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# THE COMPETITION GAME: DECISION MAKING IN A DYNAMIC ENVIRONMENT

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## *ABSTRACT*

*The Competition Game creates an environment in which individual teams must make decisions based on possibly imperfect information and with conflicting goals. The game consists of several independent rounds that may be conducted separately or in series. This gives the instructor the flexibility to use all or portions of the game to meet individual class requirements. The individual components of the game allow players to explore the effects of production capacity, production costs, market demand, and government controls within a competitive market. The game also allows players to control certain aspects of the information flow relevant to the market, and players create their own ethical business environment.*

## INTRODUCTION

One of the most difficult concepts to convey to students is the dynamic nature of decision making under incomplete or possibly inaccurate information. Problems in books have solutions in the back. Case studies have solutions in instructor's manuals, and some of these solutions can even be found posted on the internet. Computer simulations are often based on a spreadsheet model that includes predetermined parameters that result in a "winner" when the "right" decisions are made. While all of these educational experiences have an inherent value, they lack the real-time interactions found in competitive markets, and these are the types of markets in which students will eventually live and work.

The Competition Game is a family of single-period games that explore the various aspects of a competitive market. The different inputs to decision making, production capacity, product cost, and market demand, are treated separately. These exercises are further expanded by limiting or allowing information flow among the competitors, though there is no requirement for honesty. Further extensions of the game introduce government, both corrupt and honest, and demonstrate how external factors can influence decision making. The actions of the players will define the ethical environment of the market.

Since the Competition Game covers many aspects of business, it is too long to be completed in a single class session. The game was constructed to allow an instructor to use as much or as little of the game as appropriate for the class in as many class sessions as needed. An instructor can choose to conduct one round per class for several classes or several rounds in a single class or just a single round in a single class. The structure of the Competition Game is flexible enough to meet any pedagogical needs.

## OBJECTIVES AND BACKGROUND

The first objective of the Competition Game is to provide students with the opportunity to make production allocation decisions within a competitive market. Since the decisions deal with allocation of production rather than the production process itself, the determination of production capacity and selling that production within the same period focuses the decision process on the allocation problem. A second objective is to examine the manner in which information can be used in the production allocation decision. Since no requirement is made for teams to provide any information or accurate information, this allows the teams to create their own business environment and ethical system. The development of this ethical framework is the third objective of the simulation.

The Competition Game draws upon a rich heritage of games and simulations. Keyt and Cadotte (1981) created a game that demonstrated the complex interaction of production decisions. This was a multi-period game that allowed groups to interact and introduced random factors determined by the roll of the dice. While comprehensive games have their place, it is often useful for the instructor to have an exercise that can be conducted in a single period (Brozik & Zapalska, 1997). In order to construct a single-period exercise that is meaningful to the students, it is necessary to simplify the market structure (Thavikulwat, 1988) and create an environment that is intuitive (Cannon & Ternan, 1997). Additional benefit can be gained if an

ethical dimension can be designed into the exercise (Scott, Schumann, & Anderson, 1998).

The Competition Game was designed to meet all these requirements. Each of the various modules (rounds) is independent and can be played relatively quickly because the market structure has been simplified. This market, however, can be understood by the students, and student interaction creates a unique ethical environment. Random values introduced by the use of dice further assure that no two simulations will be the same, even when using the same module. The Competition Game brings together some of the best ideas of game design in a single exercise.

## THE COMPETITION GAME

In a competitive market, firms are forced to compete with other firms that have different production capacities and production cost structures. Information concerning the competition is usually incomplete and possibly inaccurate. Knowledge of the market demand for various products may not be available. The managers of each firm must make their decisions concerning production and product mix in a very uncertain environment. Life at the top can be rough.

The Competition Game creates a controlled, uncertain environment for decision making. Players are formed into teams that must decide what is best for their firm, in the presence of other teams trying to do what is best for their firms. Opportunities are created for collaboration and collusion, though teams are not required to communicate any information with any other party. The interactions of the teams develop a business ethic that can also be examined.

Each round of the Competition Game takes about 15 to 20 minutes. It is not necessary to complete the entire game in one session, and in fact it would be difficult to do so. The exercises are sequenced in a manner that allows the instructor to choose those that best match the class material. This means that the entire game could be completed in possibly three consecutive class periods, or the individual exercises could be done periodically throughout the term. The periodic scheduling of the game may actually prove more effective in some classes since it would allow students multiple exercises to break the flow of the normal class routine and give them time to assimilate what they learn in each particular exercise.

The Competition Game is designed to be played in a local environment without computer assistance. While some instructors might choose to create spreadsheets that duplicate the Instructor's Forms, it is not necessary to do so. All required calculations can be done easily in the classroom. The use of dice in the various rounds assures all players that they have the same opportunities for success as other players. There is no predetermination concerning which team will have what resources. In fact, it is possible that all teams can have either strong or weak resources. This assures that no two games are alike, and an instructor may repeat any section of the game under the new conditions dictated by the dice.

## PLAYING THE COMPETITION GAME

The Competition Game is designed to be played by four teams. Team sizes can vary between three and five members. For larger classes it is recommended that eight teams be formed and that they alternate playing the rounds. The mechanics of recording the results of each portion of the game will become complex when more than four teams are present. The teams should be formed at least one class session prior to playing the game by whatever protocol the instructor chooses. Each team is then given a Student Information Packet (Appendix A), which describes exactly how the game is played. This permits each team to use the time between classes to meet and possibly determine an initial strategy. The Student Information Packet contains all relevant information about the game and Tally Sheets to facilitate score keeping. The descriptions of the rounds dealing with Government Interaction (Appendix B) are not distributed at this point. These exercises are best left for after the completion of the other modules. The Instructor's Forms (Appendix C) include the various Master Tally Sheets and other schedules needed by the instructor.

The game is composed of several rounds, each designed to illustrate a specific dimension of decision making and the information flows associated with it. The format creates a rich enough environment that factors like group dynamics and market ethics can be examined. The areas explored in each round are:

- Round 1 - This round examines decision making in isolation. All groups have the same cost structure and production capacity, so there are no inherent differences in market power. No communication is allowed between teams, and the results of the round are totally random. Sometimes all groups will choose to pursue a middle-of-the-road strategy, and each group gets roughly the same score. The purpose of this round is to demonstrate the disadvantages of decision making without information.

- Round 2 - This round extends round 1, but the groups are allowed to communicate with each other. They can collude or allocate markets or do anything they wish. This gives the players a chance to experience the advantages of information and presents them with the opportunity to use it for personal gain. No requirement is made that the information exchanged must be accurate. Players are allowed to lie if they so choose. This is the beginning of the development of a market ethical system that may or may not change during the game.

- Rounds 3 and 4 - A roll of the dice is used to determine the production capacity of each group in each round. Manufacturing costs and market demand remain unchanged. Firms with greater production capacity have greater potential market power than those with less production capacity. During round 3, each firm must regard its production capacity as privileged information that cannot be released to the other firms. This restriction is removed in round 4. What becomes obvious in these rounds is that the firm with the greatest capacity often wins. Even with collusion, smaller firms are unable to overcome the superior production power of the larger firm. In these rounds, it becomes painfully obvious to some of the players that life may not be fair. Personalities begin to surface as individuals structure the information flow to meet their needs. Alliances can form between firms, and those firms that are perceived as not playing fairly develop a "reputation" which follows them to the later rounds.

- Round 5 and 6 - Several rolls of the dice is used to determine the manufacturing costs of each product of each group in each round. Manufacturing capacity and market demand remain unchanged. Firms with lower costs for specific products have greater potential market power than those with higher costs in those market segments. During round 5, each firm must regard its production capacity as privileged information that cannot be released to the other firms. This restriction is removed in round 6. In these rounds it becomes possible for all market participants to benefit by focusing their production on their lowest cost products. The existence of four firms and three products assures that at least two of the firms will still have to compete on at least one product line. In these rounds the firms often cut deals with each other to segment the markets, but there also may be "misunderstandings", intentional or not, about exactly what deal was made. The ethical environment is again tested.

- Rounds 7, 8, and 9 - These rounds explore the effects of changes in market demand. The demand schedules for each product are determined by the roll of the dice, but this should be done by the instructor before class in order to save time. The demand graphs are printed, and several copies of each graph (at least four copies) are placed in an envelope. During round 7, this information is not given to the teams. Round 7 is equivalent to round 2 without demand information and with the experience of working with the other teams. By this time the market ethical system should be in place, and the interactions of the teams will reflect this ethical system. In rounds 8 and 9, each team is allowed to draw one graph so that each team has one piece of information. Round 8 allows the information to be shared, but only by word of mouth. This round demonstrates whether or not the teams consider each other as trustworthy. In round 9 the teams can show their information to other teams, if they so choose.

The nine rounds allow the class to experience decision making under various conditions and to develop a market ethic. Subsequent discussion can focus on the value of specific market and product characteristics, the development of the information flow, and the behavior of market participants. It is instructive to foster a discussion concerning each team's opinion of the relative honesty of the other teams. There are definitely different opinions of exactly what happened, and it can be shown that concepts like truth and fairness can be relative or misunderstood.

The Competition Game to this point has examined firms and how they operate under various conditions, yet the role of government was ignored. It is possible to extend the game to illustrate the effects of both corrupt and clean governmental intervention. The forms associated with these exercises are found in Appendix B. These forms should not be distributed until the rounds are to be played.

In the government rounds G1 and G2, dice are used to establish different production capacities or costs in a manner similar to rounds 3 and 4 or rounds 5 and 6 (both versions are included in Appendix B). The instructor can choose whichever seems easiest based on previous experience in the class. In round G1, government officials are appointed with limited coercive powers, and their personal reward is tied to the success of their home team. This provides opportunities for members of the government to use information and power to create success for their home teams. There is no requirement for honesty, though students may behave honestly. A student who can see the value of corruption can profit therefrom. In round G2, the reward of the government is independent of team success, and coercive powers are increased. This permits the development of honest government. Discussion of these rounds demonstrates that outside influences can indeed affect corporate decision making.

There should be class discussion after each round concerning the success of each team and the market conditions that led to that success. Some of this discussion should focus on what information was available, the utility of this information, and the validity of the information. Students sometimes act as though they expect all other players to be totally honest at all times. This leads to the realization that the real world markets may not behave in such a manner. During the middle rounds, some of the discussion can be directed towards ways to improve performance in subsequent rounds. The final discussion

provides the overview to the problems of decision making in a dynamic environment.

## CONCLUSION

The Competition Game is designed to give students the opportunity to experience decision making in a dynamic setting. Competing firms may or may not have similar production processes. The firms may or may not have similar information. The information received may or may not be accurate. Government intervention may be corrupt or honest. The game shows the importance of information to decision making, and it also illustrates that market conditions may affect those decisions. Players are required to establish a market ethical system, and honesty may or may not be a part of that system. In short, the Competition Game allows students to experience a bit of the real world in the classroom.

The Competition Game gives the instructor the ability to tailor the learning experience to classroom needs. The game can be conducted in a concentrated or extended manner, and it is only necessary to use those modules appropriate to the class. Besides the exercise in decision making and information processing, the game creates a common body of experience that is rich enough to foster discussion concerning business ethics from an experiential angle. The Competition Game can be used many ways and thus provides the instructor with another approach to effective learning.

## REFERENCES

Brozik & Zapalska (1997) "The Market Game: Interactive Learning Through Market Simulation." *Developments in Business Simulation and Experiential Learning*, Volume 24, 1997, 166-171.

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Keyt & Cadotte (1981) "CHIPS: A Marketing Channels Management Game." *Developments in Business Simulation and Experiential Learning*, Volume 8, 1981, 242-246.

Scott, Schumann, & Anderson (1998) "Ethical Dilemmas to Use with Business Simulations to Teach Business Ethics." *Developments in Business Simulation and Experiential Learning*, Volume 25, 1998, 83-89.

Thavikulwat (1988) "Simulating Demand in an Independent-Across-Firms Management Game." *Developments in Business Simulation and Experiential Learning*, Volume 15, 1988, 183-187.

# APPENDIX A

# STUDENT INFORMATION PACKET

# COMPETITIVE MARKETS

**THE SCENARIO:**
Your firm is one of several international manufacturers of electrical generation and transmission equipment. Due to the recent power shortages in the United States and other parts of the world, there has been an increased demand for the products you manufacture. As managers of your firm, it is your responsibility to plan production and sales to meet the demands of a competitive market in order to maximize the wealth of your shareholders.

**THE COMPETITION:**
You have three major competitors that are roughly the same size and that produce equipment with the same capabilities as your firm's products. These four firms form an industry subgroup:

Northern Power Components
Eastern Electrical Equipment
Southern Transmission Systems
Western Energy Devices

These firms compete directly on the following items:

Turbine Generators (TG)
Voltage Transformers (VT)
Power Storage Units (PSU)

From the point of view of potential customers, your firm's products are interchangeable with those of any of your competitors. For example, a turbine generator from any of the four firms is considered to be identical in capability. (Note: A turbine generator is <u>not</u> interchangeable with a voltage transformer or power storage unit.)

**DOMICILE:**
None of the four firms is based in the United States even though the US is the major market for these products. Since the firms are not bound by US laws, there is no legal restriction (anti-trust laws) against sharing information between firms, but there is likewise no requirement that information be shared. The amount of information exchanged between firms is decided by the managers of the firm, as is the accuracy of that information. Even though these firms are based in different countries, since their products are sold in the US, all cost and price information is stated in US dollars.

**THE DECISION REQUIREMENT:**
In each round of the game, you will be required to decide how many of each type of product to sell in order to maximize the wealth of your individual shareholders. There are two specific production factors that you must consider in making your product allocation.

1. The quantity of each item you plan to produce must be a multiple of ten. For example, if you have 100 items to allocate, you can choose to produce 10 TG, 20 VT, and 70 PSU or any other combination that adds to 100 units as long as each individual allocation is a multiple of ten. You cannot choose to produce 3 TG, 5 VT, and 92 PSU. Should you choose to allocate production quantities that are not multiples of ten, the number that you choose will be rounded down to the nearest multiple of ten; this will result in your team losing production and thus losing revenues.

2. In order to maintain the ability to offer a product in the next round, you must offer at least 10 of that product in the preceding round. This requirement assures that the equipment and personnel needed for production will be available. For example, if in Round 1 you choose not to produce any TG, then you will not be allowed to offer any TG in Round 2. You will be allowed to offer TG in Round 3 should you wish to do so. The reason that you must skip the subsequent round after not offering a product is that it will take you this much time to restart the production process.

**THE GAME STRUCTURE:**

There will be multiple rounds to the game, each round examining a different aspect of competition and information flow. Cost and price structures may change between rounds, and it is your responsibility to make decisions in light of the changing market conditions. During each round, you will have approximately 10 minutes to decide your production mix.

**MANAGERIAL INCENTIVES:**

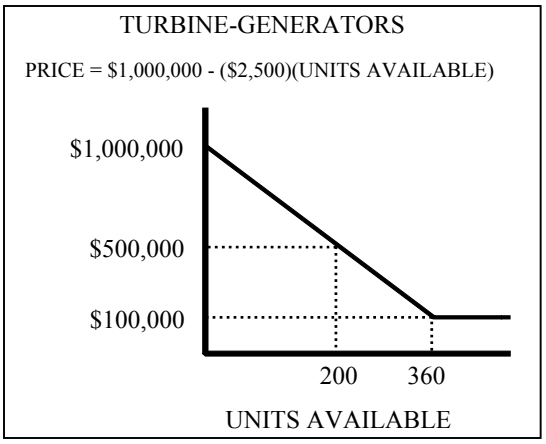
In order to receive credit for this part of the course, you will be required to submit a paper documenting the game and your performance during the game. This paper will be graded on a 100 point scale. The members of the winning team in each round of the game will receive a 5 point bonus which will be added to the grade on the paper. For example, if a single team is able to win four rounds, it would be possible for the members of that team to receive a score of 120 points on the 100 point paper (if the paper itself does not merit a score of 100, the bonus points will still be added to whatever score the paper receives). In each round, the members of the second place team will receive a bonus of 3 points, and the members of the third place team will receive a bonus of 1 point.

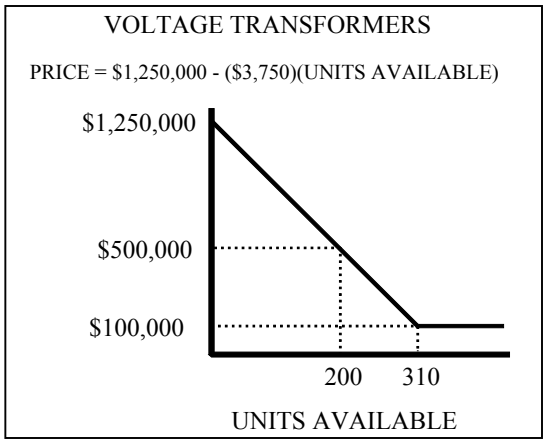
In the event of a two-way tie in any round, the combined points will be split equally between the two tying teams. If the tie involves more than two teams, that is, if three or more teams receive the same score in a specific round, no bonus points will be awarded to those teams for that round.

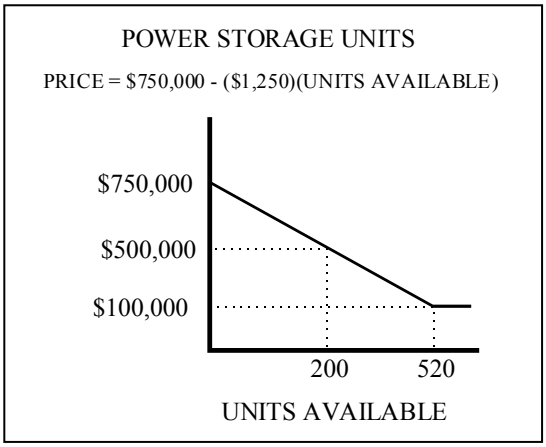
# COMPETITIVE MARKETS

# PRODUCT DEMAND CURVES

Product Demand: An industry marketing board has surveyed potential buyers of electrical equipment. Based on the information from this survey, the following demand schedules have been constructed for the products your firm manufactures. Due to market conditions, the minimum price for any product is $100,000 regardless of the quantity available in the market.



# COMPETITIVE MARKETS

## ROUNDS 1 and 2

Manufacturing Capacity: Each firm has the capacity to produce a total of 150 units. Due to the manufacturing process, it takes the same amount of time and materials for each product. The firm can therefore produce various combinations of finished products, like 150 TG and 0 VT and 0 PSU, or 50 TG and 50 VT and 50 PSU, or any other combination that totals150 units.

Manufacturing Costs: The cost to produce a single unit (TG, VT, or PSU) is $300,000.

Product Demand: See Product Demand Curve graphs.

## ROUND 1

Make your decision concerning your output mix without communicating with any of the other teams. Use the Tally Sheet to record your decision. Once all teams have announced their production decisions, the sales price of each item will be calculated, and you can calculate the total profits earned.

## ROUND 2

Prior to making the output mix decision, you may share information with the other teams. The type of information you share and its accuracy is up to you. You are under no compulsion to share information nor will there be any direct sanction for sharing inaccurate information. Use the Tally Sheet to record your decision. Once all teams have announced their production decisions, the sales price of each item will be calculated, and you can calculate the total profits earned.

# COMPETITIVE MARKETS

## ROUNDS 3 and 4

Manufacturing Capacity: Your firm's manufacturing capacity will be determined by the roll of the dice. One member of the team will roll 4 dice. Your total manufacturing capacity will be ten times the count of the dice. For example, if the total of the pips of the four dice is 16, your manufacturing capacity is 160 units of whatever products you choose.

Manufacturing Costs: The cost to produce a single unit (TG, VT, or PSU) is $300,000.

Product Demand: See Product Demand Curve graphs.

## ROUND 3

One member of the team will roll the dice to determine the production capacity for the firm. Prior to making the output mix decision, you may share information with the other teams EXCEPT information concerning your production capacity. You are to treat your production capacity as privileged information that is not to be shared in any way or form with outside parties. The other information you share and its accuracy is up to you. You are under no compulsion to share information nor will there be any direct sanction for sharing inaccurate information. Use the Tally Sheet to record your decision. Once all teams have announced their production decisions, the sales price of each item will be calculated, and you can calculate the total profits earned.

## ROUND 4

One member of the team will roll the dice again to determine a new production capacity for the firm. Prior to making the output mix decision, you may share information with the other teams INCLUDING information concerning your production capacity, if you choose to do so. The information you share and its accuracy is up to you. You are under no compulsion to share information nor will there be any direct sanction for sharing inaccurate information. Use the Tally Sheet to record your decision. Once all teams have announced their production decisions, the sales price of each item will be calculated, and you can calculate the total profits earned.

# COMPETITIVE MARKETS

## ROUNDS 5 and 6

Manufacturing Capacity: Each firm has the capacity to produce a total of 150 units.

Manufacturing Costs: The cost to produce a single unit (TG, VT, or PSU) will be determined by a roll of a die. For each product, the production cost will be

Cost = $150,000 + ($50,000)(pip count of the die)

For example, if the die cast for the turbine-generator is 4, the cost of producing a turbine generator is [$150,000 + ($50,000)(4)] = $350,000

Product Demand: See Product Demand Curve graphs.

## ROUND 5

One member of the team will roll the dice to determine the manufacturing costs for the firm. Prior to making the output mix decision, you may share information with the other teams EXCEPT information concerning your manufacturing costs. You are to treat your cost information as privileged, and it is not to be shared in any way or form with outside parties. The other information you share and its accuracy is up to you. You are under no compulsion to share information nor will there be any direct sanction for sharing inaccurate information. Use the Tally Sheet to record your decision. Once all teams have announced their production decisions, the sales price of each item will be calculated, and you can calculate the total profits earned.

## ROUND 6

One member of the team will roll the dice again to determine new manufacturing costs for the firm. Prior to making the output mix decision, you may share information with the other teams INCLUDING information concerning your manufacturing costs, if you choose to do so. The information you share and its accuracy is up to you. You are under no compulsion to share information nor will there be any direct sanction for sharing inaccurate information. Use the Tally Sheet to record your decision. Once all teams have announced their production decisions, the sales price of each item will be calculated, and you can calculate the total profits earned.

# COMPETITIVE MARKETS

## ROUNDS 7, 8, and 9

Manufacturing Capacity: Each firm has the capacity to produce a total of 150 units.

Manufacturing Costs: The cost to produce a single unit (TG, VT, or PSU) is $300,000.

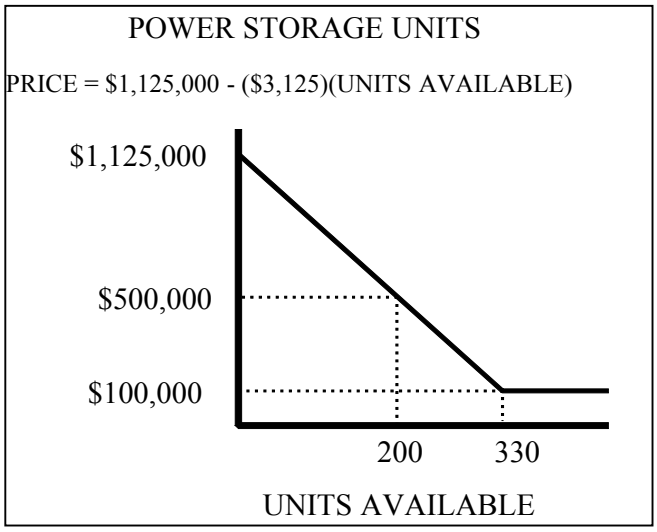
Product Demand: An industry marketing board has surveyed potential buyers of electrical equipment. Due to the vagaries of the market, it was not possible to identify a definite demand schedule for each firm. The demand schedule will be similar to that used in the other rounds; the unit price when 200 units are available is $500,000. It was not possible to identify the y-intercept of the demand function, however. For each product, the y-intercept will be determined by the dice. The instructor will roll a single die for each product, and the y-intercept will be calculated as:

y-intercept = $500,000 + ($125,000)(pip count on one die)

For example, if a 5 is rolled for power storage units, the y-intercept would be

[$500,000 + ($125,000)(5)] = $1,125,000

and the demand schedule would be as follows:




A separate demand schedule will be calculated for each product. The minimum price for any product is $100,000 regardless of the quantity available in the market.

## ROUND 7

Information concerning the product demand schedules will not be made available to the teams. This situation is roughly equivalent to working in an uncertain market. Prior to making the output mix decision, you may share information with the other teams. The type of information you share and its accuracy is up to you. You are under no compulsion to share information nor will there be any direct sanction for sharing inaccurate information. Use the Tally Sheet to record your decision. Once all teams have announced their production decisions, the sales price of each item will be calculated, and you can calculate the total profits earned.

## ROUND 8

Each team will be furnished with information concerning one of the product demand schedules. This information will be provided to you on paper, but if you choose to share this information with anyone else, you MAY NOT show the paper. You may tell any other party whatever you wish, but the paper must remain hidden. Prior to making the output mix decision, you may share information with the other teams. The type of information you share and its accuracy is up to you. You are under no compulsion to share information nor will there be any direct sanction for sharing inaccurate information. Use the Tally Sheet to record your decision. Once all teams have announced their production decisions, the sales price of each item will be calculated, and you can calculate the total profits earned.

## ROUND 9

Each team will be furnished with information concerning one of the product demand schedules. This information will be provided to you on paper. If you choose to share this information with anyone else, you MAY show the paper, but you do not have to do so. Prior to making the output mix decision, you may share information with the other teams. The type of information you share and its accuracy is up to you. You are under no compulsion to share information nor will there be any direct sanction for sharing inaccurate information. Use the Tally Sheet to record your decision. Once all teams have announced their production decisions, the sales price of each item will be calculated, and you can calculate the total profits earned.

# COMPETITIVE MARKETS TALLY SHEET

**Team Name/Members:** _____

**ROUND 1**

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | $300,000 | $300,000 | $300,000 | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | 150 |
| Total Profit per Product | | | | |
| | | | | Grand Total Profit |

**ROUND 2**

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | $300,000 | $300,000 | $300,000 | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | 150 |
| Total Profit per Product | | | | |
| | | | | Grand Total Profit |

# COMPETITIVE MARKETS TALLY SHEET

**Team Name/Members:** _____

**ROUND 3**

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | $300,000 | $300,000 | $300,000 | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | |
| Total Profit per Product | | | | |
| | | | | Grand Total Profit |

**ROUND 4**

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | $300,000 | $300,000 | $300,000 | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | |
| Total Profit per Product | | | | |
| | | | | Grand Total Profit |

# COMPETITIVE MARKETS TALLY SHEET

**Team Name/Members:** _____

**ROUND 5**

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | | | | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | 150 |
| Total Profit per Product | | | | |
| | | | | Grand Total Profit |

**ROUND 6**

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | | | | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | 150 |
| Total Profit per Product | | | | |
| | | | | Grand Total Profit |

# COMPETITIVE MARKETS TALLY SHEET

**Team Name/Members:** _____

## ROUND 7

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | $300,000 | $300,000 | $300,000 | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | 150 |
| Total Profit per Product | | | | |

Grand Total Profit

## ROUND 8

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | $300,000 | $300,000 | $300,000 | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | 150 |
| Total Profit per Product | | | | |

Grand Total Profit

## ROUND 9

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | $300,000 | $300,000 | $300,000 | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | 150 |
| Total Profit per Product | | | | |

Grand Total Profit

# APPENDIX B

# GOVERNMENT INTERACTION FORMS

# COMPETITIVE MARKETS

## ROUNDS G1 and G2

The market conditions can be set through the mechanisms described for either rounds 3 and 4 or rounds 5 and 6. The purpose of these rounds is to illustrate the functioning of government within a competitive business environment.

## ROUND G1
(Corrupt Government)

One member of each team is chosen to become a member of government. The government has access to all information. The task of the government is to convince the various firms to manufacture products so as to achieve the lowest overall cost to the general public subject to the condition that at least 100 of each product is made. In order for the government to have the ability to induce manufacturers to produce a certain mixture of items, the government has 10 bonus points that it is allowed to assign to the various manufacturers. This assignment must be announced prior to the firms announcing their production decisions. For the individual teams, the bonus points will be allotted in the normal fashion, 5 points for the highest profit, 3 points for the second highest, and so forth. The members of government will receive the same points as their "home" team.

## ROUND G2
(Clean Government)

One member of each team is chosen to become a member of government. The government has access to all information, but it cannot release private information to competing firms. The task of the government is to convince the various firms to manufacture products so as to achieve the lowest overall cost to the general public subject to the condition that at least 100 of each product is made. In order for the government to have the ability to induce manufacturers to produce a certain mixture of items, the government has 10 bonus points that it is allowed to assign to the various manufacturers. This assignment must be announced prior to the firms announcing their production decisions. For the individual teams, the bonus points will be allotted in the normal fashion, 5 points for the highest profit, 3 points for the second highest, and so forth.

Subsequent to the announcement of the production decision and the tally of profits, the government may by majority vote strip a single team of its bonus points. Only one team can have its bonus points taken away.
The members of government will receive 10 bonus points each if they are able to keep the total cost of all products in the market to within 10% of the lowest possible cost.

# COMPETITIVE MARKETS

The market conditions are the same as in rounds 3 and 4.

## ROUND G1

One member of each team is chosen to become a member of government. The government has access to all information. The task of the government is to convince the various manufacturers to manufacture products so as to achieve the lowest overall cost to the general public subject to the condition that at least 100 of each product is made. In order for the government to have the ability to induce manufacturers to produce a certain mixture of items, the government has 10 bonus points that it is allowed to assign to the various manufacturers. This assignment must be announced prior to the firms announcing their production decisions. For the individual teams, the bonus points will be allotted in the normal fashion, 5 points for the highest profit, 3 points for the second highest, and so forth. The members of government will receive the same points as their "home" team.

# COMPETITIVE MARKETS

The market conditions are the same as in rounds 5 and 6.

## ROUND G1

One member of each team is chosen to become a member of government. The government has access to all information. The task of the government is to convince the various manufacturers to manufacture products so as to achieve the lowest overall cost to the general public subject to the condition that at least 100 of each product is made. In order for the government to have the ability to induce manufacturers to produce a certain mixture of items, the government has 10 bonus points that it is allowed to assign to the various manufacturers. This assignment must be announced prior to the firms announcing their production decisions. For the individual teams, the bonus points will be allotted in the normal fashion, 5 points for the highest profit, 3 points for the second highest, and so forth. The members of government will receive the same points as their "home" team.

# COMPETITIVE MARKETS

The market conditions are the same as in rounds 3 and 4.

## ROUND G2

One member of each team is chosen to become a member of government. The government has access to all information, but it cannot release private information to competing firms. The task of the government is to convince the various manufacturers to manufacture products so as to achieve the lowest overall cost to the general public subject to the condition that at least 100 of each product is made.

In order for the government to have the ability to induce manufacturers to produce a certain mixture of items, the government has 10 bonus points that it is allowed to assign to the various manufacturers. This assignment must be announced prior to the firms announcing their production decisions. For the individual teams, the bonus points will be allotted in the normal fashion, 5 points for the highest profit, 3 points for the second highest, and so forth.

Subsequent to the announcement of the production decision and the tally of profits, the government may by majority vote strip a single team of its bonus points. Only one team can have its bonus points taken away.

The members of government will receive 10 bonus points each if they are able to keep the total cost of all products in the market to within 10% of the lowest possible cost.

# COMPETITIVE MARKETS

The market conditions are the same as in rounds 5 and 6.

## ROUND G2

One member of each team is chosen to become a member of government. The government has access to all information, but it cannot release private information to competing firms. The task of the government is to convince the various manufacturers to manufacture products so as to achieve the lowest overall cost to the general public subject to the condition that at least 100 of each product is made.

In order for the government to have the ability to induce manufacturers to produce a certain mixture of items, the government has 10 bonus points that it is allowed to assign to the various manufacturers. This assignment must be announced prior to the firms announcing their production decisions. For the individual teams, the bonus points will be allotted in the normal fashion, 5 points for the highest profit, 3 points for the second highest, and so forth.

Subsequent to the announcement of the production decision and the tally of profits, the government may by majority vote strip a single team of its bonus points. Only one team can have its bonus points taken away.

The members of government will receive 10 bonus points each if they are able to keep the total cost of all products in the market to within 10% of the lowest possible cost.

# COMPETITIVE MARKETS TALLY SHEET

**Team Name/Members:** _____

**ROUND G1**

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | | | | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | 150 |
| Total Profit per Product | | | | |
| | | | | Grand Total Profit |

**ROUND G2**

| Product | TG | VT | PSU | |
|---|---|---|---|---|
| Sales Price per Unit | | | | |
| Cost per Unit | | | | |
| Profit per Unit | | | | Total Units Sold |
| Units Sold | | | | 150 |
| Total Profit per Product | | | | |
| | | | | Grand Total Profit |

# APPENDIX C

# INSTRUCTOR'S FORMS

# MASTER TALLY SHEET

**ROUND 1**

| | TG | VT | PSU | Total units | Profit |
|---|---|---|---|---|---|
| **North** | | | | 150 | |
| **East** | | | | 150 | |
| **South** | | | | 150 | |
| **West** | | | | 150 | |

**ROUND 2**

| | TG | VT | PSU | Total units | Profit |
|---|---|---|---|---|---|
| **North** | | | | 150 | |
| **East** | | | | 150 | |
| **South** | | | | 150 | |
| **West** | | | | 150 | |

# MASTER TALLY SHEET

**ROUND 3**

| | TG | VT | PSU | Total units | Profit |
|---|---|---|---|---|---|
| **North** | | | | | |
| **East** | | | | | |
| **South** | | | | | |
| **West** | | | | | |

**ROUND 4**

| | TG | VT | PSU | Total units | Profit |
|---|---|---|---|---|---|
| **North** | | | | | |
| **East** | | | | | |
| **South** | | | | | |
| **West** | | | | | |

# MASTER TALLY SHEET

**ROUND 5**

| | TG | VT | PSU | Total units | Profit |
|---|---|---|---|---|---|
| **North** | | | | 150 | |
| **cost** | | | | | |
| **East** | | | | 150 | |
| **cost** | | | | | |
| **South** | | | | 150 | |
| **cost** | | | | | |
| **West** | | | | 150 | |
| **cost** | | | | | |

**ROUND 6**

| | TG | VT | PSU | Total units | Profit |
|---|---|---|---|---|---|
| **North** | | | | 150 | |
| **cost** | | | | | |
| **East** | | | | 150 | |
| **cost** | | | | | |
| **South** | | | | 150 | |
| **cost** | | | | | |
| **West** | | | | 150 | |
| **cost** | | | | | |

# MASTER TALLY SHEET

**ROUND 7**

| | TG | VT | PSU | Total units | Profit |
|---|---|---|---|---|---|
| **North** | | | | 150 | |
| **East** | | | | 150 | |
| **South** | | | | 150 | |
| **West** | | | | 150 | |

**ROUND 8**

| | TG | VT | PSU | Total units | Profit |
|---|---|---|---|---|---|
| **North** | | | | 150 | |
| **East** | | | | 150 | |
| **South** | | | | 150 | |
| **West** | | | | 150 | |

**ROUND 9**

| | TG | VT | PSU | Total units | Profit |
|---|---|---|---|---|---|
| **North** | | | | 150 | |
| **East** | | | | 150 | |
| **South** | | | | 150 | |
| **West** | | | | 150 | |

# BONUS POINT TALLY SHEET

| | SCORE | | | | | BONUS POINTS | | | |
|---|---|---|---|---|---|---|---|---|---|
| ROUND | N | E | S | W | | N | E | S | W |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| TOTAL BONUS POINTS | | | | | | | | | |

# BONUS POINT TALLY SHEET

| | SCORE | | | | BONUS POINTS | | | |
|---|---|---|---|---|---|---|---|---|
| ROUND | N | E | S | W | N | E | S | W |
| G1 | | | | | | | | |
| Government Assigned Bonus Points | | | | | | | | |
| G2 | | | | | | | | |
| Government Assigned Bonus Points | | | | | | | | |
| TOTAL BONUS POINTS | | | | | | | | |

| ROUND | Name of Government Official | BONUS |
|---|---|---|
| G1 | | |
| | | |
| | | |
| | | |
| | | |
| G2 | | |
| | | |
| | | |
| | | |
| | | |

## COMPETITIVE MARKETS DEMAND SCHEDULE MATRIX

### UNIT PRICES

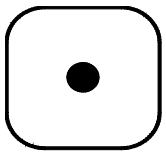
| INTERCEPT | $1,250,000 | $1,125,000 | $1,000,000 | $875,000 | $750,000 | $625,000 |
|---|---|---|---|---|---|---|
| SLOPE | -$3,750 | -$3,125 | -$2,500 | -$1,875 | -$1,250 | -$625 |
| # UNITS | | | | | | |
| 0 | 1,250,000 | 1,125,000 | 1,000,000 | 875,000 | 750,000 | 625,000 |
| 10 | 1,212,500 | 1,093,750 | 975,000 | 856,250 | 737,500 | 618,750 |
| 20 | 1,175,000 | 1,062,500 | 950,000 | 837,500 | 725,000 | 612,500 |
| 30 | 1,137,500 | 1,031,250 | 925,000 | 818,750 | 712,500 | 606,250 |
| 40 | 1,100,000 | 1,000,000 | 900,000 | 800,000 | 700,000 | 600,000 |
| 50 | 1,062,500 | 968,750 | 875,000 | 781,250 | 687,500 | 593,750 |
| 60 | 1,025,000 | 937,500 | 850,000 | 762,500 | 675,000 | 587,500 |
| 70 | 987,500 | 906,250 | 825,000 | 743,750 | 662,500 | 581,250 |
| 80 | 950,000 | 875,000 | 800,000 | 725,000 | 650,000 | 575,000 |
| 90 | 912,500 | 843,750 | 775,000 | 706,250 | 637,500 | 568,750 |
| 100 | 875,000 | 812,500 | 750,000 | 687,500 | 625,000 | 562,500 |
| 110 | 837,500 | 781,250 | 725,000 | 668,750 | 612,500 | 556,250 |
| 120 | 800,000 | 750,000 | 700,000 | 650,000 | 600,000 | 550,000 |
| 130 | 762,500 | 718,750 | 675,000 | 631,250 | 587,500 | 543,750 |
| 140 | 725,000 | 687,500 | 650,000 | 612,500 | 575,000 | 537,500 |
| 150 | 687,500 | 656,250 | 625,000 | 593,750 | 562,500 | 531,250 |
| 160 | 650,000 | 625,000 | 600,000 | 575,000 | 550,000 | 525,000 |
| 170 | 612,500 | 593,750 | 575,000 | 556,250 | 537,500 | 518,750 |
| 180 | 575,000 | 562,500 | 550,000 | 537,500 | 525,000 | 512,500 |
| 190 | 537,500 | 531,250 | 525,000 | 518,750 | 512,500 | 506,250 |
| 200 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 |
| 210 | 462,500 | 468,750 | 475,000 | 481,250 | 487,500 | 493,750 |
| 220 | 425,000 | 437,500 | 450,000 | 462,500 | 475,000 | 487,500 |
| 230 | 387,500 | 406,250 | 425,000 | 443,750 | 462,500 | 481,250 |
| 240 | 350,000 | 375,000 | 400,000 | 425,000 | 450,000 | 475,000 |
| 250 | 312,500 | 343,750 | 375,000 | 406,250 | 437,500 | 468,750 |
| 260 | 275,000 | 312,500 | 350,000 | 387,500 | 425,000 | 462,500 |
| 270 | 237,500 | 281,250 | 325,000 | 368,750 | 412,500 | 456,250 |
| 280 | 200,000 | 250,000 | 300,000 | 350,000 | 400,000 | 450,000 |
| 290 | 162,500 | 218,750 | 275,000 | 331,250 | 387,500 | 443,750 |
| 300 | 125,000 | 187,500 | 250,000 | 312,500 | 375,000 | 437,500 |
| 310 | *100,000* | 156,250 | 225,000 | 293,750 | 362,500 | 431,250 |
| 320 | *100,000* | 125,000 | 200,000 | 275,000 | 350,000 | 425,000 |
| 330 | *100,000* | *100,000* | 175,000 | 256,250 | 337,500 | 418,750 |
| 340 | *100,000* | *100,000* | 150,000 | 237,500 | 325,000 | 412,500 |
| 350 | *100,000* | *100,000* | 125,000 | 218,750 | 312,500 | 406,250 |
| 360 | *100,000* | *100,000* | *100,000* | 200,000 | 300,000 | 400,000 |
| 370 | *100,000* | *100,000* | *100,000* | 181,250 | 287,500 | 393,750 |
| 380 | *100,000* | *100,000* | *100,000* | 162,500 | 275,000 | 387,500 |
| 390 | *100,000* | *100,000* | *100,000* | 143,750 | 262,500 | 381,250 |
| 400 | *100,000* | *100,000* | *100,000* | 125,000 | 250,000 | 375,000 |

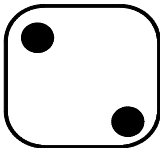
## COMPETITIVE MARKETS DEMAND SCHEDULE MATRIX

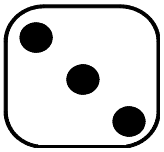
### UNIT PRICES

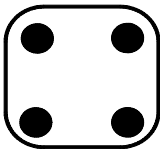
| INTERCEPT | $1,250,000 | $1,125,000 | $1,000,000 | $875,000 | $750,000 | $625,000 |
|---|---|---|---|---|---|---|
| SLOPE | -$3,750 | -$3,125 | -$2,500 | -$1,875 | -$1,250 | -$625 |
| # UNITS | | | | | | |
| 410 | *100,000* | *100,000* | *100,000* | 106,250 | 237,500 | 368,750 |
| 420 | *100,000* | *100,000* | *100,000* | *100,000* | 225,000 | 362,500 |
| 430 | *100,000* | *100,000* | *100,000* | *100,000* | 212,500 | 356,250 |
| 440 | *100,000* | *100,000* | *100,000* | *100,000* | 200,000 | 350,000 |
| 450 | *100,000* | *100,000* | *100,000* | *100,000* | 187,500 | 343,750 |
| 460 | *100,000* | *100,000* | *100,000* | *100,000* | 175,000 | 337,500 |
| 470 | *100,000* | *100,000* | *100,000* | *100,000* | 162,500 | 331,250 |
| 480 | *100,000* | *100,000* | *100,000* | *100,000* | 150,000 | 325,000 |
| 490 | *100,000* | *100,000* | *100,000* | *100,000* | 137,500 | 318,750 |
| 500 | *100,000* | *100,000* | *100,000* | *100,000* | 125,000 | 312,500 |
| 510 | *100,000* | *100,000* | *100,000* | *100,000* | 112,500 | 306,250 |
| 520 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 300,000 |
| 530 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 293,750 |
| 540 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 287,500 |
| 550 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 281,250 |
| 560 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 275,000 |
| 570 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 268,750 |
| 580 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 262,500 |
| 590 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 256,250 |
| 600 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 250,000 |
| 610 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 243,750 |
| 620 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 237,500 |
| 630 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 231,250 |
| 640 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 225,000 |
| 650 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 218,750 |
| 660 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 212,500 |
| 670 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 206,250 |
| 680 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 200,000 |
| 690 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 193,750 |
| 700 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 187,500 |
| 710 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 181,250 |
| 720 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 175,000 |
| 730 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 168,750 |
| 740 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 162,500 |
| 750 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 156,250 |
| 760 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 150,000 |
| 770 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 143,750 |
| 780 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 137,500 |
| 790 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 131,250 |
| 800 | *100,000* | *100,000* | *100,000* | *100,000* | *100,000* | 125,000 |

# DICE OUTCOMES FOR ROUNDS 5 AND 6

 = $200,000

 = $250,000

 = $300,000

 = $350,000

= $400,000

= $450,000