

Introducing and Evaluating Innovative Teaching Techniques in Economics Principles Classes

Department of Economics

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Project abstract

Classroom experiments and instructor conducted games are popular teaching techniques, in many fields, for engaging students in active learning and increasing student retention. We introduced student designed economic games in the Principles of Economics curricula as a way to promote deeper understanding of key theoretical concepts and improve learning outcomes. The experiment was run by three instructors, over multiple sections (involving around 500 students per semester) of the introductory level classes (principles of microeconomics and principles of macroeconomics) for three semesters (Fall 2015, Spring 2016, and Fall 2016).

We collected data using pre-tests, qualitative surveys and summative assessments. Regression analysis was used to measure student learning in terms of growth and value added. The results of the data analysis and students' feed-back were used to amend our teaching strategies, to develop and improve a multiple choice test bank

Project purpose

Designing an economic game offers students an opportunity to think creatively and to critically evaluate the knowledge they have acquired in lectures. They need to relate the economic concepts discussed in class to real world examples and then translate this into the game environment in a logical and engaging manner.

This project provides students with an engaging type of learning and the chance to form productive connections with their classmates. For faculty, the economic game is an additional communication line that supplements the more traditional channels. As an added benefit, it helps recast the subject of Economics, often perceived as daunting and dry, into a more familiar and reassuring framework where the students are the experts - the game universe.

Early in the semester, we ask the students to form their own teams of four to five people depending on class size. Those that are unable to do so will be randomly assigned by the instructor to a team. In order to successfully complete the project, the students will have to communicate and collaborate effectively with both peers and faculty. We stress in our guidelines the importance of cooperation, effective team management and equitable division of labor. Specific provisions are made against free riding.

The majority of the students in principles classes are freshmen and this type of teamwork provides them with an opportunity for social networking. It also makes the class environment more personable, reducing the risk of students dropping the class because they feel isolated.

Methodology

In order to test students' level of economic literacy, we have administered a pre-test during the first week of classes. The test was developed based on the Test of Understanding College Economics (see <http://store.councilforeconed.org/products/test-of-understanding-in-college-economics-manual>). The same test was used during the last week of each semester in order to measure students' overall progress in the class.

Together with the class syllabus, the students received guidelines to assist them in completing the project (see appendix). The guidelines were supplemented throughout the semester with examples (games played in class that simulated auctions and the free market mechanism) and we also provided, at the end of each module covered, a summary of key economic concepts that could be incorporated in the game project.

The various games played in the classroom were discussed and where applicable, deconstructed in order to highlight how specific economic concepts were incorporated in them. These type of activities and discussions helped illustrate and pinpoint how games can be put together and made to work (in terms of rules, objectives, challenges, etc.).

Every semester, depending on his availability, Mr. Jesse White, a Missouri S&T student and former president of the Gaming Association graciously volunteered his time to talk to our students about the basics of game design. He prepared and gave a succinct and very useful presentation on the topic that we made available to the class (see attachment).

For the first two semesters, one of the larger sections (100 - 110 students) was designated as the control group to ensure an adequate sample size. We taught the standard curricula, similar to all the other sections, with the exception that the game project was not required. Instead, the students worked on other homework projects (essays, news broadcast, economics picture, Excel projects). Overall, the effort and the grade points were consistent and fairly comparable across all our sections (both control and treatment groups).

Throughout the project, all instructors involved (Ana-Maria Ichim, Radu Puslenghea and Sarah Steelman) coordinated the class pace, structure and schedule. We communicated on a constant

basis and worked together to develop weekly multiple choice quizzes, in class activities and comparable exams in order to ensure an assessment as consistent as possible across all sections and instructors.

In addition to the standard quantitative data collected, in the Spring of 2016 we have also developed and selectively applied a qualitative survey (see attached) to gather information about students' experience on the project. In the Fall of 2016, we administered the survey across all sections. Students' feed-back has proved very valuable so far in assessing their involvement in the project, as well as helping us improve the overall project experience.

As an equal opportunity for all students across sections to showcase their own work, as well as, to playtest and evaluate (see attached form) their colleagues' projects, we organized an Economics Game Fair every semester. The fairs were possible thanks to the kind support from the Economics department.

In terms of quantitative analysis, we used quantile regression to control for multiple other factors that, besides the game project, could have had an impact on exam performance and to see if this impact differed among quartiles (top 25%, class median, or bottom 25%). The variables that we have controlled for are demographic characteristics of the students (we used dummy variables for gender and academic level), a dummy variable for treatment (worked on the game project or not), prior economic knowledge (pretest score), study habits and effort as measured by performance on the Blackboard/Canvas quizzes taken before the in class exams.

Results

The Spring 2016 qualitative survey was administered electronically to 159 students on a voluntary basis and was taken by 130.

Approximately 72 percent of the respondents showed a strong preference for the game project, as opposed to only 6 percent who stated that they would prefer a more traditional essay type assignment on an economic topic. The same percentage agreed with the statement that "Designing an economic themed game is an engaging way to think about the economic concepts covered in class and better understand the dynamics of the economic forces in the real world". More than 70 percent of students also stated that the project helped them better connect and relate to each other in the otherwise large class setting typical for introductory courses.

The vast majority of students (around 95 percent) have participated in at least one team project before, while 48 percent have worked on five group projects or more, and even had the opportunity to lead their own team. These numbers are corroborated both by the self and peer evaluations turned in as part of the project, as well as, our direct observations. Most of the students adjusted very quickly to the assigned task and did a good job at managing their team dynamics and workload.

Only eight percent of respondents have expressed a strong preference for strictly individual work, while the rest were open to some form of collaboration, with 50 percent actually choosing team work. Moreover, according to their answers, throughout the semester, approximately one third of them studied for Economics in a group which included one, or more, of their game team members. An additional 16 percent have made the attempt to study together, but the arrangement proved less successful outside the class project.

The findings described above are also backed up by our preliminary quantitative regression results which suggest a positive impact in terms of exam performance. Compared to our control group, the treatment groups, on average performed better on the exams, by half a letter grade. Furthermore, we observed that the estimated effect is statistically significant across the board, and slightly larger for the lowest quartile. This is consistent with our deeper learning hypothesis: the low performing students will benefit more on average from peer learning. Team projects offer students more opportunities to observe firsthand how their colleagues learn and thus they are in a good position to adapt and refine their existing studying habits, as well as, to acquire new effective learning strategies.

Other outcomes

For comparability purposes, and to make the assessments as consistent as possible across sections, we have critically revised and customized the existing test banks for the Principles classes. Furthermore, we have significantly expanded the question repository by adding many new, current applications purposefully tailored to our teaching goals and standards.

The students' enthusiasm for the project which often led to highly creative, well thought out and diligently executed games, motivated us to organize the game fair event as a stage for competitive playtesting and wider, well deserved peer recognition. The first edition took place in November 2015 (163 participants and 84 games), followed by April 2016 (247 participants and 89 games) and November 2016 (322 participants and 117 games).

Poster and conference presentations/ Future dissemination

We presented a poster with our first semester results at the Spring 2016 Teaching and Learning Technology Conference (IX) organized by the Educational Technology department and hosted at Missouri S&T.

At the 86th Annual Meeting of the Southern Economic Association, the Teaching Economics Session, in Washington DC, November 2016, results from the Fall of 2015 and Spring of 2016 semesters were presented by Ana Maria Ichim (see <https://www.southerneconomic.org/program-full-list/?conferenceId=2> for conference schedule).

A paper with the title “Get on Board with Economics! How Student Designed Games Can Promote Deeper Learning and Engagement in Principles Classes”, authored by both Ana-Maria Ichim and Sarah Steelman is in progress and upon completion will be submitted for publication to:

1. The Journal of Economic Education at <http://www.tandfonline.com/loi/vece20#.UxU0gDaYY3E> or
2. Journal of Economics Teaching (see <https://www.journalofeconomicsteaching.org/>)

An abstract of the paper was submitted to the 7th Annual AEA (American Economic Association) Conference on Teaching and Research in Economic Education (CTREE). See <http://www.aeaweb.org/about-aea/committees/economic-education/ctree/2017> (feed-back regarding acceptance expected in 2017).

Conclusion

Both our quantitative and qualitative preliminary results suggest the existence of significant educational benefits to the students in Principles of Economics classes when they are engaged in team based activities and projects. Based on the information we have collected and analyzed, our overall assessment is that student designed economic games can help make the class environment more personable, and relatable, contributing to better academic performance. Our three semester experiment also shows that such a project is feasible, relatively easy to implement, even in large class settings, and it offers an enjoyable experience for students and instructors alike.

Acknowledgements

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We would also like to personally thank Dr. Gelles, Diane Hagni, Dr. Radu Puslenghea and Marcy Scott for their invaluable suggestions and assistance.

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Appendix: Game Project Guidelines, Fall 2016

Task (team project, 4 or 5 members):

Design and submit a game with an economic theme. Your project should be based on material covered during the first month of classes (or something closely related). For example, it may illustrate economic concepts such as: incentives, opportunity cost and trade-offs, scarcity, marginal thinking, trade and comparative advantage theory, or the supply and demand model.

You may use an existing game (i.e. Monopoly, Taboo, The Settlers of Catan, etc.) as an inspiration source, in which case you are expected to provide references, but you need to develop your own economic scenarios. The originality and substance of the game's economic content represent the team's main contribution and this will be reflected accordingly in the project's overall score.

Objectives:

1. Gain a better understanding of economics by engaging in a creative (and hopefully fun) activity.
2. Acquire teamwork experience (learn by sharing, brainstorming ideas and get to know your colleagues).
3. Learn how to present your work effectively and succinctly (Word write-up and Power Point presentation, see below).
4. Form a potential basis for a study group.

Project requirements and grading:

1. A 5 to 10 pages Word document NOT including the title, appendices or references. One single submission per team please (electronic and physical copy).

This is the game manual that should introduce the game, explain the instructions for playing it, include the economic scenarios (i.e. game cards if there are any), list and explain which are the economics concepts illustrated. Pictures of the game board, cards or any game pieces you may design are to be included as attachments to the paper. **This is worth 60% of the score (30 points).** Each member of the group will receive these points.

Note: In evaluating the paper, attention will be given to the team's contribution (originality of the idea, economic content), style, clarity of writing, structure.

2. Power Point presentation: **worth 20% of the score (10 points)**. One single submission per team please (electronic and physical copy).

Think of a 15 minutes presentation of the game in front of an audience. This is your “sales’ pitch” for the game, so make it clear, concise and pay attention to slide design. Each member of the group will receive these points.

3. Evaluation Sheet (confidential, individual electronic submission only on Canvas)
 - Self-evaluation: **10% of the score (5 points)**. On a scale from 0 (no contribution) to 5 (fair share), rate your participation in the project.
 - Peer-evaluations: **10% of the score (5 points)**. On a scale from 0 (no contribution) to 5 (fair share), rate the participation in the project of all the other team members.
 - Each score reported should be accompanied by a few short comments to support it.

Things to consider when designing the game:

- ✓ **“Economic intrigue”:** choose and discuss the economic concepts that the game will showcase. What role does Economics plays and how is that relevant to the players? For example, the economic forces can be a source of conflict in the game that needs to be resolved. (i.e. scarce resources make players compete against each other). This is the “soul” of the game and therefore brainstorming and group discussions are especially important at this stage.
- ✓ **What type of game will it be?** Board game, card game, trivia, computer game, etc.
- ✓ **What props (if any) are required to play the game?** If props are necessary, the team needs to decide how to put them together. In general crafting these “in the house” is a lot cheaper, more fun, and the end results helps make the game feel more personal and original.
- ✓ **How many individual players or teams can participate?** Do they fulfill a specific role in the game? Are they a character or just a game piece?

- ✓ **How does the game play out?** Is there a rule for starting it? How do you advance? What is the objective of the game and how would one win it? Any time limits or is the game open-ended? Is there any room for mistakes (i.e. multiple lives or extra credit)? How do players interact with the game world and with each other?
- ✓ **What does the game offer to the player?** Is it way to test his/her knowledge? To relax? Learn? Simulate/ Role play a case scenario?
- ✓ **Playtest your game.** Is it fun? Can it pique other people's interest? Does it have replay value?
- ✓ **Make sure to make the game your own.** It is ok if it reminds people of other games, but it should not be just "Monopoly" in a "*new and greatly improved round box*".

The Basics of Game Design

Jesse White

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Gaming Association Meetings

Mondays & Wednesdays

6:00 pm - IDE 206

mstga@mst.edu



The Basics of Game Design

- What makes a good game?
- Game mechanics
- Great games to learn from



What makes a good game?

The golden rule of game design:

The game must be fun to play!

What makes a good game?

Meaningful decisions

Make player choices matter.

Allow multiple strategies to win.



What makes a good game?

Minimize down time

Keep players engaged.

Don't eliminate players.

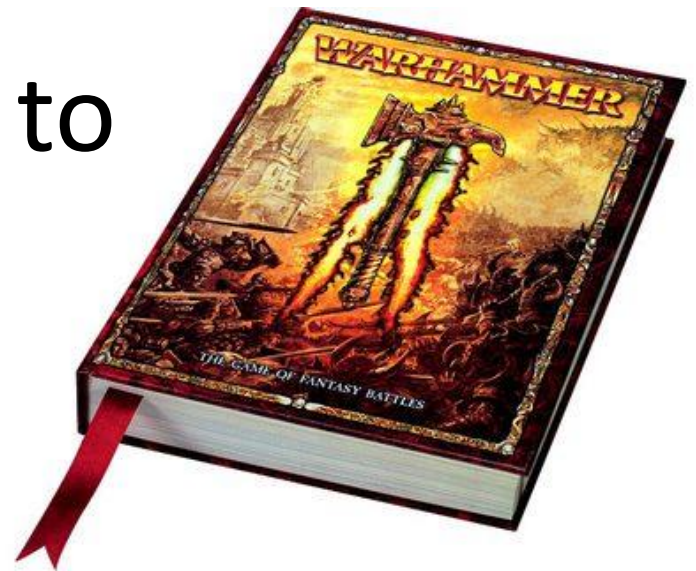


What makes a good game?

Limit complexity

Simple mechanics help
make a game easy to learn.

Offer more choices to
expand depth.



What makes a good game?

Theme does matter

Mechanics and theme need to work together to help the game flow.



Game Mechanics

Basic game mechanics

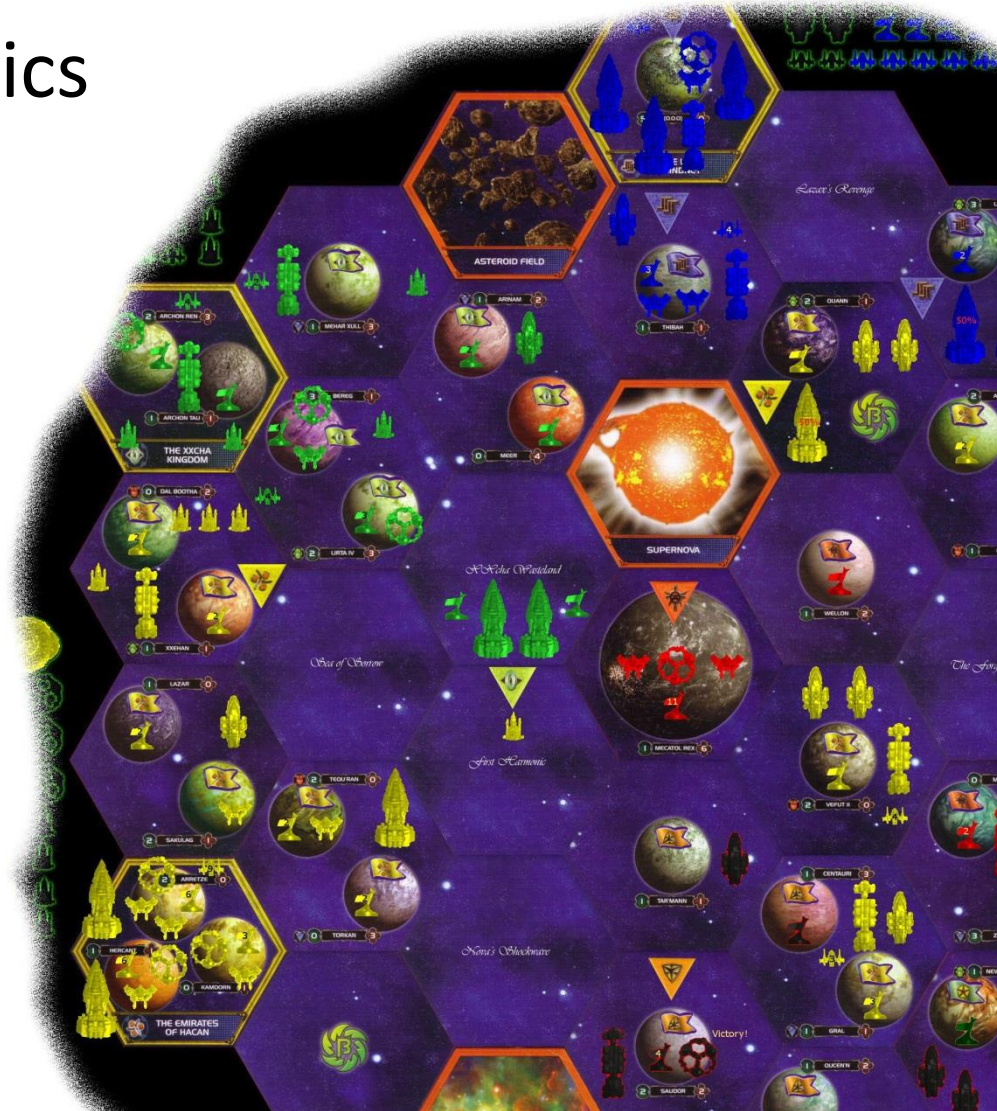
- Turns
- Trading
- Bidding
- Set collection
- Board movement
- Line drawing



Game Mechanics

Complex game mechanics

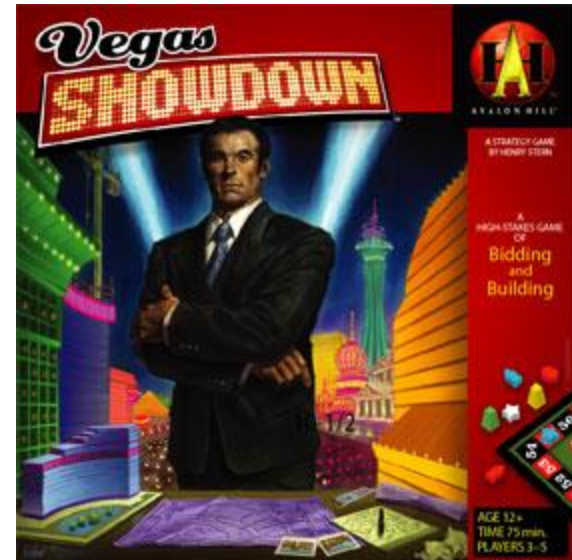
- Deck building
- Limited resources
- Simultaneous actions
- Hidden knowledge
- Board modification
- Action costs



Great games to learn from

Vegas Showdown – New Avalon Hill (Hasbro)

- Bidding
- Limited resources
- Line drawing
- Board modification
- Production restrictions



Great games to learn from

- The Settlers of Catan – Mayfair
- Trading
- Limited resources
- Resource Management
- Line drawing
- Hidden Knowledge
- Resource denial



Great games to learn from

Dominion – Rio Grande Games

- Deck building
- Limited resources
- Resource management
- Resource denial



Great games to learn from

Victory by Any Means – VBAM Games

- Resource management
- Limited resources
- Hidden knowledge
- Simultaneous actions
- Asymmetric player positions
- Multiple victory conditions



Great games to learn from

Dungeons & Dragons – Wizards of the Coast (Hasbro)

- Resource management
- Asymmetric player positions
- Hidden knowledge



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Mondays & Wednesdays

6:00 pm - IDE 206

mstga@mst.edu

Cogcon Sept 18th-20th

Havener Center 2nd floor



Survey participation points

 This is a preview of the published version of the quiz

Started: Dec 31 at 11:31pm

Quiz Instructions

For 10 participation points please take the survey. There are no right or wrong answers, the points will be awarded based on completion. The information from this survey will be used to improve students' experience in the Principles classes, so your feed-back is appreciated.

Question 1

1 pts

Assume that you are given a choice between two different types of group assignments. The first requires the team to write a 10 pages essay on an Economic topic (ideally chosen by the group) and then discuss it with the class. The second assignment is the game project that was offered this semester. You would

- ☐ strongly prefer the essay.
- ☐ you are more likely to choose the essay.
- ☐ you are indifferent between the two assignment types.
- ☐ you are more likely to choose the game project.
- ☐ strongly prefer the game project.

Question 2

1 pts

Choose the option that best characterizes your previous experience when it comes to working on a project as part of a team:

- ☐ I have not worked in a team before.
- ☐ I have completed a couple of team projects before.
- ☐ I have completed a few team projects before (between 3 and 5).
- ☐ I have completed more than 5 team projects before.
- ☐ I have been in a position to lead/coordinate at least one team project.

Question 3

1 pts

Suppose you are assigned a fairly complex academic project that can be completed over six weeks, either individually, or as part of a team. Please choose from the options below, the one that best describes your preferences:

- ☐ I would strongly prefer to complete the project on my own.
- ☐ I would rather complete the project by myself, but I am open to collaboration.
- ☐ Either way, as long as the job gets done.
- ☐ I am partial to working in a team, but I don't mind working on my own.
- ☐ More minds, more ideas. A team can cover a lot more ground than just one person.

Question 4

1 pts

Based on your team work experience (which may include the Econ Game Project), please describe in a few sentences the most challenging group functioning aspect(s) that you had to overcome in order to complete the task.

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Question 5

1 pts

Based on your team work experience (which may include the Econ Game Project), please describe in a few sentences any aspect(s) that you have found useful/ rewarding/ enjoyable while working in a group.

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**Question 6****0.5 pts**

Please evaluate the following statement:

"Designing an economic themed game is an engaging way to think about the economic concepts covered in class and better understand the dynamics of the economic forces in the real world."

☐ Strongly agree.☐ Agree.☐ Somewhat agree.☐ Neither agree, nor disagree.☐ Somewhat disagree.☐ Disagree.☐ Strongly disagree.**Question 7****1 pts**

Please evaluate the following statement:

"Completing a group project like the economic game can help students better connect and relate to each other in an otherwise large class setting".

☐ Strongly agree.☐ Agree.☐ Somewhat agree.☐ Neither agree, nor disagree.☐ Somewhat disagree.☐ Disagree.☐ Strongly disagree.

Question 8

0.5 pts

One of the reasons for assigning team projects in a large class is to encourage student collaboration and the formation of study groups. Which of the following scenarios best applies to you?

- ☐ I prefer to study by myself, so a study group was out of the question for me.
- ☐ My schedule is very busy and I couldn't have joined a study group or team project, so I chose to do everything on my own.
- ☐ No opportunities for joining, or forming a study group existed.
- ☐ There was an attempt to study together, but it did not work out.
- ☐ I had a functional study group with at least one of my teammates.
- ☐ I had a study group, but it did not include any of my team members.

Question 9

1 pts

Suppose you may choose between having a game presented to you in class by its designers and the opportunity to play test the game yourself (either an in class Game Day or at a Game Fair). Which of these two options would be more instructive? (i.e. it would help you better understand the economic concepts, game idea, etc.)

- ☐ Definitely the presentation.
- ☐ Both would help, but I am leaning towards the presentation.
- ☐ Either one is fine with me.
- ☐ Both would help, but I am leaning towards play testing.
- ☐ Definitely play testing.

Question 10

1 pts

Please provide a short list (you may add a few comments if you wish) of any economic concepts/ topics covered in class that you found challenging.

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**Question 11****1 pts**

Please choose the option that best describes your previous exposure to economics:

- ☐ I have never taken an economics class before.
- ☐ I have taken some high school level economics.
- ☐ I have never taken an economics class before, but I like to keep myself informed on economic issues.
- ☐ I have previously taken college level economics.

Quiz saved at 11:31pm

[Submit Quiz](#)

Game 1 Evaluation Sheet (5 extra credit points)

Please fill out at least one sheet for your event participation points:

Your NAME (last, first) and ECON section and TEAM number:

Circle instructor's name (for bonus points assignment):

Radu Pustlenghea

Sarah Steelman

Ana Ichim

Game 1 (please write down the project name and one author):

On a scale of 1-7, please evaluate (circle the score) the game projects along the following dimensions (1 = least positive and 7 = most positive):

Game Idea/Theme (is it interesting, original?)	1	2	3	4	5	6	7
Game Mechanics/Rules (clarity, brevity, functionality)	1	2	3	4	5	6	7
How well does the game integrate economic concepts?	1	2	3	4	5	6	7
Overall presentation (game board, game pieces and props, etc.)	1	2	3	4	5	6	7
Was the playtesting fun?	1	2	3	4	5	6	7

Comments about Game 1:

Game 2 Evaluation Sheet (5 extra credit points)

Game 2 (please write down the project name and one author):

On a scale of 1-7, please evaluate (circle the score) the game projects along the following dimensions (1 = least positive and 7 = most positive):

Game Idea/Theme (is it interesting, original?)	1	2	3	4	5	6	7
Game Mechanics/Rules (clarity, brevity, functionality)	1	2	3	4	5	6	7
How well does the game integrate economic concepts?	1	2	3	4	5	6	7
Overall presentation (game board, game pieces and props, etc.)	1	2	3	4	5	6	7
Was the playtesting fun?	1	2	3	4	5	6	7

Comments about Game 2:

How many games did you playtest today?

After evaluating your colleagues' games at the fair, how would you rate your own project?
