

**Studying for the Exam.** The best method of studying for the class exams is to (i) take notes while attending lectures and when reading the web notes, (ii) if you watch the prerecorded lectures, do the same things, (iii) take the quiz-homeworks seriously (study for them) and (iv) work through this study guide. The exams are in-class this semester and, a well-organized set of notes can also help you review for the exams and also help put the material covered in lecture into your minds..

Everything covered in the lectures and notes may be included on the exam, although the exam will focus most of its attention on the material covered after the second exam.

The hardest questions on the study guide are more difficult than the hardest questions on the midterm. And the easiest questions are easier than those likely to turn up on the exam. So, if you can do everything on the study guide you should be in good shape for the exam. The actual problems on the exam will be similar to, but somewhat different from the practice problems included below.

**I. Identify and Define (2 or 3 sentences)**

- a. Nash Equilibrium
- b. Dominant Strategy
- c. Best Reply Function
- d. Hobbesian Dilemma
- e. Commons Problem
- f. Free Rider Problem
- g. Coordination Problem
- h. Externality Problem
- i. Shirking Dilemma
- j. Ethical Dispositions
- k. Social Dilemma
- l. Pareto Superior Move
- m. Utilitarian Ideal
- n. Creative destruction
- o. Progress
- p. Shirking Dilemma
- q. Work Ethic
- r. Capital Accumulation
- s. Innovation Commons
- t. Joseph Schumpeter
- u. Frank Knight
- v. Median Voter
- w. Democratic Indecisiveness
- x. Democratic Poverty Trap

**II. Matching**

People/Terms	Definitions/Identities
Best Reply Function	The problem that occurs when every policy that receives majority support over some other option can be “beaten” in a subsequent referendum by another possible choice
Adam Smith	An American economist who argued that insurance markets can shift risks to the least risk averse, although this is not always possible for truly uncertain outcomes
Alfred Pigou	A move from one possible outcome to another that makes at least one person better off without making any other worse off
Cycling Problem	An English economist who argued that at least part of the trade that one observes is due to a “propensity to truck, barter, and exchange”
Frank Knight	A possible outcome in a game where no individual player has an incentive to alter his or her choice of strategy, given the choices of all others
Innovative Dilemma	A problem associated with the capital investment efforts of individuals in a community. Each capitalist may, in a sense, free ride on the investments of others, with the result that the community is less prosperous than it could have been.
Joseph Schumpeter	A function that describes a player’s best response to the various strategy choices that another player (or group of players) might make
Majoritarian Poverty Trap	An Austrian economist who argued that constant innovation was necessary for a firm to be successful in a competitive commercial society
Median Voter	An English economist who argued that aggregate economic output is often a good proxy for aggregate utility
Nash Equilibrium	A problem than can arise when voters favor large-scale tax and transfer programs that undermine incentives to work, save, and innovate.
Pareto Superior Move	A voter whose ideal policy, $G^*$ , is in the middle of the distribution of voter ideal points. The same number of voters prefer a higher level of $G$ than $G^*$ as prefer a level below $G^*$ .
Shirking Dilemma	A problem that can arise because of complementarity among different types of labor. Each worker increases the productivity of others, but may work less than required to maximize everyone’s output or

	income.	
Team Production Dilemma	A problem associated with the inventive efforts of individuals in a community. Each inventor may, in a sense, free ride on the efforts of others, resulting in fewer desirable inventions and lower economic growth than might have been.	

**III. Applications of Game Theory and Ethics to Social Dilemmas that Affect Rates of Economic Development**

1. **On the Advantage of Peace: Escaping from Hobbesian Anarchy.**  
Use a 3 by 3 game matrix to characterize the "Hobbesian Jungle."
  - a. Is there a Nash equilibrium?
  - b. Is the Nash equilibrium Pareto Optimal?
  - c. Now assume that both players have internalized a "better to produce than steal" norm. Show how the payoffs may change enough to escape from the Hobbesian dilemma.
  - d. In a larger society, would it be necessary for everyone to internalize this norm for peace to emerge?
  - e. Discuss how government can substitute or augment internalized norms that oppose attacking others.
  - f. Illustrate how a law enforcing organizations punishment of the attack strategy can avoid the Hobbesian dilemma.
2. **On the problem of fraud.** Construct a 3x2 game matrix that illustrates the problem of fraud. Assume that transactions cost exist and that fraudulent offers are potentially more profitable than honest one.
  - a. Find the Nash equilibrium.
  - b. Explain the nature of the problem at that equilibrium.
  - c. Explain how ethical producers may avoid this problem?
  - d. Explain why ethical producers tend to "crowd out" (displace) dishonest ones as their reputation(s) for honesty spreads.
  - e. In what sense can market be said to support ethical conduct by sellers

and producers?

3. **On the advantages of Promise Keeping.** Construct a 3x3 game in which two persons can keep their promises all of the time, half of the time, or none of the time. Assume that for this community, keeping one's promises always yields the greatest aggregate utility, but that individually each person benefits when he/she breaches their promise and the other keeps theirs.
  - a. Characterize the Nash equilibrium of this game
  - b. Are their mutual gains from adopting a norm of promise keeping?
  - c. Are their mutual gains from paying an enforcer (government) to enforce promises/contracts?
  - d. Show how either of the above can increase aggregate utility. (Hint: show how internal and external sanctions can change the payoffs and equilibrium.)
  - e. Show that either of the above solutions can be a Pareto Superior move.
4. **On the advantages a Work Ethic.** (a) Construct a 3x3 game in which two persons contribute to each other's productivity. The team's total output increases with each person's (team member's) work. However, suppose that the private rewards of free riding are always greater than those of working hard.
  - b. Characterize the Nash equilibrium of this game
  - c. Are their mutual gains from internalizing a norm of working hard?
  - d. Are their mutual gains from paying an enforcer (firm owner or coop manager) to punish shirking?
  - e. Show how either of the above can increase aggregate output and utility. (Hint: show how the internal and external norms change the payoffs and thereby change behavior, etc. and/or show how a work ethic affects the demand for labor and average salaries.)
  - f. How do these results relate to Max Weber's theory of the emergence of capitalism?
  - g. How do these results relate to Mill's theory that prosperity (and aggregate utility) tend to increase as persons become "better" at cooperation.

- h. Explain why "ethical employees" might be paid a premium wage for their services—other things (job related skills) being equal.
5. **Market Support for Ethical Dispositions.** (a) In what senses can labor markets be said to support ethics? (b) What ethical dispositions would and would not be supported by market rewards? (c) Create a diagram that shows how personal, social, market, and law enforcement affect individual investments in ethical dispositions.
6. **On the ethical escapes from free-rider problems.** Construct a 2x2 game in which two persons can jointly produce or pay for a pure public good (such a clearing a sidewalk or road of snow).
- a. Explain why your game (its strategies and payoffs) illustrate the free rider problem that affects the supply of public goods.
- b. Show how an internalized ethic can solve the problem.
- c. Show how subsidies for contributions can solve the problem.
- d. Explain why subsidies may be useful even in cases in which ethical dispositions tend to reduce free riding in many situations.
7. **Economic Development.** Construct 3x3 game matrices to illustrate why under specialization, under accumulation of capital, and low rates of innovation may occur. (Hint: the matrices for all three of these problems are very similar.) (a) Find the Nash equilibria in each case and (b) explain why the results are less than ideal—e.g. generate a lower economic growth rate than that which advances the interests of the players involved. (c) Show and discuss how changes in normative or ethical dispositions can accelerate economic development, given these dilemmas.
8. **The Law Enforcement Dilemma.** (a) Explain why pragmatic law enforcers would tend to be extractive rather than productive. (b) Explain why such enforcers may reduce rather than improve the attractiveness of Lockean communities. (c) Explain why choosing enforcers with internalized norms can solve this problem, whereas the establishment of an anti-corruption agency does necessarily do so.
9. **Majoritarian Indecisiveness.** (a) Develop a series of votes that illustrates the majoritarian indecisiveness dilemma (majoritarian cycles). (b) Explain why this tends to be a problem—that is, why this tends to undermine democratic policy making. (c) Explain and show how norms can resolve this problem even if everyone has not internalized the same norms.
10. **The Democratic Poverty Trap:** (a) Explain why democracies tend to engage in excessive redistribution if all voters are pragmatists. (b) Use a demogrant program to illustrate the problem. (c) Explain why some norms can reduce this problem while others may increase it. Use a diagram to illustrate the effects of such norms on the extent of taxation and the size of demograts.
11. **On the Dilemma of the Next Election.** (a) Explain why pragmatic office holders might not want to hold the next election. (b) Explain why pragmatic voters who favor the policies adopted by the persons elected in the last election, may want to postpone the next election. (c) Explain, why constitutional norms are necessary if an initially democratic polity is to remain democratic. (d) Explain why future open and fair elections are more likely when a sufficient number of moderate voters (on all sides) have such internalized norms.

#### IV. Conceptual Problems and Puzzles

12. (a) Explain the nature of the Hobbesian dilemma (in words). (b) Develop a game matrix that illustrates the problem. Label all relevant details. (c) It can be argued that humans have largely solved this problem within communities, but not among communities. Explain what is meant by this, and also discuss the extent to which partial solutions among groups have emerged. (d) Discuss why differences in community norms may generate conflict among communities.
13. One of the themes of the second part of the course is that internalized norms can solve a variety of social dilemmas that reduce the attractiveness of living in communities. (a) Describe a few of the dilemmas and why they tend to make living in communities less attractive or impossible. (b) Develop game matrices that illustrate the problems listed. (c) Explain how norms might emerge in small groups, if they recognize the nature of the problem. (d) Explain how such a norm may be internalized (habitualized) by members of the community and solve the prob-

- lem addressed. (e) Show how internalize norms can solve the problems developed in part b of this question.
14. One difference between John Locke's conception of the "natural state" and Thomas Hobbes' conception is that Locke argues that people have already internalized ethical rules (natural laws) and these help reduce conflict and promote productive relationships even if there is no law enforcing organization. (a) Explain why this may be true if norms emerge that ameliorate social dilemmas as argued in this class. (b) What are the limits of this process, if any?
  15. The emergence of market networks requires a variety of economic dilemmas to be solved or ameliorated. Among these are problems associated with exchange, fraud, specialization, team production, the accumulation of capital, and increasing useful innovations. (a) Use game matrices to characterize these problems. (b) Show and discuss how internalized norms can solve these problems. (c) Discuss how solutions to these problems can increase economic development and lead to the emergence of commercial societies.
  16. Governments can potentially play a role in the process through which commercial societies emerge, but to encourage rather than discourage commerce, requires various political dilemmas to be solved. In democracies, this includes problems associated with indecisiveness, excessive redistribution, voting for policies that tend to promote—rather than impede—economic development, selecting representatives with appropriate ethical dispositions, including ones that encourage constitutional constraints to be abided by. (a) Develop game matrices to illustrate this series of problems. (b) Show how particular normative dispositions can solve or ameliorate these problems. (c) Explain why extractive regimes tend to retard rather than encourage economic development in the long run. Explain why productive governments are difficult to establish and sustain.

## V. Putting It All Together

1. Public Policies and Prosperity. (a) Explain how different normative theories affect the policy preferences of voters. (b) Explain why some policy preferences tend to discourage rather than encourage economic growth. (c) Explain why policies that discourage economic development are more likely when all voters and/or all politicians are pragmatists.
2. Private Ethics and Prosperity. (a) Explain briefly how internalized norms affect the level of economic activity. (Hint provide a short list of problems that must be overcome for markets emerge and flourish and norms that tend to solve those problems.) (b) Explain 3 factors that contribute to economic growth. (c) Explain how internalized norms affect the extent to which economic growth takes place through effects on those factors (both positive and negative). (d) Explain why specialization tends to increase prosperity.
3. Herbert Spencer (1851) claims that ethical disposition could in principle evolve to solve all of a community's social dilemmas. In that case, he argues, no governments would be required. Briefly discuss the logic of Spencer's conclusion.
4. James Buchanan has argued that small groups may jointly adopt rules while, in effect, sitting around a campfire discussing problems that the group confronts. He argues that the agreements would be "enforced" by some combination of promise keeping and reciprocity norms. (a) Explain how a reciprocity norm such as a tit-for-tat may produce behavior in accord with the rules agreed to at the campfire without requiring the norm or rule to be internalized. (b) Now explain why such rules tend to work better if they eventually become internalized. (Hint: use one of rules that can solve one of the dilemmas developed in class as an illustration of Buchanan's "norm by agreement" principle.) (c) Discuss settings in which tit-for-tat generates results that are inferior to those associated with other norms.

5. Putting the Two Halves of the Course Together. (a) Discuss how changes in widely internalized norms during the 18<sup>th</sup> and 19<sup>th</sup> centuries tended to increase rates of economic growth. (b) Explain why relatively rapid growth is necessary to avoid the Malthusian/Smithian trap associated with increases in population growth than have formerly been associated with periods of prosperity.

**VI. Some Game Matrices to Practice On**

Find the Nash Equilibria to the following games and determine whether there is a “dilemma” or not. If there is one, explain the nature of the dilemma. If not explain why there is not.

**Game Matrix 1**

Al \ Bob	Work	Shirk
	(A, B)	(A, B)
Ea = 8	10, 10	6, 12
Ea = 4	12, 6	8, 8

**Game Matrix 2**

Al \ Bob	Accept Offer	Reject Offer
	(A, B)	(A, B)
Make Offer	10, 8	-3, -1
Don't Make Offer	-1, -3	5, 5

**Game Matrix 3**

Al \ Bob	Eb= 8	Eb=6	Eb=4	Eb=2
	(A, B)	(A, B)	(A, B)	(A, B)
Ea = 8	10, 10	8, 11	6, 12	5, 13
Ea = 6	11, 8	9, 9	7, 7	6, 11
Ea = 4	12, 6	10, 7	8, 8	6, 9
Ea = 2	13, 5	11, 6	9, 6	7, 7

**Game Matrix 4**

Al \ Bob	Eb= 8	Eb=6	Eb=4	Eb=2
	(A, B)	(A, B)	(A, B)	(A, B)
Ea = 8	10, 10	8, 11	6, 12	5, 13
Ea = 6	11, 8	8, 8	7, 7	5, 6
Ea = 4	12, 6	7, 7	6, 6	5, 5
Ea = 2	13, 5	6, 5	5, 5	4, 4

- As an exercise, construct a 3x3 game with a Pareto optimal equilibrium (i) in the middle cell (ii) in the upper lefthand cell, (iii) in the upper righthand and lower lefthand cells.
- As an exercise, construct a 3x3 game with a dilemma equilibrium (i) in the middle cell (ii) in the upper lefthand cell, (iii) in the upper righthand and lower lefthand cells. Explain the nature of the dilemma in each case.