



Test Preparation Services: A Market Analysis Workshop

We describe two joint four-hour workshops for economics and mathematics courses, in which student groups prepare to enter an existing market for standardized test preparation tutoring services. Instructors generate price and quantity data which groups must analyze. Groups also conduct research on four existing firms, choose whether to offer synchronous in-person or asynchronous online tutoring, determine how much to borrow, produce a pricing strategy, and identify ethical concerns. Groups deliver short presentations on their strategy and write reflection essays. The workshops force students to consider topics such as cost structure, demand elasticity, oligopoly interactions, regression analysis, and pricing strategy.

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1. Introduction

Jackson (2009) states that current business education creates a skills gap in which graduates possess knowledge but lack the soft skills to implement that knowledge in a dynamic business setting. To address this, curricula should refocus on teaching “critical thinking, intellectual curiosity, communication skills, information management skills, team working skills, and high ethical values.” Furthermore, companies look for “employability skills” such as the ability to analyze and synthesize information, think flexibly, and attack problems quantitatively (Atkins, 2011). The workshops described in this paper achieve exactly these learning goals by setting up a simulated market that student teams must quantitatively analyze to develop a successful market entry strategy.

According to its mission statement, Babson College “prepares and empowers entrepreneurial leaders who create, grow and steward sustainable economic and social value—everywhere.” One of the programs that is designed to achieve this mission is the Master of Science in Management in Entrepreneurial Leadership (MSEL), a one-year program for recent college graduates who wish to refocus their careers in business and entrepreneurship. As part of the program, students are required to take paired courses in Entrepreneurial Economics and Data Exploration. These seven-week courses culminate in a pair of transdisciplinary workshops that require students to apply data analysis techniques and economic theory to successfully enter a simulated market for test preparation services.

Greiner et al. (2003) encourage learning-by-doing as the best way to teach business strategy. In particular, this strategy focuses on “knowledge-in-action” which is developed through open-ended projects in which students must employ a trial-and-error approach to arrive at a solution. A lack of this type of exercise in business schools has led to a “knowing-doing gap.” Students possess knowledge but lack the experience to implement it. Our paired workshops fill this gap by creating a complex problem without a single “correct” solution. Because teams work on the problem over two separate four-hour periods, they must utilize a trial-and-error method. They implement an initial strategy with incomplete information, gain feedback from their first attempt, and then rethink their strategy based on the data that their initial decisions generated. At our institution, we call this approach Entrepreneurial Thought and Action™ (ET&A).

As encouraged by Ganesh and Sun (2009), our workshops move instructors from the role of a lecturer to that of a coach or a co-producer in the classroom, offering students guidance as they work with data to make strategic decisions. Importantly, Drea et al. (2005) promote in-class simulations, as students find them more engaging. Furthermore, as Cook and Swift (2006) point out, the use of simulations in class promotes higher levels of learning in Bloom’s taxonomy.

More recently, a white paper by the World Economic Forum (2023) creates a taxonomy of learning aptitudes; of which, these workshops cover: creativity, critical thinking, digital skills and programming, problem solving, collaboration, communication, adaptability, grit, initiative, civic responsibility, and discipline-specific knowledge. According to the 2023 National Association of Colleges and Employers (NACE) Jobs Outlook, communication and critical thinking skills have the largest deficit between how important employers find them to be versus how proficient recent college graduates are at them. The NACE report also lists problem-solving skills and ability to work in a team as the top two attributes that employees look for on a résumé. The workshops described below target the exact skills that employers find both important and lacking in the current labor market.

We find no similar workshops in the economic pedagogy literature; however, marketing pedagogy—as presented in Cook and Swift (2006), Drea et al. (2005), and Ganesh and Sun (2009)—does employ simulations approaching ours. The main difference is that we explicitly model the demand functions and behavior of the other firms in the simulation. Prices are thus determined in equilibrium, which allows for a rigorous economic analysis of the market data.

The remainder of this article describes the design of two workshops, discusses the results from running it in three MSEL sections in Fall 2023, and, finally, concludes. Appendix A describes the files that are needed to run these workshops. Appendix B provides sample data from Workshop I to help readers contextualize the problem that student groups face. Appendix C provides step-by-step instructions for running the workshops. Appendix D describes the economic content contained in the current parameterization of the data. All files are available from the corresponding author upon request to verified college instructors.

2. Workshop Design

These workshops do not require any preliminary preparatory work by students. They arrive in already assigned groups,¹ but unaware of what the content of the project entails. Over the course of two four-hour time blocks, groups create a mock-company to enter into a simulated market that has already been populated by four firms. Two of these firms sell *in-person tutoring services*, while the other two sell *access to online tutoring software*.² Successfully entering the market requires analyzing existing data, conducting market research, and applying economic theory.

We run these workshops for three combined course sections, or about a hundred students. The primary limitation is on presentation time. We consider it extremely valuable for students to observe other groups' presentations, especially when it comes to writing reflection essays. Having more student groups means needing to devote more time to presentations. Otherwise, the workshops should scale easily from a very small course to an extremely large course (where presentations could take place in smaller groups with teaching assistants as facilitators).

Prior to Workshop I, students cover the following topics in their Entrepreneurial Economics course: demand functions, consumer choice theory, cost functions, market structure, Porter's five competitive forces, game theory, and oligopolies. In their Data Exploration course, students learn about summary statistics, confidence intervals, and difference-in-means tests. Workshop II is conducted two weeks after Workshop I. During that interval, students learn about price strategy, ethics, and regression analysis. Faculty who are considering adopting these workshops, should ensure they cover these topics ahead of time. For example, a managerial economics course that requires econometrics would work well. Alternatively, these workshops could be run as a hackathon³ or competition for students in an economics or business club. An Excel file alone can generate data for an econometrics course; however, the true value of these workshops is encouraging students to use both quantitative and economic skills simultaneously.

¹ Students self-select groups with a maximum number of ten members. While these groups are large, the short nature of the workshops creates an all-hands-on-deck environment in which free riders are often punished in the peer review grade. We also encourage students to think of the group as a company and try to divide up tasks efficiently.

² We select the market for test preparation services because there is evidence that Asians get charged substantially more in this market than other students (Larson, Mattu, and Angwin, 2015). This provides an excellent real world ethics problem which students may explore during the second workshop. Instructors are, of course, welcome to change the market setting if they wish.

³ A hackathon is an intensive, time-restricted competition in which teams attempt to creatively solve a problem.

Instructors need to prepare the following materials prior to Workshop I: Excel files of independent variables, Excel files for price and quantity data, research briefings for the four existing firms, and presentation templates. The first Excel file used is called "1 Generate Data," and it comes with a "Read Me" sheet, which describes its function. In addition, a "Teaching Note" walks instructors through the process of preparing for the workshops. A description of these files is contained in Appendix A; however, they are not included here as they contain sensitive information about the content of the workshops. To help readers contextualize the setup, Appendix B contains a sample of the price and quantity data that instructors provide to student groups at the start of Workshop I⁴. Appendix C provides clear instructions for running the workshops, starting with the setup described here. All files are available from the corresponding author by request.

A. Workshop I

To begin, the instructors take about twenty minutes to explain the agenda for Workshop I. Students have roughly two and a half hours to analyze data about the market for test preparatory services, and then to use that analysis to make a series of strategic decisions. The initial data consists of price and quantity values in 120 U.S. zip codes for each of the four existing firms. In the Excel files, we name these firms A, B, C, and D; however, during the workshops we give each firm the name of an actual test preparation company in order to make the experience more immersive for students.

In addition to this information, each group is provided with five tokens (poker chips), which represent \$10,000 each in seed money⁵. This money can be used to purchase extra data at a cost of \$10,000 per data series or to conduct market analysis on one of the existing firms in the market for \$10,000 per firm researched.

Once the setting is presented, the instructors lay out the deliverables for the first workshop. Groups start by analyzing the given data in combination with newly acquired data to draw conclusions about the market in general. Specifically, they must (1) provide summary statistics, (2) create confidence intervals for one firm's prices, and (3) conduct at least one hypothesis test. The last requirement consists of a difference-in-means test based on market segmentation. This segmentation can only be done with additional data, so students must figure out what data is available and buy it (with their tokens) before conducting their analysis.

The process for students to acquire additional data involves reviewing previous course materials and speculating on what extra data may be available that would be a part of their customers' demand functions. Students then ask the instructor if certain data are available, which gives the instructor the opportunity to act in a mentor role and guide students in their thinking to help them come up with requests that can actually be met. Students are often surprised at how difficult they find it to independently think up what data might be available. This is an excellent learning opportunity. However, if some groups are struggling, the instructors should provide them with hints to avoid wasting precious time.

Students are also encouraged to conduct research on the existing firms in the market. When a group pays (with their tokens) to research a particular firm, they are provided with a breakdown of the firm's cost structure as well as a short written analysis of its marketing

⁴ Instructors are welcome to use the data provided in Appendix B. It is intentionally not the same as data we use in our own simulations. Additionally, the firms are only labeled as A, B, C, and D, which makes it easy to change the firm names and market setting as desired. Of course, the Excel files used to generate this data are available upon request for any instructor who wishes to construct their own dataset.

⁵ The value of each poker chip can be raised or lowered. It is more important that students recognize the cost of market research and consider the opportunity cost of buying some information at the expense of other.

and pricing strategies. Based on this research, students must describe the market structure and decide which type of product to sell: in-person tutoring services, or access to an online tutoring algorithm. Groups must also estimate their own cost structure, which will be similar to the existing firms in their market segment. They have to identify which costs are fixed and borrow enough money in the form of a startup loan to cover those costs.

After the initial analysis, groups formulate a strategy for entering the market. This begins by focusing marketing on a specific segment of the population. Groups should aim to support their decision with the data work they have already completed⁶. In addition, groups are required to select one of Porter's five competitive forces (Porter, 2008) — buyers, suppliers, substitutes, direct competitors, or new entrants — and explain how they will exploit weakness of that force to maximize their profits.

Finally, firms must select a price to charge for their product. It is explained to students that part of the goal of workshop I is to gather information so that they may form a successful strategy in workshop II. As a result, the price charged in each zip code will have a random component, with the mean price set by the group. This allows for successful regression analysis in the subsequent workshop.

I. Workshop Deliverables

Groups provide two deliverables at the end of the workshop. The first is a five minute presentation using a PowerPoint template that has been provided by the instructors. The first slide identifies the team's group number and firm name. The second slide displays data results, such as the difference-in-means hypothesis test, and how they were used to determine which product to produce and which market segment to target with their marketing. The third slide lists anticipated firm costs, and the loan amount students decided they needed to take to cover their fixed costs. The final slide includes a basic market analysis to determine the market structure of the industry the group is entering, and then to use that analysis to choose one of Porter's competitive forces as the focus of their strategy as well as a price for their product.

The second deliverable consists of a one-page reflection essay, which must be submitted by midnight on the day of the workshop. In it, students explain why they made the decisions that they did. Further, they are instructed to reflect on how well their group worked together, if they used their time efficiently, and what decisions they might wish to change in the future to increase their profit. These deliverables are each worth twenty percent of the overall workshop grade⁷.

These two deliverables work very well together. Because all groups present their strategies and analysis at the end of Workshop I, other students get an idea of what they may have done wrong or what better strategies they should have employed. The reflection essay then asks students to explain their thinking during the workshop and compare their choices to those of other teams. This reflection is useful, since new decisions can be made during Workshop II.

B. Workshop II

Students can look at the Workshop I data prior to Workshop II, but they cannot further

⁶ For example, if a group notices that in-person tutoring services do not have much market penetration in rural areas of the country, they might decide to focus on that segment of the market.

⁷ The workshops have five deliverables: two presentations, two reflection essays, and a peer review. This divides evenly into five assignments each worth twenty points. Of course, other instructors can change the grade weighing as they see fit.

strategize until they find out how the market responded to their entrance into it. For this reason, Workshop II does not require any preliminary preparatory work by students.

The instructors take the following five pieces of information and input them into the Excel file "2 Firm 0 Entry" (see Appendix A) to determine how the market responds to each group's firm entry decisions: (1) which product the firm is selling, (2) which market segment the firm is targeting with their marketing, (3) how large a startup loan the firm takes, (4) which of Porter's five competitive forces drive the group's strategy, and (5) what price their firm plans to charge on average.

The Excel file first determines if the firm took out a large enough loan to cover its fixed costs given the product it is selling. Any firm that does not borrow enough is assumed to take out a second emergency loan at a higher interest rate. Any firm that borrows too much pays interest on loaned funds they did not need.

The file then constructs a demand function for the new firm based on its targeted marketing and strategic focus. It also adjusts the demand functions for existing firms as customers react to the new service option. The file then plugs in the group's chosen price in order to determine the reaction of the existing firms to new competition and to find the market demand in each zip code. The price of the new firm is adjusted with a uniform random shock in order to create variation for the upcoming regression analysis.

The response of the firms to a group's entry is not random and is, in fact, based on several economic principles which are described in Appendix D. Information is also available from the authors upon request.

Groups are provided with data and an analysis of their previous decisions. The new data set contains updated prices and quantities for all five firms by zip code and is unique for each team. All student groups are given all four supplemental data series (from Excel file "0 Generate Data" described in Appendix A) and the market research of the original four firms (from the "Teaching Note" described in Appendix A). In addition, the groups' firms now start with a certain amount of capital, and it is assumed that depreciated capital is replaced. The groups learn about their profits, which nets total revenue with depreciation, interest payments, marketing costs, overhead, and variable costs. Finally, each groups' current outstanding loans are the net of their starting loans minus their first round economic profit.

Teams are given approximately two and a half hours to analyze their new data and make new strategic decisions. First, groups must run a regression analysis to determine the demand function for their product. Based on the regression results, groups formulate a sophisticated pricing strategy, which may consist of price matching or various forms of price discrimination. Finally, teams consider the ethical implications of their pricing strategy⁸.

I. Workshop II Deliverables

Groups provide two deliverables at the end of Workshop II. The first is a five minute presentation using a PowerPoint template that has been provided by the instructors. The first slide identifies the team's group number and firm name. The second slide displays regression results that determine the demand function. The third slide describes the pricing strategy and includes any motivating calculations on which the strategy is premised. The final slide addresses the potential ethical implications of the firm's pricing strategy.

⁸ For example, Larson, Mattu, and Angwin (2015) find that Asians are more likely to be quoted a higher price for SAT tutoring services by The Princeton Review.

The second deliverable consists of a one-page reflection essay, which must be submitted by midnight on the day of the workshop. In it, students reflect on the entire workshop and consider which tools from each class they used. Students must also explain how they arrived at their overall strategy for entering the market. These deliverables are each worth twenty percent of the overall workshop grade.

After the second workshop, the instructors input the sophisticated pricing strategy into the Excel file, "3 Pricing Strategy," and find the final profitability of the firm. This profit is divided by the assumed market interest rate of three percent in order to find the present discounted value of the future stream of profits. This stream of profits is added to the existing capital stock and outstanding loans are subtracted to determine value of the newly created firm. The firm with the highest market value is declared the winner and receives a bonus of five points on the workshop grade. Effective strategies are described in Appendix D.

The instructors write each group a short explanation of what happened to their firm based on analysis of their final sales and profits. For example, some groups accidentally started price wars with their direct competitors and others became unexpected market leaders.

Finally, students submit peer evaluations of their group members. These evaluations make up the final twenty percent of the workshop grade.

3. Alternative Options

This section describes the workshops that we have run using the files described in Appendix A; however, we recommend that faculty adopt as much or as little of our approach as they feel comfortable with. In this subsection, we list a few options for simplifying the workshops.

Instructors can eliminate the use of poker chips to buy information. This is a useful step because it requires students to make economic choices; however, students can often take too much time trying to decide what information to buy instead of spending their time analyzing the problem. The process of figuring out what extra data might be available requires student creativity and encourages robust discussion with the instructors; however, that time could be used on data work and economic analysis.

Workshop I can be run as a stand alone exercise that does not require regression analysis. In fact, when we first created this concept, we ran it as single workshop. The advantage is time saving, but students miss out on the Entrepreneurial Thought and Action™ aspect, since they do not get to learn from their initial mistakes.

We run both workshops during four-hour time blocks, but that can be difficult for faculty to schedule. As long as the poker chips are not being used to buy information, both workshops can be assigned as asynchronous projects for students to complete. Unfortunately, this has two disadvantages. First, students do not get to see other groups present their work, which is a great tool for learning because they quickly realize when another group has taken a better approach (this is apparent in their reflection essays). Second, the fast-paced nature of the workshops helps avoid the free rider problem that is common in group work. When students face a time constraint, it encourages everyone to stay on task.

To save time during the workshops, instructions could be recorded and sent to students the night before.

4. Fall 2023 Results

The descriptions below are based off the third iteration of the workshops, which was run in fall of 2023.

During the workshops, student groups sit at separate tables in a large auditorium. They occasionally send up representatives to purchase market research on the existing four firms and extra data series about key characteristics of the zip codes. These interactions are often involved, with students trying to figure out what type of data might be available and then reporting back to their group to try to decide which information is worth using one of their startup tokens on. Thus, students are forced to confront their limited resources and think critically about how to maximize the value of their starting funds. For example, should a team that wants to sell private tutoring services research both firms that sell the same service (their direct competitors), or should they research one of those firms, and one of the firms that sells access to online software (a substitute product)?

Students tend to ask for a lot of interesting data that are not available. The process of trying to figure out what data they can get a hold off is extremely informative and a good learning opportunity as students often misunderstand the nature of the data initially. Teams often ask for data that cannot be provided based on the structure of the workshop. For example, a group might wish to have time series data, or they may ask about customer specific information such as past spending habits. This provides instructors the opportunity to clarify that the data are connected to specific zip codes in a single year time frame. As the workshop progresses, we find that students become more comfortable with the data as they are forced to ask questions about it; something that probably would not happen if all data were immediate available at the beginning of the workshop.

We make two interesting observations during Workshop I. First, some groups realize that they can use their tokens to buy information from other groups instead of directly from the instructors. They make this profitable for both sides by selling at a price of two pieces of information for one token. This allows the selling team to recoup some of their costs for the market research, and the purchasing group can acquire market research cheaper than otherwise. We do not prohibit these transactions, as they are in keeping with the entrepreneurial nature of the workshops. Second, information flows quickly between the teams. As soon as one team determines that a particular data series is available, they inform their friends in other groups, and the instructors quickly experience an avalanche of requests for that data series from several teams. This highlights the fact that technology and information dispersion happen quickly in markets, leading to a free rider problem.

Students often request more time to complete their analysis. However, the short nature of the workshops is used because it reduces the free rider problem that is common in group activities. Teams cannot rely on one or two students to carry the entire workload, so other team members must step up. You can encourage teams to start by identifying roles for each student, much the same way businesses have employees specialize. Thus, these workshops require more coordinated teamwork than typical group projects to get the most out of the analysis sessions.

During Workshop II, teams develop a sophisticated pricing strategy, which may rely on price discrimination, price matching, or any number of profit-maximizing techniques. Teams employ a wide range of approaches to this problem, often using pricing strategies they learned in other courses. The best groups try to apply theories from the lecture on oligopolies and game theory. Teams must also confront the ethics of their pricing decisions. This is particularly pertinent in the realm of tutoring services since higher education plays a significant role in upward social mobility and entrenched inequality.

During both workshops, the Data Exploration instructor⁹ is available to answer technical questions about how to set up the difference-in-means hypothesis tests and regression analyses. This is in line with recommendations from Ganesh and Sun (2009) that instructors should move towards more of a coaching role in the classroom, allowing students to guide their own learning. Despite the availability of help with technical issues, many groups make mistakes in their data analysis, e.g., running regressions with competitor quantities as explanatory variables or performing a difference-in-means test using the wrong datasets. However, we do not view this as a failure since mistakes can be important learning tools (Perkinson, 1979).

At the end of each workshop, every team gives a five-minute presentation on their data and market analyses and reveals their strategic decisions for entering the market. The instructors also ask one or two clarifying questions to each group. This allows other teams to see how their competitors worked with the data. Afterwards, groups write a reflection essay that, in particular, focuses on what decisions they would change after watching the presentations. According to Cartwright and Stepanova (2012), students learn more from classroom experiments if they are required to write about it and reflect on their experiences.

A. Reflection Essay Results

Teams write reflection essays after each workshop. Generally, students express enthusiasm for the workshops, although they acknowledge that they are fast-paced and stressful. Key themes emerge about the importance of teamwork and quantitative skills. Students also clearly realize that economic analysis relies heavily on empirical techniques, so they begin to understand why Entrepreneurial Economics and Data Exploration are taught simultaneously.

Here is a sampling of comments from students' reflection essays:

"In addition, it was helpful to apply what we learned in class to a real-life scenario and see lessons from both classes intertwined, where we even got results on how we did financially."

"While the work we completed over the last two workshops was often stressful, challenging, and complicated, there were some key takeaways and learnings that we received from participating in the high-speed workshop. First, we learned to appreciate the overlap between QTM and economics. While each is its own field, in this workshop, we saw first-hand how important understanding market context while practicing statistical methods really is. In order to correctly run and interpret our regressions, we needed to understand economics."

"Additionally, we learned that teamwork is essential in a workshop environment like this. It was much harder to complete the work when group members were missing. These workshops were difficult but tested our abilities to tackle real-world data and pricing strategies for an actual product - something we will most likely be doing as future entrepreneurs."

B. Student Questionnaire

Due to the broad nature of the workshops, it is not possible to create a questionnaire that covers all of the material contained therein; however, we have constructed a short set of questions to gauge the learning outcomes from those participating in these workshops.

Out of one hundred students over three sections, eighty-three students completed the same questionnaire prior to Workshop I and immediately after Workshop II. The questionnaire first asks students about the importance of economics and quantitative methods in analyzing

⁹ A teaching assistant could handle this task as well.

markets, then quizzes them on a few economic concepts that are used in the workshops. The full questions are listed in Table 1.

Table1: Student Questionnaire Questions

Question (correct answers in **bold**)

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- 1) How important do you think economic theory is when analyzing a market?
- a) Extremely important (5)
 - b) Very important (4)
 - c) Somewhat important (3)
 - d) A little important (2)
 - e) Not important at all (1)
-
- 2) How important do you think quantitative skills are when analyzing a market?
- a) Extremely important (5)
 - b) Very important (4)
 - c) Somewhat important (3)
 - d) A little important (2)
 - e) Not important at all (1)
-
- 3) Which market features tend to lead to higher profits?
- a) Substitutable goods and low barriers to entry
 - b) Substitutable goods and high barriers to entry
 - c) Differentiated goods and low barriers to entry
 - d) **Differentiated goods and high barriers to entry**
-
- 4) Which pricing strategy is the best for learning about market demand?
- a) Price matching
 - b) **Random pricing**
 - c) Value-based pricing
 - d) Third-degree price discrimination
-
- 5) Which strategy is most effective at maximizing profits in an oligopoly market?
- a) Competing on price to increase quantity sold
 - b) Cutting costs to earn more profit per unit
 - c) **Price matching to avoid a price war**
 - d) Differentiating products through advertisement
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6) Which should **NOT** be included when estimating your demand function?

- a) **Quantity sold by competitors**
- b) Prices charged by competitors
- c) Income of customers
- d) Prices charged by your firm

7) Which costs should you consider when making your pricing decision?

- a) Fixed costs
- b) **Marginal costs**
- c) Sunk costs
- d) Average costs

Table 2 reports the results from the two survey questions, which show that students already considered both economic theory and quantitative tools important for analyzing markets. Additionally, we can see that the few skeptical students were more likely to find these skills useful after completing the workshops.

Table 2: Student Survey Results

Question (scale from 1-5)		A	B	C	D	E	Average
1) How important do you think economic theory is when analyzing a market?	Pre	30	39	12	1	0	4.20
	Post	32	43	2	1	0	4.35
2) How important do you think quantitative skills are when analyzing a market?	Pre	46	25	7	3	0	4.41
	Post	43	37	1	1	0	4.49

Although this is not a robust statistical analysis, Table 3 suggests that students improved their understanding of connected economic concepts throughout the workshops.

Table 3: Student Quiz Results

Question (correct answers in bold)		A	B	C	D	Average
3) Which market features tend to lead to higher profits?	Pre	2	3	19	58	70%
	Post	4	5	9	63	76%
4) Which pricing strategy is the best for learning about market demand?	Pre	23	12	42	6	14%
	Post	9	26	34	13	31%
5) Which strategy is most effective at maximizing profits in an oligopoly market?	Pre	12	16	31	22	37%
	Post	4	12	39	27	47%
6) Which should NOT be included when estimating your demand function?	Pre	29	16	21	11	35%
	Post	47	8	10	18	57%

7) Which costs should you consider when making your pricing decision?	Pre	11	56	3	13	67%
	Post	9	64	5	5	77%

5. Conclusions

As with all classroom materials, the workshops described in this paper continue to evolve. What started as a single workshop has been split into two distinct sessions so that students can take a trial-and-error approach to entering an existing market. Students must apply what they have learned in both Entrepreneurial Economics and Data Exploration to analyze a simulated dataset and make strategic decisions. Reflection essays and student questionnaire results both indicate that the workshops achieve their primary objective of closing the "knowing-doing gap," while developing important teamwork, critical thinking, and analytical skills.

Future work should focus on studying the effects of these workshops more rigorously, including having a control section which does not participate in the workshops.

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Appendix A

The following files are necessary to run Workshops I and II and are available upon request to verified college instructors: "0 Teaching Note," "1 Generate Data," "2 Firm 0 Entry," and "3 Pricing Strategy." Please contact the corresponding author if you would like to obtain these files.

"0 Teaching Note" is a Word document that explains how instructors should use the three Excel files to generate data and input student group decisions. In addition, the market research blurbs for the four existing firms are included at the end of the note.

The first Excel file, "1 Generate Data," is used to create the initial data for the four existing firms in the market. This consists of 120 observations (by zip code) of price and quantity data for the four existing firms. In addition, four other data series are generated, which impact customer demand functions. This file also calculates the cost structure for the four existing firms.

The second Excel file, "2 Firm 0 Entry," takes the data from the previous Excel file and also takes into account the five main decisions of each student group: 1) product type, 2) loan size, 3) target market, 4) market strategy, and 5) average price. A copy of this file is needed for each group. Once a group's decisions are inputted, the file generates new price and quantity data for the four existing firms as well as the student's company, Firm 0. In Workshop II, each group gets their own data series based on their decisions during Workshop I. This file also calculates the Firm 0 cost structure to determine if the group borrowed enough to cover fixed costs.

The last Excel file, "3 Pricing Strategy," takes group decisions from both Workshops I and II and uses them to calculate the present discounted value of the group's firm, i.e., how much they would be able to sell their company for. The instructor can use this information to determine which groups made the best economic decisions.

Appendix B

The following data is a sample of what students receive at the start of Workshop I. It lists the price (P) and quantity (Q) data for firms A, B, C, and D in 120 zip codes.

	P A	P B	P C	P D	Q A	Q B	Q C	Q D
1	\$47.38	\$64.56	\$31.43	\$31.43	61	64	1550	832
2	\$48.11	\$65.11	\$31.33	\$31.33	0	0	1647	848
3	\$46.43	\$68.64	\$33.15	\$33.15	10	0	1608	823
4	\$51.17	\$70.81	\$34.68	\$34.68	52	50	1552	824
5	\$47.74	\$68.49	\$34.61	\$34.61	3	0	1628	836
6	\$48.86	\$73.91	\$27.23	\$27.23	0	0	1722	877
7	\$47.18	\$71.12	\$27.75	\$27.75	144	195	1480	830
8	\$44.26	\$67.01	\$29.38	\$29.38	84	66	1565	850
9	\$42.71	\$64.44	\$25.14	\$25.14	161	211	1488	849
10	\$48.64	\$69.27	\$32.64	\$32.64	86	99	1537	831
11	\$56.84	\$69.06	\$25.77	\$25.77	254	735	1284	1029
12	\$55.31	\$74.87	\$27.86	\$27.86	113	430	1496	1059
13	\$52.92	\$73.33	\$30.10	\$30.10	135	430	1465	1049
14	\$53.30	\$76.51	\$26.19	\$26.19	292	733	1283	1015
15	\$56.07	\$70.36	\$26.40	\$26.40	198	636	1359	1031
16	\$57.19	\$72.53	\$33.00	\$33.00	108	460	1468	1037
17	\$54.62	\$70.82	\$25.78	\$25.78	191	638	1381	1038
18	\$57.00	\$83.03	\$22.92	\$22.92	253	634	1336	1053
19	\$57.14	\$74.66	\$26.23	\$26.23	230	691	1315	1012
20	\$51.46	\$73.96	\$23.07	\$23.07	309	731	1301	1035
21	\$65.80	\$85.03	\$21.99	\$21.99	248	188	1289	956
22	\$62.77	\$75.36	\$24.43	\$24.43	302	317	1222	927
23	\$61.68	\$80.73	\$24.86	\$24.86	321	297	1195	936
24	\$64.35	\$84.35	\$25.43	\$25.43	297	304	1225	930
25	\$60.22	\$84.68	\$26.37	\$26.37	344	259	1204	906
26	\$64.40	\$78.48	\$27.13	\$27.13	231	155	1306	950
27	\$63.94	\$81.24	\$25.94	\$25.94	382	396	1141	929
28	\$61.83	\$82.58	\$28.37	\$28.37	251	145	1289	939
29	\$61.17	\$75.03	\$25.72	\$25.72	347	398	1169	926
30	\$61.81	\$85.09	\$25.84	\$25.84	410	396	1118	921
31	\$52.74	\$62.66	\$30.88	\$30.88	136	88	1259	943
32	\$55.23	\$70.48	\$30.16	\$30.16	146	97	1224	941

33	\$54.17	\$62.75	\$30.52	\$30.52	61	0	1350	938
34	\$55.60	\$62.59	\$35.56	\$35.56	18	0	1357	927
35	\$49.23	\$67.10	\$28.14	\$28.14	252	193	1171	916
36	\$52.31	\$60.26	\$26.16	\$26.16	148	171	1235	968
37	\$53.82	\$70.22	\$33.48	\$33.48	137	42	1240	932
38	\$56.38	\$65.16	\$35.13	\$35.13	0	0	1355	949
39	\$53.02	\$68.75	\$28.44	\$28.44	51	0	1377	968
40	\$56.96	\$73.50	\$28.80	\$28.80	89	2	1274	967
41	\$59.27	\$63.45	\$27.67	\$27.67	344	792	982	1106
42	\$61.13	\$68.15	\$25.58	\$25.58	260	645	1059	1132
43	\$59.60	\$70.35	\$25.77	\$25.77	305	647	1045	1145
44	\$62.51	\$79.11	\$30.11	\$30.11	155	402	1203	1161
45	\$61.26	\$67.90	\$28.93	\$28.93	181	464	1174	1157
46	\$58.96	\$72.76	\$22.03	\$22.03	337	718	997	1148
47	\$60.52	\$68.27	\$26.39	\$26.39	318	713	999	1124
48	\$62.24	\$72.75	\$27.36	\$27.36	273	632	1038	1124
49	\$65.18	\$75.51	\$30.48	\$30.48	148	428	1159	1152
50	\$60.57	\$69.54	\$23.42	\$23.42	319	751	997	1146
51	\$71.24	\$82.09	\$26.82	\$26.82	338	205	942	1034
52	\$65.54	\$80.47	\$30.82	\$30.82	375	237	939	1014
53	\$68.81	\$82.99	\$22.65	\$22.65	440	344	858	1024
54	\$68.79	\$79.24	\$22.29	\$22.29	418	356	864	1050
55	\$68.50	\$82.20	\$28.96	\$28.96	312	147	972	1049
56	\$70.38	\$79.58	\$24.90	\$24.90	308	189	960	1032
57	\$68.10	\$79.18	\$24.18	\$24.18	341	204	991	1036
58	\$69.43	\$82.81	\$22.63	\$22.63	444	401	825	1026
59	\$66.23	\$71.77	\$23.46	\$23.46	444	442	822	1030
60	\$68.49	\$86.99	\$23.60	\$23.60	501	411	785	1010
61	\$79.00	\$81.50	\$32.48	\$32.48	234	0	1026	1021
62	\$74.65	\$77.36	\$26.30	\$26.30	291	62	978	1055
63	\$76.48	\$78.95	\$26.82	\$26.82	313	49	963	1051
64	\$79.64	\$71.45	\$23.46	\$23.46	359	261	869	1060
65	\$75.28	\$77.02	\$26.52	\$26.52	402	219	825	1028
66	\$73.87	\$77.71	\$29.40	\$29.40	287	0	980	1065
67	\$78.63	\$75.18	\$29.09	\$29.09	247	32	990	1063
68	\$78.23	\$86.72	\$31.47	\$31.47	259	0	970	1048

69	\$77.53	\$80.46	\$33.69	\$33.69	219	0	1021	1032
70	\$77.91	\$74.71	\$25.17	\$25.17	290	92	939	1066
71	\$87.83	\$84.08	\$27.54	\$27.54	497	741	669	1209
72	\$79.56	\$89.17	\$29.60	\$29.60	426	474	808	1226
73	\$87.09	\$88.61	\$24.33	\$24.33	420	585	777	1255
74	\$83.52	\$78.08	\$27.96	\$27.96	378	508	856	1268
75	\$83.62	\$84.93	\$24.90	\$24.90	474	637	728	1230
76	\$82.66	\$81.13	\$22.33	\$22.33	512	766	648	1245
77	\$85.63	\$84.83	\$23.08	\$23.08	452	620	738	1256
78	\$86.23	\$82.66	\$30.62	\$30.62	385	543	799	1229
79	\$87.85	\$82.77	\$29.61	\$29.61	408	587	761	1224
80	\$86.49	\$90.16	\$27.83	\$27.83	399	541	772	1241
81	\$92.32	\$94.40	\$25.80	\$25.80	599	348	523	1112
82	\$92.75	\$97.00	\$26.92	\$26.92	558	260	579	1131
83	\$93.57	\$89.74	\$23.88	\$23.88	496	239	626	1141
84	\$91.04	\$95.15	\$24.12	\$24.12	614	340	557	1135
85	\$89.92	\$87.73	\$29.14	\$29.14	526	268	610	1119
86	\$92.09	\$87.10	\$24.68	\$24.68	663	524	450	1108
87	\$92.22	\$95.40	\$23.87	\$23.87	626	394	503	1119
88	\$92.63	\$92.51	\$24.72	\$24.72	523	242	628	1145
89	\$92.58	\$86.75	\$25.84	\$25.84	498	237	648	1138
90	\$97.09	\$86.69	\$21.76	\$21.76	603	494	482	1117
91	\$65.32	\$78.11	\$33.61	\$33.61	307	2	920	732
92	\$71.93	\$70.72	\$32.52	\$32.52	146	0	1022	758
93	\$67.75	\$74.33	\$26.95	\$26.95	346	179	849	742
94	\$71.70	\$74.67	\$26.25	\$26.25	239	103	914	750
95	\$70.81	\$72.88	\$29.51	\$29.51	226	0	981	755
96	\$68.83	\$71.64	\$29.59	\$29.59	289	101	890	726
97	\$67.47	\$74.27	\$31.92	\$31.92	188	0	999	750
98	\$67.65	\$70.69	\$26.49	\$26.49	341	215	819	745
99	\$68.44	\$70.90	\$24.59	\$24.59	241	38	962	761
100	\$69.70	\$72.62	\$25.34	\$25.34	356	216	810	728
101	\$78.49	\$81.34	\$26.84	\$26.84	356	506	779	931
102	\$77.51	\$82.37	\$27.26	\$27.26	410	577	730	915
103	\$76.78	\$76.42	\$27.52	\$27.52	438	700	667	903
104	\$75.78	\$72.20	\$25.69	\$25.69	416	665	692	929

105	\$73.40	\$83.09	\$27.65	\$27.65	532	710	629	917
106	\$76.38	\$76.74	\$21.90	\$21.90	384	583	744	956
107	\$78.27	\$87.93	\$22.99	\$22.99	476	717	642	939
108	\$74.33	\$75.99	\$24.76	\$24.76	417	654	708	959
109	\$80.76	\$80.69	\$24.75	\$24.75	342	544	781	953
110	\$78.18	\$83.91	\$29.00	\$29.00	359	468	784	930
111	\$82.81	\$81.70	\$21.74	\$21.74	580	426	500	806
112	\$84.91	\$87.36	\$21.83	\$21.83	555	380	522	842
113	\$86.38	\$85.25	\$29.24	\$29.24	438	171	620	833
114	\$87.13	\$91.01	\$21.52	\$21.52	594	418	439	827
115	\$82.25	\$92.88	\$21.93	\$21.93	599	337	514	831
116	\$84.48	\$85.60	\$22.82	\$22.82	514	266	570	819
117	\$83.59	\$80.73	\$22.62	\$22.62	594	430	470	820
118	\$82.21	\$90.18	\$24.92	\$24.92	659	475	414	807
119	\$85.87	\$93.55	\$27.67	\$27.67	442	117	678	830
120	\$84.52	\$85.85	\$20.68	\$20.68	590	426	483	818

Appendix C

This appendix provides step-by-step instructions for setting up and running the workshops. It also indicates when alternative ways of running the workshops are available.

Prior to Workshop I

1. Read file "0 Teaching Note" and create the following files using "1 Generate Data"
 - a. Four Excel files for independent variables
 - b. One Excel file with price and quantity data (see sample in Appendix B)
 - c. Four research briefings for the four existing firms
 - d. One presentation template
2. Assign students into groups
3. Provide students with an overview of what the workshop will entail

During Workshop I

1. Take fifteen minutes to explain the workshop setup
 - a. Less than three hours to work with data to develop market entry strategy
 - b. First deliverable: five-minute presentation due one hour before end of workshop
 - c. Second deliverable: reflection paper due the following day
 - d. Clearly describe the five choices that groups must make
 - e. Explain the grading setup
2. Provide each group with the following
 - a. Five seed money tokens representing \$10,000 each
 - b. Price and quantity Excel file
 - c. Presentation template
3. Students work independently in groups for about 165 minutes
 - a. Instructor as coach: if a group is struggling, they discuss the issue with instructor
 - b. Students can buy access to one independent variable Excel file with a token
 - c. Students can buy access to one firm's research briefing with a token
4. When one hour is left, groups submit their presentation deck
5. Each group gets five minutes to present and answer instructor questions

(Alternative) Run Workshop I Remotely: saves class time, but removes instructor as coach

1. Distribute a video of Workshop I description
2. Provide each group with the following
 - a. Price and quantity Excel file
 - b. Presentation template
 - c. All four independent variable Excel files
 - d. All four research briefings
3. Group presentations occur in class when slide decks are due

Between Workshop I and Workshop II

1. Grade presentations and reflection essays
2. For each group, create a separate copy of the "2 Firm 0 Entry" Excel file
 - a. The group number should replace "0" in the file name
3. Find answers to five choices in groups' slide decks
4. Enter these choices into "2 Firm 0 Entry" file to create unique data for each group
5. Create a separate Excel file for each group with two sheets
 - a. Sheet 1: price and quantity data for all five firms and independent variables
 - b. Sheet 2: cost structure and profit data for newly created firm

(Alternative) Only Run Workshop I: saves class time, students do not learn from mistakes

1. Grade presentations and reflection essays
2. For each group, create a separate copy of the "2 Firm 0 Entry" Excel file
 - a. The group number should replace "0" in the file name
3. Find answers to five choices in groups' slide decks
4. Enter these choices into "2 Firm 0 Entry" file to create unique data for each group
5. Find the profit for each group, calculate their firm's value, and declare a winner

During Workshop II

1. Take fifteen minutes to explain the workshop setup
 - a. Less than three hours to work with data to adjust market entry strategy
 - b. First deliverable: five-minute presentation due one hour before end of workshop
 - c. Second deliverable: reflection paper due the following day
 - d. Clearly describe the new choices that groups must make

- e. Explain the grading setup
 - f. Explain calculation to determine the winner and show initial standings
 2. Provide each group with the following
 - a. Their unique price and quantity Excel file
 - b. Presentation template
 - c. All four research briefings
 3. Students work independently in groups for about 165 minutes
 - a. Instructor as coach: if a group is struggling, they discuss the issue with instructor
 4. When one hour is left, groups submit their presentation deck
 5. Each group gets five minutes to present and answer instructor questions
- (Alternative) Run Workshop II Remotely: saves class time, but removes instructor as coach
1. Distribute a video of Workshop II description
 2. Provide each group with the following
 - a. Their unique price and quantity Excel file
 - b. Presentation template
 - c. All four research briefings
 3. Group presentations occur in class when slide decks are due

After Workshop II

1. Grade presentations and reflection essays
2. For each group, create a separate copy of the "3 Pricing Strategy" Excel file
 - a. The group number should be added in the file name
3. Find answers to each group's strategy decisions in their slide decks
4. Enter these choices into "3 Pricing Strategy" file to create unique data for each group
5. Find the profit for each group, calculate their firm's value, and declare a winner

Appendix D

It is not possible to discuss all of the information that students can glean from analyzing the data in these workshops, but we provide a short overview of the existing parameterization of the data to help instructors grade students' analysis in both workshops.

The initial data describes four firms, and students are asked in Workshop I to determine what type of market they are operating in. This involves three pieces of information: barriers to entry, number of firms, and substitutability of products. Firms A and B sell in-person tutoring services and, based on the market analysis in "0 Teaching Note," they face many small competitors. In addition, their fixed costs are around \$500,000, a relatively low barrier to entry. Their demand functions are also parameterized to make their products less substitutable. These facts imply a monopolistically competitive market structure. Market analysis of Firms C and D, which sell access to online tutoring tools, mentions no other direct competitors and their fixed costs are just under \$2 million each, representing a larger barrier to entry than for Firms A and B. Firms C and D are parameterized to have more substitutable products. This means C and D operate in a more oligopolistic market.

The market research in "0 Teaching Note" also describes the pricing strategy of each firm. The pricing strategy of Firm D is the easiest to express, as its price matches Firm C (another indicator of an oligopolistic market structure). Firm B takes a naïve approach to pricing using the following formula:

$$P_i = 2MC + 0.05H_i$$

where MC is the marginal cost of the tutoring services and H_i is the price of houses in thousands in zip code i .

Firms A and C are more difficult to describe, as they optimally respond to the behavior of the other firms as well as each other. Firm A price discriminates based on the region of the country where the zip code i is located, while Firm C price discriminates based on personal disposable income in zip code i . Firms A and C know their own demand functions as described in "1 Generate Data" and take the pricing rules of Firms B and D from above as given. Their demand functions are inverted to get marginal benefit functions, which are multiplied by their quantity demanded, respectively, to get the total revenue functions. The derivative of these functions relative to their quantity demanded gives the marginal revenue function, which these firms set equal to their marginal costs to maximize profit. This leaves us with two equations and two unknowns to determine the pricing rules for Firms A and C.

Because in-person tutoring is a monopolistically competitive market, it has been parameterized to become more profitable if a group focuses on differentiating their product from their competitors. New firms have pricing power but lack the ability to steal many existing customers from Firms A and B. Online tutoring services, being an oligopolistic market, is parameterized to be more profitable as long as the new entrant does not try to move the market price too much. Trying to undercut the prices of Firms C and D could lead to a price war and result in large losses. Likewise, lack of differentiation prevents firms from having significant power to set higher prices. Groups that focus on making their product more substitutable with their direct competitors can acquire existing customers from Firms C and D to boost their profits.

Firms B and D do not change their pricing strategies in response to the new entrant in Workshop II, but Firms A and C reoptimized with their new demand functions and they take the new firm's pricing strategy as given based on students' decisions in Workshop I.

After Workshop I, each student group has a unique demand function and can determine their optimal price by 1) deriving their demand function through regression analysis, 2) inverting it to get the marginal benefit function, 3) multiplying it by quantity demanded to get total revenue, 4) taking the derivative relative to quantity demanded to find marginal revenue, and 5) equating that to marginal cost. Marginal cost can be estimated from the market research of existing firms, as long as students can correctly identify which costs are variable and which are fixed. Students do not have the pricing functions for the existing firms, however, so they cannot set optimal price response functions.

While optimal pricing is possible, many groups do not go through the steps to do so. Some might plug a series of prices into their demand function to see which price creates the most profit, while others may calculate the optimal markup based on their estimate of price elasticity of demand. Many groups take their competitors' prices as a guideline and go just above or just below them. This strategy does not work as well, since existing firms have different demand functions. Finally, some groups choose to follow Firm D's example and price match one of their competitors. This strategy works well in the market for online tutoring services, where price matching can prevent price wars, but it is less effective in the market for in-person tutoring.

Finally, each group focuses on a particular market to target in Workshop I. This leads to higher demand in certain zip codes. Groups can price discriminate to increase profits by charging higher prices in high demand areas and lower prices in low demand areas.