Property Defining and Property Defying Games (PD)

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Extended Abstract

Consider a two person game where only one person has a choice. Call that person the seller, and call the person with no choice the buyer. “Don’t deliver” is the choice with the largest payoff for the seller, but “Deliver” is the choice with the largest total payoff.

Deliver	0,4
Don’t deliver	1,1

Now allow the buyer a choice of paying the seller or not. This gives the classic **PD** payoff table. This is even more obvious in the ordinal representation.

Utility payoffs

	Pay	Don’t pay
Deliver	2,2	0,4
Don’t deliver	3,-1	1,1

Ordinal payoffs

	Pay	Don’t pay
Deliver	$3^{rd},3^{rd}$	$1^{st},4^{th}$
Don’t deliver	$4^{th},1^{st}$	$2^{nd},2^{nd}$

The “Don’t pay”, “Don’t deliver” strategies dominate when this game is played in isolation.

Instead of postulating an external contract enforcement mechanism, consider this game embedded in a stochastic sequence of games, where both the payoff values and the matching of players are random. Parameterize the probability space. Some values of parameters favor Contract Enforcement (CE), making the game **Property Defining**. Other values favor Machiavellian Opportunists (MO), making the game **Property Defying**. Specifically: Interaction favors CE. Isolation favors MO. An **efficient share** expected value much greater than a minmax expected value favors CE over MO. Note that the MO can be either the seller or the buyer.

Consider a multiplayer, multi-choice game, which is in the Property Defining region for all of its players. The rational strategy is the efficient one. That is the strategy which gives the largest sum of all payoffs. The actual payoff that each player receives is not the payoff they receive in the original game. The players who gain by having the efficient strategy chosen must share the gains with the other players. We call this actual payoff a player’s **efficient share**.

The common representation of the Markov model state is the entire history of the games. A simpler representation of the state is that each individual owes an expected debt of at least what his defection cost the others. If the distribution of matching players forms a tribe of the others, then the **Property Defining** space can be increased, and the **Property Defying** space reduced, by making the debt owed to the tribe, instead of owed to the individual. If the would be Machiavellian Opportunist is in a tribe, then the **Property Defining** space can be further increased by making that tribe owe the debt.

Of course, the expected value of the debt must take into account the probability that it can be collected and the discount rate for future collections. Because of this, the formal value of the debt goes infinite at the boundary between **Property Defining** and **Property Defying**.

Other instances of **Property Defying** space occur. In addition to the Machiavellian Opportunist (MO) in a space with fixed future probability, there is the Mortal Enemy (ME), the analysis of which requires that future probability can be modified by death. If there is an opportunity to modify the amount of future interaction as a strategy, then this must be modeled. Modeling these strategies presents the problem of calculating their effective payoff. In these models a MO may choose isolation, not just expect isolation. There may also be a Non-Mortal Enemy (NME), who is cheaper to isolate, than to deal with otherwise. In situations with imperfect information, **Property Defying** space may occur because of Missing Information (MI).

This talk can not cover all of these conditions. It will focus on CE and MO in a space with fixed future probability.