Department of International & European Studies
University of Piraeus

Quantifying Risk: The Dilemma of the Apprehensive Niece

John A. Paravantis
Associate Professor
April 2018

Scenario

Niece of Professor of regional University asks for his help in finding an academic position.

Her uncle addresses himself to the Chairman of his department.

The Chairman says he is willing to help but asks for a portfolio of research publications by the niece.

The Uncle transfers the President's request to the niece.

And here comes the surprise.

The niece is ambivalent as to whether she should send a sample of her research works to the Chairman, asserting that she has had her work plagiarized when she was doing her doctorate.

Unethical use of the work by the Chairman would be, for example, the distribution of her work to his associates with the intent of plagiarizing it.

To send, or not to send, that is the question!

Game theoretic model

The game has three players:

1. Niece
2. Uncle (Professor)
3. Chairman.

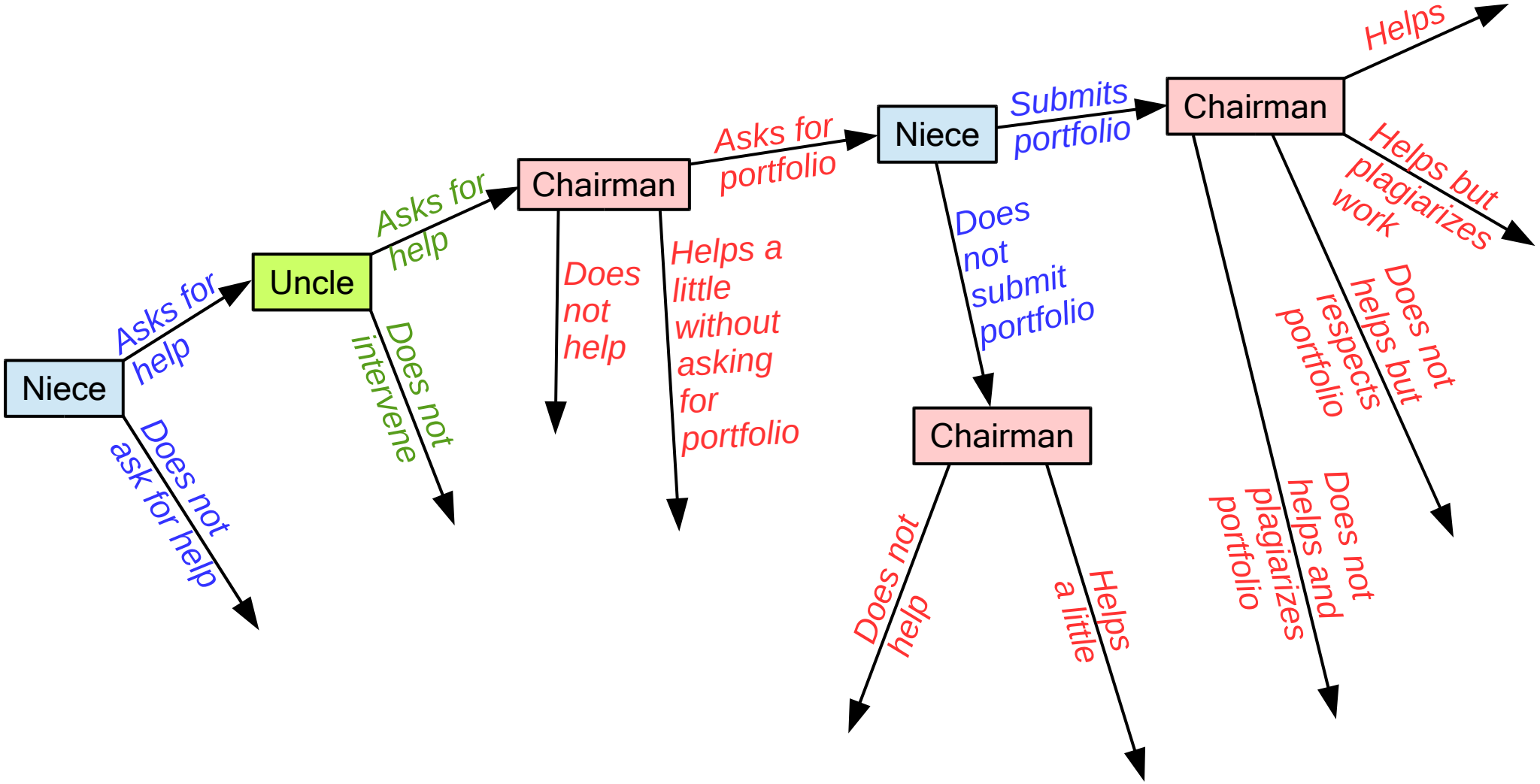
It may be analyzed as a game of sequential moves, where the three players move in the order shown above.

Before a game tree may be constructed, we must

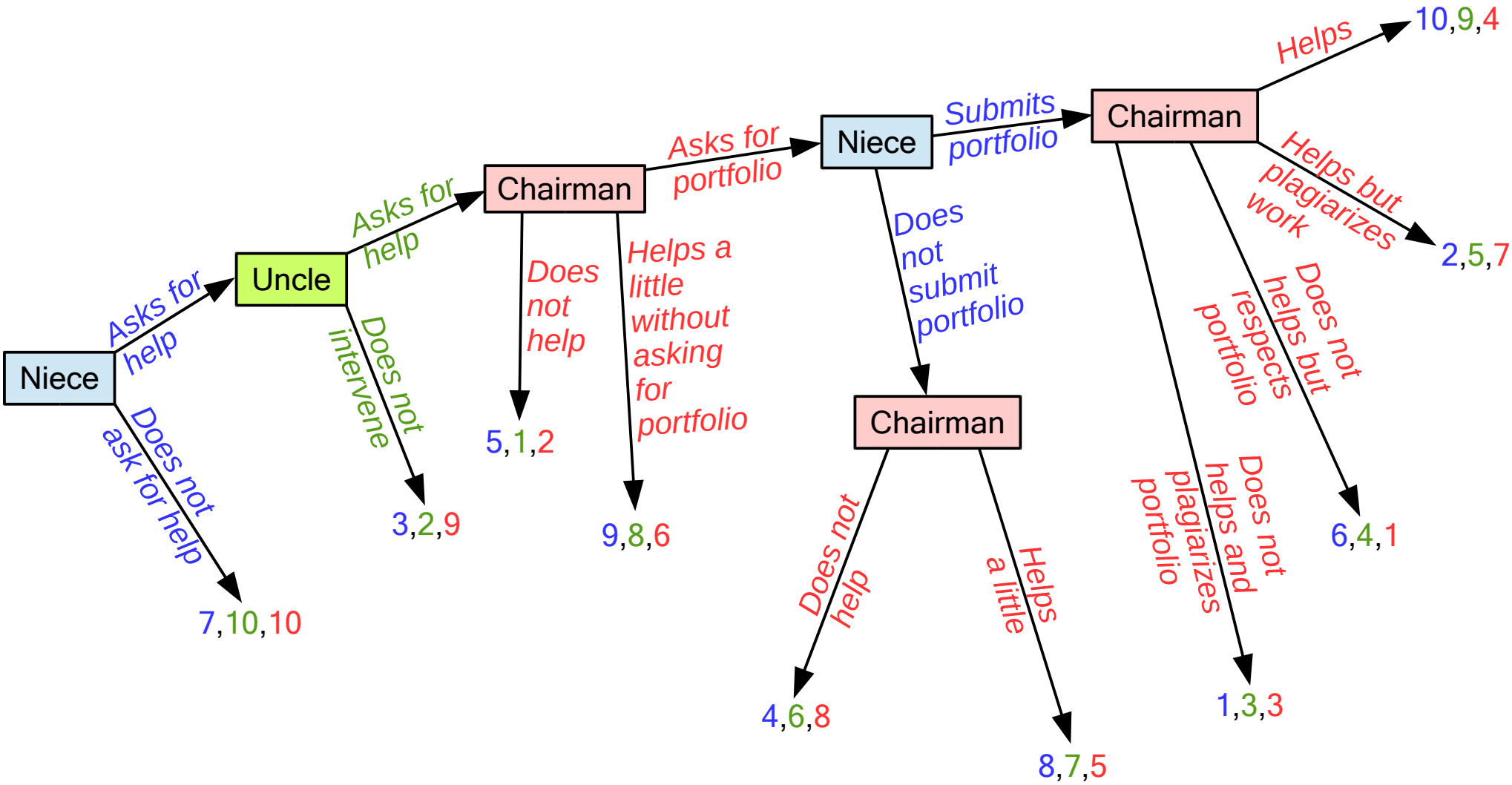
- enumerate the alternative moves available to each player
- decide on the payoffs of each player for all possible outcomes of the game.

The game may be depicted on a game tree that shows all the outcomes with the corresponding payoffs.

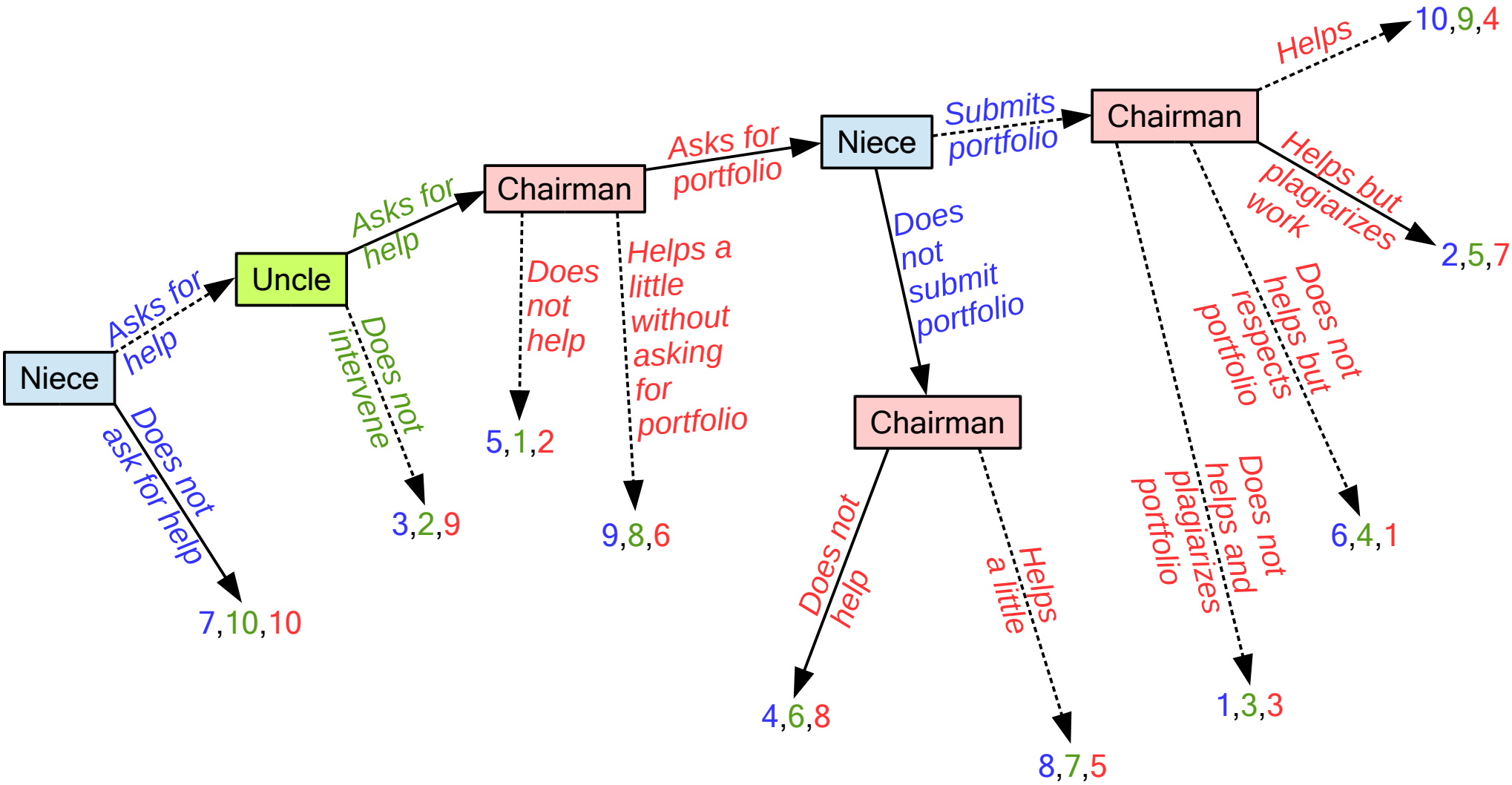
Game tree


Niece
Asks for help
Does not ask for help
Uncle
Asks for help
Does not intervene
Chairman
Does not help
Asks for portfolio
Helps a little without asking for portfolio
Niece
Submits portfolio
Does not submit portfolio
Chairman
Does not help
Helps a little
Chairman
Helps
Helps but plagiarizes work
Does not helps but respects portfolio
Does not helps and plagiarizes portfolio

Game tree with payoffs



Rollback & equilibrium



Discussion

Apparently, the personality of the Chairman influences the equilibrium of the game.

An honest and moral Chairman would have other rewards from an immoral and self-serving Chairman.

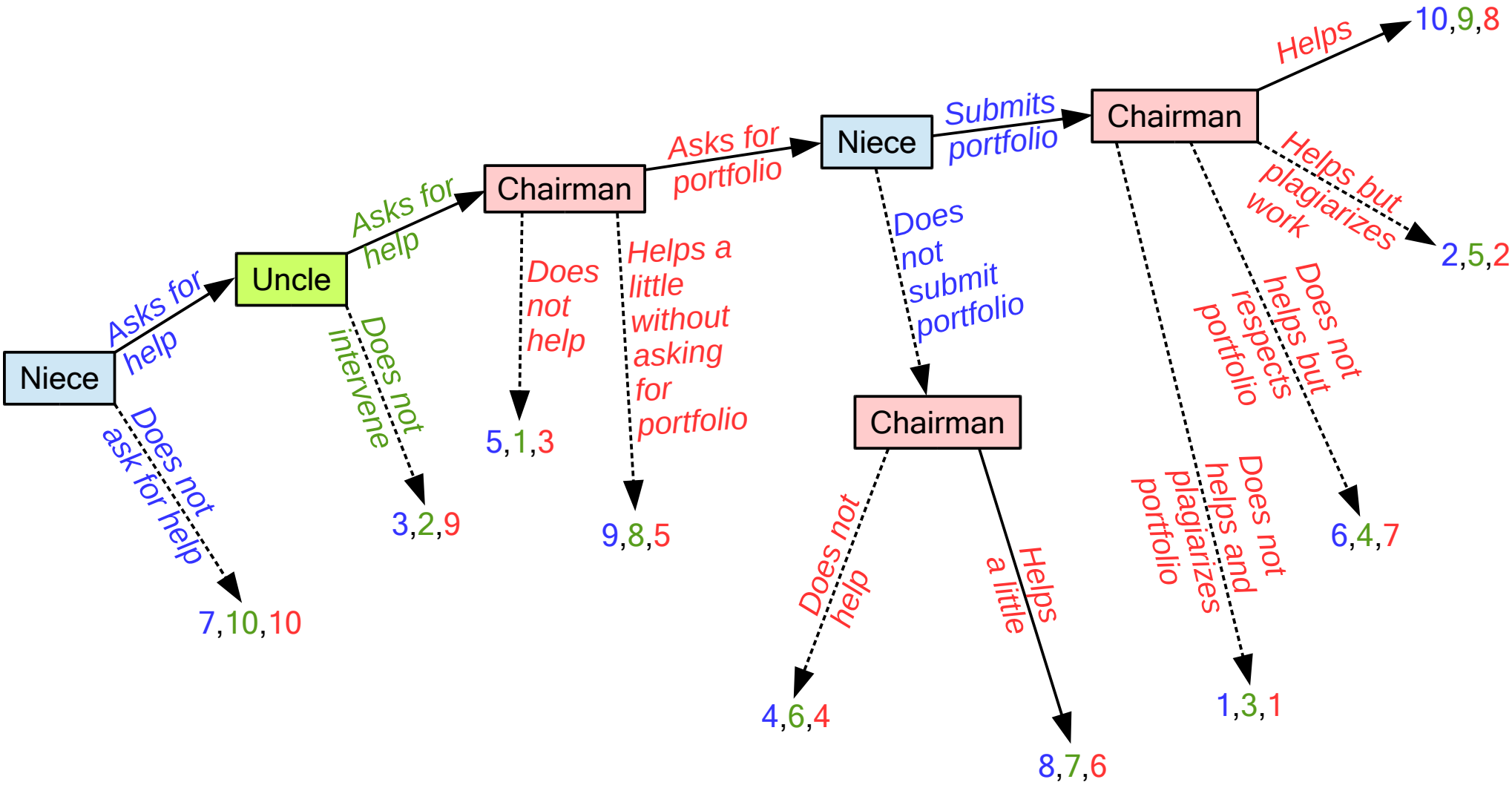
Let us simplify things by assuming that the choice is only between these two extremes.

If the probability of the Chairman being honest equals p, the probability of him being immoral would be equal to 1-p.

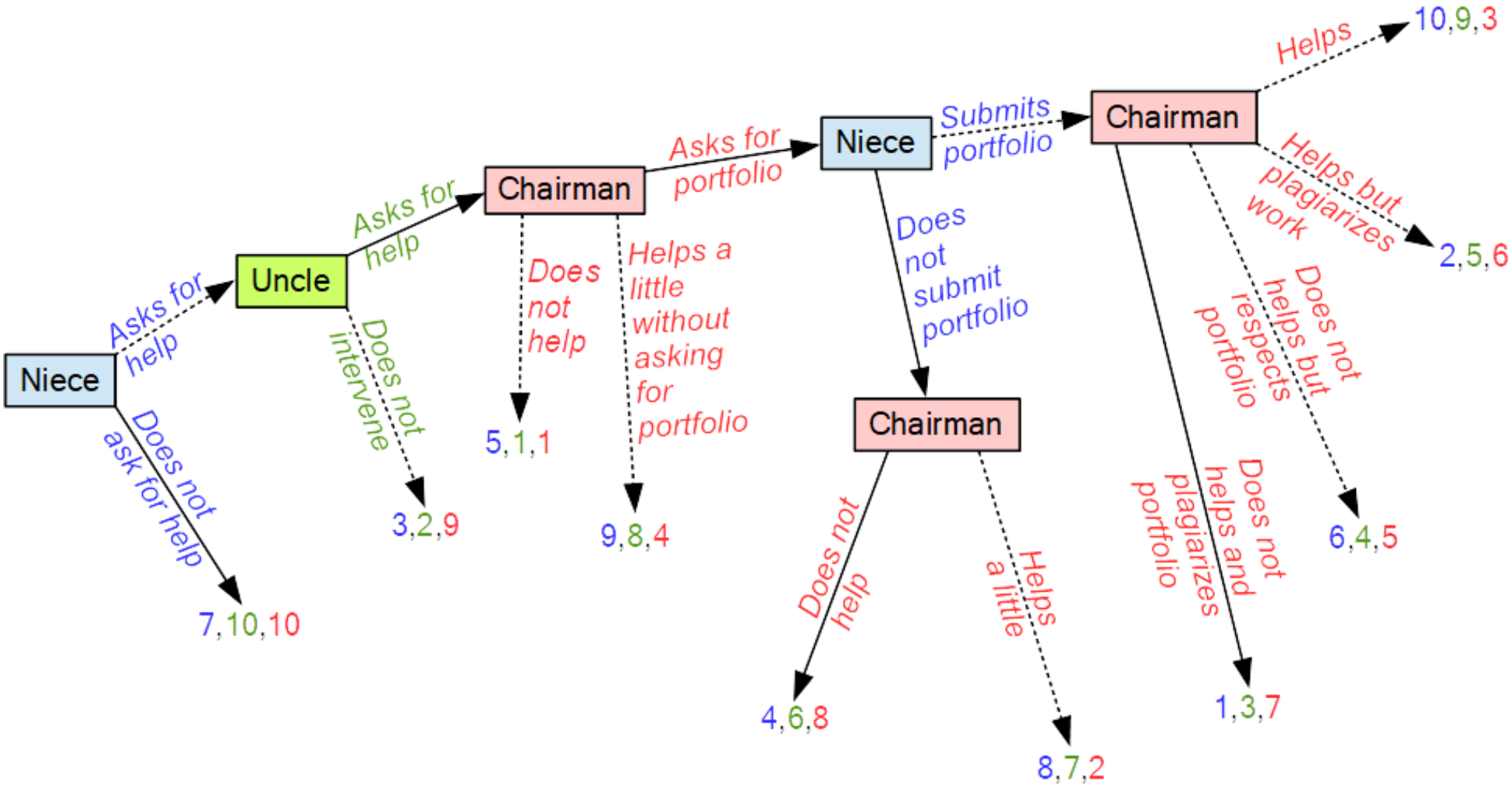
As in the Cold War game of the Cuban missiles (Dixit & Skeath, 2004), stochastic elements are introduced into the game.

Thus, nature is introduced as an additional player who decides in a random manner whether the Chairman is honest or not.

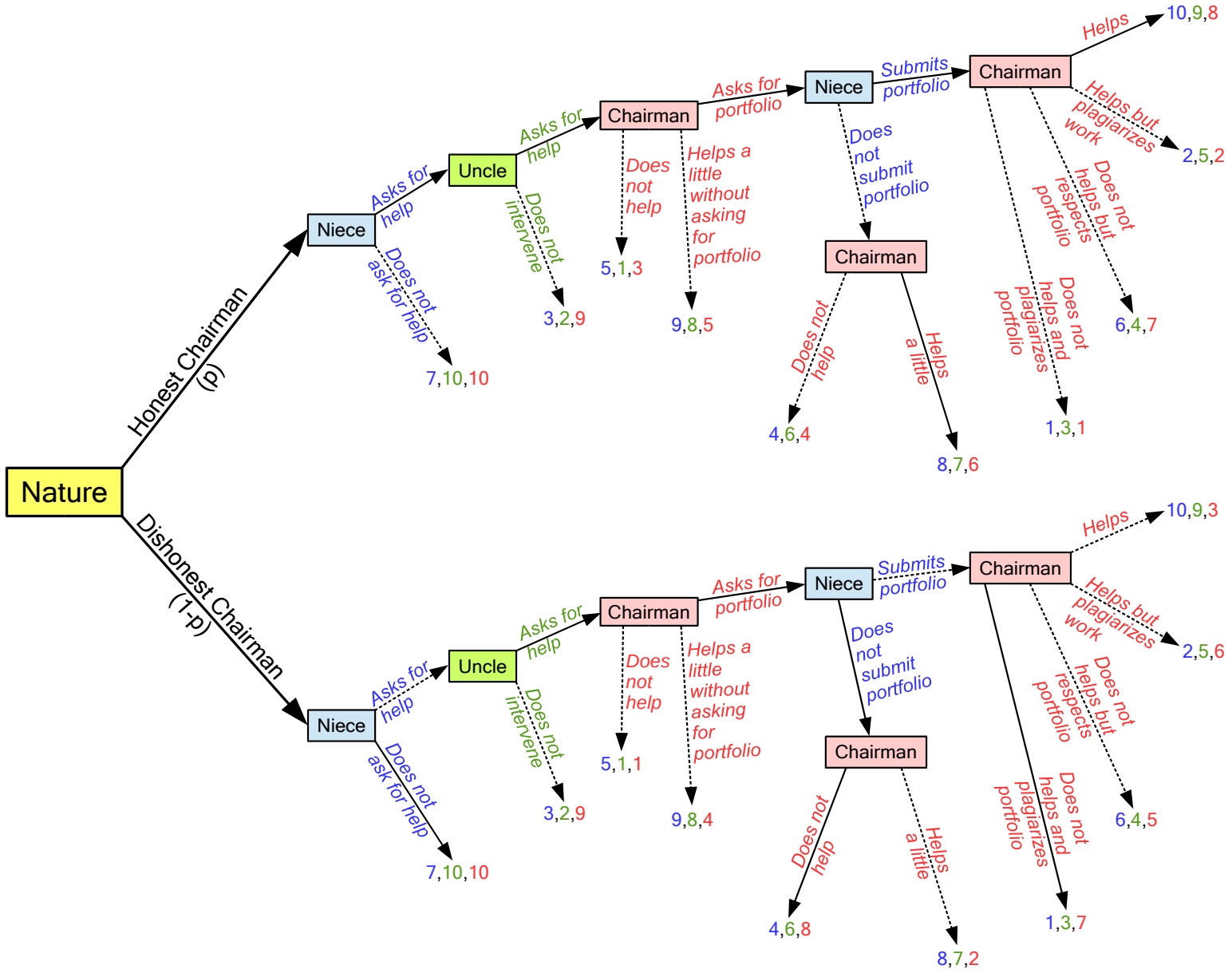
Rollback with honest chairperson



Rollback with dishonest chairperson



Entire game tree



What should the niece do?

If the Chairman is honest, the top half of the entire tree shows that the payoff of the niece will be 10p.

If the Chairman is dishonest, the bottom half of the entire tree shows that the payoff of the niece will be 7(1-p).

Setting the two equal, and solving for p:

$$10p=7(1-p) \Rightarrow 10p=7-7p \Rightarrow 10p+7p=7 \Rightarrow 17p=7 \Rightarrow p=\frac{7}{17}=0.41$$

This means that when p is greater than 0.41, the 10p payoff is greater than the 7(1-p) payoff.

Therefore, it is in the interest of the niece to get involved in the game if the probability of the Chairman being honest is greater than 41%!

How may p be estimated?

In reality, the niece could ask her uncle

Uncle, what is your opinion of the Chairman?
Should we trust him or not?

A positive answer would imply an estimate of $p>0.5$, so it would be safe for the niece to go ahead with the game!

Unfortunately, the results of this analysis are highly dependent on the magnitude of the payoffs.

Thus the need to (a) set realistic payoffs, and (b) carry out sensitivity analysis.

Parting thoughts

Could the niece guess that the Chairman would ask for a sample of her research work?

If not, we would have a game of incomplete information.

Such games may be found in the movie:

References

Dixit, A., & S. Skeath (2004): *Games of Strategy* .2nd edition, W.W. Norton & Company.