

Understanding Real World Organizations

TSE M1 – Semester 1

September 2019

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Week 2: The Development of Markets through History

The Development of Markets through History

- 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)

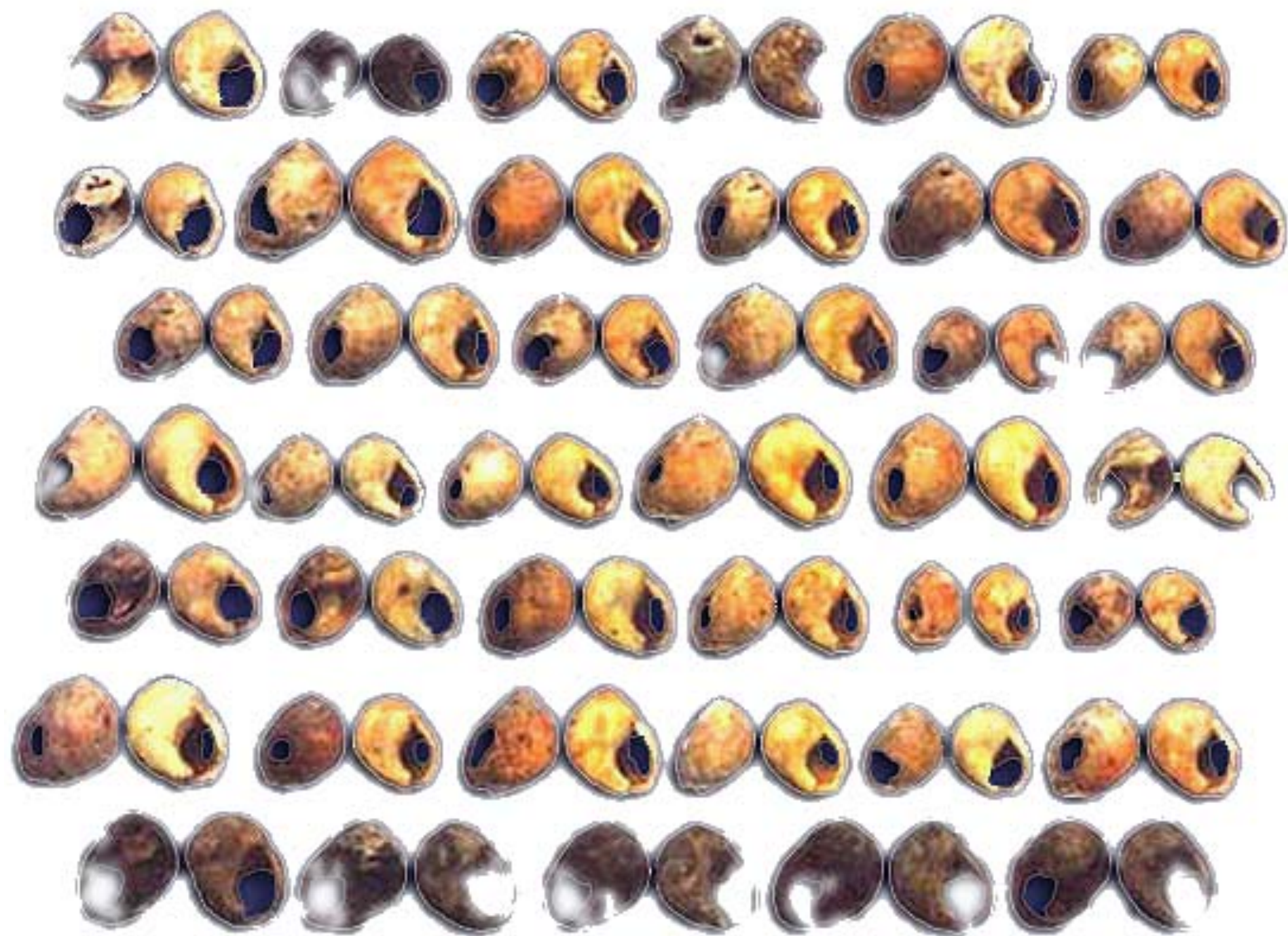
- Non-human animals have division of labour based on kinship alone
- Early humans probably lived in progressively increasing group size
 - Chimps 60 per band
 - Australopithecus c.70 (4.5 m years ago)
 - Homo habilis c.80 (2 m years ago)
 - Homo erectus c.110 (1.8 m years ago)
 - Homo neanderthalis c.140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

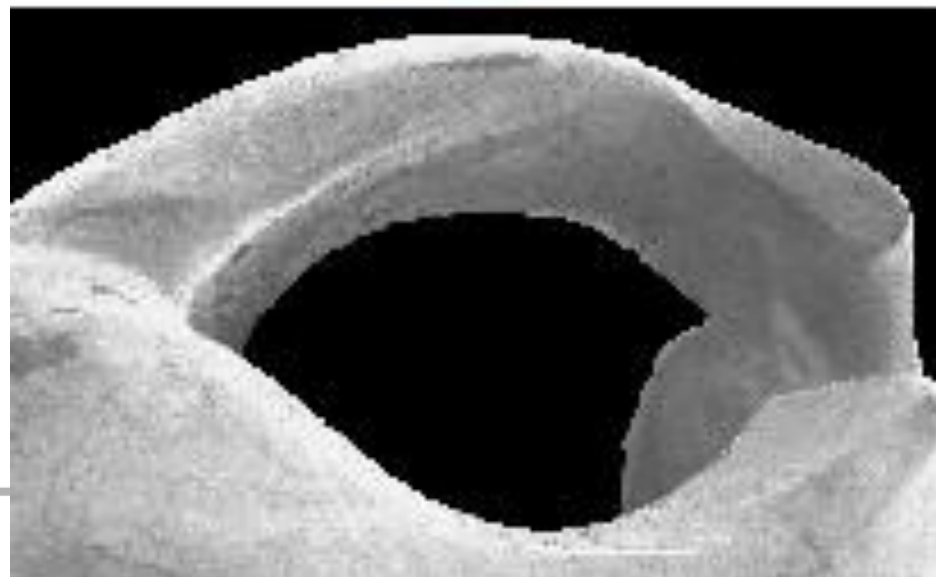


The division of labour: a history (2)

- 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)

- 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
-



Kashgar market on the Silk Road

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by Mark Parisi

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I'LL TRADE YOU A LITTLE
PIG FOR SOME LEFTOVER
GRANDMA...



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1-7 Mark
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How would trade get started
between people who have not
traded before.....?



Herodotus describing trade between Libyans and visiting Carthaginians (5th century BC):

- “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 (14th century AD):

- “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

- 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

- 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

- 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*
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Consider a standard prisoners' dilemma payoff matrix

- 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?
-

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

- 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

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



The role of trust

- 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”?



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

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

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

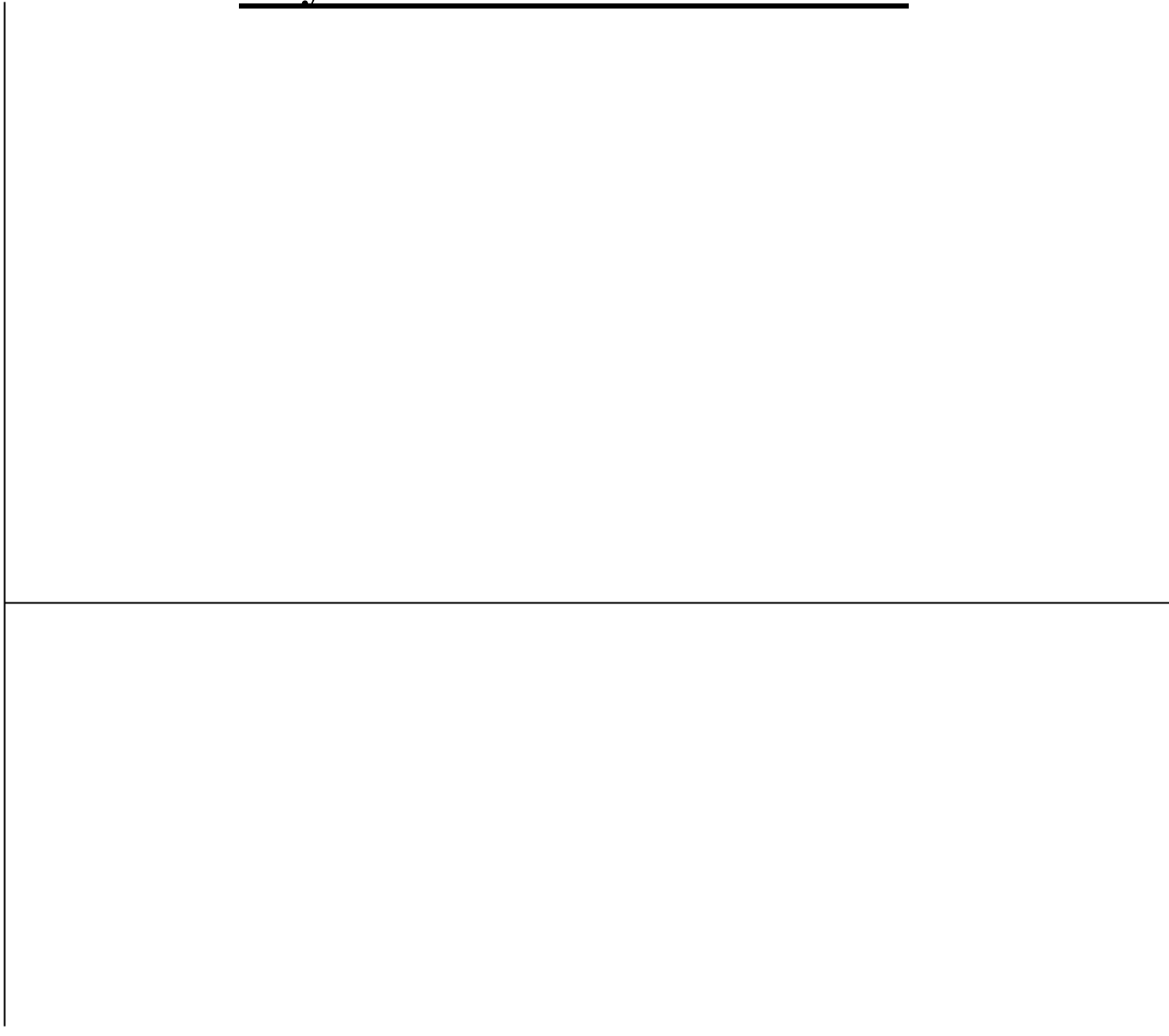
$$(4) p^*(X, Y, Z) = \frac{Z(1-g)}{[X(1-g^{t+1}) + (Z-Y)(1-g)]}$$

$$p_X^* < 0$$

$$p_Y^* > 0$$

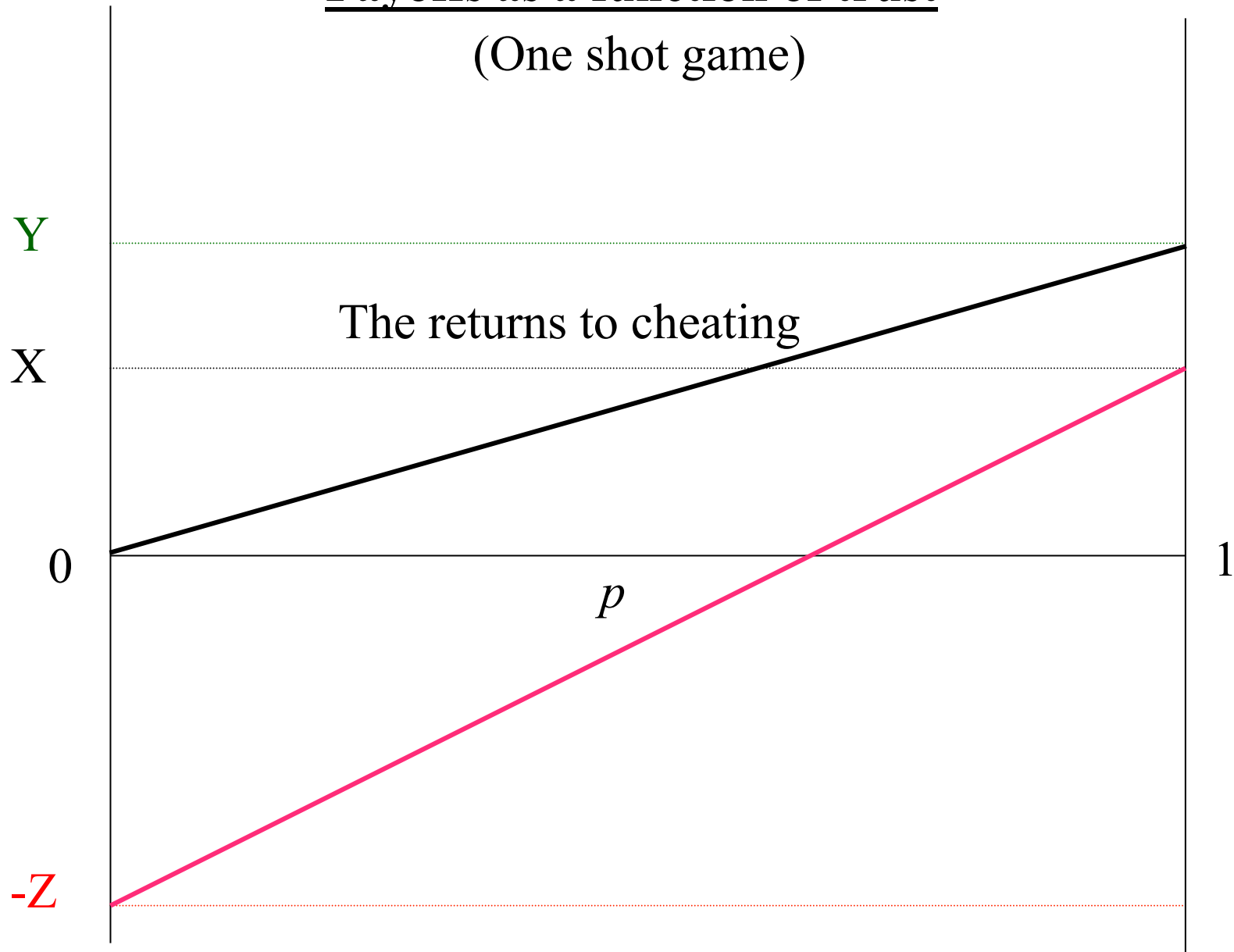
$$p_Z^* > 0$$

Payoffs as a function of trust

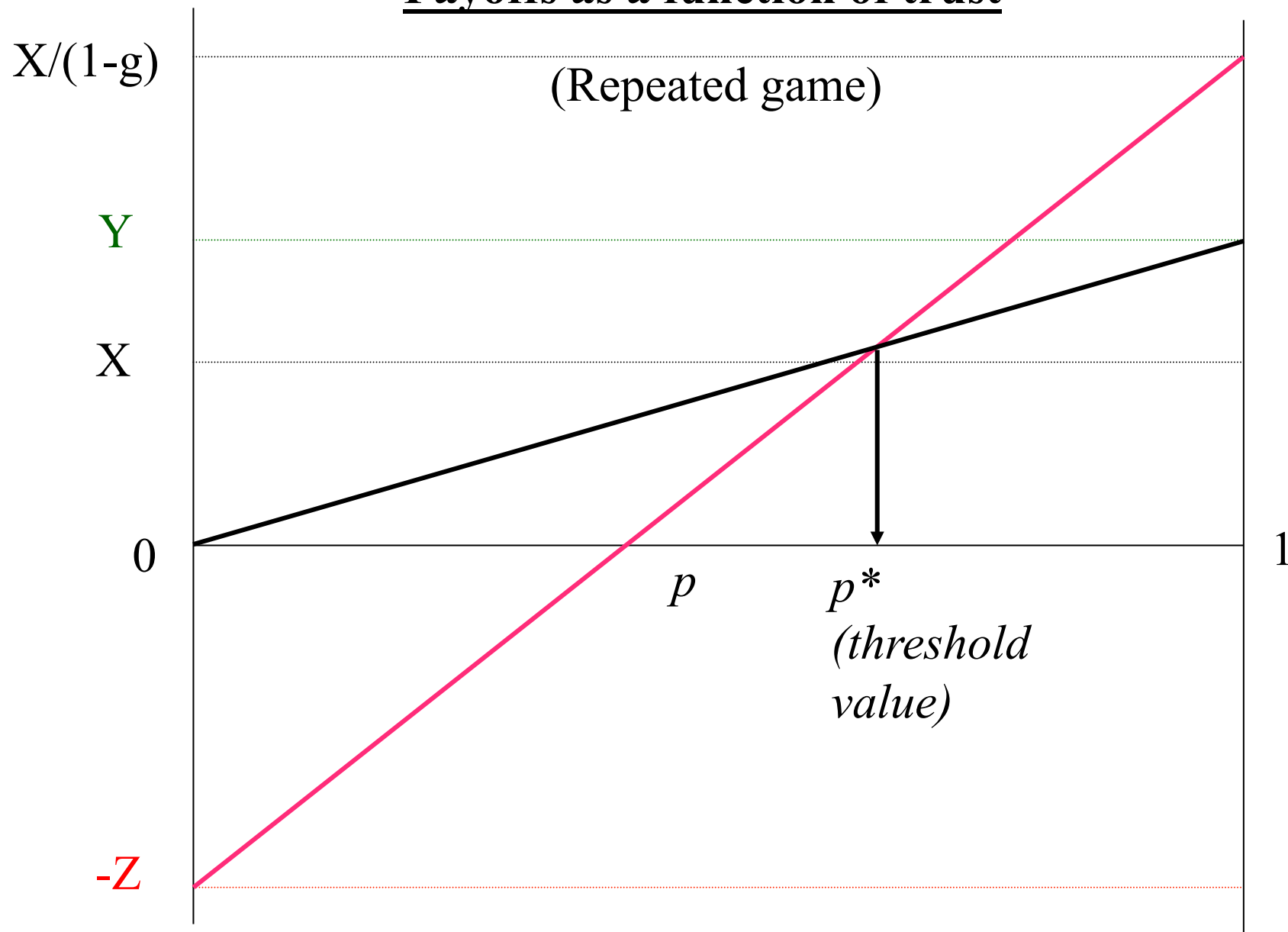


Payoffs as a function of trust

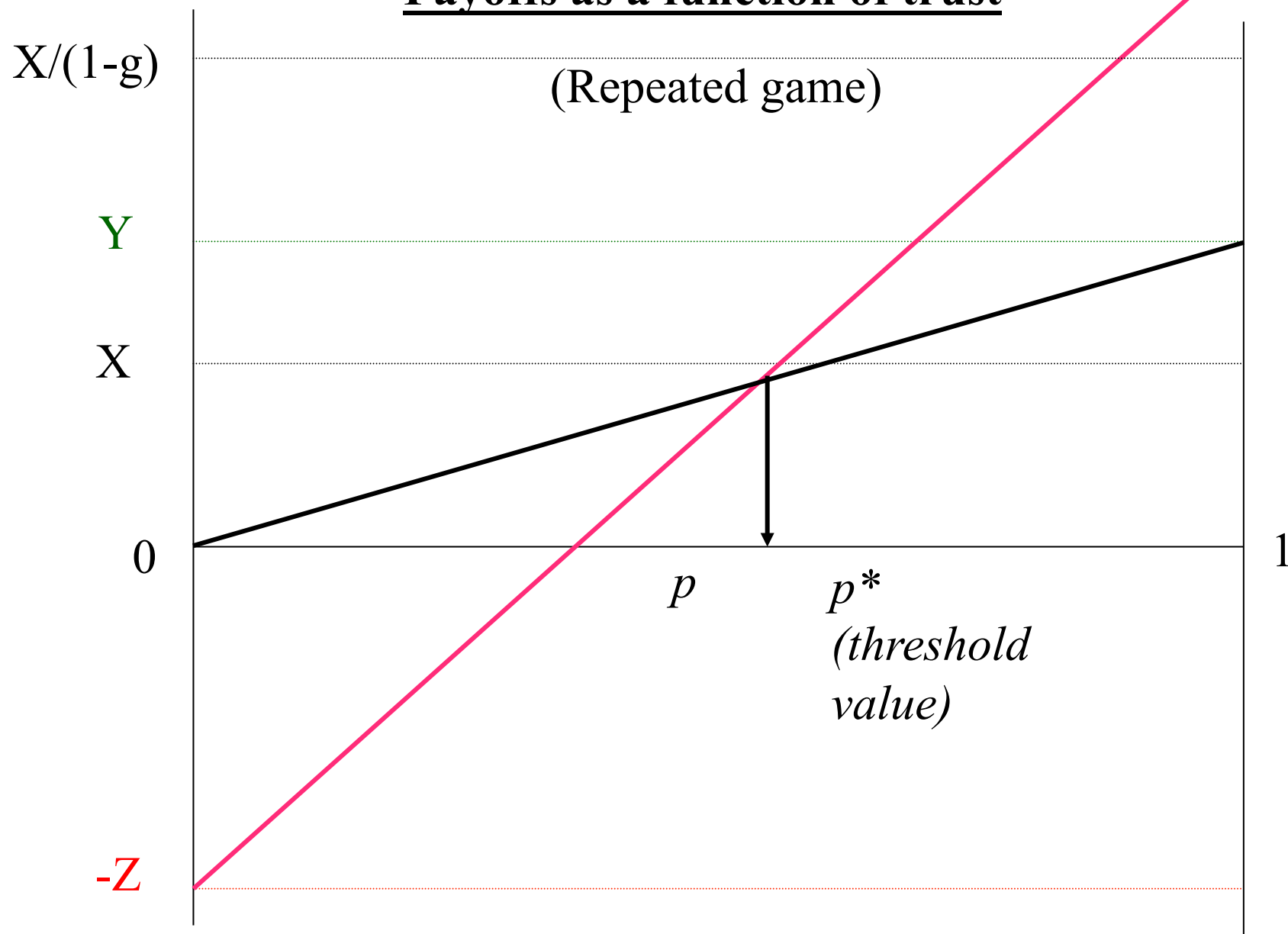
(One shot game)



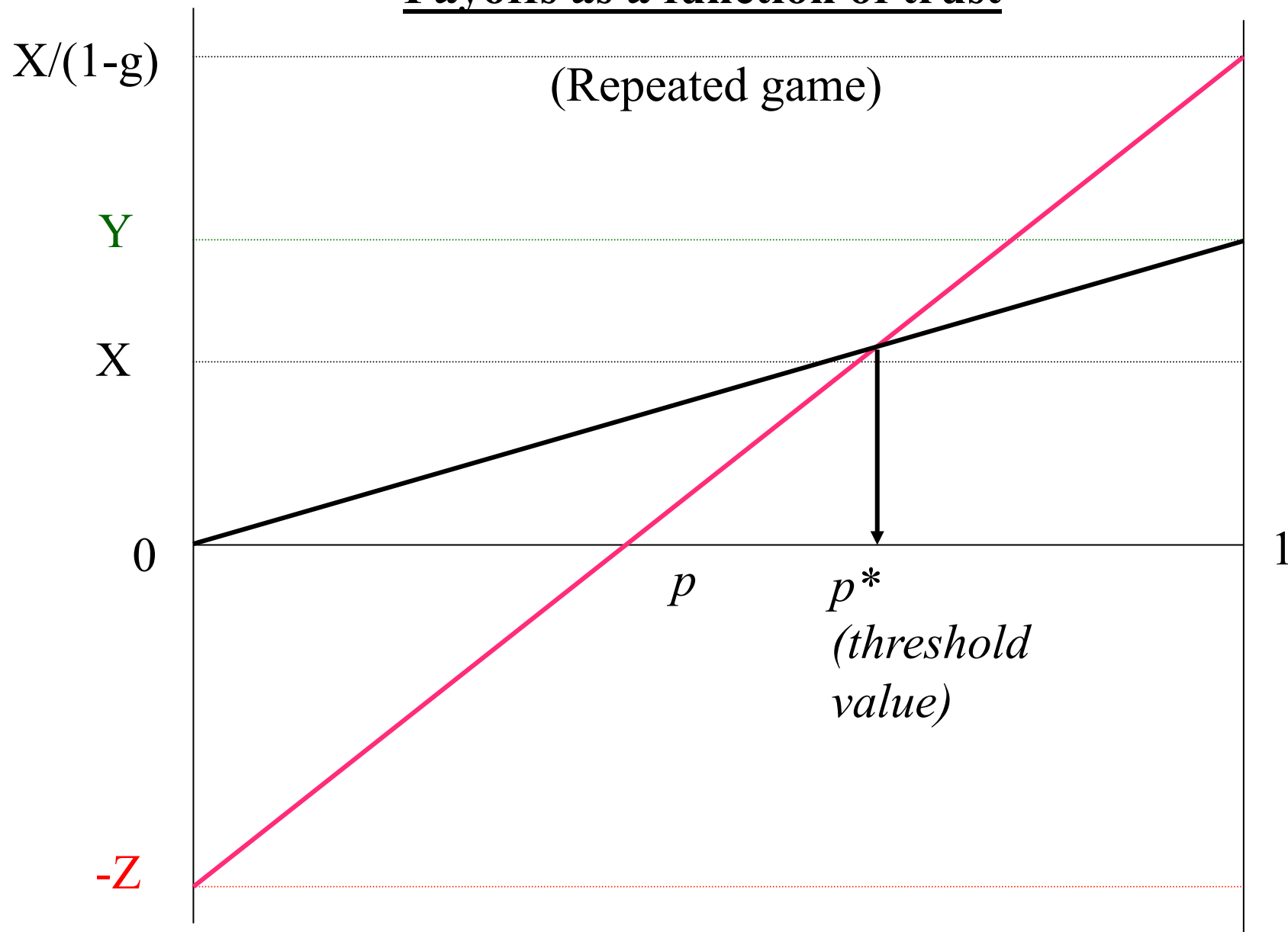
Payoffs as a function of trust



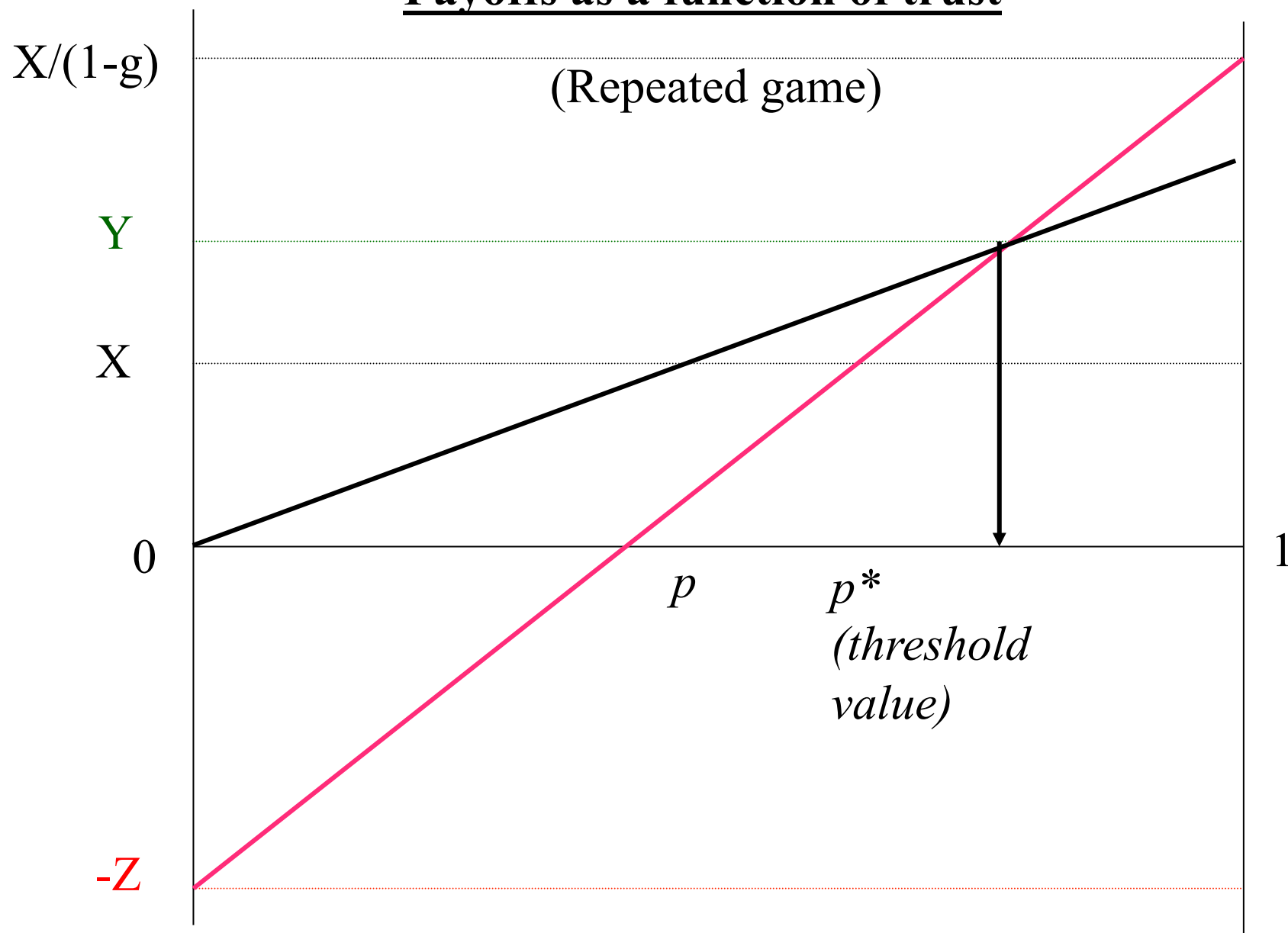
Payoffs as a function of trust



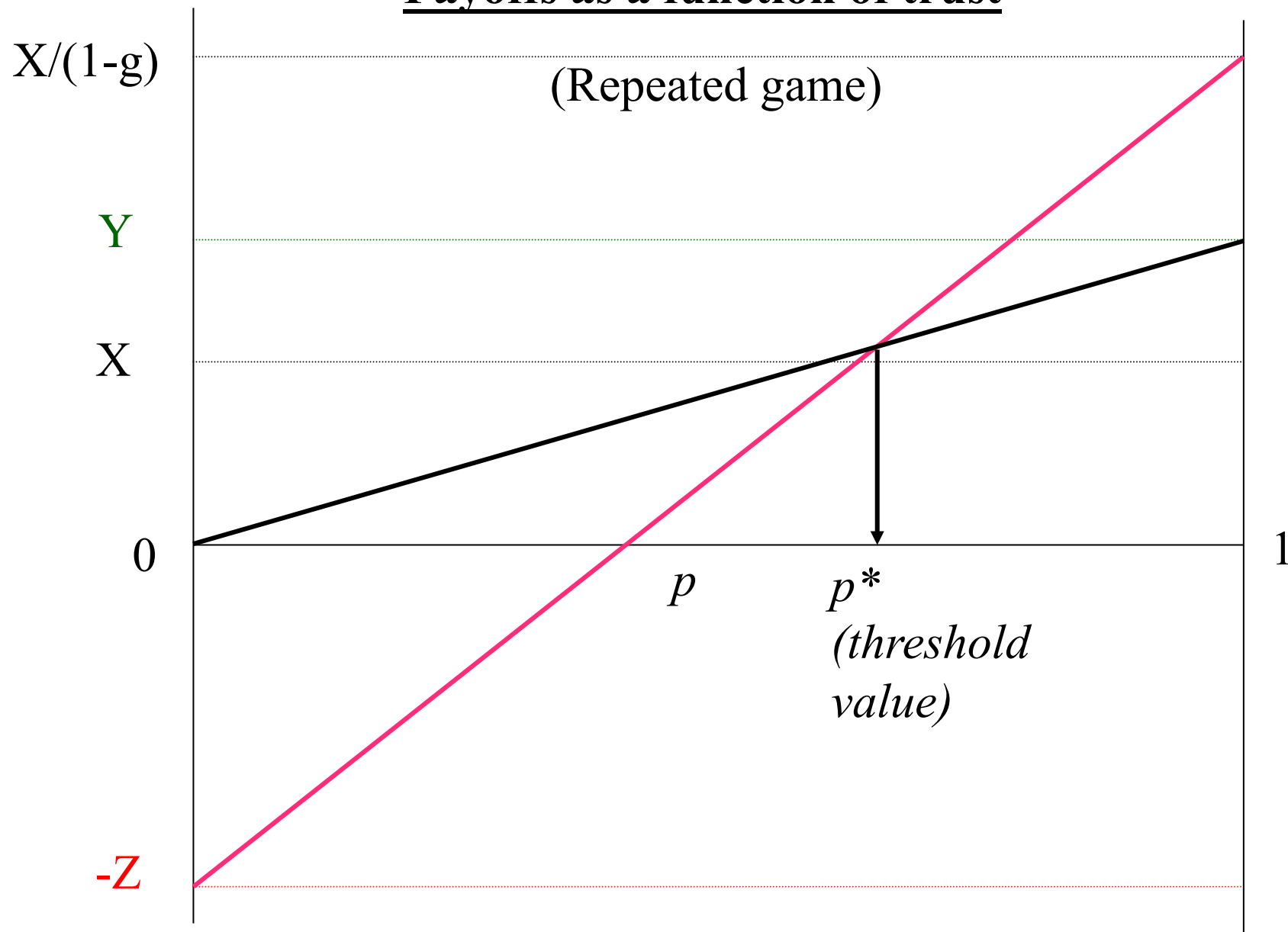
Payoffs as a function of trust



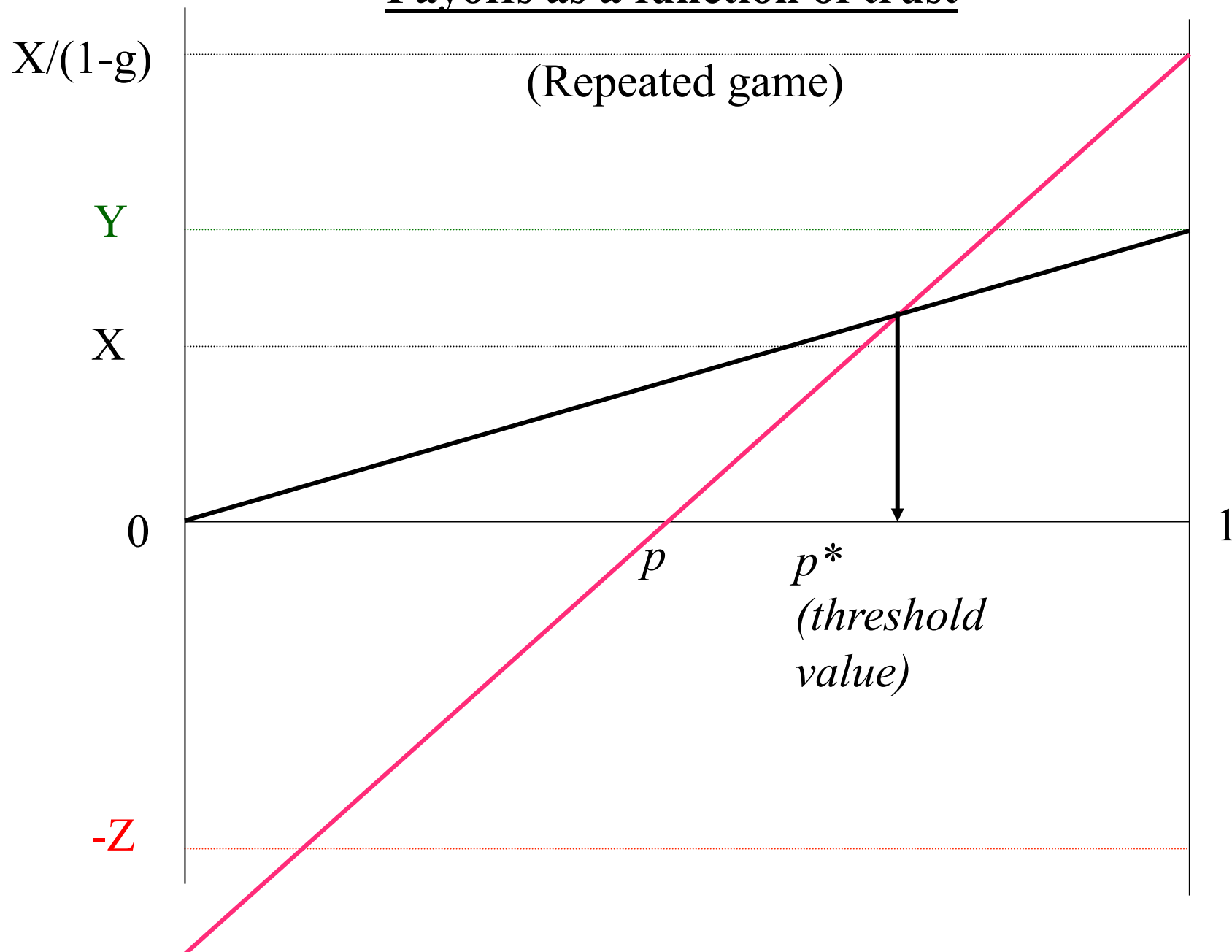
Payoffs as a function of trust



Payoffs as a function of trust



Payoffs as a function of trust



Can there be “self-confirming equilibria”?

- 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:

<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

The expansion of market exchange

- Comparison of present industrialised societies with their past
 - Locay on North America in C 17
 - Comparison of industrialised countries with poor countries today
 - Dreze & Sharma on Palanpur (“inter-village exchange is infrequent”)
 - Comparison of human with non-human social organization
-

“On sitting down for an everyday meal, a typical European-American family in seventeenth-century New England would find that it had itself produced almost all the components of the meal...the family grew the crops, raised the livestock, harvested and stored the products, and in general did all the processing necessary to prepare the food for consumption..The house..was likely to have been built by the family..The chairs and table the family used may also have been home produced, as well as the clothes the family wore to the meal. Had one considered instead an American Indian family of a century earlier, one would find that even their tools - their hoes, their mortars and pestles for grinding, and their arrowheads - were all of home manufacture”. *Locay (JPE 1990, pp.965-966).*

Families, firms and markets

- Why does economic activity take place in groups?
- Why families? Why firms?
- Why is family production more prevalent in poorer countries?
 - Do low levels of development favour family production? (Adam Smith: “the division of labour is limited by the extent of the market”)
 - Does family production perpetuate poverty?



A formal model (inspired by Locay, *JPE* 1990)

- Initial returns to scale:

- $x = F(L)$ $F' > 0, F'' > 0$ for $L < L^*$; $F'' < 0$ else
- $L = n.e$

- Limits to household size:

- $L_H \leq M$

- Firm production needs costly monitoring:

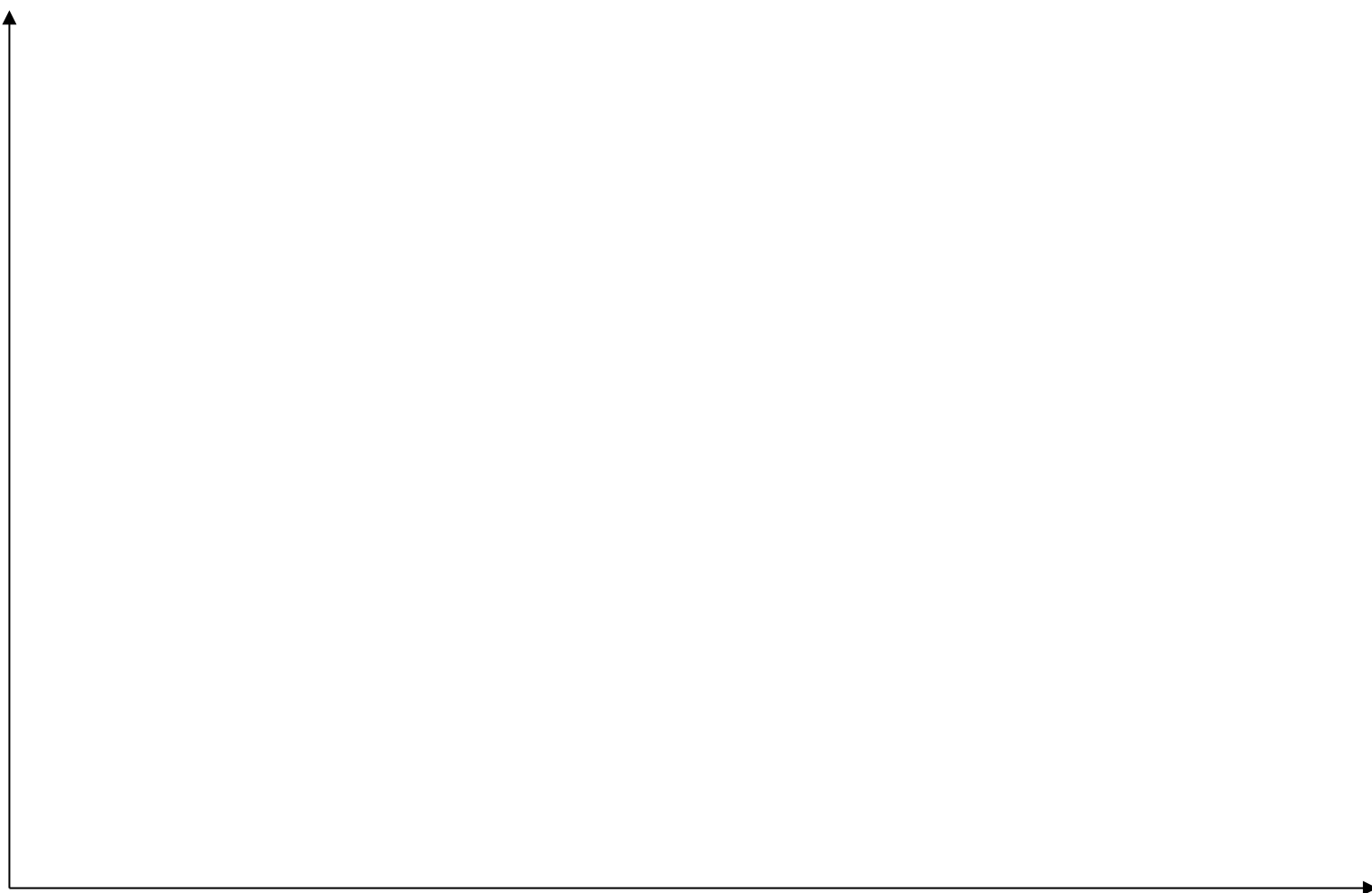
- $e = e(n); \quad e' < 0$
- $x = F(n.e(n))$



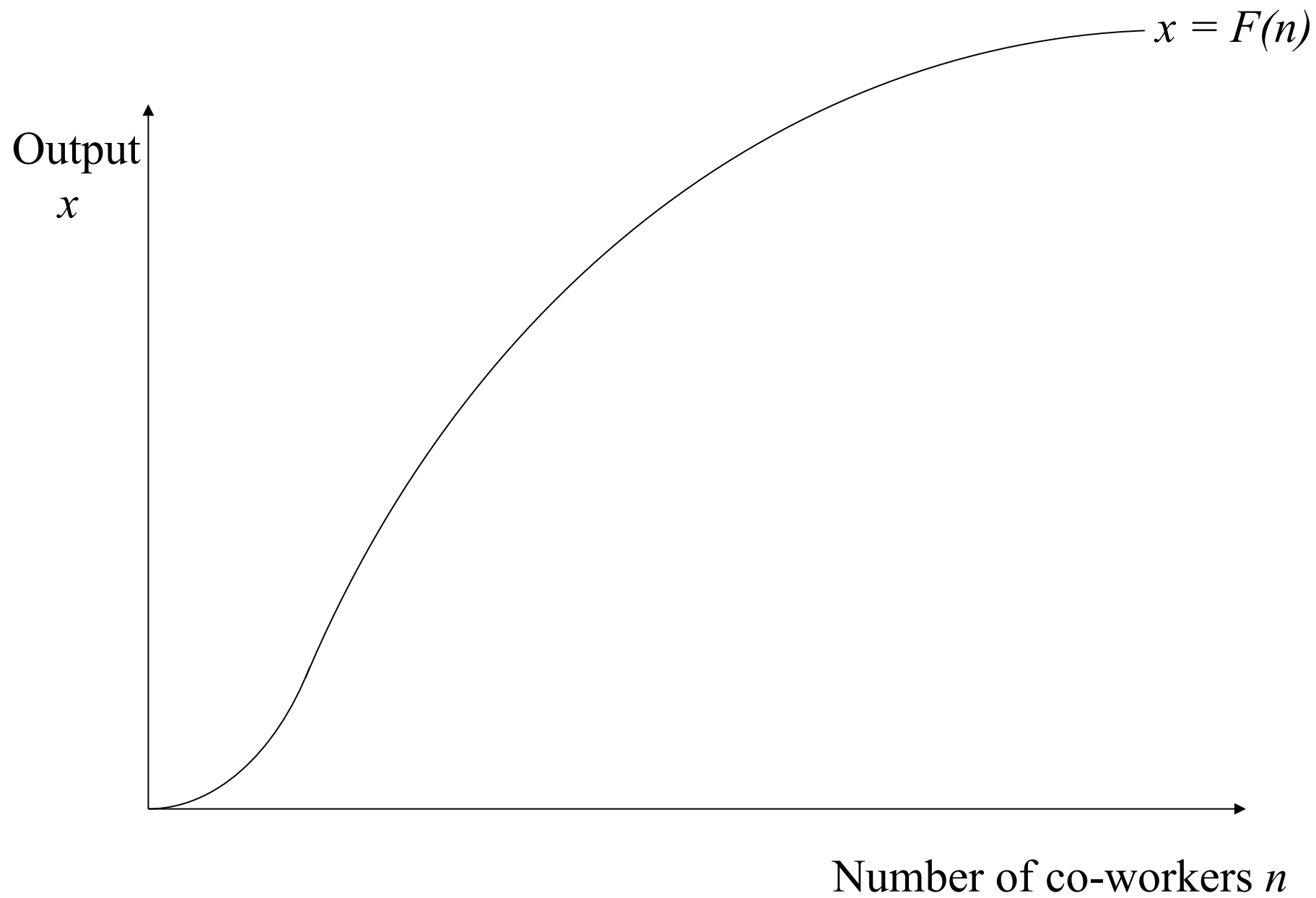
Implications:

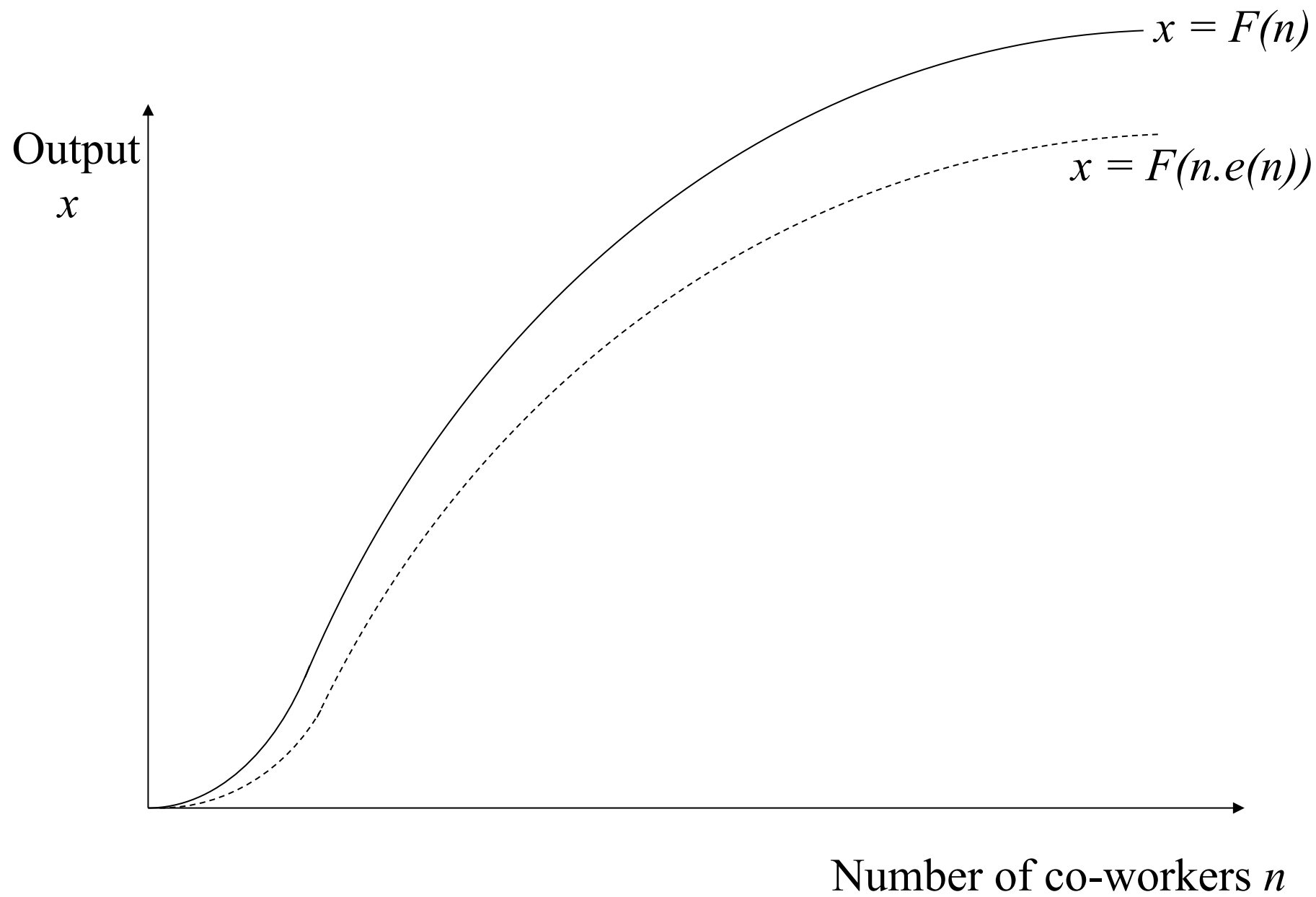
- Efficient size of firms depends on wage rate:
 - $n^*(w)$ solves $\text{Max } F(n.e(n)) - wn$

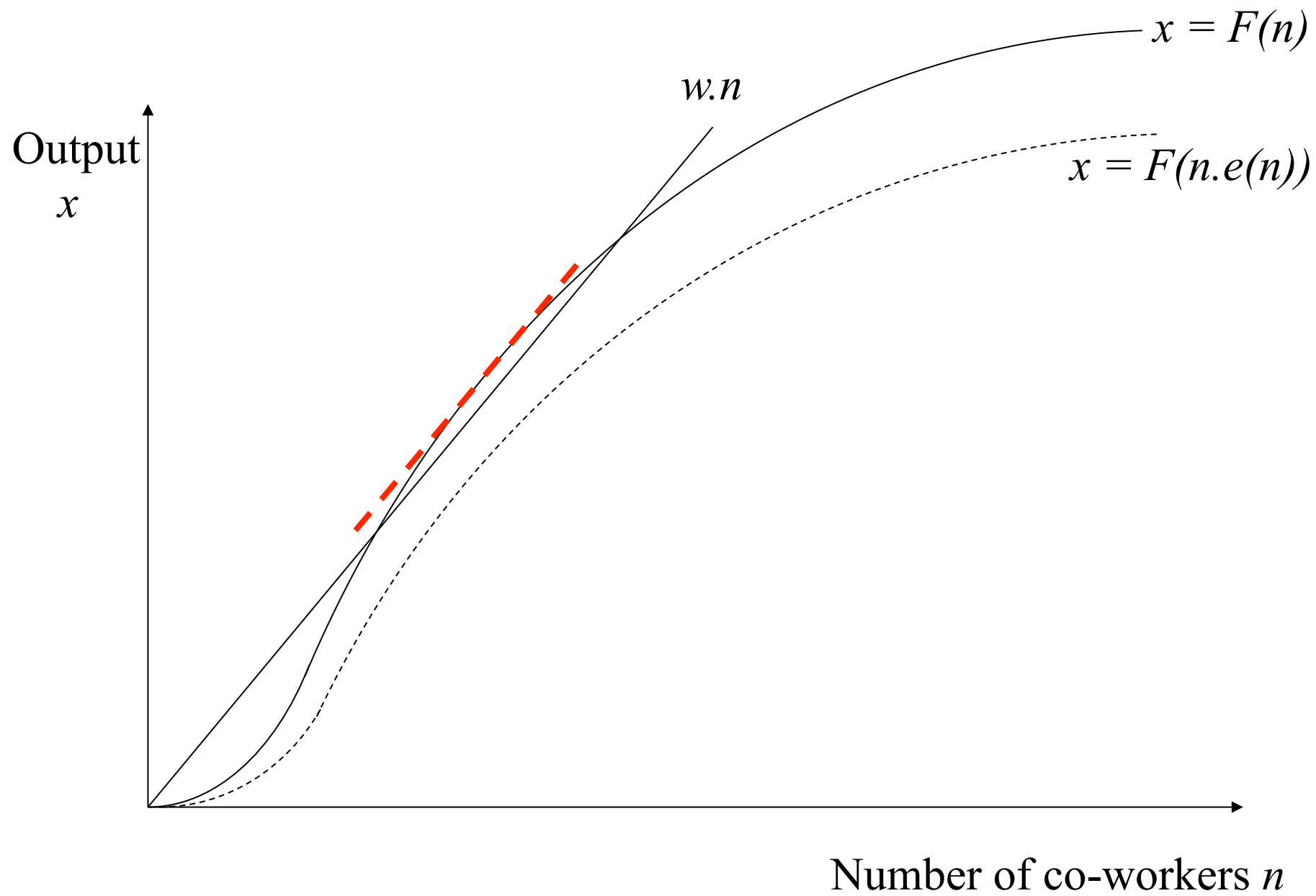


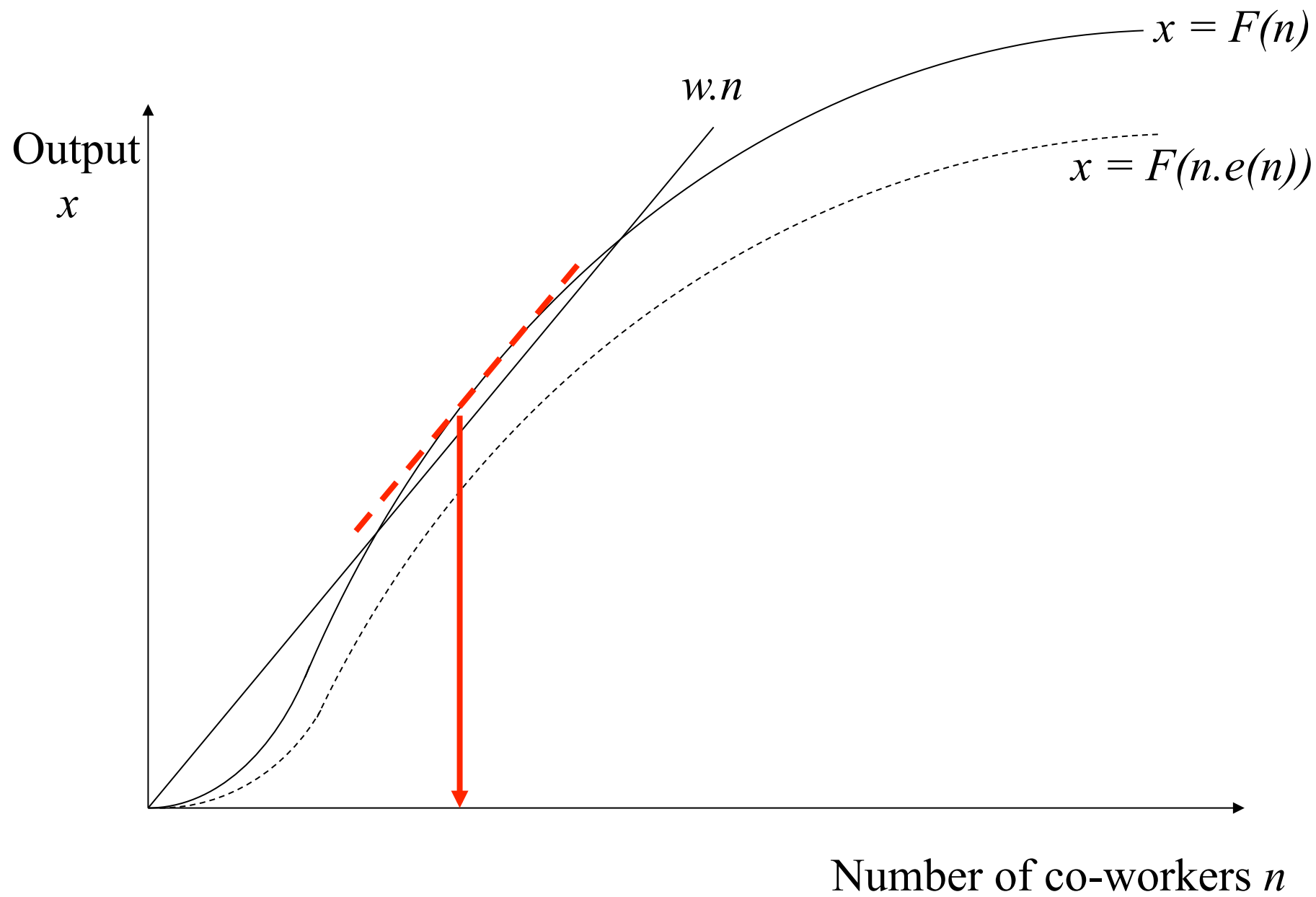


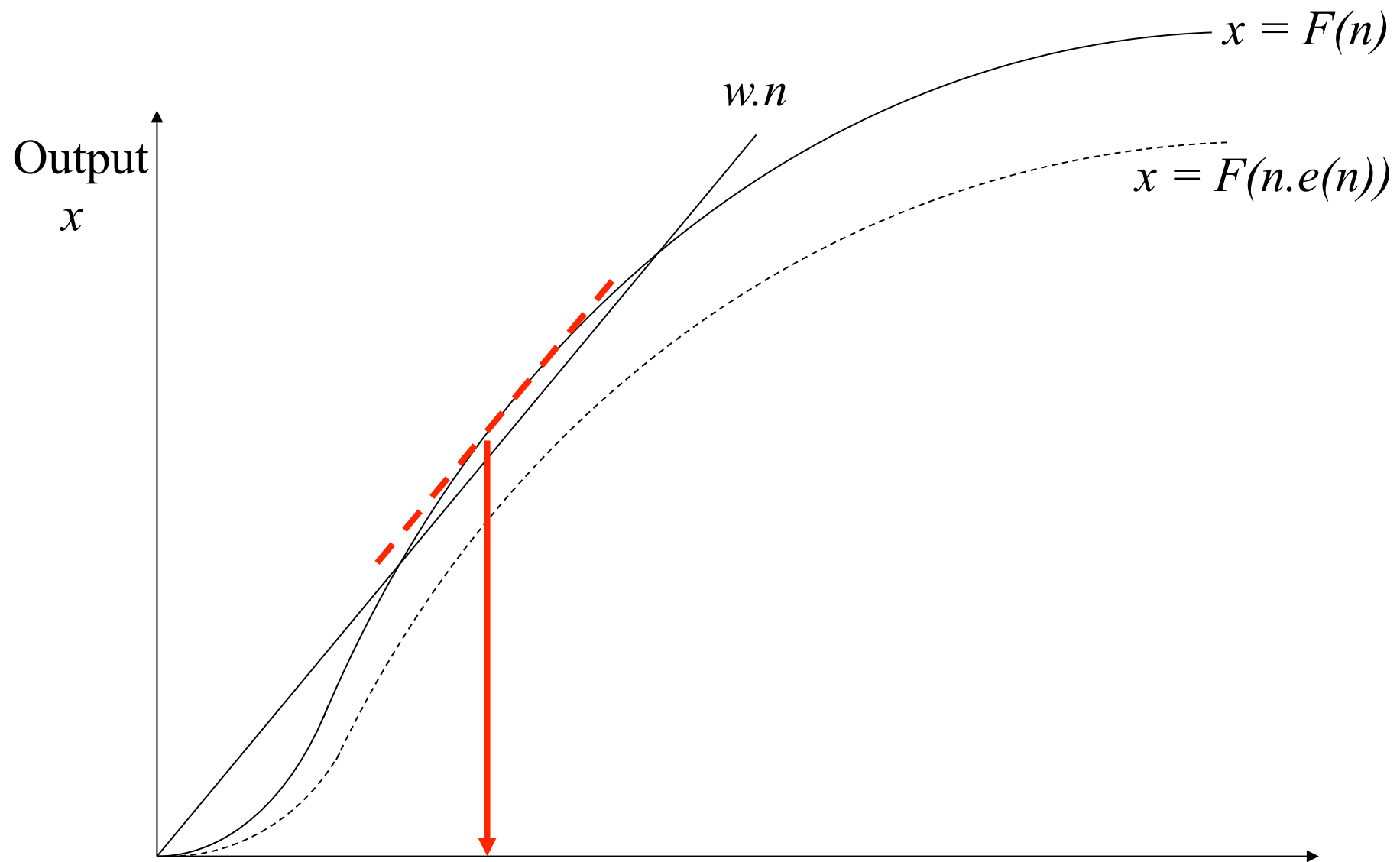










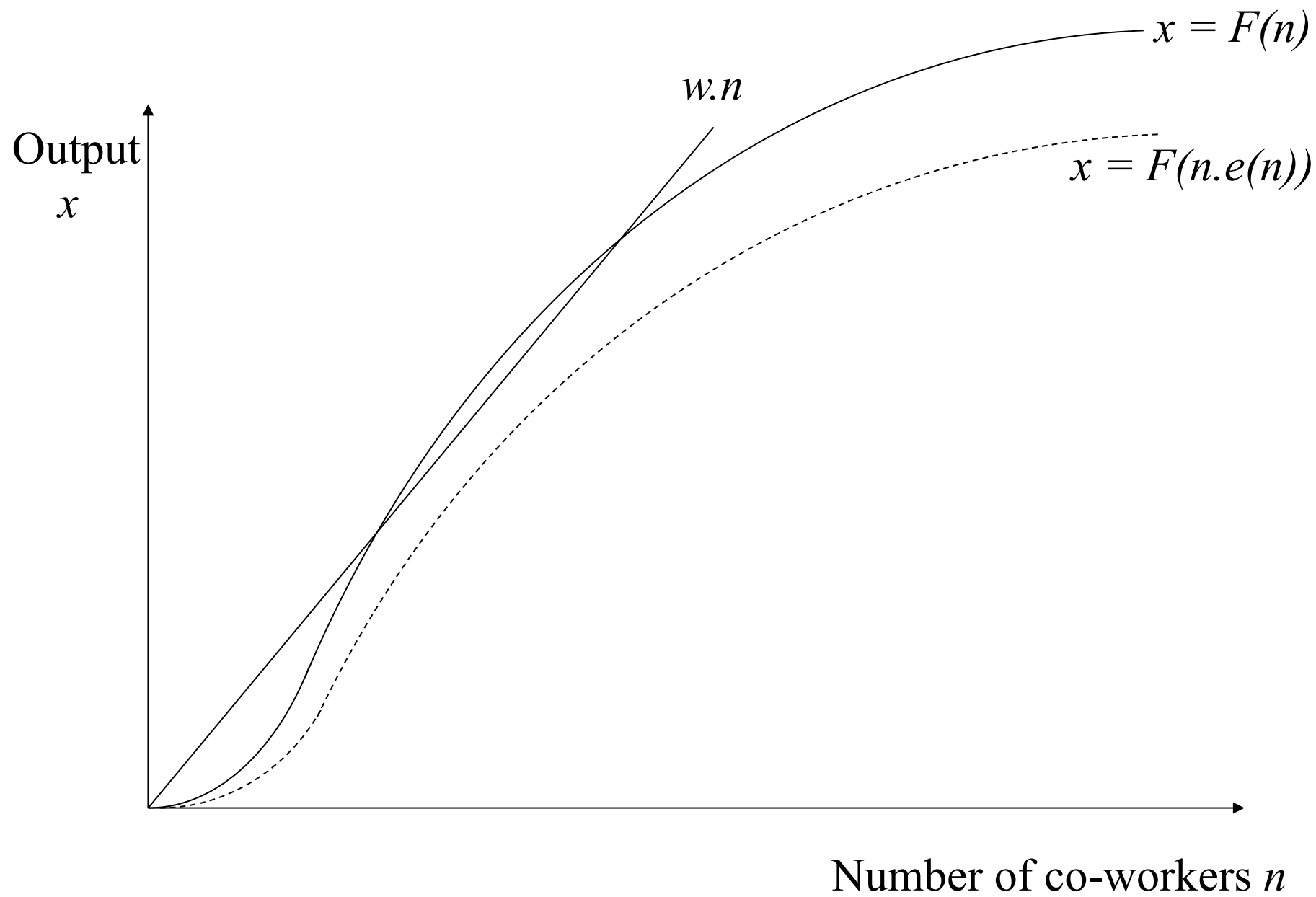


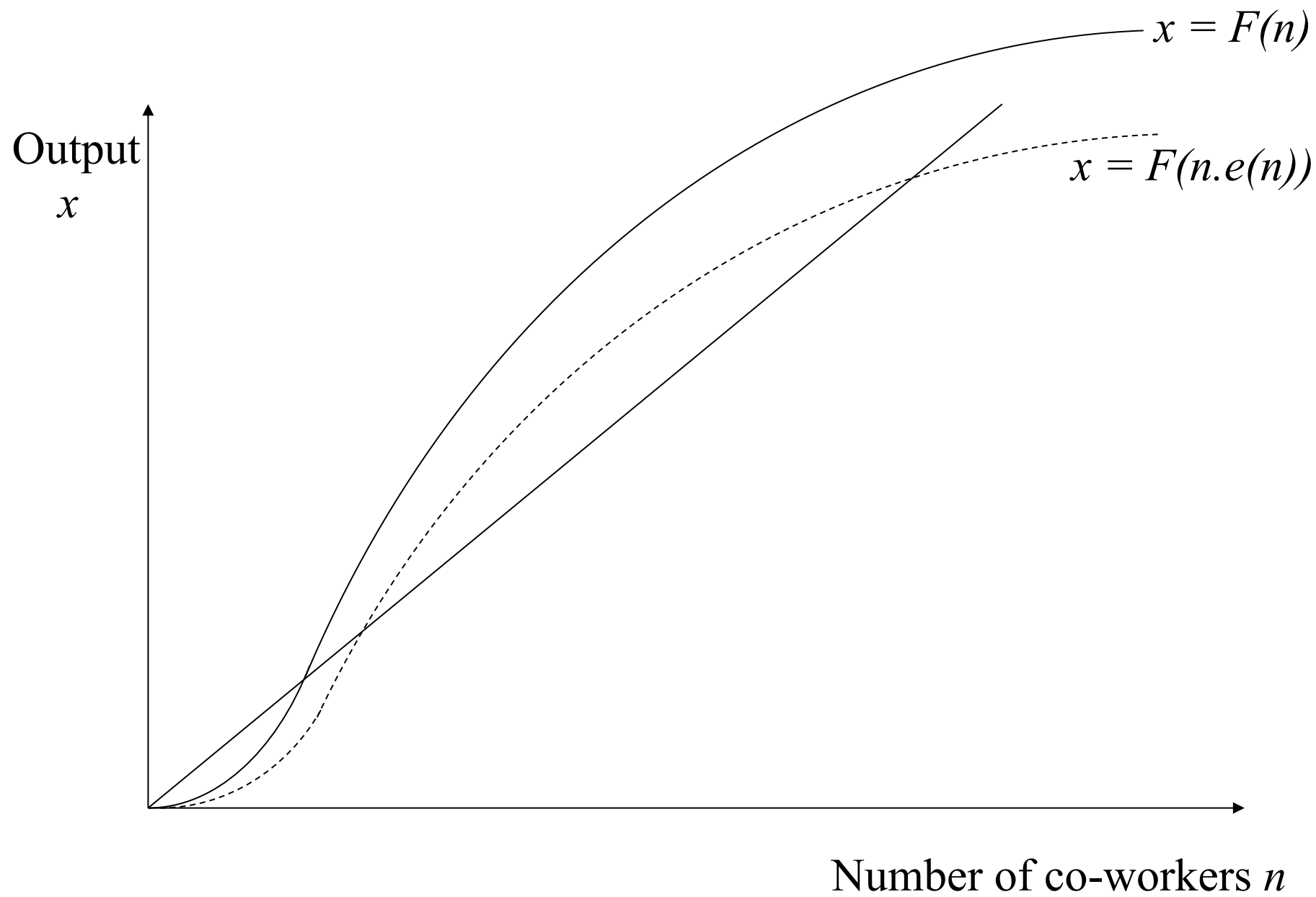
Surplus-maximising
output (produced by
household)

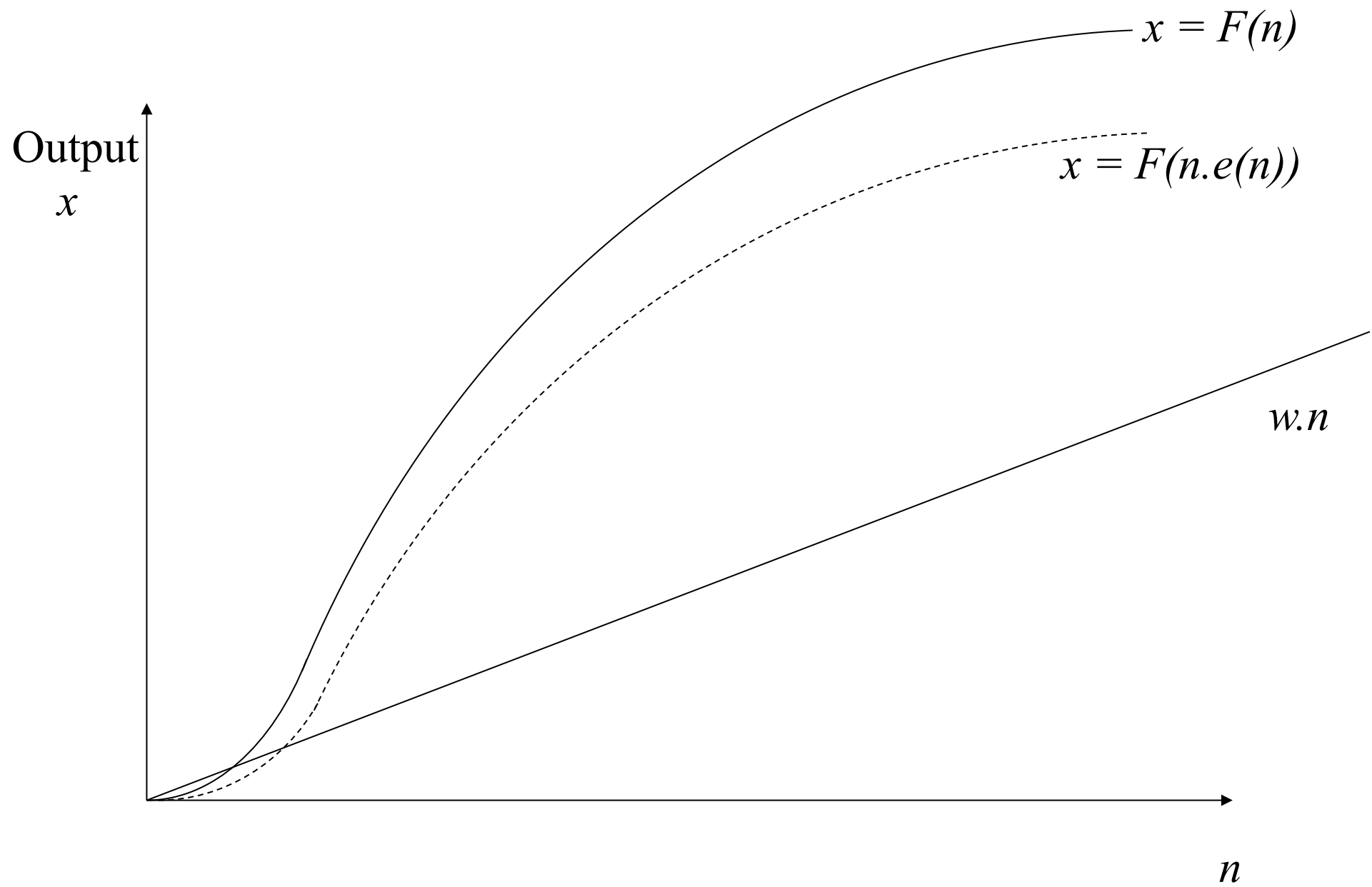
Number of co-workers n

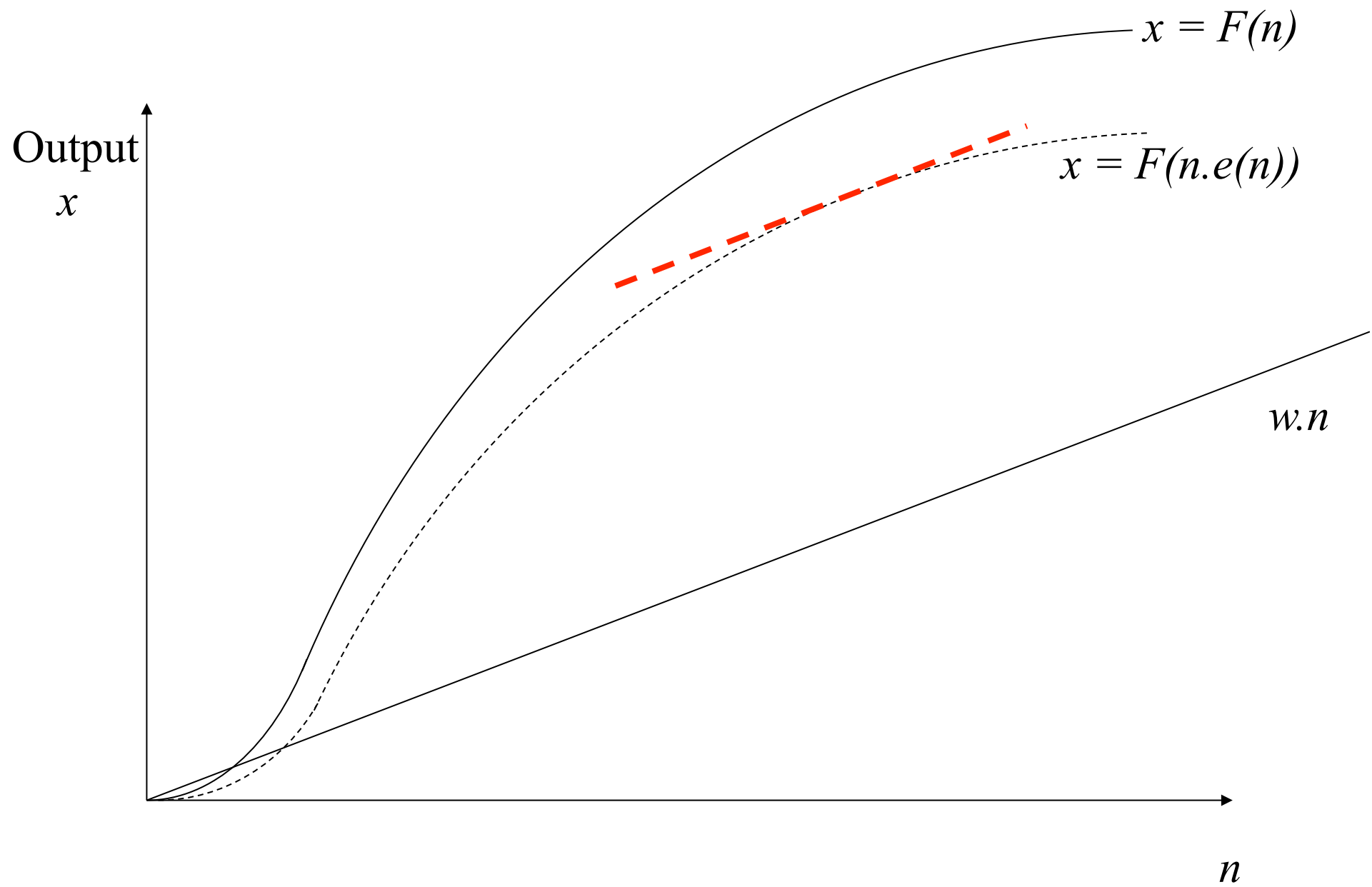
Now consider a fall in w :

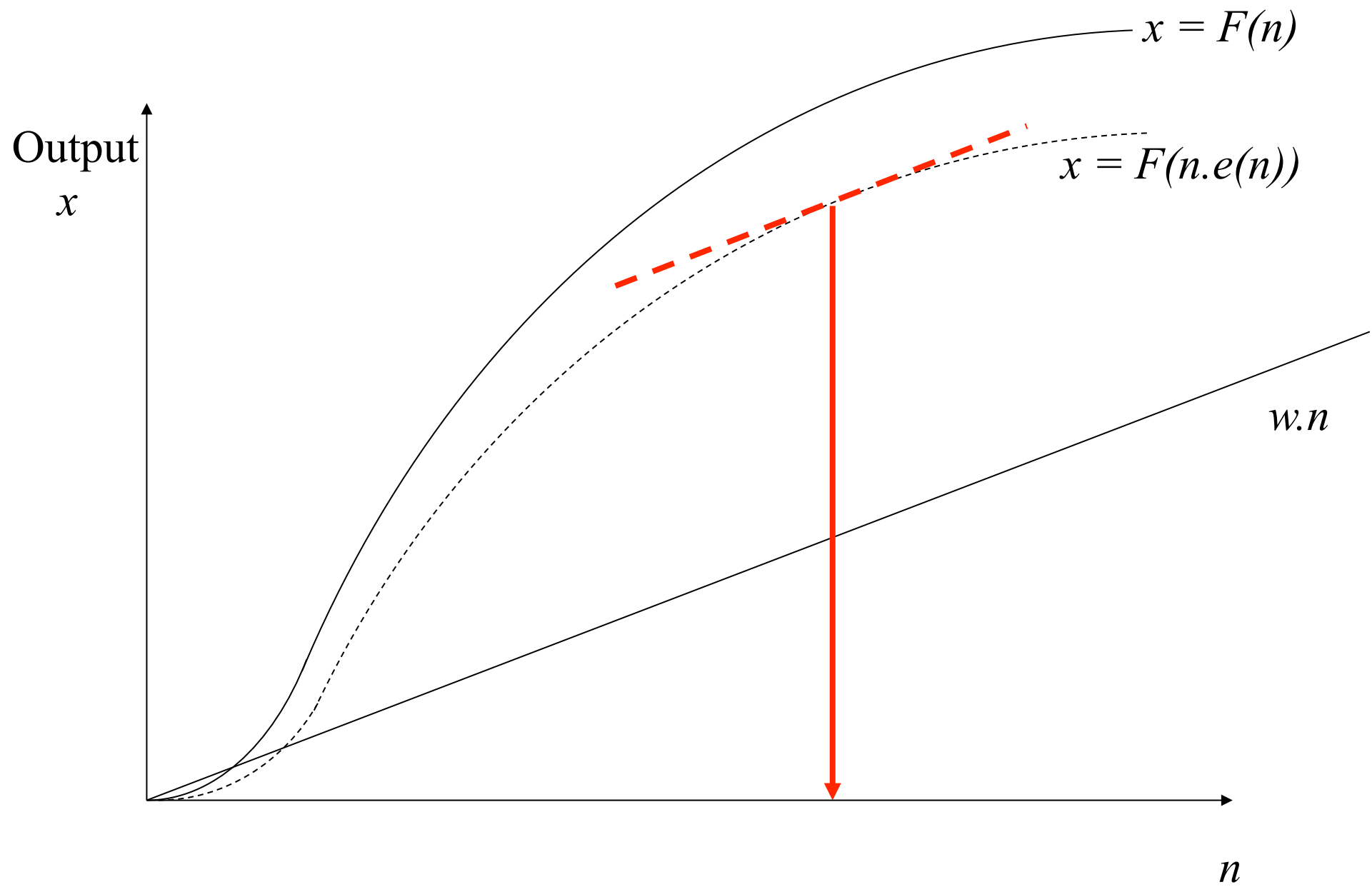


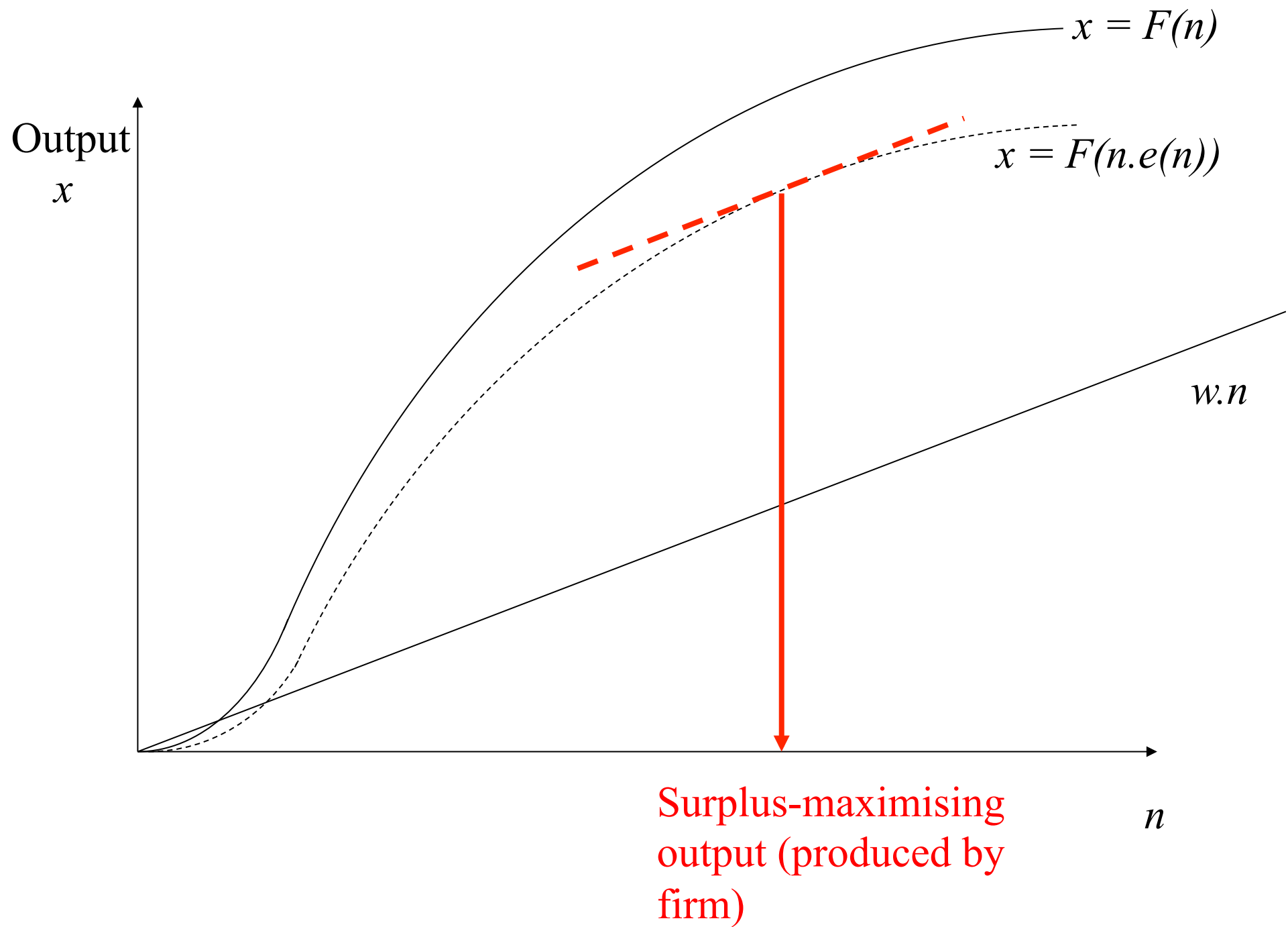


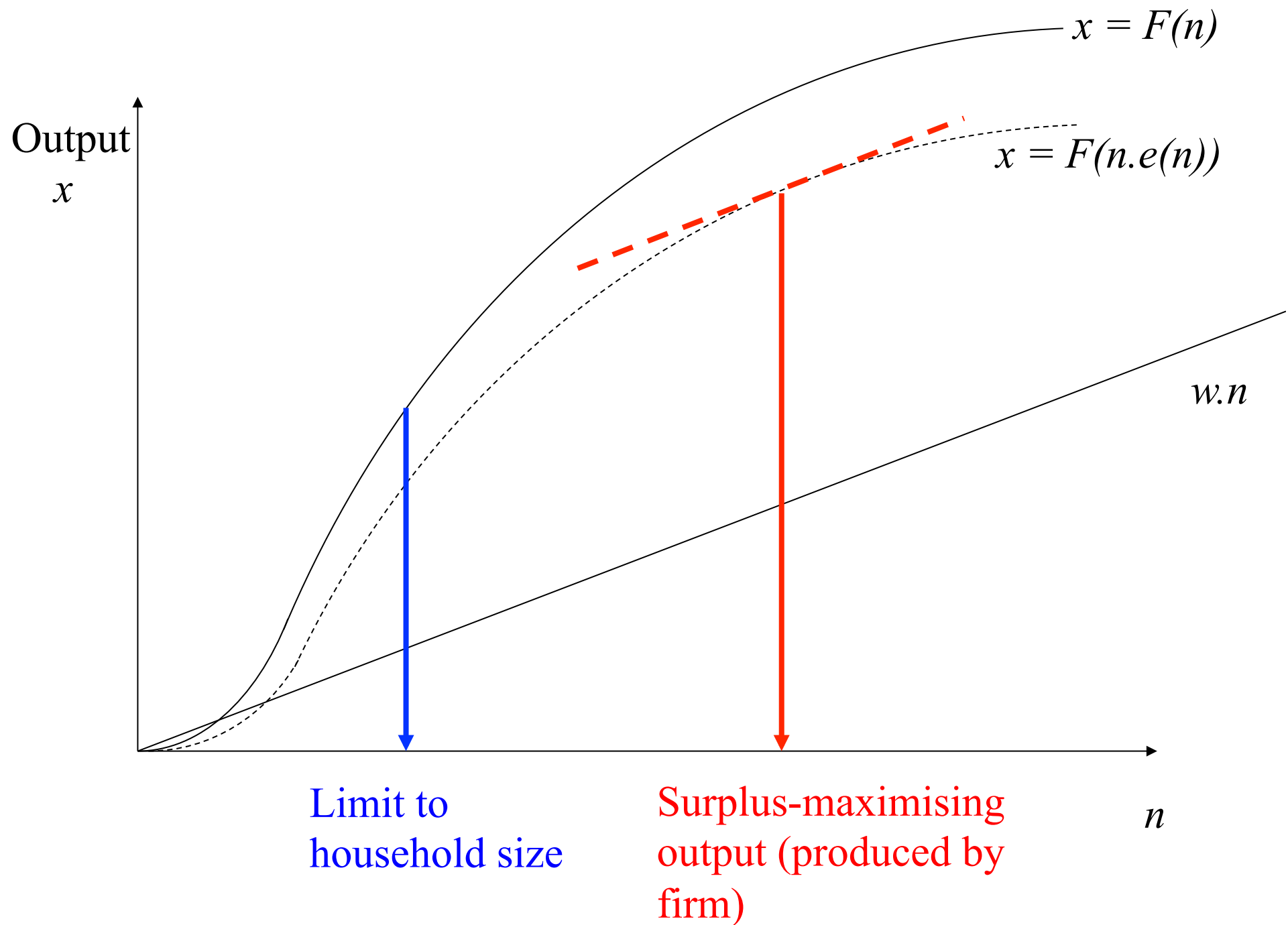


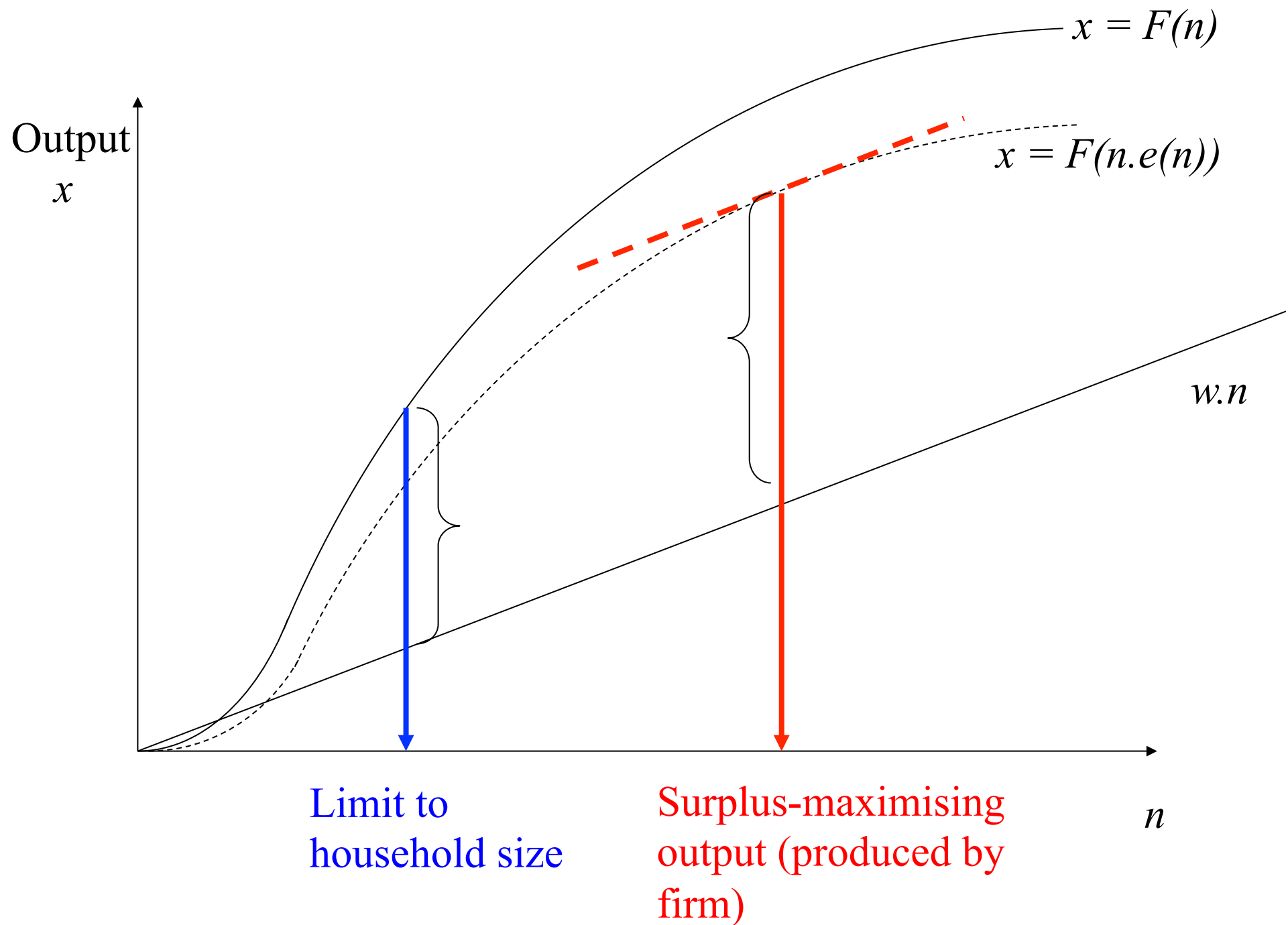


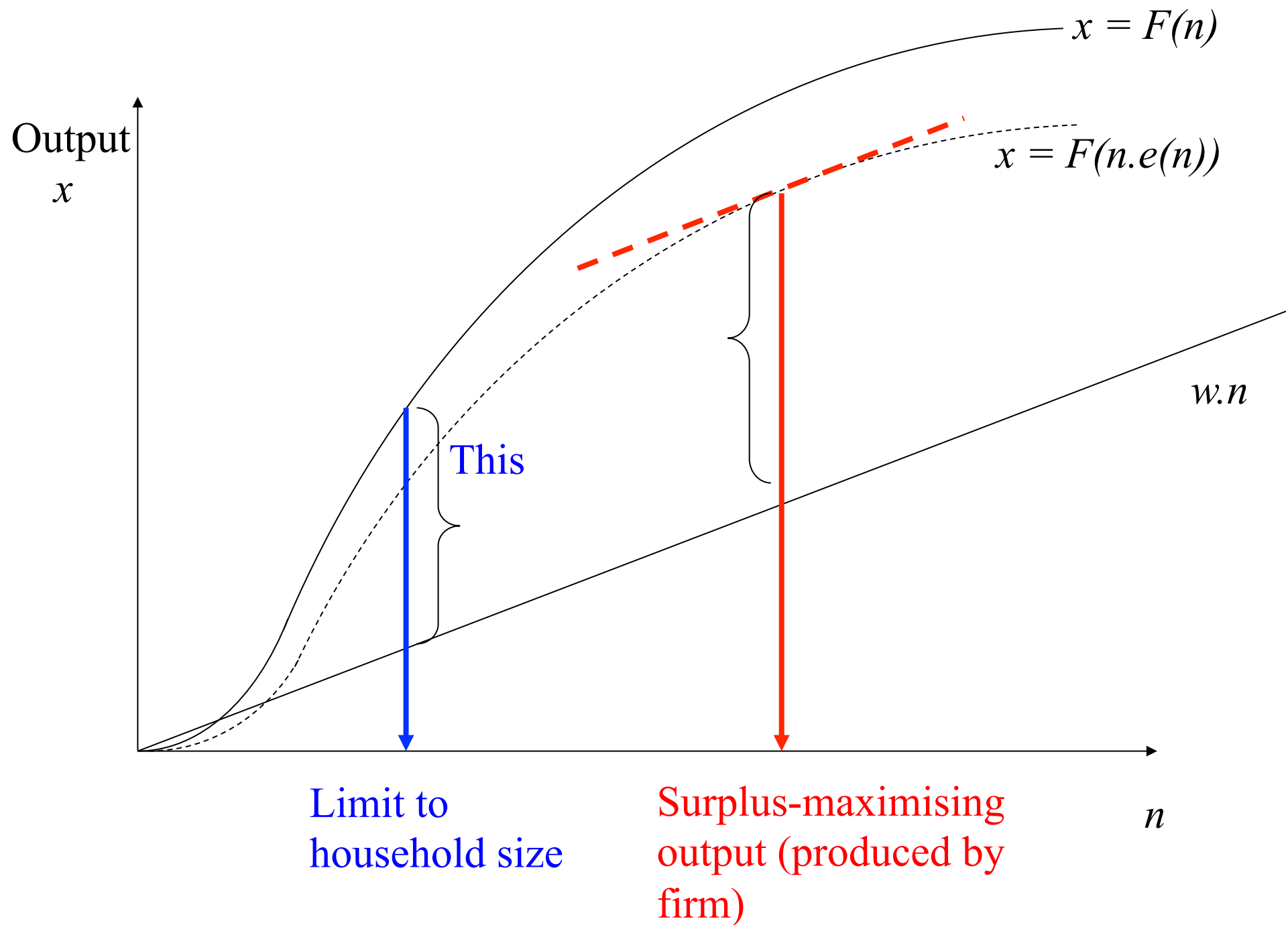


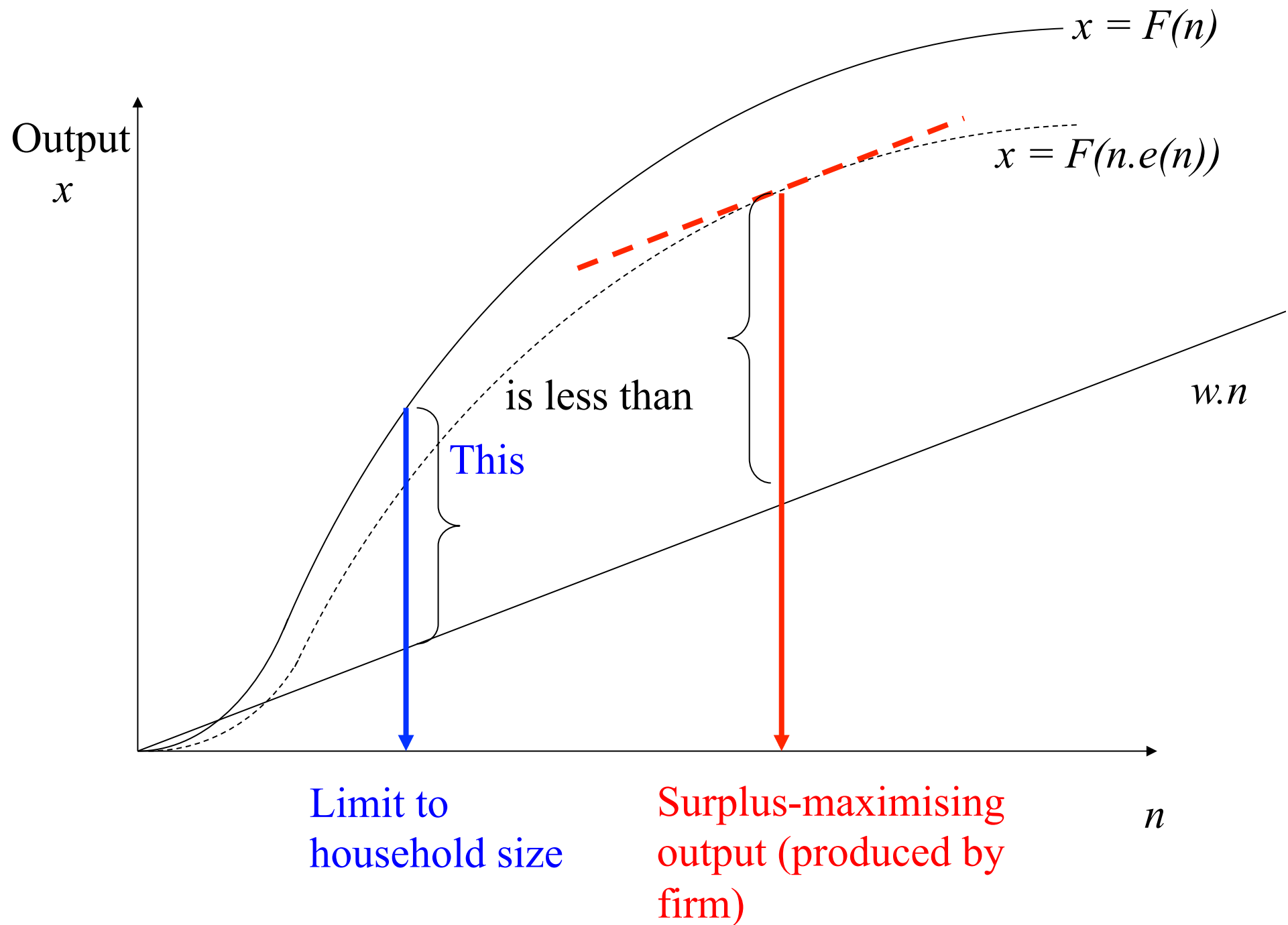


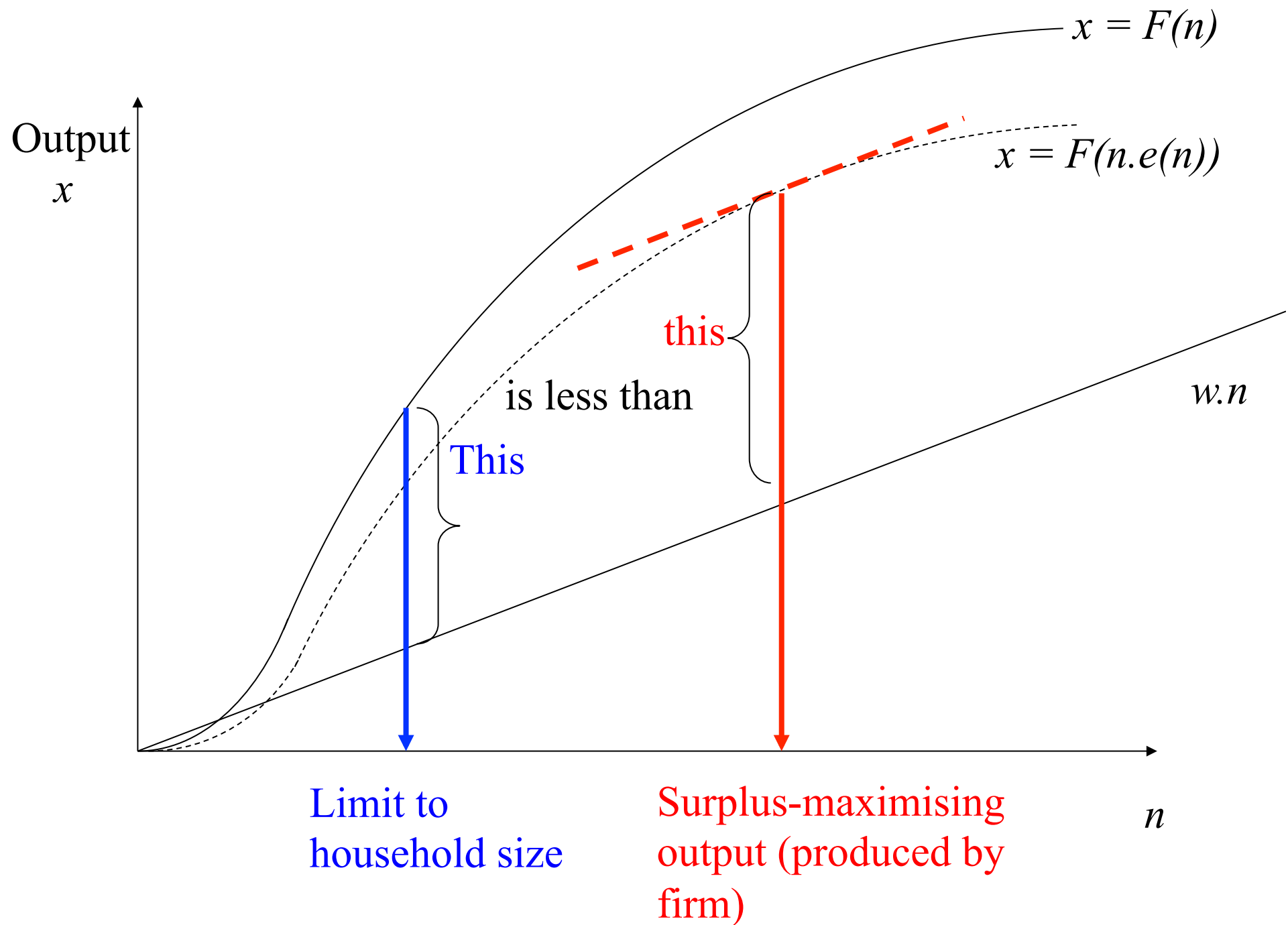












Implications:

- Efficient size of firms depends on wage rate:
 - $n^*(w)$ solves $\text{Max } F(n.e(n)) - wn$
 - Good will be produced in households if:
 - $F(n^*e(n^*)) < F(M)$, otherwise in firms
 - Decrease in wages favours firms:
 - $n^*(w)$ is decreasing in w
 - Increase in size of economy has 2 effects:
 - demand and supply of labour both increase
 - net impact depends on wage rates
-

More general lessons

- Institutions can be seen as a response to contractual incompleteness
- Without formal enforcement individuals need incentives to cooperate
- Kinship is one incentive; there are others
- Institutions create coordinated expectations about the behaviour of others



What about media of exchange?

- In principle economic exchange is all about trading something you have for something you want – a “barter” phenomenon
 - But in complex economies direct barter is rare – why?
 - The usual reason the “double coincidence of wants” (Jevons 1893).
 - A good modern example is the incompatibility of kidney donors and transplant patients – (for kidney exchanges, see Roth et.al.)
 - But even with reduced search costs (eg via internet), barter can be difficult because of the double quality verification problem
 - Banerjee & Maskin (QJE 1996) have proposed an elegant “Walrasian theory of money and barter”
-

The Banerjee-Maskin model

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- 3 goods, each of which comes in two quality levels, High and Low
 - Each trader can tell the difference between High and Low qualities of goods only if she either consumes or produces them
 - Therefore in competitive equilibrium only low qualities are traded
 - There is no single market but there are markets for each good, so a medium of exchange is necessary
 - Only one good serves as a medium of exchange – the one for which the difference in the value of Low and High qualities is the smallest
 - If the good is costly to produce, equilibrium is inefficient because too much is produced relative to the first best
-

What could serve as a medium of exchange?

- Gold or silver coinage had two major advantages due to historical innovations:
 - Archimedean specific gravity test
 - Serrated edge of coins
 - Non-counterfeitable paper money (called fiat money) is even better because it is much cheaper to produce
 - In some circumstances other standardized goods could serve: cigarettes in prisoner-of-war camps
 - What was special about cigarettes? (Not that everyone smoked) Rather, that everyone could tell the quality
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