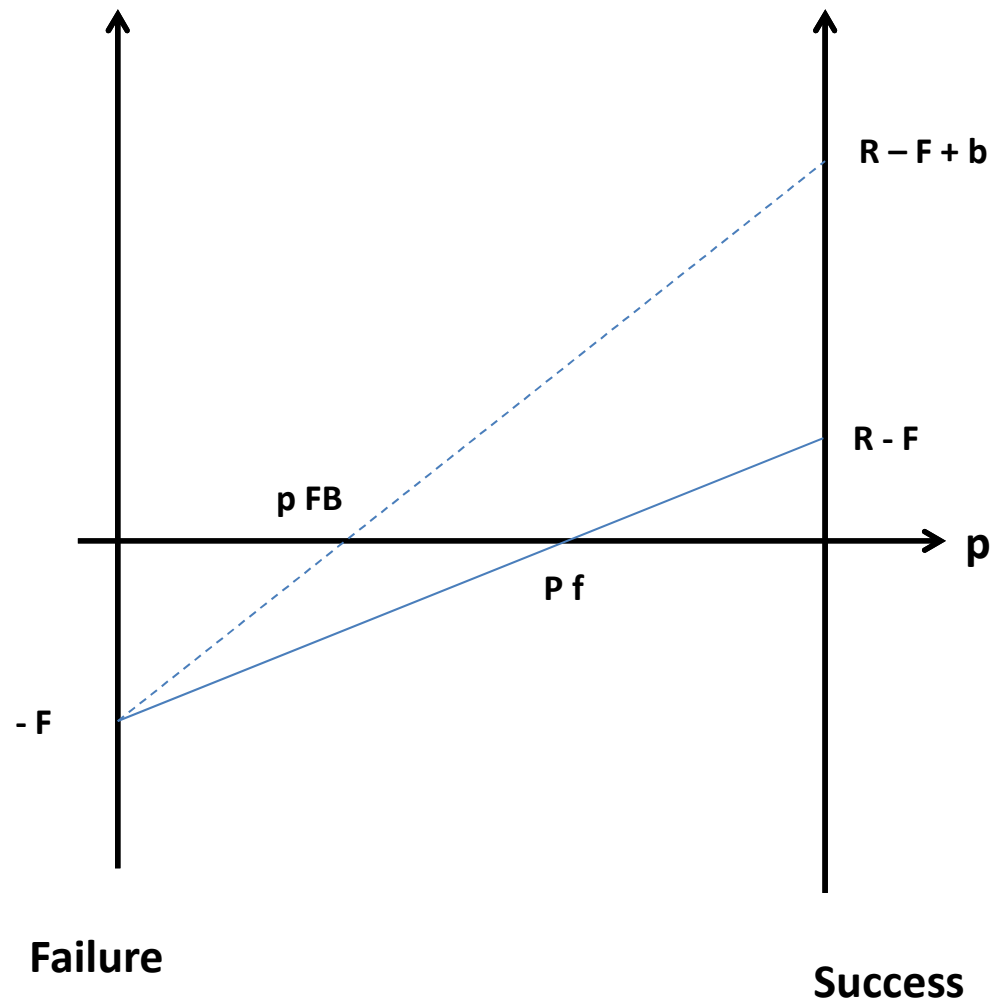
# A simple model

- N uncertain projects
- Two periods
- At period 1 a sunk investment cost  $F$
- Uncertainty unfolds
  - success with prob  $p$
  - failure with prob  $1 - p$
  - $p$  uniformly distributed on  $[0, 1]$
- At period 2
  - success private profit is  $R$  and externality is  $b$
  - failure nothing

The proba  $p$  is private information to the firm

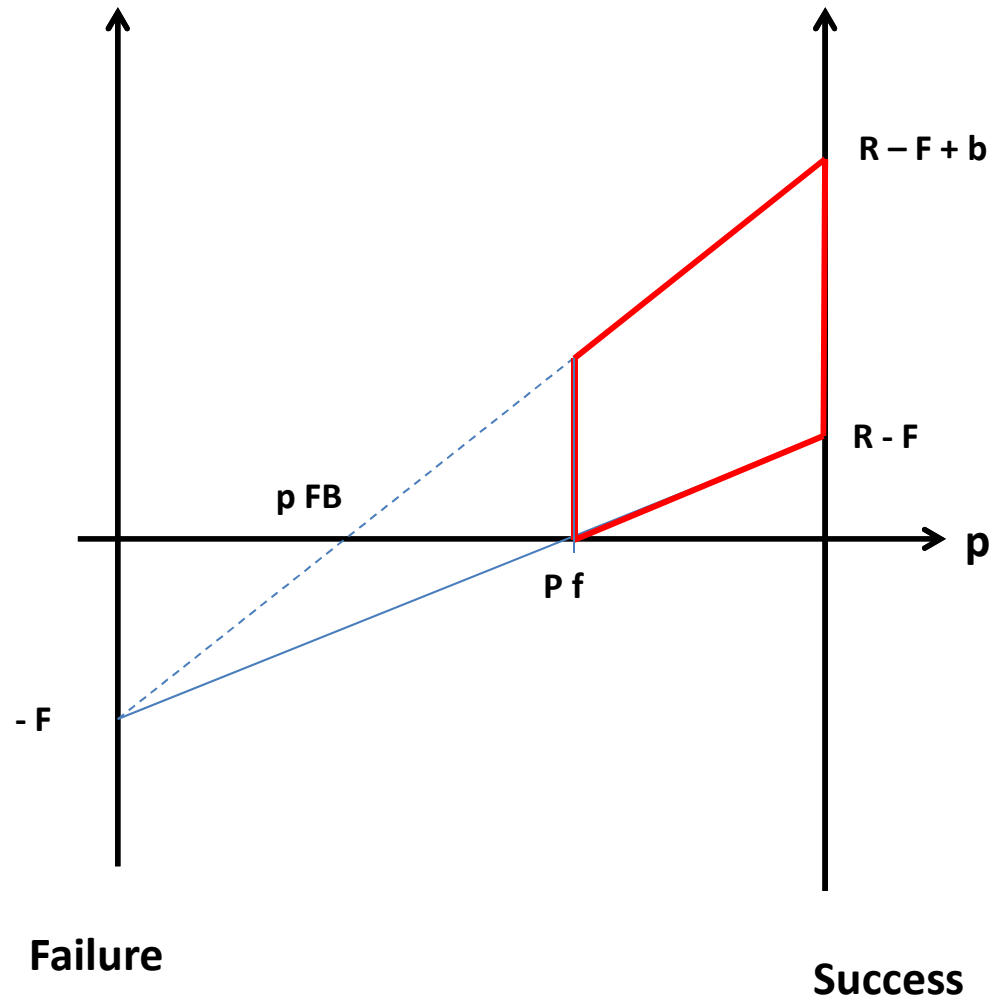
Ex post the state and the firm observe success or failure

# A simple model



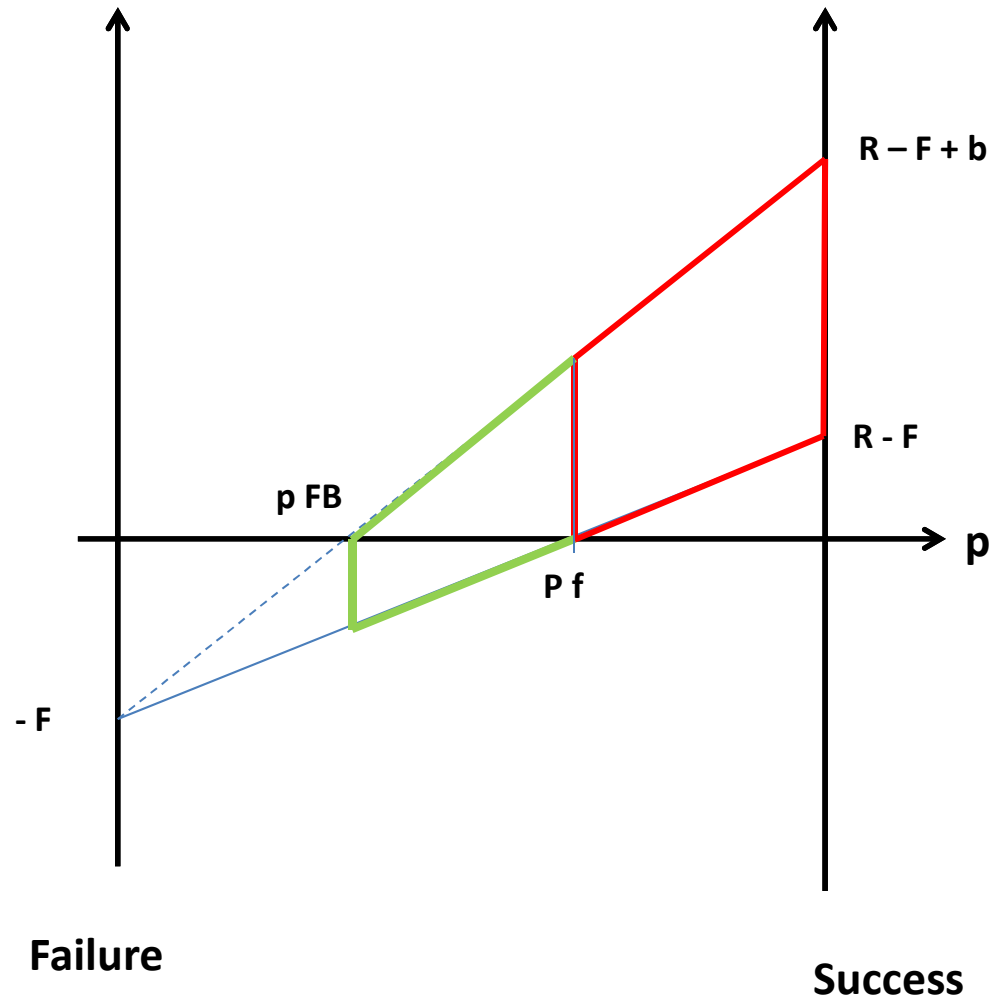
Net social benefit = social benefit – cost of implementation

BAU



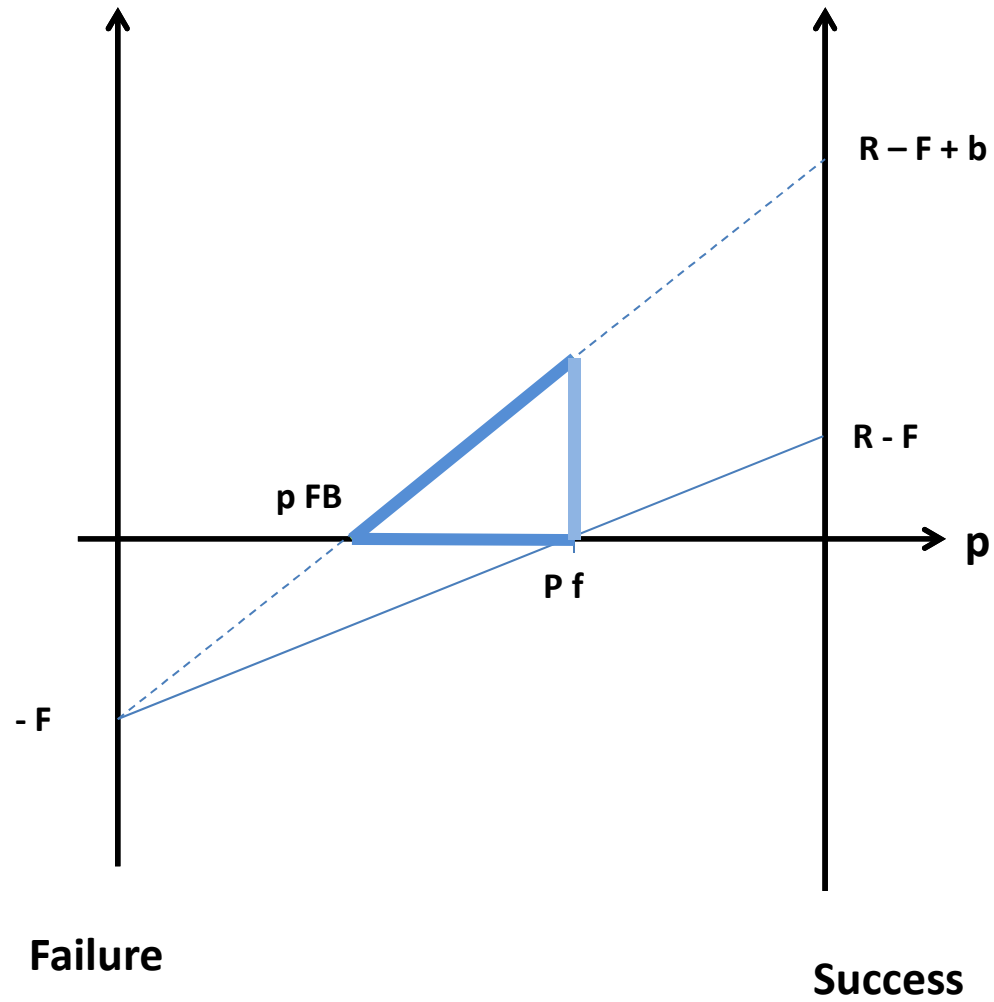
Net social benefit = social benefit – cost of implementation

### First best

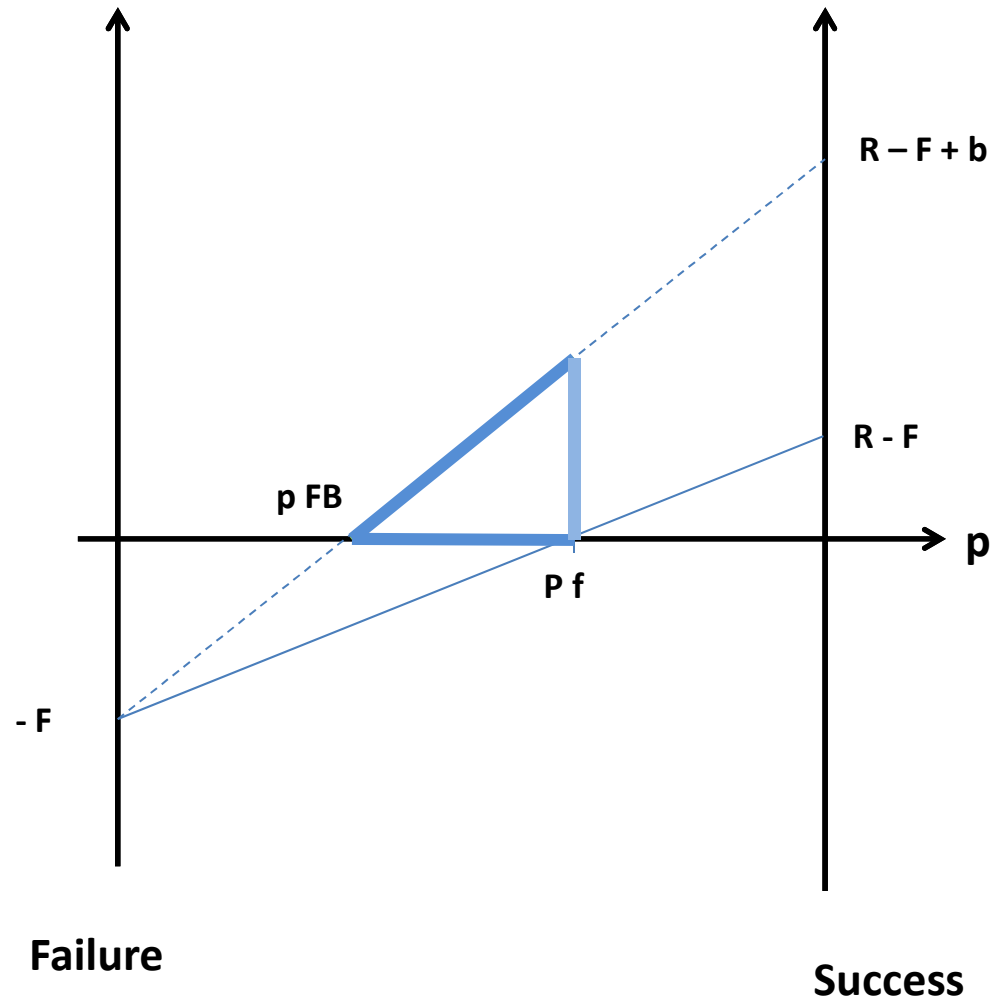


Net social benefit = social benefit – cost of implementation

### Net social benefit for First best

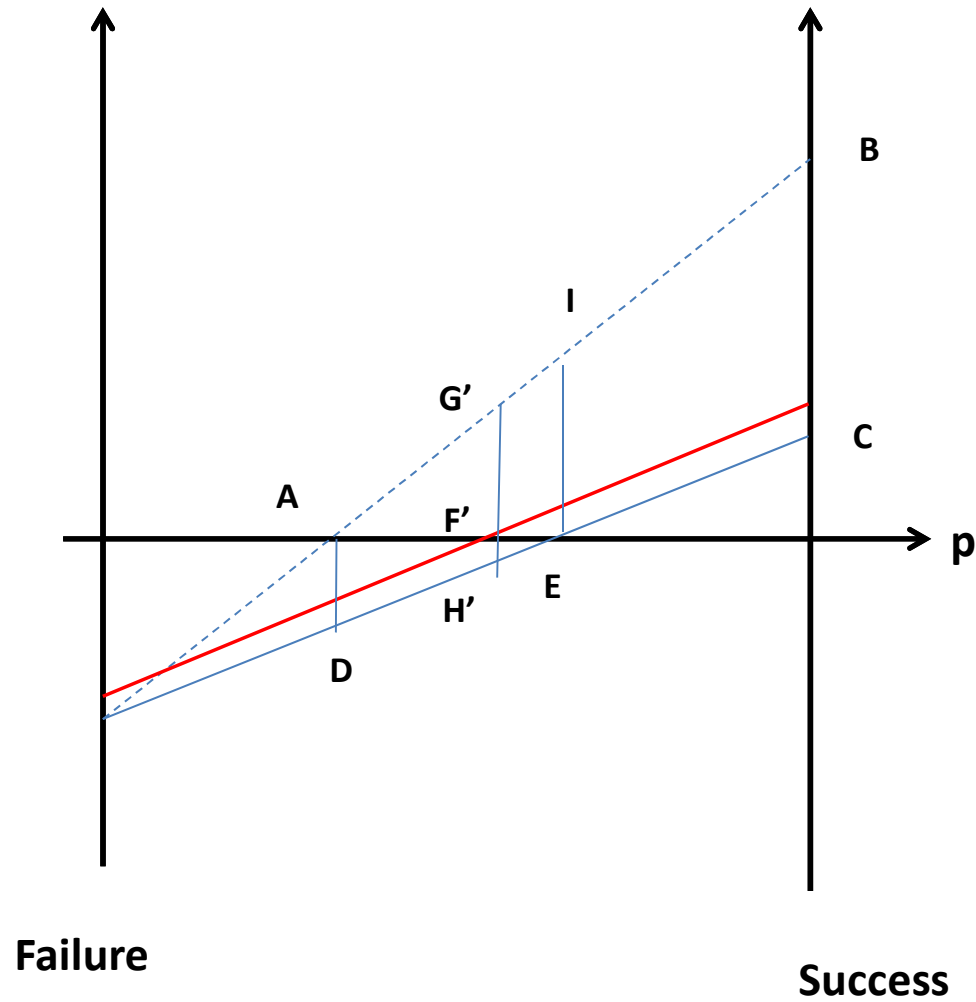


Which policy to get as much of possible of this net social benefit

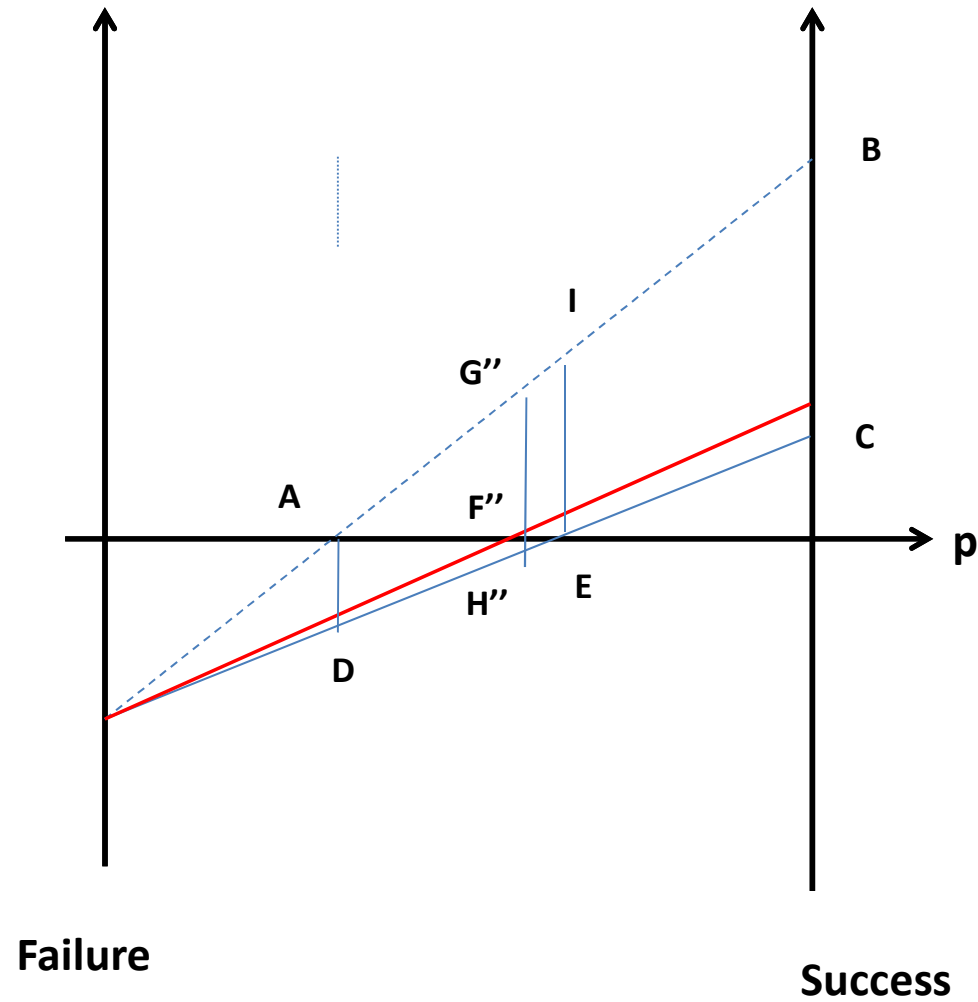




# A flat subsidy?

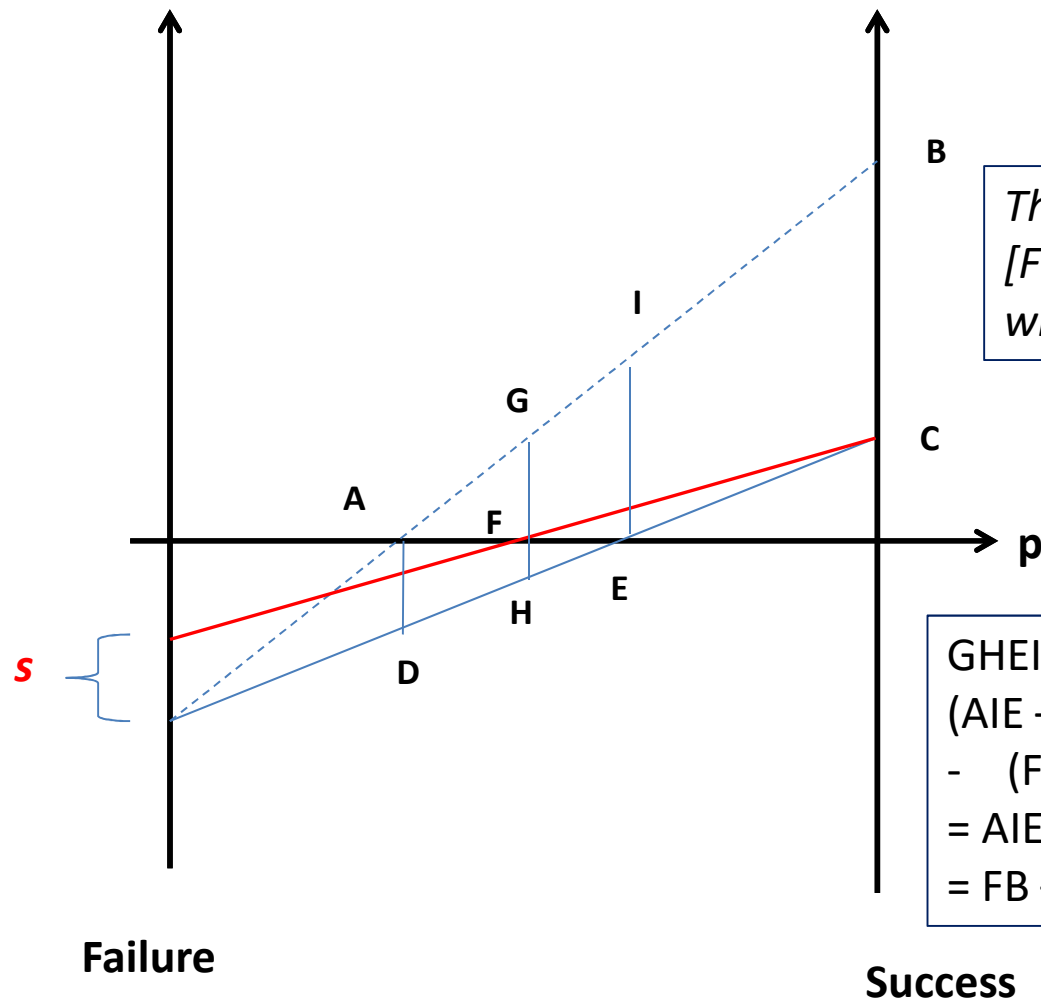


# A proportional subsidy?



# The answer

## A subsidy conditional on failure!



The optimal subsidy  $s$  is  
 $[F(R + 2b) - R^2] / (R + 2b - F)$   
 with  $b > b^*$

$$\begin{aligned}
 GHEI - FHC &= \\
 &= (AIE - AGF + FHE) \\
 &\quad - (FHE + FCE) \\
 &= AIE - AGF - FCE \\
 &= FB - \text{selection bias} - \text{windfall}
 \end{aligned}$$

# Illustration with data from BEV

Results	first best	second best		
		conditional %	flat %	proportional %
trigger prob	0,756	0,792	0,867	0,874
Social benefit (BAU excl.)	1,00	79%	31%	27%
cost of policy	0,45	102%	50%	44%
Net social benefit	0,55	59%	16%	13%
as % of FB net social benefit				
net social benefit		59%	16%	13%
wind fall profit		35%	34%	31%
selection bias		5%	50%	56%

# References

- Fischer, C., (2005). Project-based mechanisms for emissions reductions: balancing trade-offs with baselines, *Energy Policy* 33(14), 1807-1823.
- Brunet, J., Kotelnikova, A. and Ponsard, J.-P. (2015). [The deployment of BEV and FCEV in 2015: California, Germany, France, Japan, Denmark](#). Ecole Polytechnique Chair Energy and Prosperity.
- Laffitte, M., Leguet, B, Quint, A., Le Mer, C. ( 2015) Proposal for an innovative financing mechanism involving the establishment of eTICCs (Energy Transition Infrastructures with Carbon reduction Certificates) to encourage « early movers » of solutions for energy and environmental transition – Application to a hydrogen distribution infrastructure for road vehicles. Note Air Liquide CDC Climat.
- Aglietta, M., Espagne, E., et Perrissin Fabert, B. (2015) Une proposition pour financer l'investissement bas carbone en Europe. Note d'analyse, France Stratégie, <http://www.strategie.gouv.fr/publications/une-proposition-financer-linvestissement-bas-carbone-europe>

# Extensions

- Application to subsidies for BEV: compare flat subsidy with conditional subsidy
- More general assumptions on parameters
- Enrich the model wrt asymmetry of information
- Introduce moral hazard wrt success
- Introduce moral hazard for the State
- ...

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Thank you for your attention !