

Project # 1

Modeling Economic Policies as Games

In the syllabus, I said that we will study “why don’t companies go green?” That is exactly what we are going to study with our first project! What is game theory if you don’t play games? In this assignment, everyone will be paired in two, pretending to be two competing cleaning companies – Prof. Klenital and Dunne N. Dusted – both are looking at whether they should continue with their standard cleaning formulas or if they should release an eco-friendly formula. One can assume that these two firms make up the entire cleaning products market, so there is no outside influence that needs to be considered.

Below you will see the first normal form game represented. There are the two firms—Prof. Klenital (P) and Dunne N. Dusted (D) – who each have two options. Either they can prepare an eco-friendly cleaning chemical and go green (G) or stick to the standard conventional formula (C). The payoff matrix is presented in Table 1.

		Dunne N. Dusted	
		G	C
Prof. Klenital	G	4, 3	2, 4
	C	5, 1	3, 2

Table 1: Standard “Going Green” Game

Now we consider the second normal form game. Prof. Klenital has been in the business a long time and is known to be anti-greenwashing, so newer companies like Dunne N. Dusted have to contend with Prof. Klenital’s legacy. The payoff matrix is presented in Table 2.

		Dunne N. Dusted	
		G	C
Prof. Klenital	G	4, 4	3, 1
	C	4, 1	2, 2

Table 2: Modified “Industry Standard” of the Going Green Game

Lastly, we consider the third game. Although Dunne N. Dusted is newer, their marketing team is impeccable. If both firms choose the same option, Dunne N. Dusted will outsell the other firm. However, if they choose different options, Prof. Klenital will undercut on price so consumers will choose that option. The payoff matrix is presented in Table 3.

		Dunne N. Dusted	
		G	C
Prof. Klenital	G	1, 5	5, 3
	C	5, 2	4, 5

Table 3: Modified “Brand Building” of the Going Green Game

Assignment

1. Play the standard “Going Green” game.

- Play the normal form game represented in Table 1 30 times statically, i.e. simultaneously and independently. With every round have each player mark down their choice, their partner’s choice and your running total of points.
- Play the game 15 times with Prof. Klenital going first, then Dunne N. Dusted playing after. With every round have each player mark down their choice, their partner’s choice and your running total of points. Note, this is no longer a static game because one person is going first. In fact, this is called “dynamic”, which we will study at the end of the GT module.
- Play the game 15 times with Dunne N. Dusted going first, then Prof. Klenital playing after. With every round have each player mark down their choice, their partner’s choice and your running total of points.
- Take a photo of you and your partner meeting up and playing this game.

2. Play the “Industry Standard” game.

- Play the normal form game represented in Table 2 30 times statically, i.e. simultaneously and independently.
- Play the game 15 times with Prof. Klenital going first, then Dunne N. Dusted playing after.
- Play the game 15 times with Dunne N. Dusted going first, then Prof. Klenital playing after.

3. Play the “Building a Brand” game.

- Play the normal form game represented in Table 3 30 times statically, i.e. simultaneously and independently.
- Play the game 15 times with Prof. Klenital going first, then Dunne N. Dusted playing after.
- Play the game 15 times with Dunne N. Dusted going first, then Prof. Klenital playing after.

4. **AFTER DOING THE ABOVE, analyze the above games using skills taught in this course.**
 - (a) For each game, find the IESDS-equilibrium, if there are any.
 - (b) For each game, find the Nash Equilibrium, if there are any. Are there any relationships between IESDS and Nash?
 - (c) Rich Mann, the CFO at Prof. Klenital, said, “it is always better to make your decision second because you get to respond and do what is best!” Is this true? Respond based on the games above and with your own experience in the project.
5. **Write a 3-5 page report on this project with your detailed work included. This should include all of the technical work above.**
6. **Prepare a 5-7 minute presentation based on the following questions:**
 - (a) Are any of these games fair? (You have to define “fair” with your group first.)
 - (b) What is your personal relationship to risk, and how was that seen in the above games?
 - (c) How did your strategy change as you played each game. Use MATLAB to plot your percentage of choosing G over time, and compare this to the analyzed equilibrium.
 - (d) How does this connect to real world issues? What is one sustainability issue you and your partner care about? Can you set it up as a normal form game?
7. **Individually, end your report with feedback for this project. (This will not count for or against the 3-5 page report.) What did you like? What didn’t you like? What worked well? What didn’t? How long did this take you? Is there anything else you want me to know to make the project better for future years?**

Teams

Group Number	Prof. Klenital	Dunne N. Dusted
1		

Rubric

The rubric is a direct reflection of the learning objective for this course:

- Breaking down problems into smaller, tractable steps
- Connecting what we are learning to the real work
- Communicating technical details to a general audience
- Working on a project with people in an equitable and responsible fashion.

The last learning objective will be measured by your peers on how the work was split, performed, and communicated.

Below is the rubric that the professor will use to evaluate.

Presentation	Points
<i>Delivery</i> (13 points)	
Topical Knowledge (10 points)	
Time Limit (3 points)	
<i>Content</i> (12 points)	
Titles/ Headings (2 points)	
Informative (7 points)	
Cohesive Story (3 points)	
<i>Total Presentation Points</i>	
Report	Points
<i>Content</i> (50 points)	
Picture of playing the game (5 points)	
Written records of the above games (10 points)	
IESDS analysis (15 points)	
Nash equilibrium (15 points)	
Stackelberg analysis (5 points)	
<i>Clarity</i> (10 points)	
Technical Communication (5 points)	
Supporting Data (5 points)	
<i>Formatting</i> (5 points)	
Font (1 point)	
Executive Summary (1 point)	
Page Number (2 points)	
Correct Margins (1 point)	
<i>Total Report Points</i>	
Presentation (25 points)	
Report (65 points)	
Peer Review (10 points)	
<i>TOTAL PROJECT POINTS</i>	

Name: _____

Group #: _____

Category	0: Improving	1: Good	2: Excellent	Total
Communication	Communicating with this student was difficult. It was hard to get ahold of them, and when talking to them, it was sparse and disconnected.	Communicating with this student was overall good. They were somewhat repsonsive to messaging about meeting. They were receptive to chatting.	This student was great about communicating where they were, what they needed to do, and helped make the project succeed.	
Content	This student doesn't have mastery of the content, and it slowed the project down	This student has a good grasp on the content and made accurate and correct contributions to the project	This student has mastery of the material. They clearly know what is going on, and everything they added to the project was correct and beneficial	
Workload	This student contributed very little to the content of this project. They did not pull their fair share.	This student overall did their fair share, but it did require check-ins and reminders.	This student did their fair share or more. They were willing to add more content and go above and beyond.	
Presentation	This student did a poor job presenting the material, either from reading off the slides, not knowing the material, etc.	This student presented well. They knew what they were talking about and were engaging.	This student showed mastery in presenting. They laid out a wonderful narrative arc and were very engaging.	
Attitude	This student had a poor attitude about the project. It made working with them uncomfortable.	This student had a positive attitude and made this project fun.	This student had a wonderful attitude. They were really excited, interested, and motivated to help.	
<i>Peer Review Points</i>				