Teaching Statement

Ying Fan

Department of Economics, University of Michigan

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In my most recent teaching evaluations, one student said "*great class, well-paced, well structured, great notes, great application of real-life examples*", and another one stated "*I like how she made herself available to discuss the more difficult concepts. This class might've been too difficult for me without that.*" While invariably subjective, I believe these comments are a testimony to the improvement of my teaching over the years I have taught at the University of Michigan.

Since 2009 when I arrived at the University, I have taught two undergraduate courses, Econ 431 "Industrial Organization and Performance" (Fall 2009, 2010, 2011, 2013, 2014, 2016, Winter 2014, 2016), and Econ 432 "Government Regulation of Industry" (Fall 2010, 2011, 2013, 2014, 2015), and one graduate course, Econ 631 "Industrial Organization" (Fall 2009, 2010, 2011, 2013, 2014, 2015). Over this period of time, I believe I have learned much about teaching. Some aspects of my teaching philosophy have been important to me since the start of my career and have worked well. Others I have developed over time, based on the feedback I received from students.

In this teaching statement, I describe my teaching philosophy and how this philosophy has evolved over time. I also explain remaining challenges in teaching, and what I would like to improve further. The last section discusses my advising of Ph.D. students.

Undergraduate Teaching

I have taught two undergraduate courses: Econ 431 and Econ 432. Econ 431 is an upper-level course on the theory of Industrial Organization. Industrial Organization studies firm behavior in imperfectly competitive markets and its influence on market outcomes such as consumer welfare. An imperfectly competitive market is one where firms are large and their actions influence their competitors' performance and actions. In other words, firms are strategic and interdependent, which means that the tools of modern game theory have to be used in this course. Since we rely heavily on mathematical game theoretic frameworks, the course can at times seem somewhat abstract. Similarly, I co-taught Econ 432 with various (former) colleagues from the Economics Department (Kai-Uwe Kuhn and Jeremy Fox). My part of the course covers the economics behind antitrust laws. Antitrust laws are designed to limit actions that let firms acquire and extend market power, which may harm market efficiency and thus consumers. Since antitrust issues occur only in markets where firms have market power (i.e., only in imperfectly competitive markets), this course presents similar challenges for the students with learning the mathematical and abstract material.

The challenge for me, as a teacher, is therefore to engage the students and make them interested so that they are motivated to study the difficult and abstract topics, and then to make the difficult concepts accessible to them. The student comments above may serve as an endorsement that I am on the right track. Next, I describe my teaching philosophy which summarizes my approach to deal with these challenges.

Teaching Philosophy

(1) Understanding the needs of the students

When I taught for the first time in Fall 2009, I used a lot of abstract examples. For instance, I used a generic mathematical parameter instead of a concrete number to describe the slope of the demand function. Even though I believe this is a good approach for some students, I learned that it is not for most. Students got too nervous about the math. As a result, they tended to ignore economic intuitions behind the examples

no matter how much I emphasized them. After understanding students' need for a more concrete approach, I replaced the abstract examples by numerical ones. Students became visibly more comfortable and devoted more energy towards understanding intuitions. This is supported by some of the comments I got from the teaching evaluations. One comment from the Fall 2009 teaching evaluation was "*The class is very theoretical. It is hard to see how the things we learn in class can actually be implemented in a real-world environment*." By contrast, students in Fall 2010, after I made the change, wrote that "*she is very good in explaining the materials and has taught us how to apply the concepts of industrial org economics in real life. I have learned a great deal from her*." and "*A well-structured and interesting course, covering tough material and managing to make it accessible*." Seeing that my modification to the lecture made a difference was a very rewarding experience.

(2) Repetition!

There is another lesson I learned over time: repetition is helpful, not boring. I now always try to explain the same concept in multiple ways. For example, whenever I introduce an optimization problem to describe firm decisions, I explain it both in terms of math (calculus) and in terms of economics (e.g., the location of a firm affects its profit directly through demand and indirectly through influencing the prices that will be charged by itself and by its competitors).

I also start every lecture with a quick review of what we have learned in the previous lecture. I summarize the key points and link those key points to what we will learn in class. For instance, before I start the lecture on how firms choose the quality of their products (a so-called vertical-differentiation problem), I summarize what we have learned about how firms choose locations (a so-called horizontal-differentiation problem). More importantly, I reiterate the key insights from horizontal differentiation and initiate a discussion on whether some of these insights can be used to study vertical differentiation, and if so which ones and why.

I think this approach works well for students. For example, in the Winter 2016 teaching evaluations, several students pointed out that they appreciated the repetition: "*Professor Fan went above and beyond trying to explain difficult concepts over and over*", "*She likes to reiterate the previous material which I find to be very helpful*". "*She is extremely clear in how she explains the material because she explains things in multiple ways so that everyone will understand*."

Implementing this approach also helps me to understand some concepts and topics better. When I work on finding different ways to explain the same concept, I often find myself understanding this concept at a deeper level. In other words, I have found that there exists a beneficial feedback between my teaching and my own understanding of the field of Industrial Organization.

Being clear and making difficult topics accessible to students are, however, not sufficient to make a good class. I also want to keep my students interested so that they are motivated to learn these difficult topics.

(3) Providing motivation

For example, in the first lecture of Econ 431, I explain that Industrial Organization is the economics of *imperfectly* competitive markets such as monopoly and oligopoly markets. To motivate the students, I asked the students to give me an example of a *perfectly* competitive market (where firms in the market do not choose prices and, instead, take the market price as given), which is the focus of Introductory Microeconomics. There typically is a long silence because it is, of course, hard to find a perfectly competitive market in the real world. I then ask the students to give me examples of imperfectly competitive markets. The students become active as they can easily name many such markets, for example, the airline industry, the automobile industry, the PC market, etc. Through this contrast (not being able to come up with an example of a perfectly competitive market vs. being able to give many examples of imperfectly competitive markets), the students are convinced that this course studies realistic firm behavior in important markets.

I take a similar approach whenever we begin a new topic, hoping to achieve two goals: first, providing motivation for why we study a certain topic; second, giving a big picture or background for it. For example, when I introduce asymmetric information (one party to a transaction has better and/or more information than the other party) and adverse selection (there is a tendency that only those informed participants who bring the least benefit to the uninformed are willing to transact), I start with a New York Times column about Obamacare. In this example, asymmetric information in the health insurance market occurs because buyers are likely to have better information about their own health status than insurance companies; and the adverse selection problem is that very healthy consumers may not buy a health insurance plan, leading insurance companies to raise the price to cover the cost of a pool of insurees with worse than average health. Discussing Obamacare motivates the students, and also gives a real-world context to the somewhat abstract models we discuss later on the topic.

It seems that this philosophy works well as testified by one student in the Winter 2016 teaching evaluation: "*Quality of instruction of the course was excellent. Each concept was explained clearly and real world situations were included, giving meaning to why as we were learning them.*"

(4) Relating abstract concepts to personal real-life experiences

I also try to relate abstract economic concepts and definitions to students' personal real-life experience. For example, when explaining the concept of cross-price elasticity and its relationship to the concept of substitutability (a measure of the sensitivity of the demand for one good to changes in the price of another good), I ask who would transfer to a community college if the tuition of the University of Michigan increased by 1,000 dollars, 5,000 dollars or 10,000 dollars. Usually, no one raises their hand even with a tuition raise of 10,000 dollars. When I ask who would transfer to a more similar university (say Wisconsin), more hands are raised as I increase the tuition raise. With this example, I can explain the concept of cross-price elasticity, and why cross-price elasticity is related to the concept of substitution (e.g., University of Michigan and a community college are not close substitutes, while University of Michigan and a more similar university are).

I believe because I relate to students' personal life when teaching, they feel comfortable contributing to the class by bringing in their own interests. For example, as part of the assignments in Econ 432, students present actual antitrust cases in groups. Each group focuses on a topic that we discussed in class. I usually suggest cases that are close to students' real life, for example, the AT&T and T-Mobile merger. In Fall 2016, one group chose their own topic (an option I always give to students) and gave a fascinating presentation on a case by the Federal Trade Commission against Paramount in the 1930's. When I asked the students why they chose their own and this specific case, they responded that all of them were interested in movies. Driven by their intrinsic interests, they did a great job at presenting the case.

Summary and Remaining Challenges

I really enjoy teaching. It is very rewarding to make a difference for students. I have been told by students that my courses are really challenging, but that they feel that they learned a lot. Some of them also told me that they became very interested in Industrial Organization after taking my courses and that they wanted to pursue this topic further. Over the last six years, I have written many recommendation letters for students applying for master or Ph.D. programs. Some of them were admitted to such prestigious institutions as the University of Pennsylvania and Yale University.

I believe my teaching has improved over time. I have made the courses more interesting, the structure of the lectures clearer, and the explanations of difficult concepts more accessible. Yet there are many aspects I would like to work on. For example, some students told me that while they feel that they understand

everything in the lecture, they do not always know how to approach a problem in the problem sets and the exams.

In response, I have redesigned some problem sets to give students a chance to try to solve a specific problem/example before we discuss the general insights/principles. My courses used to follow the structure of me lecturing first, and then students apply what they learned in the lectures to the problem sets. I have now experimented with the reverse order for some topics. I sometimes give the students a simple problem to solve on their own before I go over the general model which nests this simple problem as a special case. After the discussion of the general model, I give the students another problem set for them to apply the general model to additional specific problems. In sum, the new structure is "students solve a specific problem → I discuss general models in lectures → students apply the general models learned to another set of specific problems". Such an active learning experience helps students build problem-solving skills and understand the interconnections between a specific problem and the general models better.

This is an on-going project for me. For example, I am still working on designing the best problems for students to work through before my lectures and those after my lectures to achieve these new goals. The pre-lecture problems should be sufficiently simple for students to solve on their own without knowledge of the general models we then discuss in class. The post-lecture problems, on the other hand, should be sufficiently different so that the students can think through the common structure of the problems and relate them to the general models.

Graduate Teaching

The principles of my teaching philosophy apply equally to my graduate teaching. But I have additional objectives for it. Econ 631 is a course on empirical Industrial Organization. Different from my undergraduate courses, where I discuss *theoretical* models applied to real-world problems and policy issues, this course teaches students *empirical* methods to *quantify* the importance of the various economic forces highlighted by more sophisticated theoretical models (compared to those in my undergraduate courses), or to gauge the welfare consequences of certain economic activities (such as a merger) or government interventions (such as (de-)regulation). To this end, I teach the students to bring together theoretical models, industry data, and skills in modern statistics and econometrics. This is called "the structural approach", which would be beyond the scope of an undergraduate course.

The first goal of Econ 631 is to help the students master the recent methodological developments in the field so that they can use these tools to address their own research questions. The second goal of the course is to help the students get familiar with the literature so that they have a good understanding of what has been studied, the contribution of key papers in the literature, and what the remaining open questions are. The third goal is to help students develop their own research ideas.

To achieve these goals, I make reading and discussing papers the primary approach of this course. Throughout, when students read and we discuss papers, I encourage critical thinking. For example, in the first lecture, we discuss a list of questions that should guide students' reading of scholarly papers. I ask them to think about the questions on the list while they read the assigned papers. For example, "What economic question(s) does the paper address? Why is the paper important, according to the author? Do you agree? Do you believe the answers the author obtains? Why or why not?" Before we go into the details of each paper in class, we discuss the answers to these questions, the limitations of the paper, the model and the estimation method used in the paper, and sometimes whether the paper uses the best dataset available. To nurture critical thinking, I also encourage the students to ask questions and challenge me. I tend to show how much I enjoy these questions and the lively interactions with the students; and it seems that the students catch on. One said in a teaching evaluation comment that "*Ying is fantastic. She was always able to answer our strange questions and get at the root of what was confusing us. I loved this course.*"

I also help students to develop their own research ideas. I encourage them to meet with me in open office hours and discuss their ideas, and ask each student to give a 30-minute presentation on his/her own research proposal. After these presentations, the students need to submit a written proposal. In both the presentation and the written proposal, the students have to clearly state their research question, explain (and defend) why the question is interesting, describe what data would be ideal for addressing the question, and delineate what economic models and econometric methods they will use.

By asking students to present and write a research proposal, I pursue another objective for graduate teaching: training students' communication skills. As a non-native speaker, I probably was not a very good communicator when I started my Ph.D. studies at Yale. Over my years in graduate school, I learned the importance of explaining ideas clearly using simple terms and with a strict logical progression. More importantly, I learned that such skills can be acquired through practice. Through many presentations, some unsuccessful, I learned what to emphasize or omit, and when to slow down or speed up. Had I realized the importance of communication earlier, I probably would have acquired these skills sooner. Drawing from my own personal experience, I thus emphasize the importance of effective professional communication in the first lecture of the course.

Ph.D. Student Advising

Another important part of my graduate teaching portfolio is advising Ph.D. students. Watching students grow professionally is one of the most rewarding experiences for me as a professor. Since arriving at the University, I have advised ten Ph.D. students, four of them have graduated (Elena Patel, 2013, initial placement at the Department of the Treasury; Jongyearn Lee, 2015, initial placement at the Korea Development Institute; James Wang, 2015, initial placement at the Federal Reserve Board; Chenyu Yang, 2016, initial placement at the Simon Business School, Rochester University) and six of them are expected to graduate in 2017 (Adam Dearing, Harim Kim, Sarah Johnston, Christopher Sullivan, Evan Wright (Chair), Yiyuan Zhang).

Not all of these students share my own research interests. Some of them are more interested in understanding Industrial Organization issues from a theoretical rather than an empirical perspective; and some have a passion for topics related to the environment and natural resources. It is therefore a fun and interesting experience for me to advise these students. I bring different perspectives to their research, and, at the same time, learn from them about topics, papers and institutions that are outside of my specific expertise. On the other hand, some of the students do share my research interests, and the advising relationship with them then sometimes evolves into collaborations. For example, Chenyu Yang and I have written a joint paper on how smartphone producers choose their product offerings.

When advising Ph.D. students, I follow two main principles. First, I make myself available to students to discuss any questions or issues regardless of whether they are about a model, a method, data, research questions themselves, presentations, or writing. Second, I guide and challenge students. For example, I offer my opinion on the importance and the tractability of research topics they come up with, rather than telling students which topics they should pursue. I also tend to direct the students to a certain literature or a set of papers rather than handing a solution to them. I believe helping students write a dissertation so that they can graduate is not the ultimate goal. Instead, I view helping them succeed as researchers in the future – no matter whether they will work in an academic environment or for the government or the private industry – as a key part of my role as an adviser. As the saying goes, "give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime".