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Updating Our Approach to Intermediate Microeconomics

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Abstract

Symposia in the Journal of Economic Literature and the Journal of Economics Education have considered what should be taught in the introductory economics classroom. Scaling that question up to the major as a whole involves a discussion of the competencies that a graduate with an economics major ought to have. Within this discussion, relatively less attention is devoted to what and how economic theory should be taught to economics majors. Here, we focus on a class in intermediate microeconomic theory. We discuss how the content and emphasis of the course could be modified to (a) more closely reflect what economists do, (b) respond to—though not determined by—the changing interests of economics majors, and (c) be more inclusive. We argue that instructors could take a more intuitive, problem-centered approach to teaching micro-economic theory and prioritize discussion of strategic interactions, social preferences, incomplete information, and common pool resource problems.

Keywords

economics education, intermediate microeconomic theory

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> "[Students] have heard a lot about how interesting and exciting physics is—the theory of relativity, quantum mechanics, and other modern ideas. By the end of two years of our previous course, many would be very discouraged because there were really very few grand, new, modern ideas presented to them. They were made to study inclined planes, electrostatics, and so forth, and after two years it was quite stultifying."
>
> Richard Feynman, Lectures on Physics, 1963.

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Introduction

Symposia in the Journal of Economic Literature (see Bowles and Carlin (2020) and Mankiw (2020)) and the Journal of Economics Education have considered what should be taught in the introductory economics classroom.[1] Scaling that question up to the major involves a discussion of the competencies that a graduate with an economics major ought to have. Within this discussion, relatively less attention is devoted to what economic theory and how economic theory should be taught to economics majors, especially given the changes over the past two generations in what economists at the forefront of the discipline do and think, changes which largely have not been reflected in the core theory of the undergraduate curriculum. Here, we focus on a class in intermediate microeconomic theory. We discuss how the content and emphasis of the course could be modified to (a) more closely reflect what economists do, (b) respond to—though are not determined by—the changing interests of economics majors, and (c) be more inclusive. Specifically, we argue that instructors could take a more intuitive, problem-centered approach to teaching microeconomic theory and prioritize discussion of strategic interactions, social preferences, incomplete information, and related problems. In the context of the Feynman epigraph above, we argue that many students—who have heard about the advances in economics over the past 30 years—find the first 2 years of economics "stultifying" and are discouraged by the uninspiring and outdated theory they are asked to study.

Though most students who take an economics course never take more than one (Stock, 2024), economists care about intermediate theory because it plays a role in who becomes an economics major and what they believe economics is—that is, the economics paradigm. As Kuhn (1996: 43) says, "The community's paradigms [are] revealed in its textbooks, lectures, and laboratory exercises. By studying them and practicing with them, the members of the corresponding community learn their trade." Following Kuhn, we therefore understand that what students study in intermediate microeconomics—its content, the textbooks, problem sets, and applications taught—constitutes the "microeconomics paradigm" with which they will leave an undergraduate major.

When thinking about this paradigm—and the forces that act on individual departments—we argue that it results in homogeneity in course offerings in general and in the structure and content of microeconomic theory courses in particular. Departments homogenize their core courses in competitive response to other departments. Re-contextualizing Schelling (2006) in the mode of DiMaggio and Powell (1983), in constructing their majors (and core classes like their intermediate microeconomics classes), departments respond to an environment of other economics departments responding to the environment which consists of departments responding to an environment of departments' responses. As DiMaggio and Powell (1983) argue for organizations broadly, such responses among competing organizations often result in isomorphism—the homogenization of the offerings departments make to students in their core classes.[2] Though individual institutions or departments may have differing student bodies, goals for their graduating majors, or imperatives imposed by their state legislatures, etc., as Lozano et al. (2020:136) argue for business schools, they may "feel compelled to adopt practices and curricula similar to highly ranked schools." The homogenization may also be justified on the basis of students seeing other methods or approaches in field courses or electives, but many students may not take the courses that may re-contextualize or re-frame what they did in the homogenized core theory.

For context, we should say that what we mean by intermediate microeconomics is the standard practice in many colleges and universities to have a one-semester microeconomic theory course and a one-semester macroeconomic theory course that constitute the "intermediate theory" courses. Most conventional courses in intermediate microeconomics start with the assumption of complete information and self-regarding individuals. Consumer theory, firm theory, and the market equilibrium are studied with these assumptions as foundations. Incomplete information,

social preferences, externalities, and common pool resource problems are introduced as exceptions to the norm, time permitting. That pattern can be observed in a variety of intermediate microeconomics textbooks (Perloff, 2022; Pindyck & Rubinfeld, 2017; Varian & Melitz, 2024). This approach constrains the real-world problems that can be studied. This is because a large variety of economic interactions (e.g., in the labor, credit, insurance, and rental markets) happen in the context of incomplete information and incomplete contracts. Given the restrictive nature of the assumptions, it also means students study theory for the sake of studying theory and not necessarily to understand the economy better. The focus is on understanding and applying the mathematical tool of constrained optimization without enough of a focus on what that teaches students about the economy they live in.

The one-semester intermediate microeconomic theory structure is not true in all universities in the US or internationally. For example, in the UK it is standard for a graduate with an economics degree to have two 10–12 week courses for each of microeconomic and macroeconomic theory as the intermediate theory courses, that is, roughly double the one-semester standard. A similar trend has begun to emerge in certain (typically private) universities in the US. For example, Stanford University requires that economics majors take two 10-week quarters of intermediate theory, where the first quarter focuses on producer and consumer theory and the second quarter focuses more on non-competitive markets, market failure, and strategic interactions. Where students are required to do more courses in intermediate theory, what are considered "extras" for the course focused on consumer and producer theory—such as public goods, externalities, and strategic interactions—are the core of the second course. We argue, nonetheless, that if one were to have to pick *one course* that should be taught in intermediate theory, it is in fact this "second" course rather than the first one that focuses on consumer and producer theory.[3]

Our focus on intermediate microeconomics can be situated in larger debates about core economics courses which have gone on for the past generation or longer (Becker, 2003; Siegfried & Sanderson, 2003). Colander (2005), engaging with that debate, noted that the way economics has evolved as a profession is different from the ways principles courses have evolved. Colander also suggests ways to bring microeconomics courses up to date with how the profession has evolved. Among these proposed changes is to modify how models are taught. Theoretical models, it is argued, should be presented as logical exercises to understand the economy better and not as gospel truths.

We argue that students will be more motivated to study economics when we situate economics as a set of tools students can wield to confront their real-world concerns and that taking this approach is more pedagogically sound than an approach which centers theory based on greater abstraction from real-world facts or for the sake of graduate school admissions. As we explain in greater detail later, nearly 30–40% of economics PhDs do not have undergraduate degrees in economics. We also argue that the kind of economics that students need to understand to be responsible citizens in the 21st century coheres around topics that are at the forefront of what economists study and research—external effects, incomplete contracts, institutions, strategic interactions, and empirical economics—rather than older ways of studying well-worn topics—perfect competition as the standard model of firm competition, using Lagrangeans in consumer and producer theory, etc. Though other papers have addressed some of these ideas historically, the debates have tended to be about specific *examples* used in teaching rather than highlighting the importance of the theory specifically and the centrality of *problems* to motivate and center the use of theory and to separate between and among conflicting explanations of what occurs in the real world.

Burkholder et al. (2022) explain how a problem-centered approach taken in an introductory physics course with calculus can improve student learning outcomes and be more inclusive. They model how this can be done with three steps: (1) identifying less important content for subsequent

courses and cutting it, (2) figure out which content had less overlap with high school physics, and (3) they found unique problem-solving skills that could be taught in the course when the methods were applied to solve real-world problems. Similar approaches are being considered in mathematics education (Teaching & Curriculum Resources – Mathematical Association of America, nd). Economics instructors can go through a similar process by focusing on real-world problems to which the tools of microeconomic theory can be applied in a modern and relevant way.

Though it remains important for students to understand the keystone of constrained optimization—what we call "doing the best you can"—we ask what it would mean to situate constrained maximization alongside its contemporary brethren of strategic interactions, incomplete contracts, and external effects. The so-called "market failures" should be taught not as their name implies as "failures of the market" but as commonplaces that people, governments, and firms do their best to navigate and manage individually and collectively. As Tirole (2015), says, "Competition is rarely perfect, markets fail, and market power […] must be kept in check." Standard models of perfect competition and information have been taught for several decades and have been iterated on and made accessible over time. Teaching strategic interactions, incomplete contracts, external effects, mechanism design, etc., will similarly benefit from such investment of instructor time and energy. We outline some strides that have already been made.

Below, we propose five major updates to our approach of intermediate microeconomics courses as they are predominantly taught. We then discuss two examples in teaching concepts that intuitively explain real-world phenomena. We finally address the opportunities and foreseeable challenges to making these updates at scale.

An Updated Approach to Intermediate Microeconomics

Here, we propose five updates to the conventional approach to intermediate microeconomics. These updates are not mutually exclusive and not in any particular order.

Update 1: Moving the "Optional" Content at the End to the Core

Given that we argue for a reform of the curriculum, what do we think the curriculum should contain? First, the approach should be a problem-centered one. Students arrive at university motivated to study *problems* not to study *opportunity cost* or *Nash equilibrium*. A problem-centered approach to economics is different from teaching theory and coming up with examples of where it might apply. It puts the problem front and center and uses the model in service of the problem at hand. It also demonstrates the importance of evidence to understand that problem and the relevance of the theory. The other concern with approaching it as theory for its own sake followed by applications is that the applications are often relegated to the end of the chapter or to discussion sections. When an instructor decides on "what to cover," the applications are the first to go and discussion sections may be taught by tutors/TAs who may not always convey the centrality of the application and *why* the model is useful.[4]

Second, content that instructors often relegate to the end of the semester, if they teach it at all, should instead be shifted to the start of the semester and constitute the core of what the instructor teaches. This requires instructors to make tradeoffs and to drop some content, some of which may have already been taught in introductory economics, but where the standard plan may have been to teach with more mathematics in intermediate theory.

What topics do we think should be emphasized given the problems that students propose as the most pressing? We build on Bowles and Carlin (2020) as well as on national qualification frameworks (Chaudhury et al., 2023) and highlight specific topics that can be brought to the forefront of an intermediate theory course.

(1) **Game theory, social interactions, and institutions**: Sequential and simultaneous games provide a framework for understanding social interactions with conflicts of interest and common interest and can be contextualized with an adequate understanding of Pareto efficiency, multiple equilibria, external effects, increasing returns, expected payoffs, and risk dominance.
(2) **Incomplete contracts**: The different parties to a contract hold asymmetric and unverifiable information which results in Pareto-inefficient outcomes compared to a hypothetical complete contracting alternative. Students can use these tools to address the gig economy, monitoring technologies in the workplace, credit constraints and credit market exclusion, and many more aspects of modern economies.
(3) **Preferences and economics as an experimental social science**: Preferences can be rational while including benefits to others—students can see observe these preferences from laboratory and field experimental results and analyze the idea using standards tools of tradeoffs (the marginal rate of substitution from indifference curves) and opportunity costs (the marginal rate of transformation from a constraint). Experimental evidence suggests that people are not entirely self-regarding.
(4) **Common pool resources, overcrowding, and governing the commons**: Many courses in intermediate theory may teach Cournot oligopoly as a specific kind of market structure instead of thinking about the general class of problems in which Cournot oligopoly falls, that is, the general class of common pool resource problems with rival and non-excludable benefits with Pareto-inefficient overcrowding in equilibrium. Students can use these tools to understand overfishing, climate change, industrial organization, and a variety of other topics.

Update 2: Not as Prep for Graduate School in Economics

Most economics majors *do not* go on to graduate school in economics and microeconomic theory should not merely concern itself with preparing students for graduate school. Instead, an economics education broadly, and an intermediate microeconomics course particularly, should prepare our students to be 21st-century citizens equipped with what we believe constitutes a modern and current paradigm of microeconomics.[5]

The vast majority of undergraduate students in economics do not go on to a PhD in economics, and the faculty who teach our students represent a highly biased sample of the socioeconomic status of members of the US population (Stansbury & Schultz, 2023). About 60% of PhDs in economics are awarded to international students and about 40% to domestic US citizens or permanent residents—roughly 450 per year (Stock & Siegfried, 2015). Using Stock and Siegfried's data, 75% of those students who do a PhD in Economics did at least one major in economics, so roughly 338 economics majors who are US citizens or permanent residents go on to complete a PhD in economics. Using IPEDS data for 2015-16 where roughly 34,000 students completed a major in economics, this is approximately 1% of economics undergraduate students (National Center for Education Statistics, 2016). More recent data suggest that the proportion of PhDs in Economics who did an economics major is down to 60–70% (NCSES, 2018, 2023), which suggests that the proportion of econ majors who go on to graduate school may have decreased further since 2015 (IPEDS data suggests that the number of economics majors increased to roughly 35,000 in 2019/20 (National Center for Education Statistics, 2021)).

Students are unevenly distributed across higher education institutions, however, with most coming from a subset of colleges and universities, and many selective liberal arts colleges producing a disproportionate number of eventual PhDs (Stock & Siegfried, 2015). The faculty at the institutions that teach economics does not represent the economics profession broadly. Among

economics faculty at the top 96 institutions in the US, 60% earned their PhDs at top-15 institutions and one-third of those who did their undergraduate degrees in the US (regardless of major) earned them at top-15 institutions (T. R. Jones & Sloan, 2024). As Stansbury and Schultz (2023: 208) show, "US-born economics PhD recipients are around five times less likely to have a parent with no college degree, and five times more likely to have a parent with a graduate degree" suggesting that economics PhD holders do not represent the students in the classes that they teach, let alone the population at large. Siegfried and Raymond (1984) find in their profile of economics senior majors that only 33% of the students surveyed wanted to immediately go on to any formal education after graduation and 15.3% of them wanted to go on to graduate school in economics. So, our coursework at the undergraduate level should not be useful only as preparation for graduate school in economics. Instead, our coursework should help students better understand the economy and society they actually live in. It should improve their competencies as well as their wisdom.

Notwithstanding these statistics, Hoyt, Marshall, O'Sullivan, and Patell (this issue) report data suggesting that about 72% of instructors of intermediate micro believe they are preparing students for the labor market and 35% report that they expect intermediate microeconomics to prepare students for graduate school. While a course in intermediate theory may act as preparation for graduate school, math courses (e.g., linear algebra and real analysis) are arguably more important. Jones et al. (2020) survey admissions coordinators for economics PhD programs. They find that while 60% of programs considered coursework in intermediate theory "highly" important for admission, nearly 90% of the programs considered coursework in Calculus 1 & 2 "highly" important. Similarly, there were more programs that considered GPA in Math "highly important" than programs that considered GPA in economics "highly important" (albeit by a small margin). Given that roughly 30–40% of students who do not have an undergraduate major in economics graduate with a PhD in economics, completing intermediate microeconomics is not essential to graduate school admissions, let alone the specific content covered (NCSES, 2018, 2023).

Update 3: Competencies as Well as Wisdom

Allgood and Bayer (2017) outline five major competencies of economics students:

(1) The ability to apply the scientific process to economic phenomena.
(2) The ability to analyze and evaluate behavior and outcomes using economic concepts and models.
(3) The ability to use quantitative approaches in economics.
(4) The ability to think critically about economic methods and their applications.
(5) The ability to communicate economic ideas in diverse collaborations.

What students learn in a college economics class can affect (a) the way they perceive and understand the economy and the society in which they live and (b) the way they act as citizens of their communities and the world. Economics majors may provide preparation for graduate school and for student post-graduation employability (T. Carroll et al., 2014; Jenkins & Lane, 2019), but the larger goal of an economics major should be to make students wiser about how individual actions shape macro outcomes and, conversely, how macro trends constrain individual action. The specific competencies we expect an economics major to have constitute a part of this larger, more foundational goal.

If we do not view economics as simply preparation for graduate school or the workplace, what else do we think is valuable for an economics degree? We think that economics is among the best-suited among the social sciences to prepare students for citizenship in the 21st century. Economics

recognizes the importance of markets and the state (or government), while also recognizing the importance of civil society or community alongside the rigorous preparation it provides for the workplace (Bowles & Carlin, 2021; Bowles et al., 2025; Bowles & Halliday, 2022).

Update 4: A Closer Reflection of What Economists do

Current classes in intermediate micro theory depict a paradigm that's outdated. Constrained optimization is not the only thing economists do, neither is the study of market structures focused mostly on perfect competition. Much more work is done on game theory, strategic interactions, externalities, institutions, incomplete contracts, mechanism design, inequality, and related topics, as is reflected in the work of economists working in the private sector and for governments, such as Hal Varian at Google, John List at Lyft and Walmart, and teams of economists at Amazon, Microsoft, and even video game companies. Consider Table 1.1 in the Appendix where we have summarized the Nobel prize winners in Economics for the past 30 years and the corresponding topics in intermediate theory that could be taught relating to these topics (Bowles et al., forthcoming; Bowles & Carlin, 2020). An instructor might suggest that they "teach these topics at the end of the semester once they have taught the fundamentals." But such an admission misses the point (alongside the concern one might have that often the topics get dropped when an instructor decides they "don't have enough time"). The point is that if one were to focus on these topics as the *contemporary paradigm in economics,* then the fundamentals one would teach would also change.

Changing the emphasis of intermediate microeconomics presents a challenge for economics instructors. For almost 130 years, since the publication of Marshall's *Principles of Economics* in 1890*,* we have been focused on particular ways of teaching microeconomics and iterating on that (Marshall, 1920). Samuelson, in the 1940s, substantially added to and revised the approach of Marshallian (and to a lesser extent the approach of Ely et al. (1919) in the US), re-orienting the course towards constrained maximization and the use of mathematics based on his PhD thesis. Further attempts at improving on and updating the pedagogy of microeconomics were made by Stigler (1942) and Alchian and Allen (1969) (who innovated in teaching marginal benefits—or as they called them "marginal personal use value" or "marginal value"), alongside a flowering of books in the 1970s through the 1990s. Examples include Snyder and Nicholson (2021), Walter (2021) in 1972, Varian (2024) in 1987, Pindyck and Rubinfeld (2017) in 1988, Frank (2017) in 1991, and Perloff (2022) in 1998. All of these books built on and honed the pedagogical innovation of teaching a standard intermediate microeconomic theory that had been built up over roughly two generations since Samuelson.

Consider, for example, the use of Edgeworth(-Bowley) boxes to teach general equilibrium,[6] Samuelson's innovation of the Keynesian Cross to teach otherwise more complicated ideas from the IS-LM model in macro theory, or, going back even earlier, Marshall's innovations in the "scissors" of demand and supply (also called the "Marshallian Cross"), and teaching ideas like "consumer surplus" (or, in his original 1890 parlance, "the consumer's rent"), marginal utility (based on more advanced treatments by Jevons, Walras, and others), and so on. The job of professors engaged with the forefront of research includes finding ways to include advanced theories in textbooks and classes such that an undergraduate can engage with such theory in their core courses—as happened with Marshall, Ely, Samuelson, Stigler, and others throughout the late 19th and 20th centuries—revolutionizing the way economics is taught in a way that incorporates advances in the core paradigm of the discipline. To relegate advances in theory to "field courses" is a pernicious and modern idea that our predecessors would not have understood.

We would, however, be unreasonable to expect new ways of teaching intermediate microeconomics to compete perfectly with 75 years of iteration and innovation purely in terms of

pedagogical approach. On the contrary, with topics like mechanism design, contract theory, and other newer ideas and techniques in economic theory, we have neither fully created nor iterated on the best ways to teach these ideas. To be sure, a variety of authors have tried to incorporate particular ideas into their texts in various ways, for example, Frank incorporates the importance of information and contracts in Chapter 6, altruism and other-regarding preferences more broadly in Chapter 7, and cognitive limitations (e.g., bounded rationality) in Chapter 8; though he regrettably takes as standard the model of perfect competition (chapter 11) rather than imperfect or monopolistic competition (which he does address, though only at the end of that section of the book in Chapter 13). With respect to the topic of Mechanism Design, Bowles and Halliday (2022: 931) teach the intuition of mechanism design as follows, "The task of mechanism design is then to reverse-engineer that desired allocation. This requires finding a set of rules of the game under which the desired allocation will be a Nash equilibrium, and therefore could be implemented by introducing the mechanism (the new rules of the game) [the Mechanism Designer] has discovered. The creation of a new superior equilibrium by a change in the rules of the game is called implementation by Nash equilibrium." When teaching new ideas, as these authors do, there is much to be learned about *what can be left out* as much as in *what to include*. For example, Bowles and Halliday (2022) repeatedly emphasize the ideas of participation constraints and incentive compatibility constraints as analogous to ideas taught in standard micro theory so that when similar ideas arise when students arrive at contract theory or mechanism design, they are not surprising and the analogies of mechanisms that produce Pareto-efficient outcomes through the appropriate institutional (mechanism) design are more straightforward.

Update 5: Economic Intuition Over Mathematical Patterns

Since intermediate theory courses are two of the most theory-focused classes an economics major takes, it is the right opportunity to expound on the usefulness of theory, broadly, and in economics specifically. This includes what a model is and why it is important. Bowles and Halliday (2022), for example, distinguish maps from territories to explain the usefulness of a model (a map) from reality (the territory).[7] Additionally, for students who will go on to take classes in econometrics or statistics, it is useful to explain how theoretical models (whether or not they are explicitly stated) form the basis on which empirical investigations are conducted. Theory informs what we look for in the data and what the mechanisms underlying the results from data might be. A theoretical examination of data can result in a kind of "rubbish in, rubbish out" use of data.

Many instructors, perhaps because of complaints by students about how "mathematically challenging" intermediate microeconomics is or perhaps because of the curse of knowledge, believe that the rigor in intermediate microeconomics is rooted in its mathematical difficulty rather than in the economics they teach. We believe instructors who have such a belief fail to give their discipline sufficient credit. Economics is hard. Economics is rigorous. Economics is hard and rigorous even without the related mathematics. Thinking about the distributed actions of agents trying to achieve their goals in interdependent ways and achieving counter-intuitive results—such as the cooperative outcomes that benefit many actors—is not how the average person has been trained or is inclined to think. On the contrary, many people think in zero sum ways (Meegan, 2010) as demonstrated by polling on topics like immigration or labor markets where respondents think in terms like "immigrants take our jobs" (failing to account for immigrants creating demand) or "technological change means all jobs will be eliminated" (failing to account for complementarities between labor and capital and for capacity constraints in production, comparative advantage, or other ideas in economics that might lead one to think otherwise) (Chinoy et al., 2023). If, as instructors, we think that the reason that microeconomics is hard is purely because of mathematics, then we misunderstand both our students' misunderstanding of our courses and the

rigors of our own discipline. Let us reiterate: economics, independent of its mathematical content, is hard.

Given that, let us consider Figure 1, which depicts a two-by-two relationship with potential students in an intermediate microeconomics course: students may struggle to understand the mathematics or understand the mathematics and they may struggle to understand the economic intuition of a problem or understand the economic intuition of a problem. Our argument is that the instructors of many intermediate microeconomics courses seem to think that their course is successful when they have some students in box A (students who understand both) and some in box C (students who understand the mathematics and not the intuition) while recognizing that there are others who inevitably fall into categories B and D. If intermediate microeconomics were simply a course in "mathematics for economics," then this might be an adequate outcome. However, intermediate microeconomics is a core course in the economics major, not just a "mathematics" course, so the emphasis should be on the competency in understanding economic theory and its intuitions and not simply mathematical recipes. Our argument therefore is that a successful intermediate microeconomics course is one that has students in categories A and D, with some unfortunately falling into categories B and C (or perhaps with all students above a northwest-southeast diagonal).

Teaching economic intuition requires the kind of deliberate practice that has been shown to work in a variety of fields to improve expert knowledge (Ericsson & Pool, 2016). In disciplines that are similar to economics, say, Physics, employing deliberate practice for homework (in conjunction with other active learning strategies) has been shown to improve learning outcomes

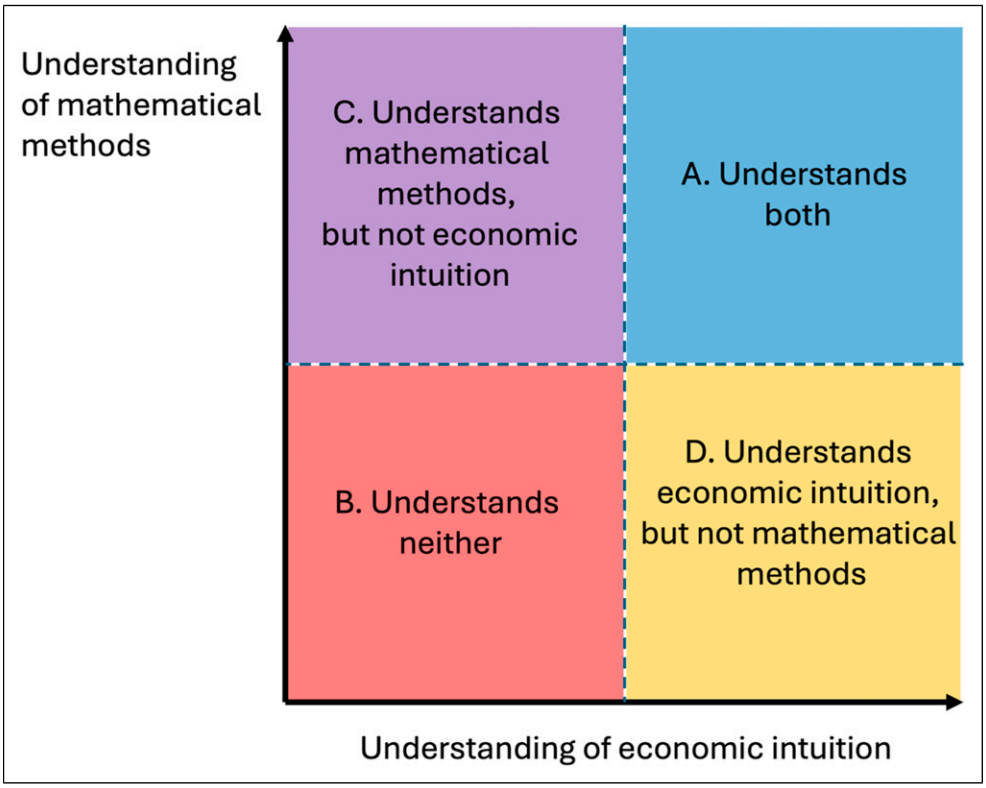

Figure 1. Understanding Economic Intuition and Understanding Mathematical Methods

significantly (Miller et al., 2021). Students need deliberate practice so that they do not get caught up purely in applying algorithmic thinking to, say, one particular style of mathematical problems in economics and learn *why* the mathematics produces the results that it does and how the mathematical results have specific economic interpretations that can be conveyed in plain English.

Examples in Teaching

Here, we explain particular examples and contrast them with other uses of the same content space in intermediate microeconomics.

Poverty, an Assurance Game, and Risk Dominance

Here, we construct a teaching example that builds on three important ideas. First, as Nobel Laureate (Schultz, 1980): 639) said, "Most of the people in the world are poor, so if we knew the economics of being poor, we would know much of the economics that really matters" or framed in contemporary thinking, about 83% of the world's population live in lower- or middle-income countries. Second, in many of these economies the assumptions of competitive markets, complete information, no externalities, and complete contracting fail to reflect the empirical reality of inadequate competition, incomplete information, pervasive externalities, and incomplete contracting. Third, and given the above, economic models that have economic multiple equilibria and or depict strategic interactions with conflicts of interest among multiple efficient outcomes, or hard to achieve Pareto-efficient outcomes compared to persistent Pareto-inferior equilibria, better reflect these on-the-ground empirical facts and theoretical realities.

What learning outcomes does a student get from the exercise?

(1) Students identify that multiple equilibria occur regularly in real-world situations.
(2) Students realize that interdependence among actors—their actions affect the actions and payoffs others receive—is crucial for how people interact in economics interactions.
(3) Students recognize that people can rationally and reasonably play strategies that lead to Pareto-inferior outcomes.
(4) Students also learn about the intersection of lines (when they sketch expected payoffs), but that the intersection of lines alone doesn't constitute an equilibrium (in fact, the case of an Assurance Game, the intersection is not a stable outcome—which is another important lesson!).
(5) Students can learn to identify other real-world phenomena that *mirror* assurance or coordination game type phenomena.

In our experience, for example, students who learn about supply and demand often misconstrue these ideas thinking that "there is only one equilibrium." That misconception can result in disastrous misunderstanding of real-world contexts and social coordination problems where there are multiple equilibria and where people rationally and reasonably can choose to play strategies that lead them to a Pareto-inferior outcome. Consider a 2×2 simultaneous (normal-form) game as depicted in Figure 2. Each player has two strategies: Plant Early & Plant Late. The specific context of this game was motivated by real-world problems that farmers in India face: they know they *could* adopt other strategies to improve their lot, but they are unable to coordinate on doing so (Himanshu et al., 2018; Lanjouw & Stern, 1998).[8]

Solving the game using best response analysis, students identify that there are two Nash equilibria (Early, Early) and (Late, Late) where (Early, Early) is Pareto-superior to (Late, Late) and Pareto efficient. Such an outcome is standard in Assurance Games. Students immediately wonder

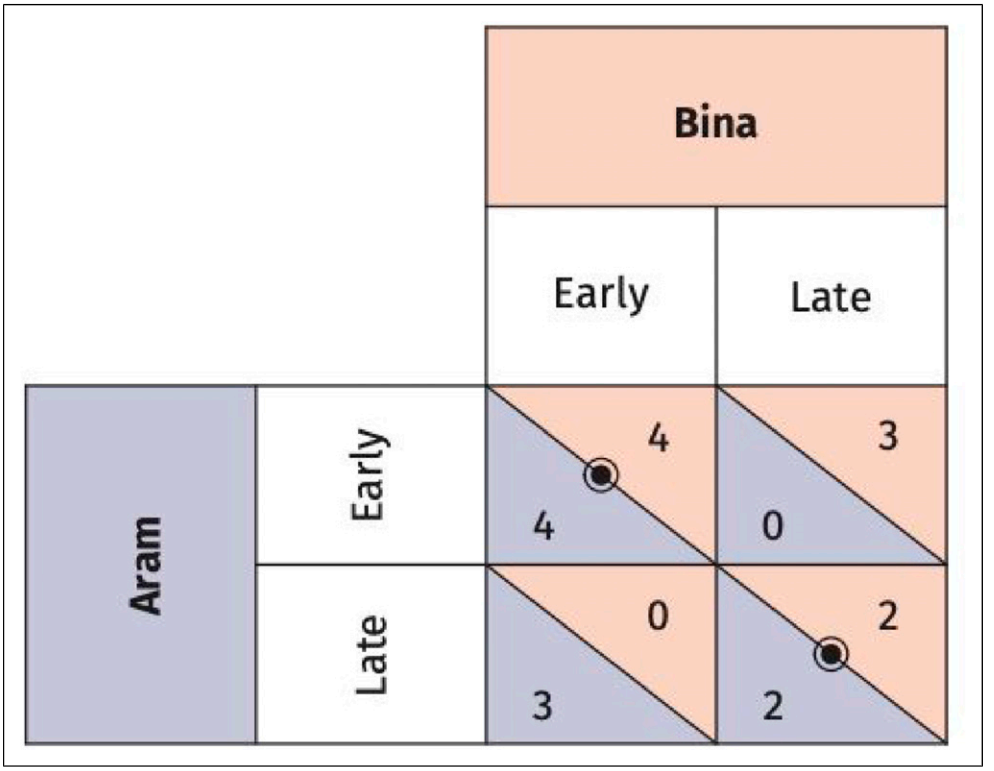

Figure 2. An Assurance Game: Planting Early or Planting Late in Palanpur. The Nash Equilibria Are (Early, Early) and (Late, Late) as Indicated by the Cells With a Circle and a Dot in Them (source: Bowles and Halliday (2022)).

how people might coordinate on the "better" outcome. But then, we reintroduce them to the idea that there are farmers *in the real world* who know it would be in their interests to plant early, but they fail to do so and instead all plant late. How could this occur?

Using just algebra, you can show the students that when people don't know what other people will do, a rational choice can be made to *expect* others to play each strategy with the probability 50–50 (there are theoretical underpinnings for this that students don't need to be taught based on Bayes' Rule). In economics, and based on Harsanyi (1995) and Harsanyi and Selten (1988), we call this idea **risk dominance**. In the game depicted in Figure 2, Late has a higher expected payoff than Early does when players expect that others will play each strategy with the probability $p = 0.5$ (players would be indifferent at $p = 0.66$). When players play the risk-dominant strategy (Late), they end up at the Pareto-inferior Nash equilibrium. And these are *risk neutral* players; they aren't even risk *averse* (which some students will inevitably ask about)![9]

In addressing the problem of poverty in this stylized way, students demonstrate the ability to fulfill several of the competencies outlined by Allgood and Bayer (2017), especially as we combine the explanations outlined above with evidence from choices people make in the real world about agricultural choices and risk.

Charitable Giving, Cobb-Douglas Utility, and Demand

What learning outcomes does a student typically get from applying Lagrangeans to a consumer or producer theory problem? They typically learn that applying a mathematical recipe gives them a demand function (consumer theory) or some production choice (producer theory). But do they know what these mean or how to interpret them? We would argue, typically no. What real-world ideas and analogies are they making when they derive a demand function from Cobb-Douglas utilities?

Here, we use the function to think through the real-world context of charitable giving and to understand how economics can inform us about whether and to what extent people are self-regarding or other-regarding. Students often consider volunteering as part of their own identities, for example, and relate to the fact that charitable giving is now roughly 2% of GDP annually (List, 2011). Furthermore, and, as List and others articulate, tax incentives change the "price" of giving and thus lead us to think through how people respond to changes in prices at the margin.

Our setup involves a dictator game between two people: one person (A) giving money to someone else (B), which can be framed inter-personally or as a charitable interaction (B can be a charity).[10] Person A splits an endowment, m, between her own payoff (π^A) and another person's payoff (π^B). The level of A's preference for keeping money for herself is the standard alpha in a Cobb-Doulas utility function where $\alpha = 1$ implies pure self-regarding behavior (no giving to B or to charity) because they give no weight to the other person's payoff and $0 < \alpha < 1$ implies some other-regarding or charitable giving behavior.

In solving the problem of charitable giving and altruistic behavior, you can teach students the idea that *altruistic behavior follows the law of demand: as the price of altruism increases, the quantity of altruistic behavior decreases.* Students find this fascinating and many *immediately* see the connection to funding drives with "matching funds" that *lower the price of charitable giving:* a 2x match means the price of giving is \$0.50 rather than \$1, a 4x match means the price is \$0.25, etc. Evidence from laboratory experiments shows how such price changes can work (Andreoni & Miller, 2002), while field experiments show that, while matches increase charitable giving, the response is relatively inelastic (Karlan & List, 2007). In seeing the application of a model to a real-world problem, understanding and evaluating an experiment, and seeing evidence from laboratory and field experiments with sometimes conflicting results, they are also fulfilling tasks to achieve the first four competencies outlined by Allgood and Bayer (2017).

Foreseeable Opportunities and Challenges

In this section, we outline the opportunities and challenges that instructors might encounter in updating their approach. We argue that instructors have several opportunities to incrementally or substantially change their approach. In this, they are aided by changing student demand, evidence on how a problem-centered approach to economics can improve inclusivity of the discipline, and growing freely available resources. The challenges instructors might face, on the other hand, include path dependency at the level of institutions and individual instructors, as well as a reluctance to experiment and innovate.

Opportunities

Student Interest and Demand. Students of introductory economics were asked, "What is the most pressing problem economists today should be addressing?" (Piccoli, 2022). Responses from students at Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany, in 2021 are summarized by the word cloud below, more examples of which can be found here. The word cloud

demonstrates that students are interested in a variety of different real-world economic challenges. And therefore, an update in the topics covered in intermediate microeconomics is less likely to meet with resistance from them and more likely to be welcomed.

When considering student demand, though, this should not be seen as the only reason to change the content of intermediate-level courses. Students' preferences may change over time and respond to particular circumstances—for example, during the height of the COVID-19 pandemic, students became concerned with that and with the subsequent inflation that swept the globe, the surveys picked up on those problems too. We do not believe that economic theory should continuously be repurposed to address the potentially fickle ideas of the day, but it should concern big issues that students care about. For example, despite changes over time in the body of students responding to the survey above, poverty, inequality, unemployment, the future of work, and climate change have persisted as important challenges. They are also important challenges that economic theory can address. Taking real-world problems as the central case of theory is also not specific to economics but rather has adherents in STEM disciplines like physics, biology, and chemistry (e.g., Hoskinson et al. (2013) and Morra (2018)).

Availability of Resources. Very often instructors might be less inclined to change how they have taught intermediate microeconomics because the prevailing conventional version of the course has been taught long enough and widely enough that a lot more resources in the form of teaching material, quizzes, and practice problems exist. However, we believe that the good news is that this is changing. CORE The Economy 2.0, which many instructors teach at the intermediate level, is open source and Bowles and Halliday (2022) is freely accessible (although only as a flat PDF. OUP sells an interactive e-book with additional resources). Moreover, if an instructor is simply willing to restructure their course, many textbooks may have resources towards the end of the book that an instructor can prioritize to be earlier in their course or use in combination with other textbooks, for example, combining content from, say, Frank (2017) with Dixit et al. (2014) centered on addressing important, real-world problems.

Impact on Inclusivity. When considering the preferences of students, it has been suggested that we should "revise how we present economics to undergraduates" (Bayer & Rouse, 2016). Like Bayer and Rouse (2016), we believe that improving pedagogy is an important component of this, for example, by improving teaching practices to reflect high-return practices from the learning sciences like deliberate practice, but, as we assert here, curricular reform also constitutes an important component of revising how we present economics.

Why might this be the case? Within the economics profession itself the evidence suggests that male and female economists have different preferences about what to study and about what is most important to study: for example, more female economists are interested in policy-related and applied questions in economics (May et al., 2014, 2018) and on average female economists also have different attitudes towards climate change and the environment than male economists (May et al., 2021).[11] Though we do not have directly comparable research on race, recent research by Francis et al. (2022) suggests that there are similar differences in approach and interest for Black economists related to topics of education, public economics, poverty, and mobility.

We might then wonder whether similar differences emerge among our students. Zhargamee et al. (2017) quote a female student as saying:

> "I hoped economics would give me a way to describe and predict human behaviour through mathematical tools … after semesters of study, I had mathematical tools. But all the people whose behaviour I wanted to study had disappeared from the scene."

We believe therefore that reforming the curriculum and changing the content of important paradigm-forming courses like intermediate microeconomics could improve the recruitment and retention of undergraduate students in economics.

In clarifying what we argue for, let us also make clear what we do not argue. We do not argue for an approach based on "remediation" of quantitative skills, an approach that changes the "inclusiveness" of the classroom by showing pictures of underrepresented communities and their work, or an approach that requires instructors to send emails to students in the hope that we might get them to change their minds about economics.[12] Instead, we argue the standard intermediate microeconomics course itself is not fit for purpose and should change. We economists need to change what we think the course is for and what purpose it serves our students. None of the content we argue for is controversial in the discipline of economics as it is based on content for which Nobel Prize winners have won awards and which is published in flagship journals in the discipline. We do not argue that we should abandon calculus as a mathematical tool (if your course uses calculus).

Challenges

Path-Dependency at the Level of Instructors. Instructor preferences tend to differ from student preferences when it comes to economics classes. Most instructors acquire a PhD in economics and that is not the norm for an economics major. Additionally, current instructors of intermediate microeconomics may have studied that course using resources, textbooks, and content that were standard at that time but may need updating now. This may be seen in empirical courses. For example, instructors teach data analysis using SPSS or Excel (which they learned), but employers may prefer graduates to know R or Python or Tableau (see Footnote 7). There may also be an unwillingness to experiment with courses that are considered core to the major both because the costs of experimentation are perceived to be too high and because these courses are believed to reflect the reputation of the degree and the institution.

Path-Dependency at the Level of Institutions. Even if individual instructors in larger departments would like an update of the intermediate theory courses, they act not in isolation but in the context of how departments traditionally taught these courses. Moreover, even if there is a broad agreement that intermediate courses should be updated, there may not be consensus on the specifics of where updates are needed and how it should be updated. And the lack of consensus in turn results in a bias towards the status quo. A lack of consensus may also emerge because there might be (real and/or perceived) external effects of changing the content of one course on other courses in the major. We believe that these external effects may be overstated because the basics required for any other course need to be reviewed or taught concisely again in most cases.

With respect to both of the concerns so far at the level of instructors and institutions, we believe that the availability of free resources like CORE's *The Economy 2.0*, Bowles and Halliday (2022) available free online, OpenStax, and many others lowers the fixed cost of transitioning. To be sure, it may nonetheless be easier for faculty and institutions who have hired recently graduated PhDs to adopt these resources or for a small group of faculty simultaneously to coordinate switching and to support each other in doing so (Halliday did this with two other instructors at a previous institution where all three coordinated on creating homework problems, midterm exams, quizzes, etc.).

Concerns by Instructors of Upper-Level Electives. Instructors of upper-level electives may be concerned that the specific tool that they employ in their elective that they believe is currently taught in intermediate theory would no longer be taught if the curriculum changes. One can respond to this concern in many ways: first, even if the specific tool that they wanted a student to learn had been

taught (e.g., constrained utility maximization with a Lagrangean), it remains the case that a student may not understand *why* the tool achieves the outcome it does in terms of understanding the underlying economics rather than applying the mathematical tool as a specific understanding-agnostic method (a problem we identified earlier). Second, even if a particular tool has been taught, students may not remember it (this is true for topics from an updated paradigm too) (Wargo & Vilceanu, 2011). Third, even if *some* electives would like a particular tool to have been taught in intermediate theory, it is likely the case that *other electives* would have liked *other tools* to have been taught and that if these electives reflect more modern topics in economics, that teaching the modern economics paradigm would better prepare these students for these electives. Not changing therefore may reflect status quo bias or a concern over loss aversion by existing instructors.

Conclusion

We have argued here for updating the content of intermediate microeconomic theory courses to become more problem-centered. Courses in an economics major broadly and intermediate microeconomic theory courses specifically shouldn't be taught as preparation for graduate school in economics because a large majority of economics majors do not go on to graduate school in economics. Instead, the goal should be to give students the tools to understand the economy better and be wiser 21st-century citizens. Specifically, we believe that instructors should prioritize topics on strategic interaction, social preferences, incomplete information, and common pool resource problems. Doing so might come with some institutional- and individual-level teething challenges, but, as student interest in real-world concerns grows and resources become more abundantly available, we believe this is an opportune time to reform the curriculum and push the frontier of education towards the frontier of research.

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Supplemental Material

Supplemental material for this article is available online.

Notes

1. The J. Econ Ed has many discussions of the introductory economics class and we cannot cite them all. A recent example includes the special issue introduced by Cohen et al. (2024) with a focus on the only introductory economics class students will take and a discussion of the pedagogical approach of "literacy targeted" instruction.
2. Even in the most heterodox departments—where one might expect the faculty to teach unconventional materials—many tend to teach very standard—homogeneous, isomorphic—content (Page-Hoongrajok & Mamunuru, 2023).
3. One student we discussed this project called the course focused on consumer and producer theory, "Introduction to Micro with more math."

4. See our discussion in the appendix about how CORE's *The Economy 2.0* does this.
5. Then we consider the ways in which empirical methods in economics have changed and the empirical turn in economics ((Angrist et al., 2017; Hamermesh, 2013), the economics curriculum has adapted to this in various ways through the incorporation of work with data in spreadsheets or statistical programming languages (see, e.g., (Dvorak et al., 2019; Halliday, 2019; Mendez-Carbajo & Dellachiesa, 2023) among many others) to meet the corresponding proficiencies (Allgood & Bayer, 2017). We argue that core microeconomic theory has not adapted in the same way.
6. Using Edgeworth-Bowley boxes has persisted subsequent to theoretical innovations by Arrow, Debreu, Hahn, and Koopmans, among others, where one could teach a "more mathematical" and complicated version of general equilibrium beyond the grasp of most undergraduates—we make the wise decision not to teach general equilibrium in this way. See, for example, Koopmans (2013), originally published in 1957.
7. Bowles and Halliday (2022) draw on the Lewis Carroll (1893) story *Sylvie and Bruno Concluded* in making this point, which was also made by Korzybski (2000 [1933]: 750) in his statement "A map is not the territory."
8. Bowles and Halliday (2022: 4) recount researchers conversing with a farmer in Palanpur, India: "A visitor to the village approached a farmer and his three daughters weeding a small plot of land. The conversation turned to the fact that Palanpur farmers plant their winter crops several weeks after the date that would maximize the amount of grain they could get at harvest time. The farmers knew that planting earlier would produce larger harvests, but no one, the farmer explained, wants to be the first farmer to plant, as the seeds on any lone plot would be quickly eaten by birds. Curious, the visitor asked if a large group of farmers, perhaps members of the same extended family, had ever agreed to plant their seeds earlier, perhaps on the same day to minimize the individual losses. The farmer looked up from his hoe and made eye contact with the visitor for the first time 'If we knew how to do that', he said, addressing the visitor as 'bhai' or brother, 'we would not be poor'."
9. See the appendix for a graphical depiction of the players' expected payoffs and risk dominance.
10. In a meta-study of dictator games, Engel (2011) shows that dictator giving is roughly 30% of the endowment. Additional supporting material for this section is available in the appendix.
11. Recent research suggests that women are roughly 27% of intermediate courses in economics, for a sample of institutions (Emerson & McGoldrick, 2024). However, many women do not transition from intro to intermediate, suggesting that the margin where we can affect the course is as follows: if we change the content of the course to become more attractive to women, then perhaps more women will choose to transition from intro to intermediate. This may result in a perverse outcome where more women may drop or fail intermediate micro if they turn out to dislike it having been attracted by the content.
12. We think these are valuable things to do and think they are the minimum required—for example, all economists should be represented in one's classroom. But these are, at best, sops to a wider problem—the content of the course itself.

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