Regret & Climate Action

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...my presentation is based off another paper...

Regret in Games

Bocconi

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SWUFE

indications regret matters to life's most important decisions:

- deathbed reflections... *if anticipated, might have powerful impact on previous choices ... influence education, family formation, and... why not:* CLIMATE ACTION!

So, how does regret influence behavior & outcomes?

- little done by economists ... some DT
  Bell '82, LRS '82
  heterogeneous work on specific games
  - auctions ... E&W '89, FO&O '07, B et al '25
  - product diff'n ... SK&H '08, ZZ&J '25
  - specific static games ... CF&N '25

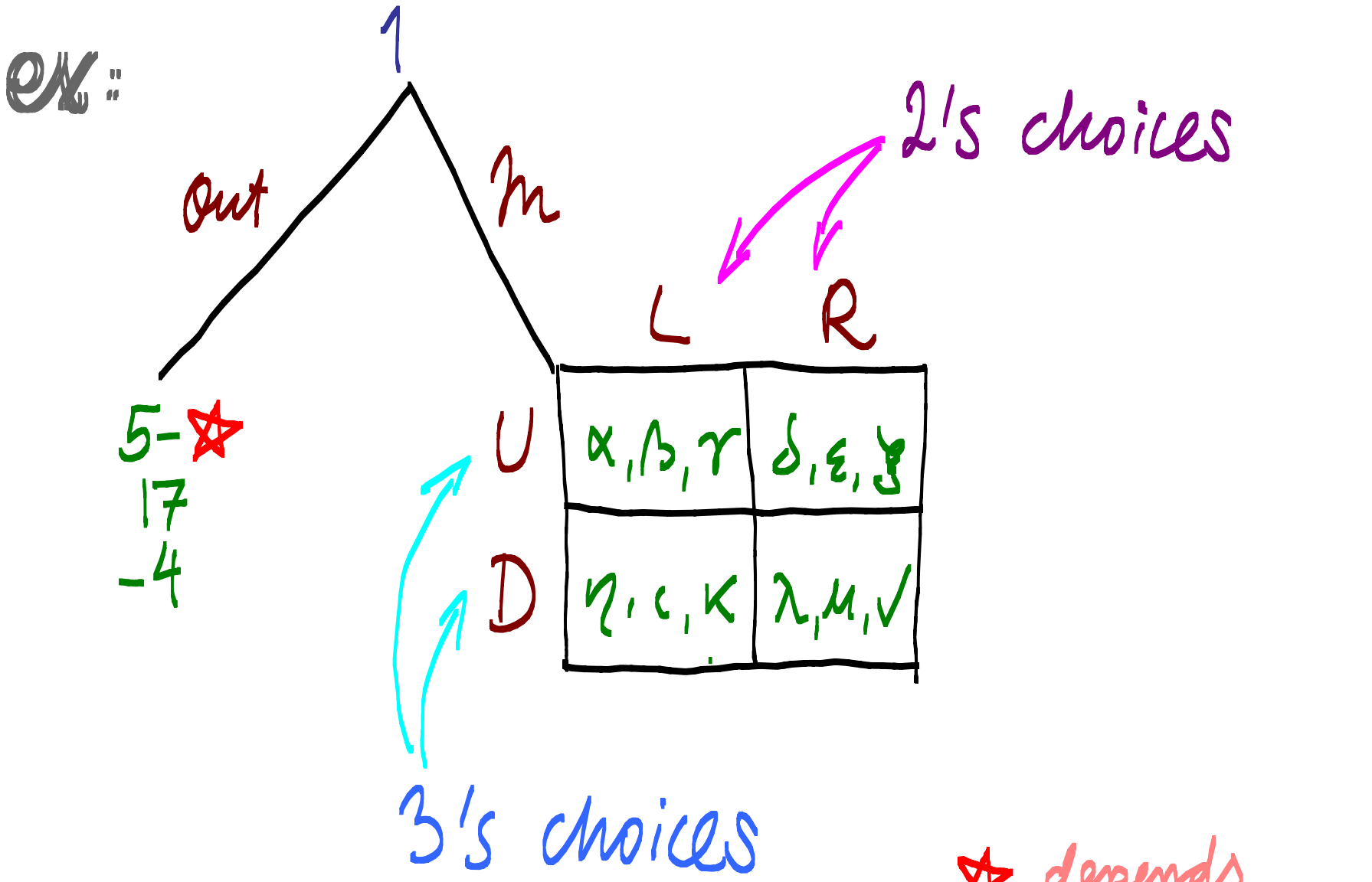
We develop a general approach!

Key feature: To explore how regret influences strategic interaction one needs to consider a form of ***belief-dependent utility***. Reflect intuitively:

- mental time-travel and psychology of post-play rumination...
- pondering what might have been...
- *beliefs formed at terminal histories shape pangs of regret that are then anticipated and reacted to earlier on!*

To model this we need the mathematical framework of PGT. ← see B&D (2022, JET)

illustration... →


ex:
1
Out
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2's choices
L
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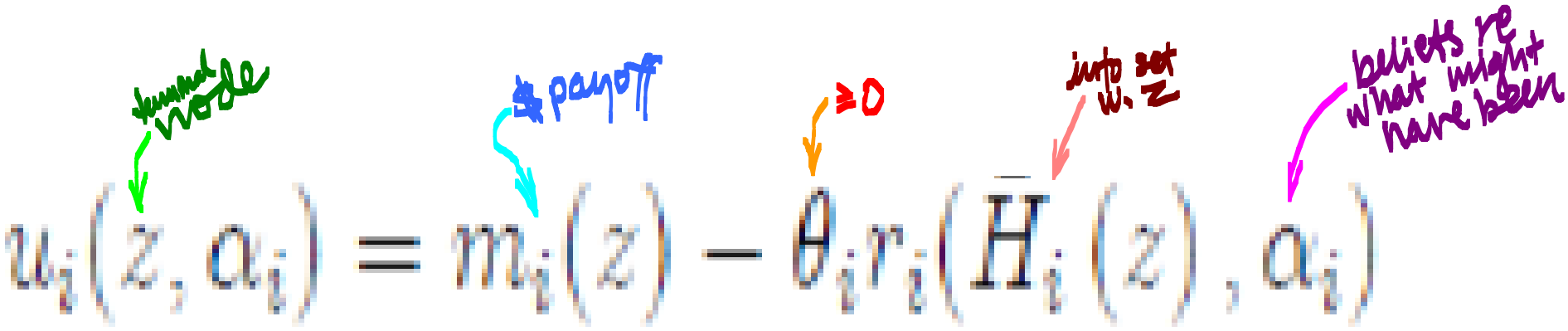
α, β, γ
δ, ε, ϕ
η, ι, κ
λ, μ, ν
3's choices
☆ depends on 1's beliefs re 2&3's choices

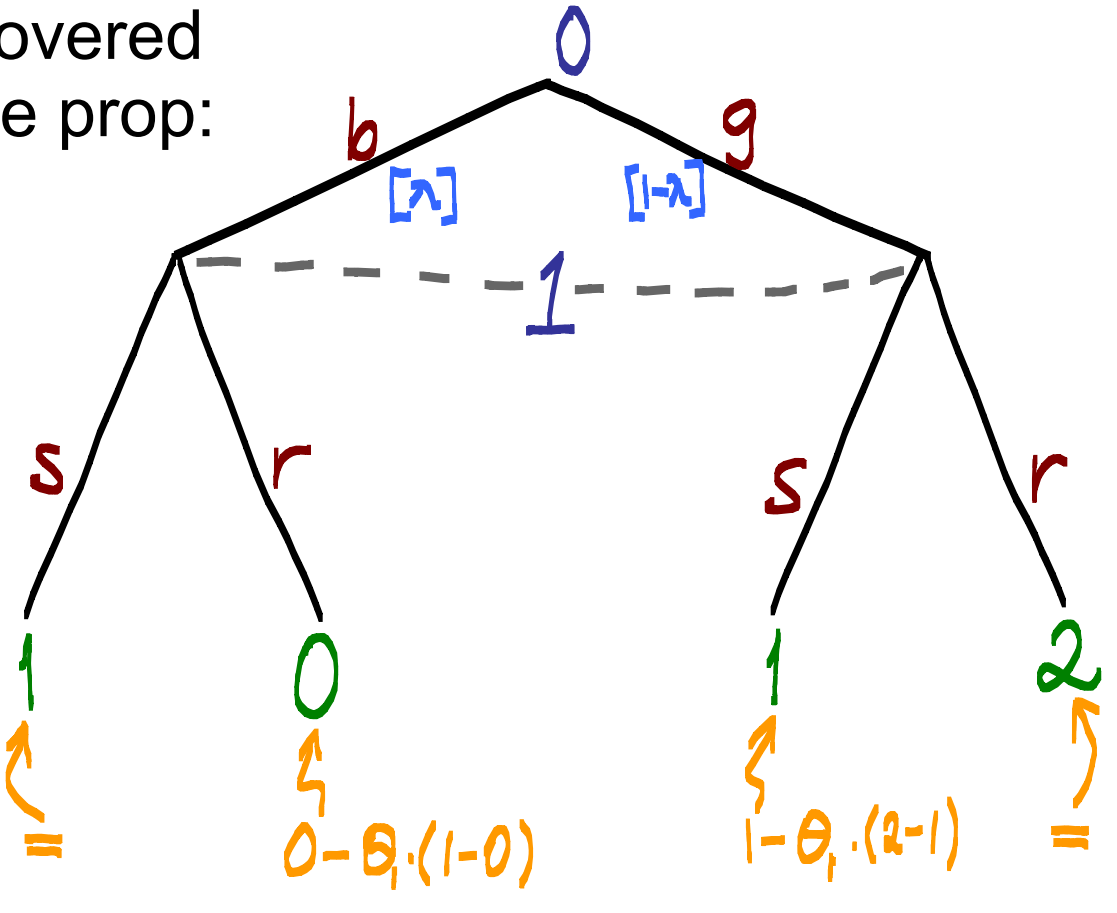
not enough time to present paper in full... i'll give you a utility function + a key result that has bearing on my focus today:



PROP *Consider a game form Γ with (i) essentially simultaneous moves, and (ii) perfect feedback. Let G^θ be the associated* linear regret *game where $\theta = (\theta_i)_{i \in I}$. The set of SEs in G^θ is invariant with respect to θ. Moreover, each player behaves as if he maximized expected material payoff.*

let's do one example and then move to climate action →

start w ex covered by the above prop:



utility = ...

$s \succsim r \iff$

$\lambda \cdot 1 + (1-\lambda)(1-\theta_1) \geq \lambda \cdot (-\theta_1) + (1-\lambda) \cdot 2$

$1 - \theta_1 + \lambda\theta_1 \geq -\lambda\theta_1 + 2 - 2\lambda$

$(2\lambda - 1)\theta_1 \geq 1 - 2\lambda$

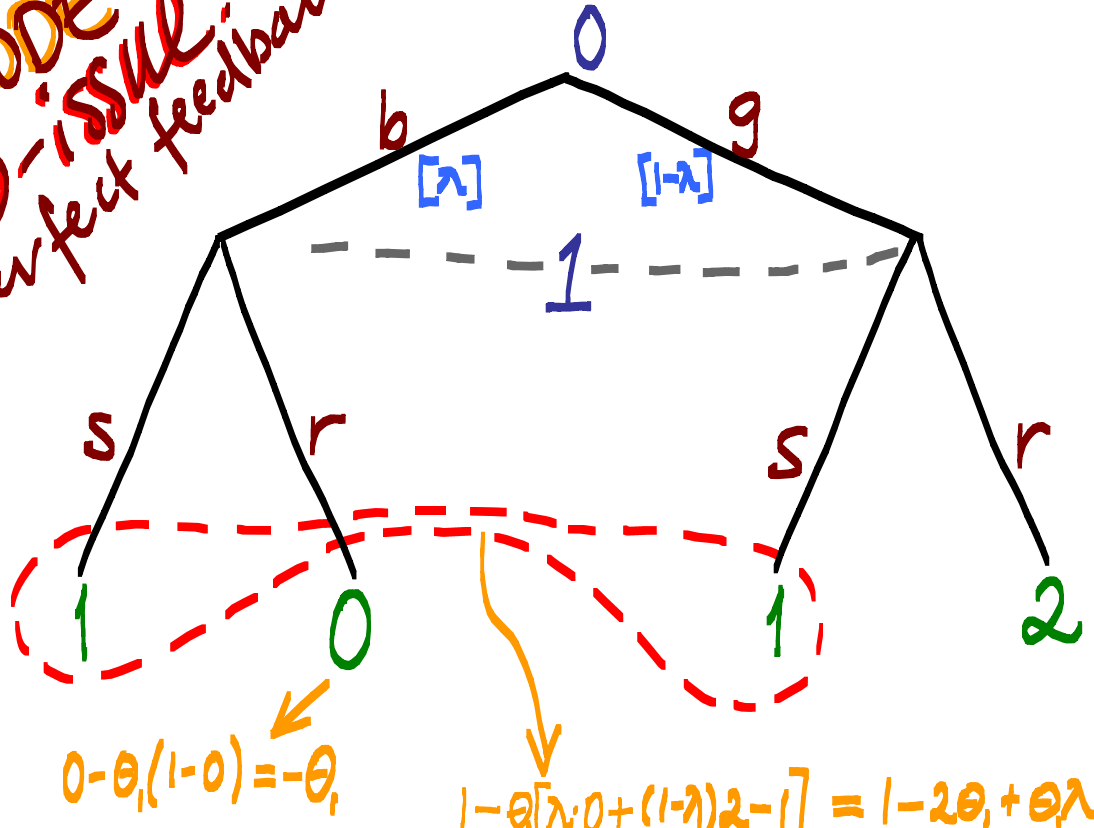
$\theta_1 \geq \frac{1-2\lambda}{2\lambda-1}$

true iff $\lambda \geq \frac{1}{2}$

$\therefore$ EV-maximization

END NODE INFO-ISSUE: not perfect feedback

assume $\lambda < \frac{1}{2}$



mention: stock market vs. casino

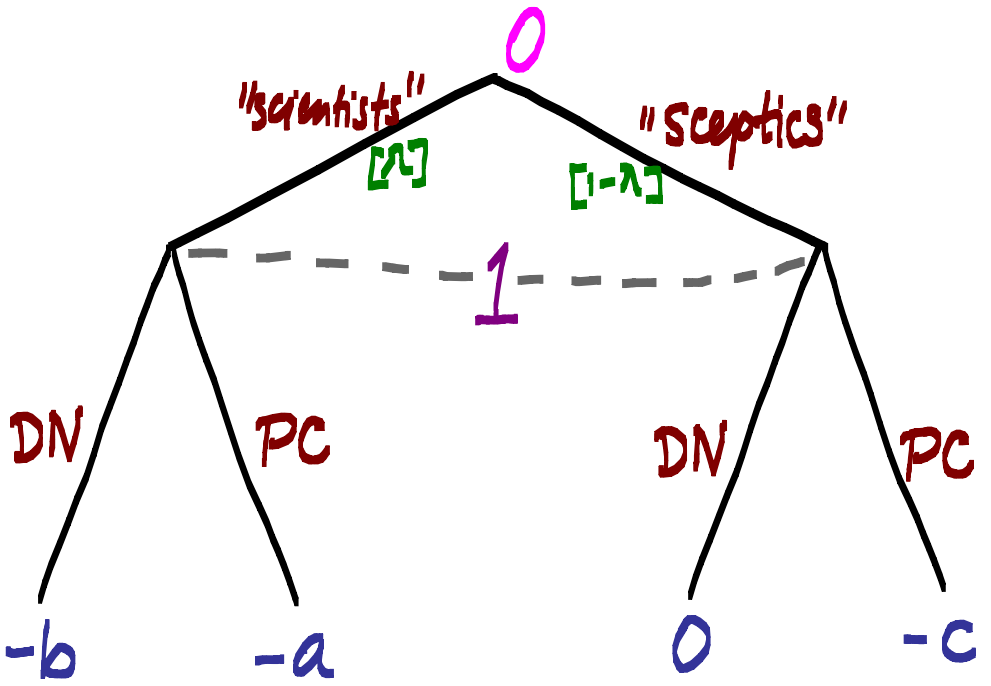
$s \geq r \iff$

$1-\theta_1+\theta_1\lambda 2 \geq \lambda(-\theta_1)+(1-\lambda)2 \Rightarrow \theta_1(3\lambda-1) \geq 1-2\lambda$

$\Rightarrow \theta_1 \geq \frac{1-2\lambda}{3\lambda-1}$ ∵ Even if $\lambda \in (\frac{1}{3}, \frac{1}{2})$, 1 will prefer s if θ_1 is high enough

time to move to climate action . . .

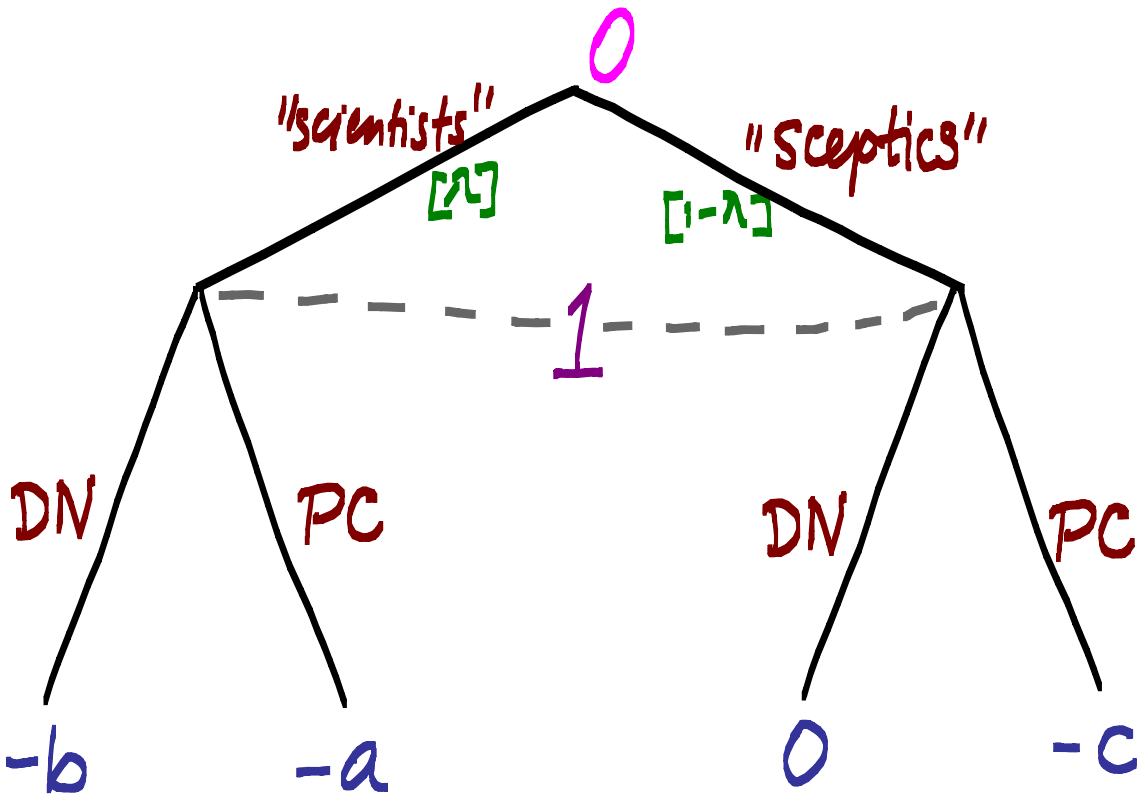
Climate scientists: global warming is anthropogenic ... carbon taxation could solve the problem
Skeptics: dispute that.... **Many folks are in between**, unsure about physics/policy impact.
Who will support climate action? Van der Ploeg & Rezai (2019, *EER*) (vdP&R) tackle issue from a variety of decision-theoretic angles. **We apply our regret model to their game form:**



$0 < c < a < b$

Player **1** -- unsure whether scientists or skeptics are right -- consider to *price carbon* (PC) or *do nothing* (DN). The chance move reflects **1**'s state of mind; he assigns prob λ to scientists being right. If **1** chooses DN and skeptics are right, then **1**'s (normalized) payoff is **0**; c, "the costs of unnecessarily distorting energy decisions," is small relative to b (which reflects a catastrophe); finally, $a < b$ as PC reflects best policy in a warming world while $a > c$ "since pricing carbon would not mitigate all emissions from now onward and human emissions do not damage welfare if climate deniers are right." (vdP&R).

If **1** maximizes expected payoffs then he prefers PC to DN if $\lambda > c/(b-a+c)$, and vice versa. If others are like him, except that their (homegrown) parameter values (λ *a b c*) differ, we can divide the population into those who choose (and presumably vote for) PC or those who favor DN. We now ask how the size of these groups changes if voters are affected by regret, as we

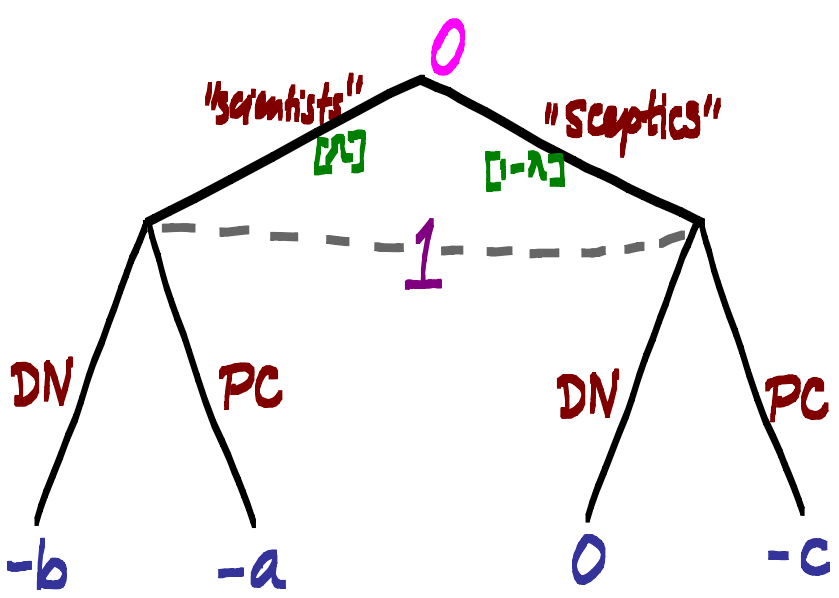


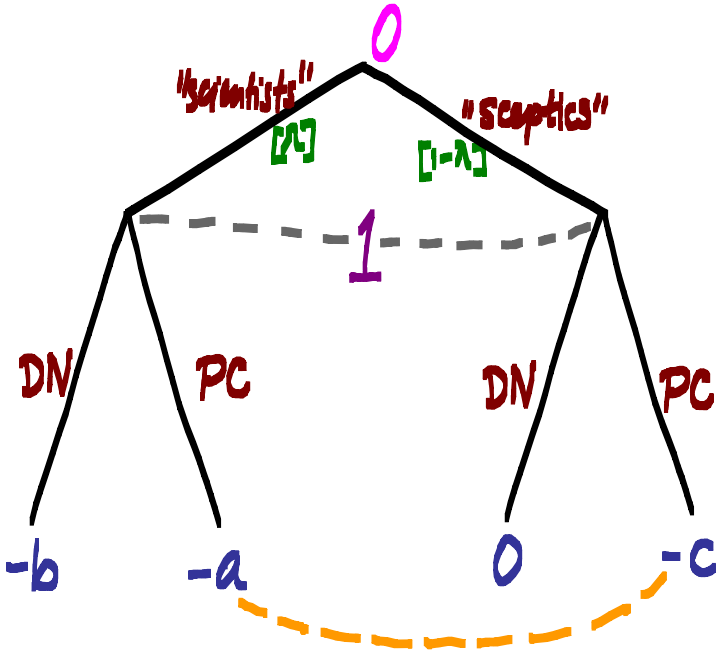
$0<c<a<b$

The game is covered by the proposition I presented:
incorporating regret changes no conclusion!

but, there is an issue...

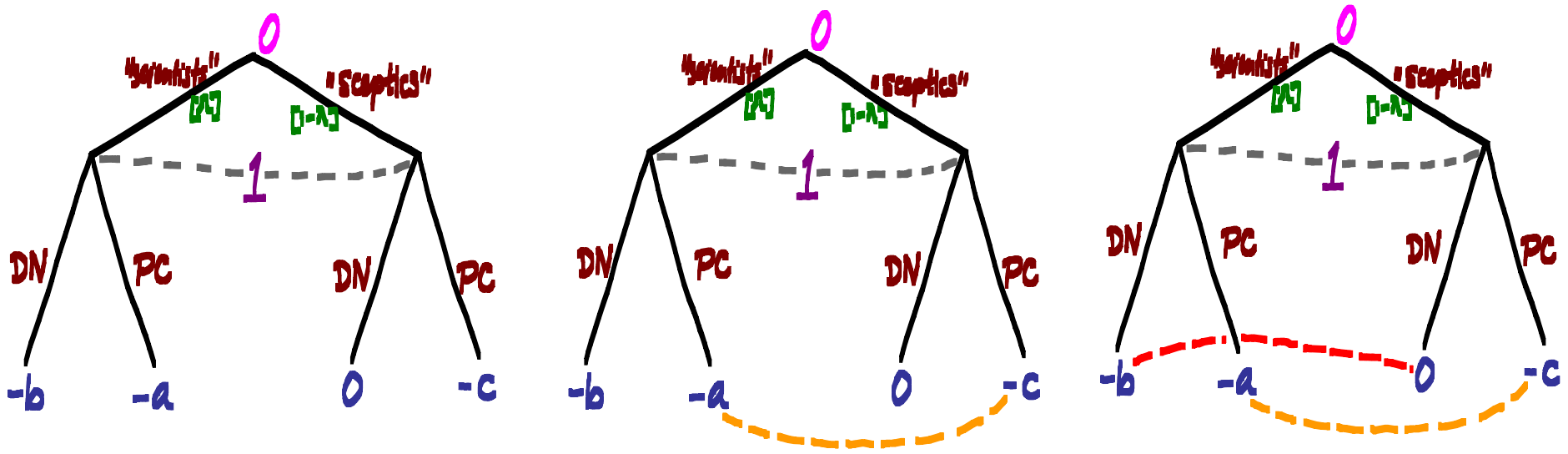
Did we analyze the wrong game? It featured observable own payoffs. While that is a natural assumption in many economic contexts, it need not be the case here: **1** may not be able to distinguish where he gets ***-c*** and ***-a***. Even if these numbers differ, lots of realistic background noise is not incorporated, e.g., that the temp on earth is probably subject to random shocks that shroud the clarity with which the nodes can be distinguished. *We get the game to the right instead!* Compare with the previous example. *Conclusion:* **The higher is θ_1, the more folks choose PC.**





but, there is one more issue...

1 may not be able to distinguish the nodes where he gets -b and 0! ... may appear implausible ... *b* is much larger than **0** ... BUT: effects of climate change may take time to realize. While **1** may (deeply) care about the difference *-b* vs **0**, he may be **dead** when Chance's choice is revealed! If so, we move another step to the right. Again, regret won't influence the analysis (check!). Even if **1** cares about the welfare of his offspring, he cannot experience regret after he dies, so regret has no effect. His offspring also cannot experience regret, since they did not make the choice.



Is it really likely **1** will be **dead** once the outcome with *-b* is revealed? This may actually depend on how much longer **1** has to live! Perhaps, for *young* people middle game is relevant, while for *older* people it's the rightmost one. *Regret may influence preferences differently dep on age!*

$\Theta_{EP} = 0$?

Tack för idag!

regret can be a powerful emotion – take it from Piet Hein:

TRØSTE-GRUK
Den, som taber sin ene handske,
er heldig i forhold til den,
som taber den ene,
kasserer den anden . . .
og finder den første igen.

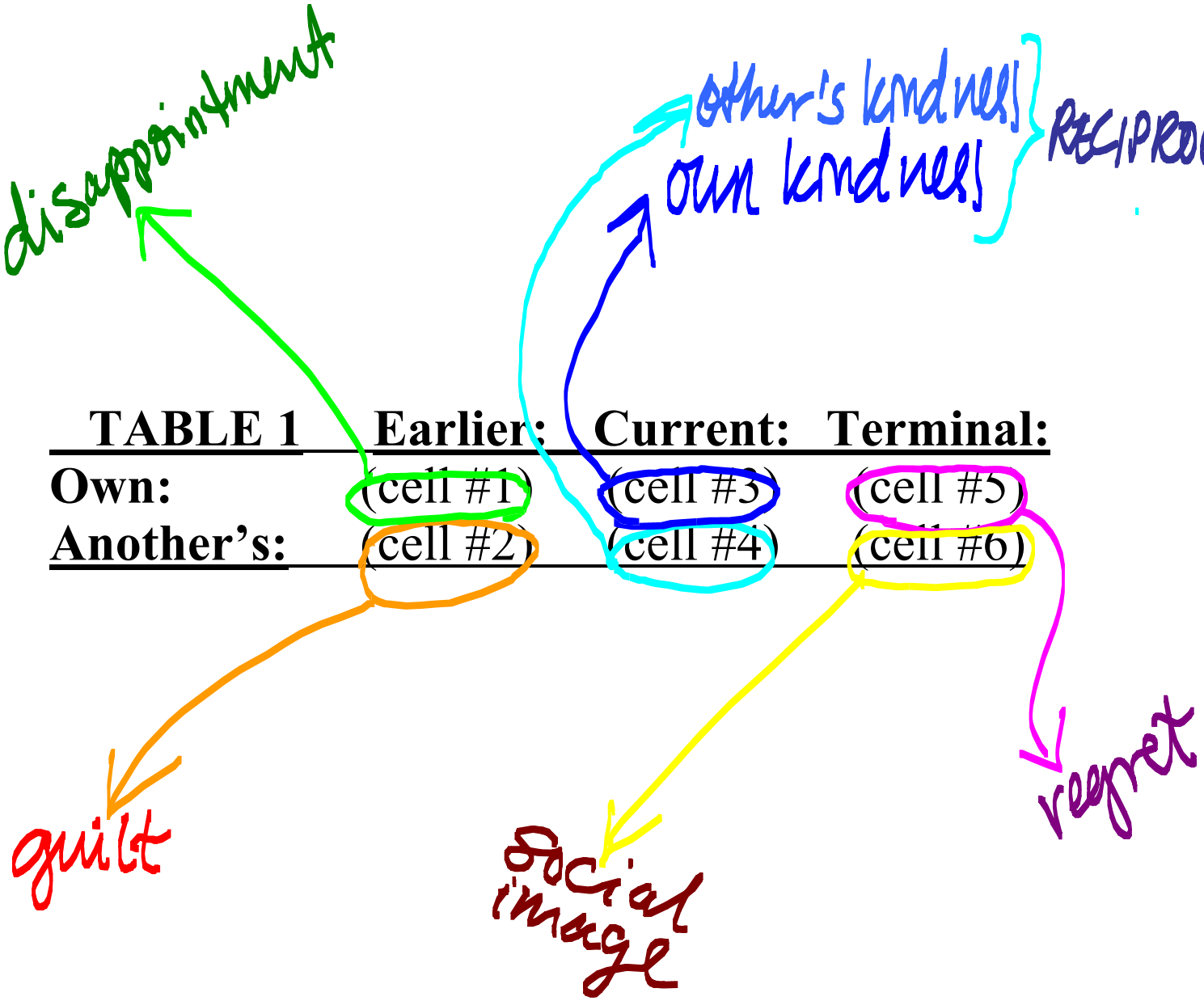
Losing one glove is certainly painful,
but nothing compared to the pain,
of losing one, throwing away the other,
and finding the first one again.

(Piet Hein)

EXTRA: ... let's look at T1 from Elgar text:

TABLE 1	Earlier:	Current:	Terminal:
Own:	(cell #1)	(cell #3)	(cell #5)
Another's:	(cell #2)	(cell #4)	(cell #6)

Which boxes have we exemplified and what might go in the remaining boxes?



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