

# Understanding Real World Organizations

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TSE M1 – Semester 1

September 2022

Paul Seabright

Week 3: The Development of Markets through History

# The Development of Markets through History

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- The division of labor – a history
- The evolution of trust
- A model of cooperation through repeated interaction
- The expansion of market exchange
- A formal model



# The division of labour: a history (1)

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- Non-human animals have division of labour based on kinship alone
- Early humans probably lived in progressively increasing group size
  - Chimps 60 per band
  - Australopithecus c.70 (4.5 m years ago)
  - Homo habilis c.80 (2 m years ago)
  - Homo erectus c.110 (1.8 m years ago)
  - Homo neanderthalis c.140 (150 K years ago)



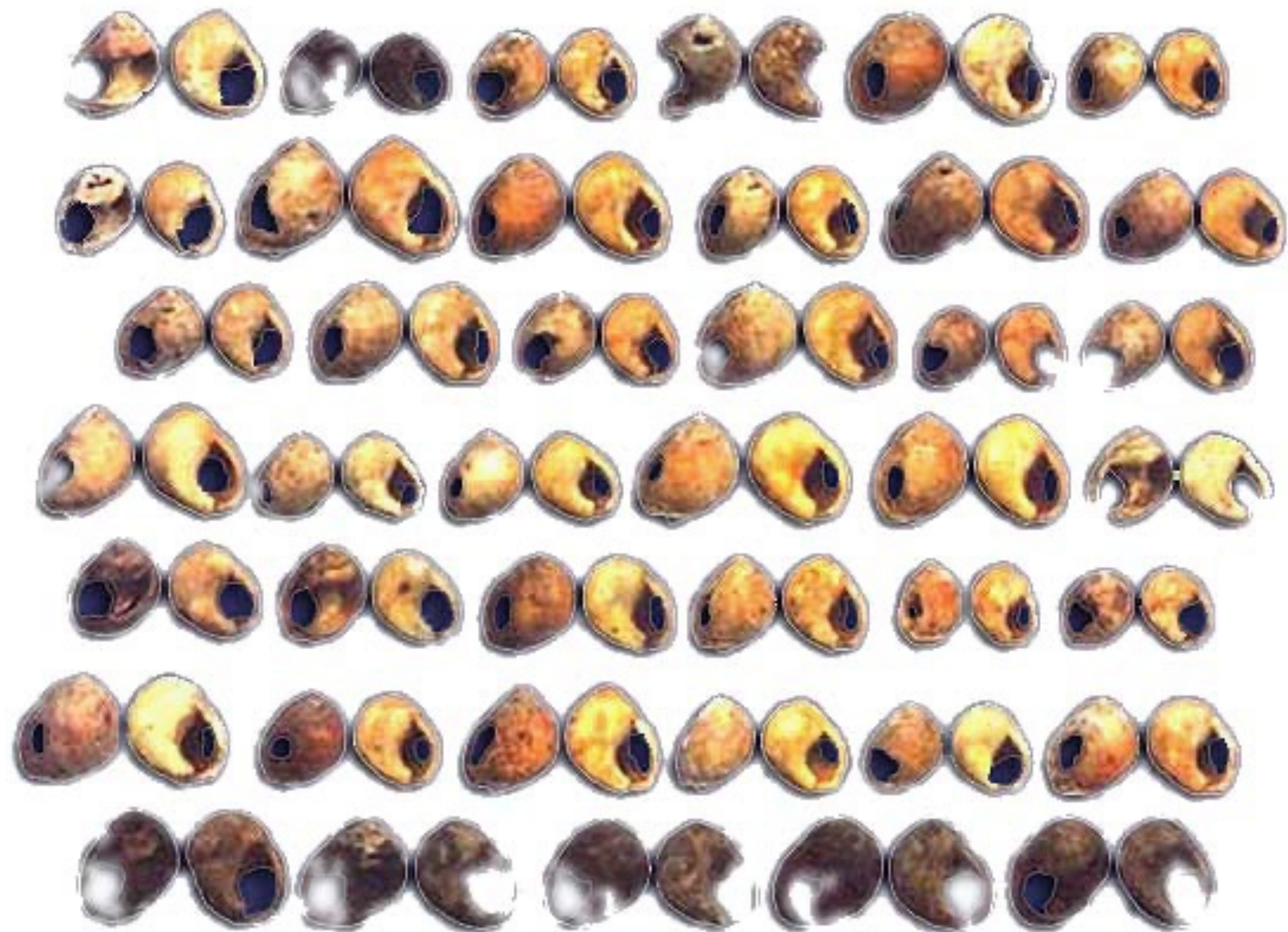
## The division of labour: a history (2)

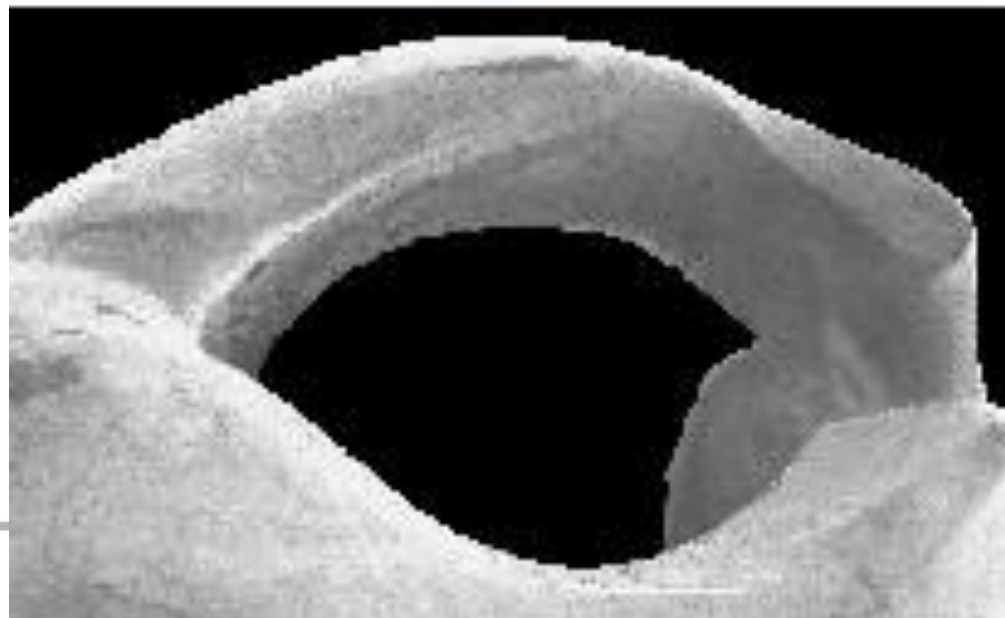
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- A division of labour is inherent in sexual reproduction
  - Social animals have divisions of function; primates engage in cooperation based on kinship and dominance hierarchy
  - Explicit trading is rare (chimps and bonobos) and usually simultaneous
  - First evidence of more complex trading comes from humans c. 40,000 years ago
  - Controversial claims that it may date to 75,000 years ago – but not before!
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# The division of labour: a history (3)

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- Trade in tools and objects of adornment
  - Villages and towns; private versus public enforcement bodies
  - The infrastructure of trade
    - Means of transport
    - Physical security
    - Trading posts
    - Money and credit
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Kashgar market on the Silk Road



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How would trade get started  
between people who have not  
traded before.....?





## Herodotus describing trade between Libyans and visiting Carthaginians (5<sup>th</sup> century BC):

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- “The Libyans put some gold on the ground for the goods, and then pull back away from the goods. At that point the Carthaginians..have a look, and if they think there is enough gold to pay for the cargo they take it and leave....neither side cheats the other...the Carthaginians do not touch the gold until it is equal in value to the cargo, and the natives do not touch the goods until the Carthaginians have taken the gold”





## Arab geographer Ibn Battuta describing trade along the Volga river (14<sup>th</sup> century AD):

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- “Each traveler leaves the goods he has brought...and they retire to their camping ground. Next day they go back to...their goods and find opposite them skins of sable, miniver and ermine. If the merchant is satisfied with the exchange he takes them, but if not he leaves them. The inhabitants then add more skins, but sometimes they take away their goods and leave the merchants’. This is their method of commerce. Those who go there do not know whom they are trading with or whether they be jinn or men, for they never see anyone”



# The evolution of trust

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- Increasing group size based on gradual trust in familiar non-relatives
- Required increased neural processing power (larger brains)
- Modern society based on trust in strangers
- This is harder to explain for humans than other animals
- Costs of mistakes are higher



# The benefits of trust in strangers

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- Expands range of consumption possibilities enormously
  - Yir Yoront aboriginals of N. Australia
  - Used stone axes (but nearest stone quarries are 400 miles away)
  - Produce stingray-barbed spears to trade
  - Already had steel axes before 1st encounters with white traders in late 19th century
- Allows large-scale risk-sharing
- Dramatically reduces risks of “mistakes”



# The foundation for trust in strangers

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- Combines two elements:
  - Impersonal enforcement mechanisms (forward-looking)
  - Reciprocity (backward-looking)
- Most effective mechanisms are self-enforcing - such as money
- ....provided the basic conditions are right
- Those conditions involve an assurance of future cooperation
- Note also the importance of *observability*





# Consider a standard prisoners' dilemma payoff matrix

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- Many exchange contexts are like this
    - Exchange may not be simultaneous
    - Quality may not be observable
  - In one-off exchanges defection is a dominant strategy
  - Mere repetition of the interaction will not solve the problem
  - So what kind of conditions make cooperation an equilibrium strategy?
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Player 2's move

Cooperate Defect

Player 1's move

Cooperate

Defect

	X	Y
X		-Z
Y	-Z	0

Assumptions:

$$Y > X > 0 \quad Z > 0$$

$g$  is discount factor

# Co-operation through threat of retaliation

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- Provided  $Y-X < gX/(1-g)$  there exists a retaliation strategy supporting cooperation
- This consists of playing Defect for  $T$  periods, where  $T$  is the lowest integer such that  $Y-X \leq gX + g^2X + \dots + g^TX$ .
- If harsher retaliation is possible, cooperation can be supported at lower discount factors
- This can explain why outside enforcement may make a big difference – those harmed by defection can inflict bigger costs on defectors than merely those of their own later defection

# Problems with this kind of explanation

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- “Too many” equilibria
- Cannot explain partial co-operation
- Yet evidence suggests this is very common





# The role of trust

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- Suppose player 1 attaches probability  $p$  to player 2 playing agreed equilibrium strategy
- Then expected payoff to 1 from playing this strategy is increasing in  $p$
- Two players with high subjective values of  $p$  will be more likely to co-operate
- Does this mean co-operation can be “habit-forming”?



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$$(1)P(C) = \frac{pX}{1-g} + (1-p)\left(-Z + g^{t+1} \frac{X}{1-g}\right)$$

$$(2)P(D) = p\left(Y + g^{t+1} \frac{X}{1-g}\right) + (1-p)g^{t+1} \frac{X}{1-g}$$

$$(3)P(C) - P(D) = pX \frac{1-g^{t+1}}{1-g} - pY - (1-p)Z$$

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$$(4) p^*(X, Y, Z) = \frac{Z(1-g)}{[X(1-g^{t+1}) + (Z-Y)(1-g)]}$$

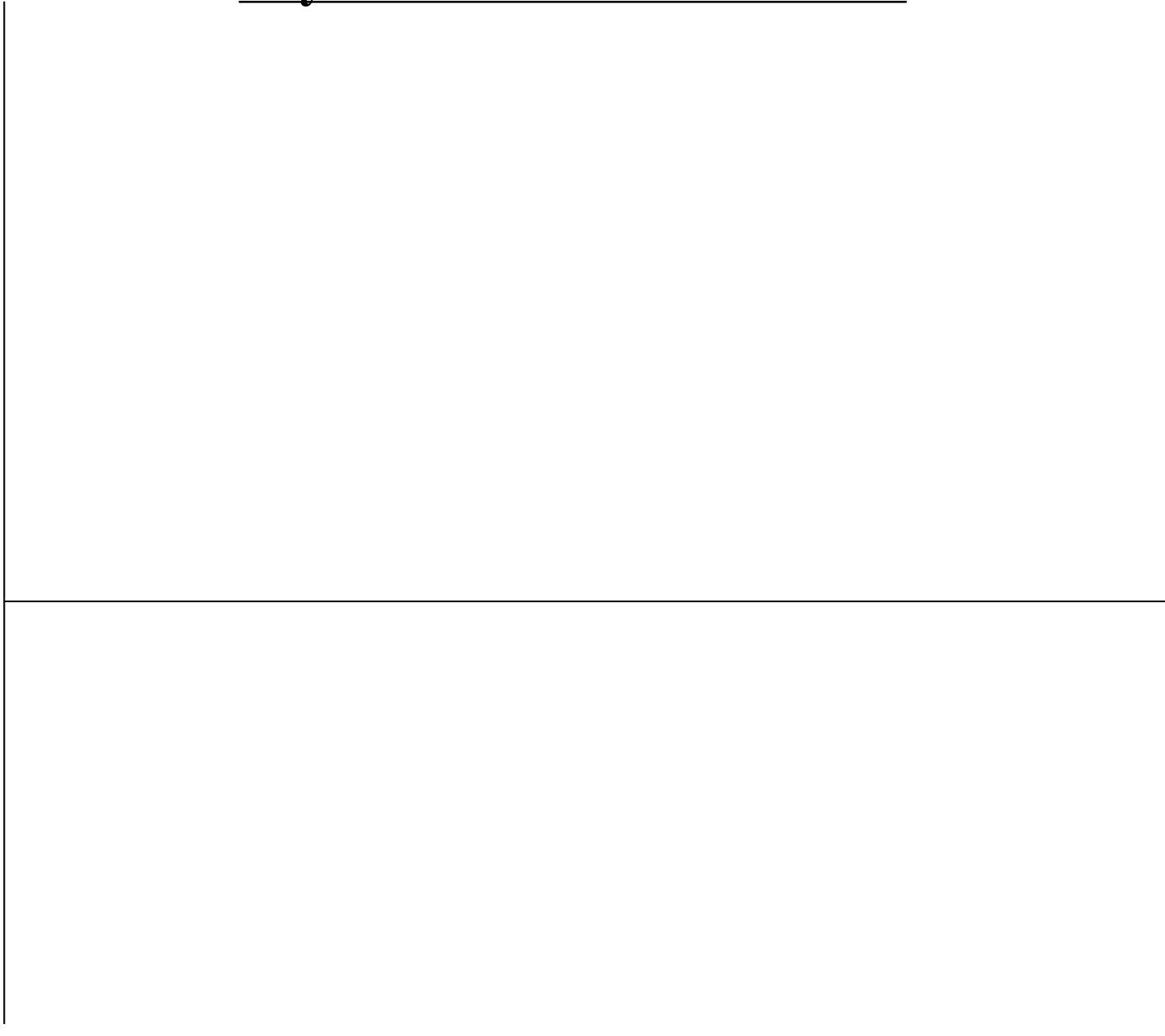
$$p_X^* < 0$$

$$p_Y^* > 0$$

$$p_Z^* > 0$$

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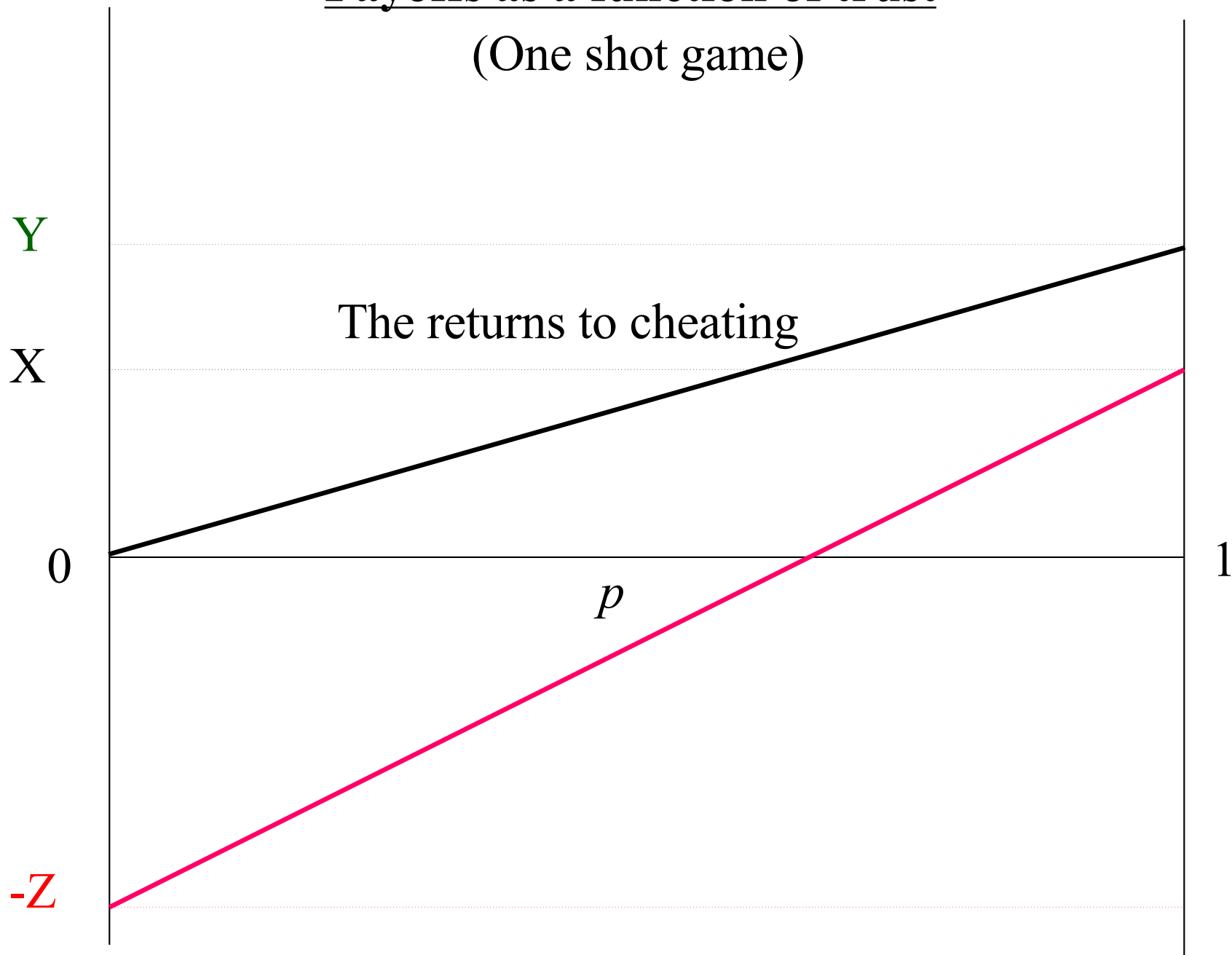
## Payoffs as a function of trust



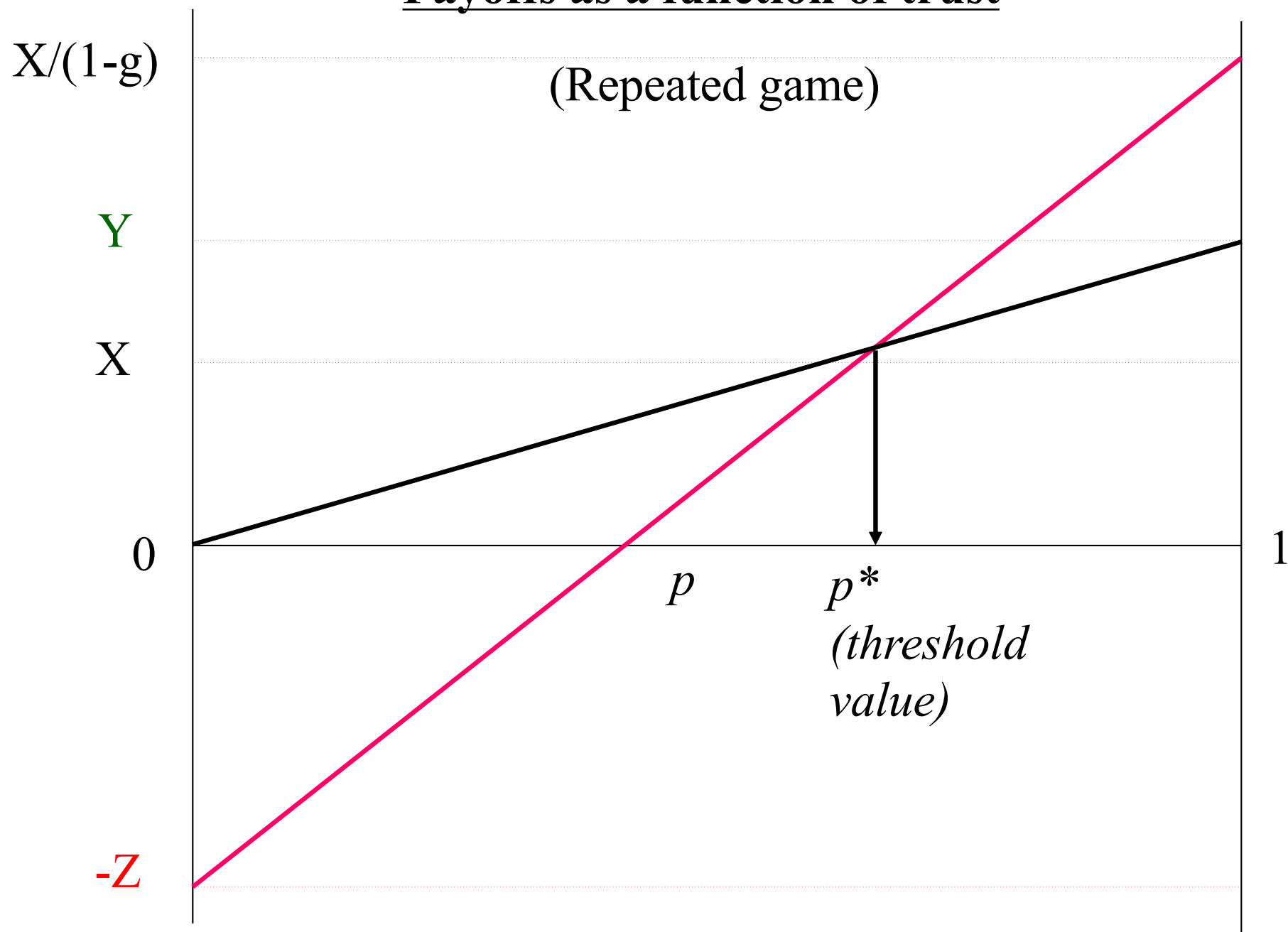


# Payoffs as a function of trust

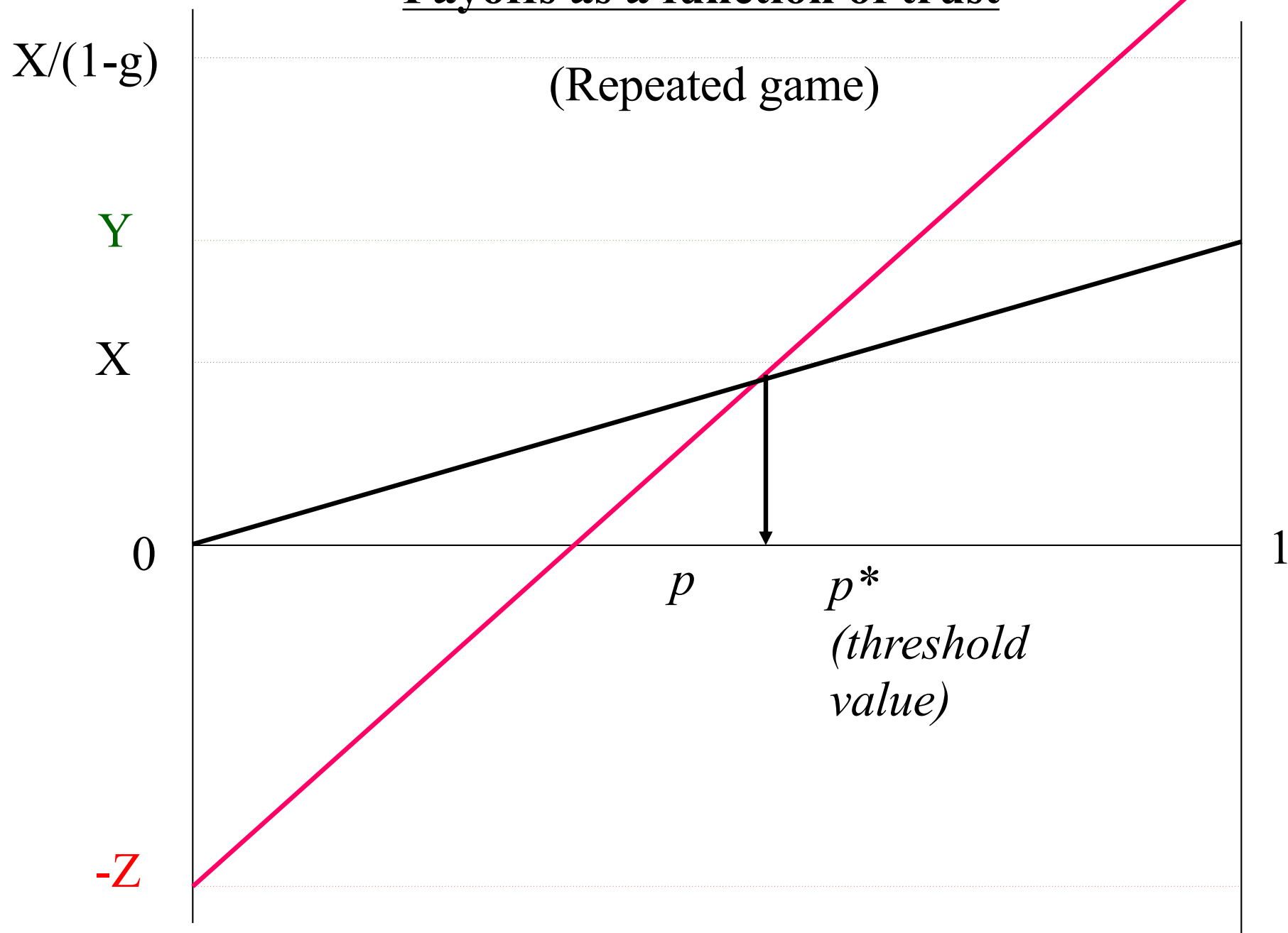
(One shot game)



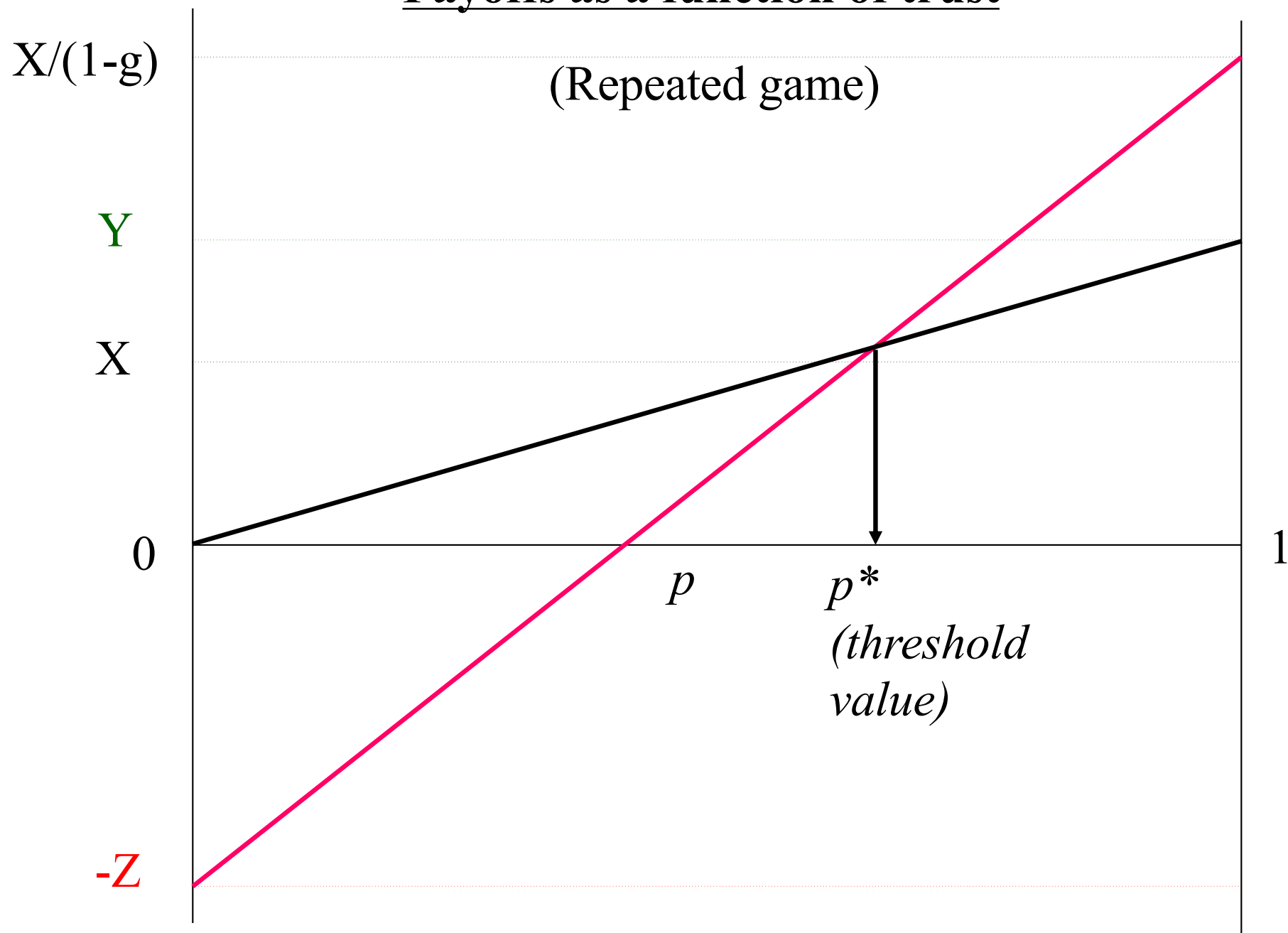
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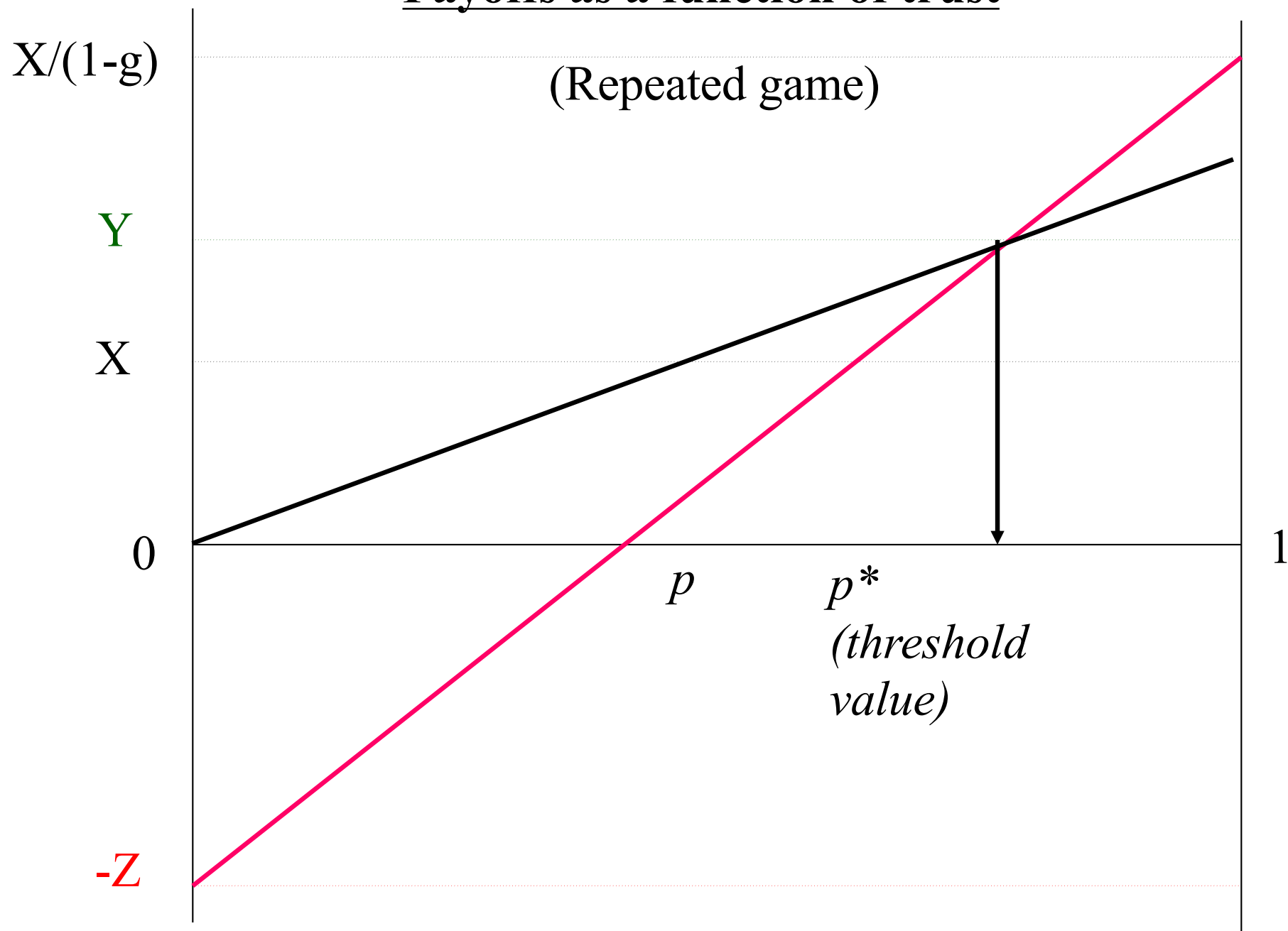
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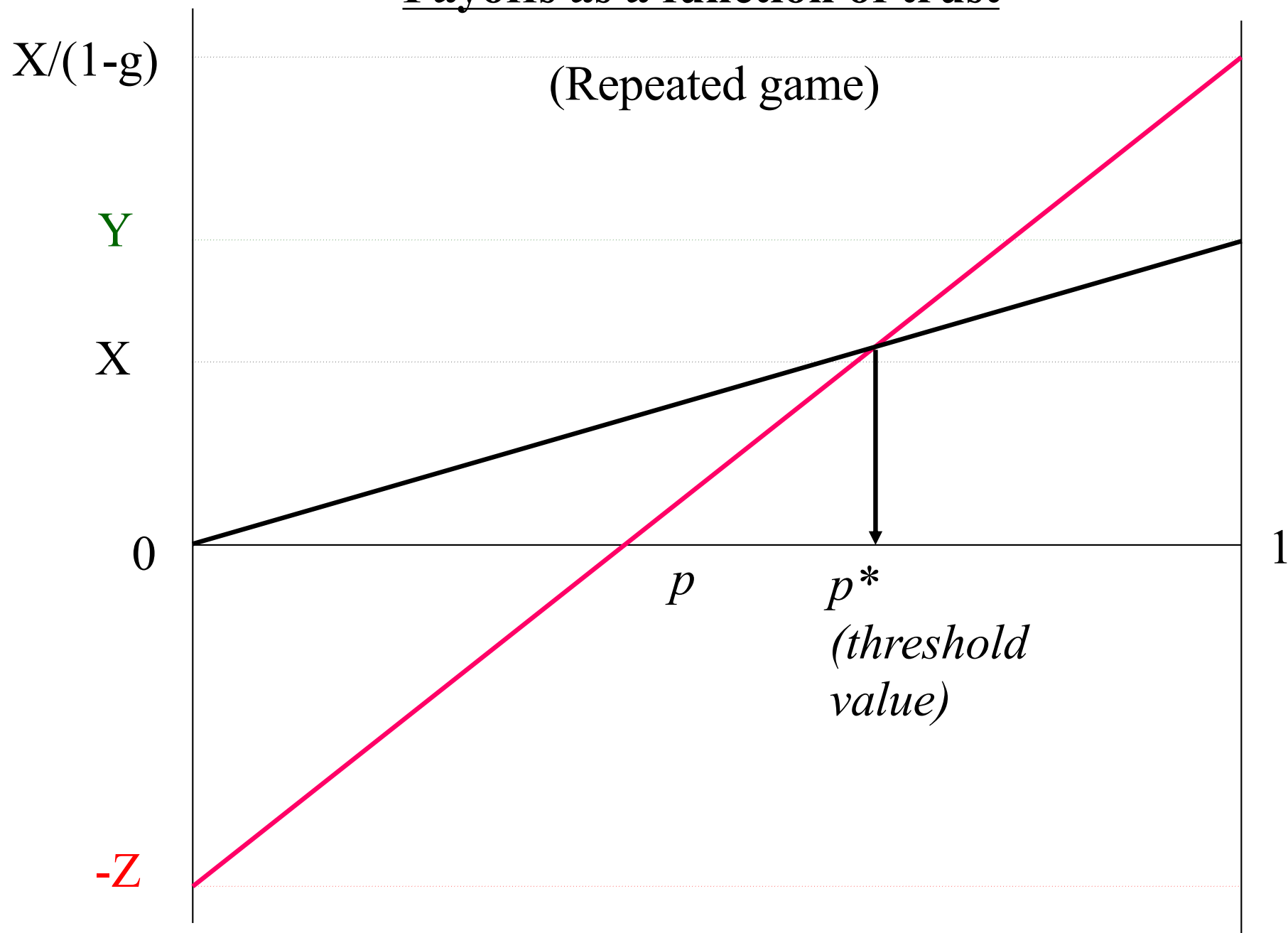
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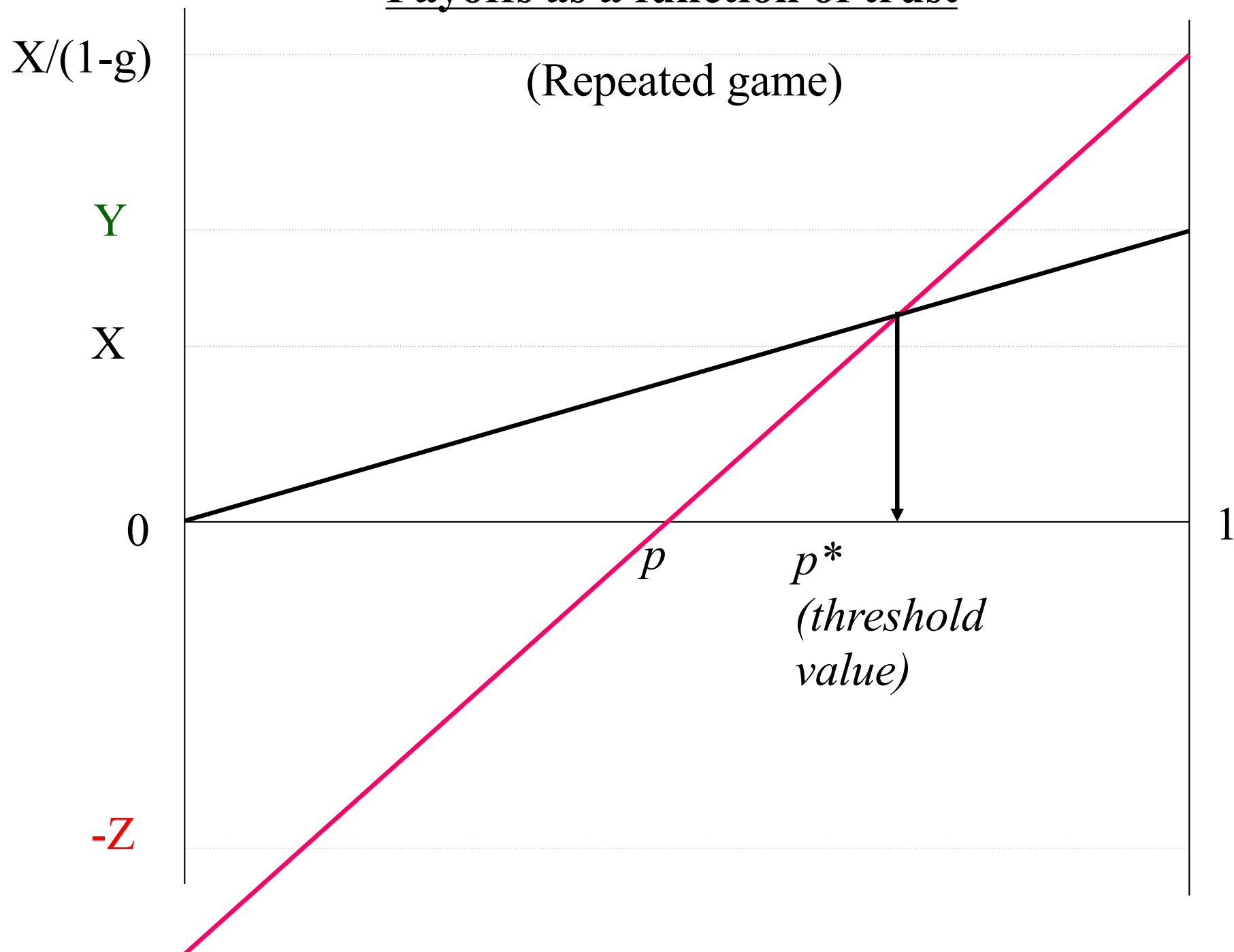
## Payoffs as a function of trust



## Payoffs as a function of trust



## Payoffs as a function of trust





# Can there be “self-confirming equilibria”?

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- Obviously yes at  $p = 0$  and  $p=1$
- For other values of  $p$ , need another source of uncertainty
- Positive but imperfect correlation between sources of confidence will do (e.g. sun/rain, calm/wind)
- These equilibria can be stable under plausible accounts of social learning



## Example:

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<u>Player</u>	<u>Objective State</u>	<u>Subjective State</u>	<u>Subj. probability that other will cooperate</u>	<u>Probability of state</u>
1	Sunshine	Optimism	P1	Q
1	Rain	Pessimism	P2	1-Q
2	Calm	Optimism	Q1	P
2	Wind	Pessimism	Q2	1-P

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