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The COherence and RElevance of CORE Econ's new benchmark model

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We review the economics and pedagogy of the CORE Econ open-access introductory course, of which we are co-authors, a decade after its launch. We make the case that the coherence and relevance of undergraduate economics instruction requires a new benchmark model – not the ad hoc addition of even more 'frictions', 'imperfections' and extensions to the conventional model. The new CORE benchmark will not strike anyone with recent graduate training in the field as particularly novel: it conveys to recent undergraduates the foundations of the economics that research economists today routinely use and that graduate students are taught. We also explain the major innovations in both content and pedagogy motivated by what we have learned from The Economy 1.0 *having been taught to around a million students globally over the past six years.*

Keywords: *curriculum reform, principles textbooks, pedagogical strategies, benchmark models*

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1 INTRODUCTION: EXPERIENCING INTRO

Ask an audience of students or those at a public lecture to use their arms to represent what they think 'economics' is about. You will get an arms-crossed supply-and-demand diagram. Economics, everyone knows, is about how markets allocate scarce resources among price-taking actors in response to price signals. Setting up this model takes many chapters and its priority in teaching conveys that this is an all-purpose framework.

The message is that if you are going to retain only a single idea from your economics studies, it should be the efficiency properties of a market-clearing supply-and-demand model. For many who study only a first course, the same model is transferred to the macro economy, although few would be able to explain how the aggregate supply/aggregate demand model actually works.

A recent article in *The Economist* (2023) suggests that economics has lost its appeal to students of business because its focus on markets neglects a substantial share of resource allocation that is not actually allocated by the market but instead occurs inside firms. Ronald Coase's essential insight – the power of the employer to assign tasks to the worker – is absent. One might add that the substantial role of governments in the allocation of resources is also largely ignored.

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Other students just do not recognize themselves in the actors populating the models they are taught. They have learned from the model about employees who can walk away from their current job, assured that they will find an equivalent job at the same wage, due to market clearing, for example. But many of them and their parents are quantity-constrained in labour and credit markets, though they would not have heard that term in their introductory course.

Students expect economics to equip them with tools to understand pressing problems – inequality (local and global), climate change, financial crises, the future of work, the pandemic, and most recently, after COVID-19, the 'cost of living crisis' – topics that appear at the end of the conventional text (signifying 'summer reading') if at all.

A decade ago, the CORE project set out to change how students experience their first encounter with economics. We had been warned about the '15% rule': to succeed as a new text, you must not change more than 15% of the content. As we began to work, we concluded that making good our aspirations required much more than that. Specifically, we parted company with the conventional texts in five ways, on which we will expand in the pages that follow:

- *New content*: We built the course around the major societal problems facing humankind today, especially inequality and environmental degradation, requiring a substantial update of the largely Marshall plus Keynes content of standard texts;
- *New pedagogy*: We replaced the standard approach – begin with a model, then illustrate it by a toy empirical example – by instead starting with a complex real-world problem, introducing a model to help better understand it, and then return to the real-world question to consider how good the model is;
- *New methods for producing knowledge*: Our global collaboration of researchers and educators produced the content for free and allocated the intellectual property rights to CORE;
- *New mode of delivery*: Our digital first content was designed for interactive student-centred learning and frequent updating (our print versions were an afterthought);
- *New price*: Zero, it's free for the taking on your phone or any other device, under a Creative Commons license.

2 THE CORE ECON PROJECT

From the outset, the group of researchers who initiated the project and the wider community drawn in to work on the first book, *The Economy*, aspired to create a course that would engage students with the best of contemporary economics. Looking backward, Samuelson's 1948 textbook *Economics* had succeeded spectacularly in this regard, and somewhat to our surprise, we came to take 'Samuelson 48' as an exemplar of what we were attempting. (Subsequent editions of that textbook retreated substantially from Samuelson's initial break with the conventional content.)

The purpose of economics instruction, to Samuelson, was to educate future citizens and policymakers by showing how economics could contribute to addressing important problems in the world. His objective was to provide students with the tools to understand the causes of the Great Depression, the economic policies that could prevent its recurrence, and to explain that if such policies were successful in the world in creating 'an economy with fully utilized resources', then the previously central Marshallian

apparatus of price and value – what he affectionately termed the 'classical verities' – would again acquire greater prominence in the curriculum.

Samuelson turned the conventional textbook upside down, bringing the treatment of 'national income' to the front, devoting the first two-thirds of the book to this. The model of supply and demand appeared in Chapter 19 on page 457; he concluded ten pages later: 'This is all there is to the doctrine of supply and demand. All that is left is to point out some cases to which it can be applied and some to which it cannot'. He said it applied to 'a few agricultural industries' but that it applied neither to most firms and industries (for which monopolistic or imperfect competition was the rule) nor to the aggregate labour market.

A coherent model of national income to explain the persistence of mass unemployment was to hand in the research literature – Keynes' *General Theory* and the work of his contemporaries – and Samuelson's job was to produce a 'teachable' version of the determination of national income by aggregate demand. Samuelson stressed that the methods he was bringing to the classroom were ones 'employed by 90 per cent of the active academic economists under the age of 50 over the last decade'. He was bringing the teaching of introductory economics closer to the practice of his colleagues in their research. This is also one of the aspirations of the CORE Econ project.

At CORE's first meetings there was agreement that to be successful pedagogically, the call for 'real-world relevance' had to be married with conceptual coherence. We knew, too, that the 'classical verities' would not do the job.

Our challenge in 2013 was to craft a new benchmark model fit for twenty-first century problems; and ten years on, the process of refining the benchmark continues as we create the 2.0 version of *The Economy*. Writing down the underlying principles in the form of a benchmark model is a way of communicating about coherence with colleagues who may be sceptical of departing from traditional approaches to teaching. One worry they voice, and to which we return later, is about how to connect a first course with later courses for students who major in economics.

To be useful, a benchmark needs to not only connect to the rest of the curriculum but also be responsive to what is happening in the world and in economic theory and practice. As an example, in campuses in many countries, a project of 'decolonizing the curriculum' emerged in the last few years. 'History' has a role in the new benchmark, which signifies attention to such issues, and we return below to discuss how the treatment of colonialism and slavery has changed between the first and second versions of *The Economy*.

A second example relates to the case made by the CORE community for 'pluralism by integration' rather than 'by juxtaposition' when teaching introductory economics.[1] Integrative pluralism entails embracing the best that economics has to offer in response to the questions that are to be addressed rather than proceeding by juxtaposing competing schools of thought. A course either in the first or later years of study introducing different schools of thought is complementary to CORE's approach to the first course.

Pluralism by integration is illustrated by the 'power' entry in the benchmark and highlights where CORE aligns with recent research literature in its treatment of inflation. In *The Economy*, we teach a 'conflict-based' model of inflation, which is described in more detail below. This model was formalized in 1977 by Bob Rowthorn in a paper titled 'Conflict, inflation and money'. Rowthorn's model combines insights from Kalecki, Marx and Friedman – a powerful example of pluralism by integration. This model was first brought into mainstream textbook macroeconomics teaching at intermediate

1. We make the case for pluralism by integration in Bowles and Carlin (2018).

level in Carlin and Soskice (1990) and later by Blanchard (1996) whose 1986 paper was an early research contribution (Blanchard 1986). Stimulated by the re-emergence of rising inflation following the pandemic, this model is now being intensively discussed in frontier macroeconomics, for example by Lorenzoni and Werning (2023). In publicizing the work on Twitter, Werning emphasizes the benefits to 'mainstream' researchers of widening their knowledge of contributions from many schools of thought.

This paper proceeds by first setting out CORE's new benchmark model and showing how it is implemented in an introductory course. This is followed by an explanation of the changes in the 2.0 version of *The Economy* published in 2023/24. The question of 'what comes after CORE' is frequently asked and we look at the implications of learning with CORE for later study in an economics major.

3 UPDATING ECONOMICS: HAYEK AND NASH JOIN MARSHALL, WALRAS AND KEYNES

In his redesign of the economics curriculum, Samuelson added Keynes' model of the aggregate economy to Marshall's 'laws of value'. CORE's new benchmark adds two further giants of twentieth-century economics – Friedrich Hayek and John Nash.

Hayek introduced the idea of the market as an information-processing system. His most famous article, published in 1945, made the case that economic systems and organizations should be evaluated on how well they made use of the economically relevant information that was necessarily available to some, but not to others. Hayek stressed that governments could not access all the information necessary to centrally plan an economy. His main ideas – that information is incomplete, costly to acquire and local – became the foundation of the theories of incomplete contracts in labour and credit markets (typically without recognizing Hayek's work), which we bring into the introductory course.

Drawing on ideas from John von Neumann and Oskar Morgenstern, the mathematician John Nash pioneered the development of game theory to model strategic interactions among economic and political actors. In many situations, Nash argued, people will take account of the likely responses of others to the actions that they take, rather than interacting with a fixed set of prices (as a price-taker). The Nash equilibrium provides a way of studying outcomes that we find in real economies, because they represent the joint outcome of large numbers of people doing the best they can, given what others are doing.

As the notion of integrative pluralism suggests, we have been inspired by, and learned from, these thinkers but we have not swallowed whole the contributions of any of them. Models and evidence are presented that question Keynes' optimism that a government's demand-management policies would substantially eliminate involuntary unemployment in the long run. Problems of market failure and economic instability provide reasons to reject Hayek's argument that governments should limit their activities to enforcing property rights and the other fundamental rules that permit markets to function. Finally, the insights of Nash-inspired modelling of interactions among individuals who are apparently able to calculate the highly complex consequences of their own actions, but who are also incapable of cooperating amongst each other to arrive at solutions to their problems, has been questioned by modern behavioural experiments and research on human cognitive capacities. We are with von Neumann who had objected to Nash that his equilibrium concept was a little 'too individualistic' (Nash responded, 'It's the American way').

The contributions of Keynes, Hayek and Nash – aggregate demand, the economics of information and strategic interactions modelled by game theory – have become foundations of modern economic thinking. Before the end of the twentieth century, all three innovations had become the standard content of postgraduate economic courses. But only aggregate demand found its way into the introductory courses.

It is time to let students in intro learn what got left out – Nash's strategic action as an alternative to price-taking behaviour and Hayek's information economics as an alternative to the assumption of complete contracts. These two ideas challenge the foundational concepts of the standard model and should be the essential ingredients of an alternative benchmark model. We have also integrated more recent developments in the discipline from the fields of behavioural economics, economic dynamics and institutional economics.

4 CORE ECON'S BENCHMARK MODEL

In Table 1, we contrast the conventional benchmark (it is still the basis of most introductory texts) with CORE's new benchmark. We consider the conventional benchmark model as in the left column to be the standard case that most students are taught, from which 'deviations' are studied. (We sometimes call it Walrasian, but it could also be Walras–Marshall–Keynes.) The most obvious example of this is the idea that price-taking markets are the standard case, with monopolistic competition being an extension (or an 'imperfection').

The right-hand column provides a very different vision of the economy. For example, Hayek (1948, p. 97) pointed out that assuming a state of equilibrium among price-taking traders in the model of perfect competition effectively shuts down any serious analysis of competition, which, following Samuel Johnson, he defines as 'the action of endeavouring to gain what another endeavours to gain at the same time.' He continued:

> Now, how many of the devices adopted in ordinary life to that end would still be open to a seller in a market in which so-called 'perfect competition' prevails? I believe that the answer is exactly none. Advertising, undercutting, and improving ('differentiating') the goods or services produced are all excluded by definition — 'perfect' competition means indeed the absence of all competitive activities. (Hayek 1948, p. 96)

The choice of benchmark is not simply a question of taste. The concepts in the right-hand column are essential if we want to answer the questions that students all over the world have told us should be the focus of economics. The left-hand column of Table 2 shows some of these problems; the middle column shows some of the concepts essential to understanding these problems, and in the right are illustrative sources in the research literature. The new benchmark in Table 1 will surely be superseded as new problems, new data and new tools of analysis arrive.

A distinctive feature of the CORE approach is the interdependence of advances in economics with those in other disciplines. Another mid-twentieth-century economist, Abba Lerner, explained how the conventional benchmark insulated economics from politics:

> An economic transaction is a solved political problem … Economics has gained the title Queen of the Social Sciences by choosing solved political problems as its domain. (Lerner 1972, p. 259)

The conflict of interest that exists in every transaction, he argued, is resolved in a contract that would be enforced by the courts, not by the parties to the transaction.

Table 1 Alternate benchmarks for teaching economics

Topics	Benchmark as Taught in Introductory Economics	CORE Econ's New Benchmark
People	Are far-sighted and self-interested.	Are also cognitively limited (e.g., they may not maximize expected utility) and have motives other than self-interest, such as social norms of fairness, reciprocity and valuing sustainability.
Interactions	Are among price-takers.	Include price-, interest-rate-, and wage-setters, strategic interactions and non-market interactions.
Technology	Constant returns or diseconomies of scale.	Also increasing returns, downward sloping long-run average cost curves, positive feedbacks.
Information	Is complete.	Is usually incomplete, asymmetric and non-verifiable.
Contracts	Are complete and enforceable at zero cost to the exchanging parties.	Are incomplete for effort and diligence in labour and credit markets, and for other external effects such as traffic congestion or knowledge.
Institutions	Include markets, private property, and governments.	Also include informal rules (norms), firms, unions and banks.
History	Is largely ignored.	Provides data about alternative rules of the game and the process of change.
Differences among people	Are confined to preference and budget constraint differences among buyers and sellers.	Also include asymmetric positions, principals, and agents, e.g., as employers or employees, and as lenders or borrowers, or owners of firms and the buyers they sell to.
Power	Is restricted to market power and political power.	Includes also structural power and bargaining power, e.g., a principal's power over someone in labour, credit and other markets.
Economic rents	Create inefficiencies through 'rent-seeking'.	Are also endemic in a well-functioning private economy, creating the incentive to innovate, or to work hard.
Stability and instability	The economy is self-stabilizing.	Stability and instability are both characteristics of the economy.
Evaluation	Is confined to the presence of unexploited mutual gains (Pareto-inefficiency).	Also includes fairness and sustainability.
Twentieth century origins	Marshall, Walras, Keynes.	Also Schumpeter, Nash, Ostrom, Hayek.

Source: Bowles and Carlin (2020, p. 196).

'The [conventional] solution is essentially the transformation of the conflict from a political problem to an economic transaction,' he wrote (Ibid.).

In a world that ran according to the Walrasian competitive model, based on complete contracts, there would be no role for power: if the contract was really complete there would be nothing for the exercise of power to be about. For example, if the worker did

Table 2 Important problems and concepts to bring to the introductory economics classroom

Problems in the World	Essential Economic Concepts	Illustrative Sources
Wealth creation, innovation, and growth	Schumpeterian (innovation) rents, disequilibrium.	Schumpeter (1934 [1911]), Hayek (1945), Makowski and Ostroy (2001), Aghion and Howitt (1992), Romer (1990), Matsuyama (1991).
Environmental sustainability	Non-market social interactions, other-regarding preferences, positive feedbacks, instability.	Bénabou and Tirole (2006), Camerer (2003), Jackson (2008), Ostrom (1990), Schelling (1978).
Inequality	Rents, structural and bargaining power, institutions, fairness.	Coase (1937), Fehr and Schmidt (1999), Hart (1995), Holmstrom and Milgrom (1994), Milgrom and Roberts (1990), Nash (1951), von Neumann and Morgenstern (1944).
Unemployment and fluctuations	Incomplete contracts in labour and credit markets.	Akerlof (1982), Shapiro and Stiglitz (1984), Simon (1951), Stiglitz and Weiss (1981).
Instability	Prices as information and the dynamics of price-setting.	Hayek (1945), Minsky (1986), Geanakoplos (2010), Morris and Shin (2001).

not work as hard as they had agreed to work, then they simply would not be paid. The employer would have no need to exercise power over the employee, for example, by threatening to sack them. The contract would be sufficient in itself to guarantee the outcome needed for the firm to make profits. This aspect of the Walrasian model was what motivated Samuelson's remark (made ironically in a paper about Marx's economics) that, 'In a perfectly competitive market, it really doesn't matter who hires whom, so have labour hire capital' (Samuelson 1957, p. 894).

The assumption of a complete employment contract also meant that the employer had no need to be concerned about the prospective employee's preferences – for example, their work ethic or desire to send instant messages to friends while working. A result of these and other assumptions of the benchmark Walrasian model incorporated in typical introductory courses was that Lerner's 'Queen of the Social Sciences' could reign alone.

Economists thus gave themselves permission to ignore a host of other important insights, including those relevant to students of business and other non-economics majors, from:

- legal scholars who have studied contracts in the real world, and the challenges of enforcing them;
- psychologists and sociologists who seek to understand the motivations and thought processes of real people;
- philosophers and ordinary citizens who are animated by economic justice, individual freedom, and dignity;
- political scientists who consider the top-down structure of a firm as partly a system of the unaccountable private exercise of power;

- historians, anthropologists and archaeologists who study the variety of institutions governing our economic lives, which have shaped our development since pre-history;
- biologists, ecologists and others who see the economy as a part of the biosphere with unavoidable 'external' effects on the way it functions, and its sustainability.

CORE draws on these insights and those from other disciplines in order to understand how prices, wages and interest rates are determined; how the aggregate economy functions; and other central questions of economics. Instead of seeing all economic activity through the lens of a single model of competitive markets with complete contracts, CORE invites students to see the economy the way research economists see it, as a diverse combination of institutions and behaviours that is best studied by judiciously choosing among factually tested models.

5 FROM THE NEW BENCHMARK TO TEACHING HOW TO DO ECONOMICS

Implementing the new benchmark in a textbook and course entails making decisions about the sequence of teaching and the pedagogy. On pedagogy, we begin each unit of study with an important question taken from the world and illustrated with data; from there we teach tools of economics that can shed light on the question. We then go back to 'the world' and ask what the model leaves out.

This 'to and fro' between the world, data and models mimics the methods of a researcher and stands in contrast to the approach typical of economics pedagogy, which begins with a model, teaches it and then provides an illustration, typically cherry-picked to show off the model. Conveying the inner logic of the model, not applying it to an important question, is the measure of success. By contrast, in the CORE Econ method, successful learning is gauged not only by a student's ability to demonstrate understanding of the model itself but also to explain its relevance to real-world questions.

Constrained choice is a canonical model in the economics curriculum (including CORE's) and is useful for addressing many questions about how the economy works. The conventional approach is to teach the model first graphically with a budget set and indifference curves with or without calculus and then illustrate it using a consumer choice example (pizza and beer). In *The Economy,* we set the scene with data on hours of work and consumption over time and across countries.

Then, the constrained choice model is developed and put to work to illuminate the patterns and puzzles in the data. Having started with the question and the data, this method compels us to ask 'what does the model leave out?' This provides the natural motivation to bring in the insights from different schools of thought (in this case, e.g., Veblen and conspicuous consumption) and disciplines (e.g., sociology and cultural differences among nations), which helps students to appreciate the strengths and weaknesses of economics, as well as to see how it can be complemented by a broader perspective. Our hope is that this approach keeps on board a subset of students who are put off by the combination of formalism and often trivial examples that accompany the standard method of teaching a topic such as constrained choice.

The deep contextualization of the teaching of models brings with it the need to enable students to see how to apply a model to different contexts. To facilitate transfer of learning, we use a common graphical template for the feasible set and the indifference

(or iso-profit) curves. In many problems introduced in *The Economy*, the 'MRS = MRT' set-up introduced with the consumption-free time decision is repeated – for example, in consumer choice, intertemporal choice, bargaining, the firm's hiring decision, price-setting and even in the central bank's inflation-targeting decision.

The commitment to teach the principles of economics by way of teaching about 'the economy' led us to model how the major actors make decisions before we introduce markets. This has the added advantage that you can play CORE's variant of Vernon Smith's 'market game' with your class ahead of teaching the topic, which gives them an 'unprimed' experience of the dynamics of supply and demand and how (with complete contracts) a market-clearing price emerges.

Throughout the course we make repeated use of two workhorse models: the standard constrained choice model and the Nash equilibrium.

In the first models in *The Economy*, an entrepreneur choosing a technology, or an individual choosing work hours, makes choices against 'nature', where relative prices are given. We model the latter using a feasible set (given by the wage rate) and a family of indifference curves expressing the actor's valuation of the goods that can be purchased with labour earnings and free time.

We then move to introduce strategic interaction with a series of games in Unit 4 and then in a bargaining set-up in Unit 5. The 'mutual dependence' recognized, and the Nash equilibrium concept used, in these units, expresses the irreducibly social nature of economics.

Unit 5 brings together constrained choice with strategic interaction in a sequence of institutional settings to illustrate how the rules of the game affect who gets what and why. Students are led 'to discover' the reasoning of the Coase Theorem: in Case 3 of the bargaining problem between the farmer and the landowner in Unit 5, legislation produces a less unequal outcome but it is not Pareto efficient. The parties will bargain to an outcome in which both are better off.

Firms are modelled as organizations with owners, managers and workers. Different departments of the firm solve different problems. The human resources department sets the wage – facing an upward sloping wage curve (giving the least wage sufficient to recruit and motivate labour) and using iso-profit curves to make their choice of wage and employment. There is a strategic interaction between the employer and the job-seeker as the employer must take account of the worker's (unobservable) effort on the job when setting the wage. Given the wage, the marketing department sets the price (for its differentiated product) taking the downward sloping demand curve as its constraint and using the iso-profit curves to choose its price and quantity.

In Unit 8 we introduce price-*taking* firms (as in Samuelson 48, this comes after students have learned a lot about the overall economic setting). If students have played the market game, this helps them to develop intuition about what is meant by a market-clearing price, how it arises – through active out-of-equilibrium rent seeking by buyers and sellers – and what it entails in terms of welfare. In the preceding weeks, students have learnt about the forces of supply and demand in many settings and are better able to appreciate the uses of the supply-and-demand framework itself by this stage of the course. By postponing the study of price-taking and supply and demand, students come to understand that the economy is characterized by the imperfect and local information that Hayek emphasized. Introducing principal–agent relationships like game theory is a natural step in a first course because it shows how economics can formalize and generalize from experiences students are familiar with in both the labour and the credit markets. In the firm, we focus on the relationship between the employer and the worker where effort is not observable, and the effort required by

Table 3 The rules of the game determine 'who gets what and why'

	Baseline case: Angela owns the land		
An independent farmer	Angela owns the land. The government protects her right to exclude others from the land (or its produce). *Angela decides*: how many hours to work and how much grain to produce and consume.		
	Bruno owns the land and Angela farms it What happens depends on the institutional setting		
A landowner and a farmer	Case 1 *Forced labour*	Case 2 *A take-it-or-leave-it contract*	Case 3 *Bargaining in a democracy*
The rules of the game	Bruno can force Angela to work for him, producing grain which he owns.	*Bruno decides*: Bruno offers Angela a contract (either an employment contract, or a farm tenancy).	*Bruno decides*: offers Angela a contract. *Angela decides*. She can accept, reject, or negotiate for alternative contract terms. Angela and other farmers now can vote to pass legislation setting the maximum work hours and ages.
	Bruno decides: Angel's hours and amount of grain she can consume.	*Angela decides*: Accept or reject.	

the employer for production to be profitable cannot be stipulated in contractual terms. The employer pays a wage above the worker's reservation wage to incentivize them to work hard. This becomes the foundation for the presence of involuntary unemployment at equilibrium in the aggregate economy.

In parallel fashion, we introduce the incomplete contract between the borrower and the lender arising from the fact that it is not possible to perfectly monitor the uses to which the loan is put including the effort taken to ensure a loan is repaid. Credit rationing in equilibrium is the result. As is the case for the labour market, this is a recognizable result for students, and it proves useful in the modelling of the aggregate economy. Special assumptions ('myopic' or 'hand to mouth' households) do not have to be invoked for there to be households who deviate from permanent income behaviour. The marginal propensity to consume out of temporary increases in income is sizeable, so negative aggregate demand shocks lead to reductions in spending which are large and so consequently is the multiplier.

In the 'macro' units, the motivations of additional key economic actors and the constraints they face are introduced. For example, by highlighting the motivation of banks to make profits by borrowing short and lending long, students learn how bank (private) money is created. This stands in sharp contrast to the neglect of banks as economic actors in a staple of the conventional course, Quantity Theory of Money. An inflation-targeting central bank has explicit objectives and policy instruments and faces the constraint of the

Phillips curve when responding to shocks. The Phillips curve itself is derived from the wage- and price-setting decisions of firms encountered in the earlier part of the book.

The 'conflict' theory of inflation mentioned in the Introduction rests on the fact that at a given unemployment rate, the real wage required to recruit and motivate workers is not necessarily equal to the real wage that workers get once firms have set their profit-maximizing prices given output per worker and the conditions of (possibly limited) competition in the product and labour markets. Unless these two real wages are equal, there will be either upward or downward pressure on inflation at the prevailing unemployment rate. This model of inflation exemplifies CORE's pedagogy: firms with wage- and price-setting power are affected by the conditions in the aggregate economy; in turn the implications of the level of aggregate demand and the supply side for inflation affect the choices made by the central bank.

6 THE 2.0 REVISION OF *THE ECONOMY*

Following an extensive survey of 178 users in 40 countries, the CORE Econ Editorial Board convened a workshop in Oxford in 2021 to plan the 2.0 version of *The Economy*. Student voices through the queries they raised in classroom discussion forums, surveys, workshops and as critics of draft units influenced the revisions.

In response to feedback, we have made two important changes in pedagogy. First, *The Economy* 2.0 will now be produced in two volumes for ease of adoption in single-semester micro and macro courses. Table A1 in the Appendix compares the structures of the 2.0 and 1.0 versions of *The Economy*.

Second, we have amended the structure and writing within units to make each unit less immediately dependent on those before and after it. This entailed creating 'building blocks' of one or more sections that can be referred to from elsewhere in the book to refresh students' memories or to cover a prerequisite that would have been missed if the unit containing the building block was skipped. For example, two building blocks referred to in several places throughout the book are the 'constrained choice model' and the structure of 'contracts, principals and agents'. These steps increase the flexibility of the text, allowing for a greater range of instructor choices in designing their course. User feedback has been used in the very extensive rewriting of the book to streamline the presentation of models.

The following changes to content have been implemented in the first volume of *The Economy 2.0*:

- *Climate change and other environmental problems* have been added to inequality as a central set of economics-teaching opportunities throughout the book.
- *The capitalist revolution – living standards in England and India*. Our representation of capitalism and what we had called 'the British Industrial Revolution' struck some students and researchers as an overly rosy and insufficiently global account. We agree. From our team of authors, economic historians Kevin O'Rourke and Suresh Naidu, led the work on revisions, and we also consulted Bishnupriya Gupta and historian Prasannan Parthasarathi and others. In addition to the original focus on a system of institutions – capitalism – as the cause of the upturn in Britain's 'hockey stick' of per capita income, the role of colonies and also of carbon are brought to the fore. The entire global economy was restructured as the technological revolution and trade reversed the fortunes of the British and Indian textile industries.

- *The Industrial Revolution and slavery*. In 2.0, we examine the question of whether colonies and enslaved labour were necessary in the sense that had they not been available, the Industrial Revolution would most likely not have occurred when and where it did. The evidence is clear that slavery contributed to the Industrial Revolution primarily via cotton for the mills and calories to sustain the industrial workers. We show how plausible counterfactuals can be used to ask if it was necessary.
- *A new sequence for macroeconomics.* Volume II begins by setting out the supply-side wage-setting price-setting (WS-PS) model in the first unit and then working through a series of applications in the second. This is followed by the demand-side, which introduces the components of aggregate demand and the multiplier model. Inflation is the topic of the fourth unit. The Phillips curve is derived directly from the WS-PS model. Movements along the Phillips curve arise from shifts in aggregate demand as shown in the multiplier model. By the end of four units, the students have a working model of the determination of real wages, employment (unemployment), inflation and inequality (using the Lorenz curve to map the WS-PS model and showing how inequality is affected by changes in the supply-side equilibrium). Stabilization policy is the subject of the fifth unit, with the emphasis on fiscal policy and on inflation-targeting monetary policy. To this point money and the banking system are in the background. They come to the fore in Unit 6, which introduces balance sheets as an essential tool of analysis.
- *A new unit on systemic instability – financial and environmental.* The objective of Unit 7 is to use both environmental and financial examples to make students aware of the importance of positive feedback processes and unstable equilibria. We develop a 45-degree diagram with the price this period on the horizontal and next period on the vertical to explore stable equilibria – high and low price – where the price dynamics curve exhibits negative feedbacks and has a slope of less than 45-degrees. An intermediate unstable equilibrium is where a price dynamics curve with a slope of greater than 45-degrees intersects the 45-degree line. By combining both negative and positive feedback in types of dynamic processes, we have an S-shaped model of tipping points in financial and environmental contexts. These are models of potential crises, but the same model is applied to a tipping point in the adoption of a new green technology.
- *A new model of the labour market including monopsony as well as labour discipline.* A more substantial innovation is the development of a new (and novel at the introductory level) approach to the labour market, which we describe in the paragraphs below.

7 A NEW MODEL OF THE LABOUR MARKET: MONOPSONY POWER AND INCOMPLETE CONTRACTS

What was missing from our treatment of the labour market in *The Economy* 1.0 were tools for analysis at the level of individual labour markets, including the exercise of monopsony power by firms. We went straight from the one-worker, one-firm case in the labour discipline model to equilibrium aggregate employment in the WS-PS model. But students need a model that can explain, for example, the observed effects of the minimum wage, the existence of vacancies, and the distribution of wages, and one that directly connects employment determined by the WS-PS model with the

labour market flow analysis and the Beveridge curve, previously in Unit 16 (and in Unit 8 of the macroeconomics volume in 2.0).

In the 2.0 book, we provide a coherent replacement for the misleading supply and demand model of a spot labour market that we have been so keen to avoid. In the new model, workers and jobs are heterogeneous and the labour market is a dynamic matching process as firms open vacancies and seek to fill them, and workers move between labour market states looking for jobs. Employers have labour market power arising because the cost of recruiting labour increases the larger the number the firm wishes to hire.

As in the labour discipline model that we taught in the 1.0 version, relationships are governed by long-term but incomplete contracts. In this setting, the firm sets the wage to both recruit and motivate workers, so the model brings together the dynamic monopsony model with the labour discipline model.

Table 4 shows how the new model of the labour market fits into the structure of the new volumes of 2.0. The new labour market model begins with how the firm manages hiring and quitting when facing an upward sloping reservation wage curve. We make the problem tractable by letting the job-seeker have a fixed planning horizon. The expression for the reservation wage is the analogue of what typically appears in the search literature.

The second component is the labour discipline model. The firm's no-shirking wage curve is equal to the reservation wage of the *n*th worker plus the effort cost plus the rent that is required to deter shirking, which will depend on the proportion of her time during which she expects to remain unemployed. This is just the standard no-shirking condition. The wage and employment chosen by the firm are derived graphically using iso-profit curves (another application of MRS = MRT).

Table 4 The labour market in The Economy 2.0, Volume I Microeconomics and Volume II Macroeconomics

	Unit title	**Where the labour market comes in**
Vol. I Unit 3	Doing the best you can: Scarcity, wellbeing, and working hours.	Choice of consumption and working hours, to explain long-run trends. As before, but for a worker with a fixed wage simplifying teaching the constrained choice model.
Vol. I Unit 6	The firm and its owners	How labour markets work; the micro model of wage-setting with employer monopsony power and incomplete contracts (unobserved effort).
Vol. II Units 1 and 2	The supply side of the macroeconomy: Unemployment and real wages.	Deriving the WS-curve from the U6 model and the PS-curve from the U7 model→ labour market equilibrium, involuntary structural unemployment, and policy analysis.
	Unemployment, wages, and inequality: Supply side policies and institutions.	
Vol. II Unit 4	Inflation, unemployment and the Phillips curve.	Unemployment over the business cycle.
Vol. II Unit 9	Creative destruction and the future of work.	Job creation and destruction, labour market flows and the Beveridge curve; WS-PS policy applications.

This setup enables analysis of changes in the minimum wage, for example, as well as of the effect of a change in the unemployment rate, the probability of being caught shirking (better surveillance technology), a fall in morale in the firm or a rise in productivity in other firms. From here, it is straightforward to derive the wage-setting (WS) curve for the whole economy (i.e., the wage as a function of the unemployment rate), which forms half of the supply-side model. Combining the WS-curve with the price-setting (PS) curve gives the real wage and unemployment rate in the economy, which is a Nash equilibrium, and at which inflation is constant.

8 WHAT COMES AFTER CORE'S *THE ECONOMY*? FITTING INTO THE ECONOMICS CURRICULUM

We did not develop CORE's intro course to improve student performance in subsequent conventional micro and macro courses. But there is some very preliminary evidence that we may have done this.

Cardak et al. (2023) report on a study at La Trobe University's Business School where students who took CORE's *The Economy* as their first course in economics received higher grades in their subsequent (conventional) modules than those who had studied intro with a standard book. The effect sizes in Cardak et al.'s difference-in-differences analysis[2] are substantial and are also observed not only in intermediate micro and macro but also in non-economics-related modules. Cardak and his coauthors suggest that the positive effects for courses across the board in the degree programme may arise because CORE equips students for more effective learning in general and not only in economics.

At University College London, the first cohort of intro students taught using CORE did substantially better in their second-year micro and macro courses than had previous cohorts. There was no difference in their marks in econometrics, so it does not appear that they were an unusual cohort.

The modelling in *The Economy* is demanding and students will have seen that it is possible to use mathematical models to formalize problems covering large chunks of the economy. The aim of the project is that they leave with a different vision of the economy from one in which markets mostly work in the idealized, perfectly competitive way and that they have some understanding of how economists tackle problems in the world.

Students who begin their university study of economics with CORE may have higher expectations of the intermediate courses than other students, which can prove challenging for instructors. CORE-trained students may expect models to be motivated by substantive real-world problems. Some instructors expressed worry that CORE-trained students may not be ready for their second-year courses, but it could be the other way around.

There are textbooks for the intermediate courses that embody the same approach to teaching economics. The closest fits are co-authored by Bowles' *Microeconomics: Conflict, Competition and Coordination* co-authored with Simon Halliday (Bowles and Halliday 2022), and Carlin's *Macroeconomics: Institutions, Instability, and Inequality*, co-authored

2. Cardak et al. (2023) compare results for the pre-CORE cohort on one degree pathway with the first cohort taught introductory economics with CORE on the same degree pathway. The results of the pre-CORE and CORE cohorts are in each case compared with a control group – that is, with students in another degree pathway, where the second cohort continues to receive the standard introductory economics module. Students in both pathways select from a common pool of subsequent modules and it is performance in these subsequent modules on which the study focuses.

with David Soskice (Carlin and Soskice 2023). Both are available as free PDFs via the CORE webpage (and on the authors' webpages).

There are other compatible books and course structures – in micro, those placing weight on teaching game theory first (rather than beginning with the 'consumer, producer, general equilibrium' sequence) are a better fit, and in macro, using a variant of the WS-PS model of the supply side combined with a three-equation policy model (rather than a variant of the AD/AS model). Macro books that begin with growth are also a good follow-on from *The Economy*.

Universities around the world have combined CORE's *The Economy* with material on the economy of the region, in some cases making substantial use of the units in *The Economy* for second- and third-year courses (in some case using the calculus options).

9 CONCLUSION

Daniel Kahneman and his colleagues at the Hebrew University initiated a collaborative team to produce a new curriculum in psychology. The structure and ambition of that group were similar to the CORE Econ project (Kahneman 2011). At the end of a year spent in weekly meetings to map out the content, Kahneman asked how much longer his group members thought it would take to bring the material to the classroom. Most thought it would be about two more years.

The Dean of the School of Education at Hebrew, a member of the group with extensive experience in curriculum development, interjected that almost 40% of such projects with which he was familiar never brought their materials into practice. Among those that do, no group in his experience has ever taken less than seven years. Using this example to illustrate the dangers of wishful thinking, Kahneman later reflected 'We should have quit that day'; but they did not (Kahneman 2011, p. 247). The project was completed in a total of eight years; but, sadly for the psychology students of the world, the text was never used.

Fortunately, when we set out to change how economics is taught, we had not read the passage in Kahneman's *Thinking, Fast and Slow,* in which this sorry story is reported. We had taken on a more challenging task than the group at Hebrew University because our method of delivery as well as our content was to be entirely novel. Moreover, our authors and producers were located throughout the world. Consistent with our commitment to open access instructional materials all of our knowledge creators sign over their intellectual property rights to CORE Econ allowing us to make our materials freely available to others for non-commercial use under a creative commons license.

Since we first brought together a CORE team in 2013, the fact that our content is digital-first and open access has supported a community culture that CORE content and pedagogy are perpetually in evolution. We invite you, reader, to suggest further improvements in what CORE offers.

REFERENCES

Aghion, P. and Howitt, P. (1992), 'A model of growth through creative destruction', *Econometrica*, 60(2), 323–351.

Akerlof, G.A. (1982), 'Labor contracts as partial gift exchange', *Quarterly Journal of Economics*, 97(4), 543–569.

Bénabou, R. and Tirole, J. (2006), 'Incentives and prosocial behavior', *American Economic Review*, 96(5), 1652–1678.
Blanchard, O. (1986), 'The wage-price spiral', *Quarterly Journal of Economics*, 101(3), 543–565.
Blanchard, O. (1996), *Macroeconomics*, London: Pearson.
Bowles, S. and Carlin, W. (2018), 'How to fix university economics courses: a syllabus that does not integrate the insights of other disciplines fails students', *Financial Times Opinion*, 16 January.
Bowles, S. and Carlin, W. (2020), 'What students learn in economics 101: time for a change', *Journal of Economic Literature*, 58(1), 176–214.
Bowles, S. and Halliday, S. (2022), *Microeconomics: Competition, Conflict and Coordination*, Oxford, UK: Oxford University Press.
Camerer, C.F. (2003), *Behavioural Game Theory: Experiments in Strategic Interaction*, New York: Routledge.
Cardak, B., O'Keefe, S., Tong, Y.D. and Walker, D. (2023), 'Teaching economics 101 using CORE's *The Economy*: evidence on the benefits of a new approach', Unpublished paper.
Carlin, W. and Soskice, D. (1990), *Macroeconomics and the Wage Bargain: A Modern Approach to Employment, Inflation, and the Exchange Rate*, Oxford, UK: Oxford University Press.
Carlin, W. and Soskice, D. (2023), *Macroeconomics*, Oxford, UK: Oxford University Press.
Coase, R.H. (1937), 'The nature of the firm', *Economica*, 4(16), 386–405.
Fehr, E. and Schmidt, K.M. (1999), 'A theory of fairness, competition, and cooperation', *Quarterly Journal of Economics*, 114(3), 817–868.
Geanakoplos, J. (2010), 'The leverage cycle', in D. Acemoglu, K. Rogoff and M. Woodford (eds), *NBER Macroeconomics Annual 2009*, Chicago: University of Chicago Press, pp. 1–65.
Hart, O. (1995), *Firms, Contracts, and Financial Structure*, Oxford, UK: Oxford University Press.
Hayek, F.A. (1945), 'The use of knowledge in society', *American Economic Review*, 35(4), 519–530.
Hayek, F.A. (1948), 'The meaning of competition', in F.A. Hayek (ed.), *Individualism and Economic Order*, Chicago: University of Chicago Press, pp. 92–106.
Holmstrom, B. and Milgrom, P. (1994), 'The firm as an incentive system', *American Economic Review*, 84(4), 972–991.
Jackson, M.O. (2008), *Social and Economic Networks*, Princeton, NJ: Princeton University Press.
Kahneman, D. (2011), *Thinking Fast and Slow*, New York: Farrar, Straus and Giroux.
Lerner, A. (1972), 'The economics and politics of consumer sovereignty', *American Economic Review*, 62(2), 258–266.
Lorenzoni, G. and Werning, I. (2023), 'Inflation is conflict', NBER Working Paper, No. 31099.
Makowski, L. and Ostroy, J. (2001), 'Perfect competition and the creativity of the market', *Journal of Economic Literature*, 39(2), 479–535.
Matsuyama, K. (1991), 'Increasing returns, industrialization, and indeterminacy of equilibrium', *Quarterly Journal of Economics*, 106(2), 617–650.
Milgrom, P. and Roberts, J. (1990), 'Bargaining costs, influence costs, and the organization of economic activity', in J.E. Alt and K.A. Shepsle (eds), *Perspectives on Positive Political Economy*, Cambridge, UK: Cambridge University Press, pp. 57–89.
Minsky, H.P. (1986), *Stabilizing an Unstable Economy*, New Haven, CT: Yale University Press.
Morris, S. and Shin, H.S. (2001), 'Rethinking multiple equilibria in macroeconomic modeling', in B.F. Bernanke and K. Rogoff (eds), *NBER Macroeconomics Annual 2000*, Cambridge, MA: MIT Press, pp. 139–182.
Nash, J.F. (1951), 'Non-cooperative games', *Annals of Mathematics*, 54, 286–295.
Ostrom, E. (1990), *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge, UK: Cambridge University Press.
Romer, P. (1990), 'Endogenous technical change', *Journal of Political Economy*, 98(5),71–102.
Rowthorn, R.E. (1977), 'Conflict, inflation and money', *Cambridge Journal of Economics*, 1, 215–239.
Samuelson, P. (1948), *Economics: An Introductory Analysis*, New York: McGraw Hill.

Samuelson, P. (1957), 'Wages and interest: a modern dissection of Marxian economic models', *American Economic Review*, 47(6), 884–921.
Schelling, T.C. (1978), *Micromotives and Macrobehavior*, New York: W.W. Norton and Company.
Schumpeter, J. (1934 [1911]), *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle*, Oxford, UK: Oxford University Press.
Shapiro, C. and Stiglitz, J.E. (1984), 'Equilibrium unemployment as a worker discipline device', *American Economic Review*, 74(3), 433–444.
Simon, H.A. (1951), 'A formal theory of the employment relationship', *Econometrica*, 19(3), 293–305.
Stiglitz, J.E. and Weiss, A. (1981), 'Credit rationing in markets with imperfect information', *American Economic Review*, 71(3), 393–410.
The Economist (2023), 'Why economics does not understand business: dogma gets in the way', 4 April.
von Neumann, J. and Morgenstern, O. (1944), *Theory of Games and Economic Behavior*, Princeton, NJ: Princeton University Press.

APPENDIX

Table A1 Sources in The Economy *1.0 for the units in* The Economy *2.0*

The Economy* 2.0 – *Microeconomics	***The Economy* 1.0**
1. Prosperity, inequality, and planetary limits.	1. The capitalist revolution.
2. Technology and incentives.	2. Technology, population, and growth.
3. Doing the best you can: Scarcity, wellbeing, and working hours.	3. Scarcity, work, and choice.
4. Strategic interactions and social dilemmas.	4. Social interactions.
5. The rules of the game: Who gets what and why.	5. Property and power: Mutual gains and conflicts.
6. The firm and its employees.	6. The firm: Owners, managers, and employees.
7. The firm and its customers.	7. The firm and its customers.
8. Supply and demand: Markets with many buyers and sellers.	8. Supply and demand: Price-taking and competitive markets.
9. Lenders, borrowers, and differences in wealth.	10. Banks, money, and the credit market. Note that the part on money and banks is included in *The Economy* 2.0: *Macroeconomics.*
10. Market successes and failures: The societal effects of private decisions.	12. Markets, efficiency, and public policy.
The Economy* 2.0: *Macroeconomics	***The Economy* 1.0**
1. The supply-side model: Unemployment, real wages, and inequality.	9. The labour market: Wages, profits, and unemployment.
2. Supply-side policies, institutions and inequality.	New.
3. Aggregate demand and the multiplier model.	13. Economic fluctuations and unemployment.
	14. Unemployment and fiscal policy.
4. Inflation and unemployment.	15. Inflation, unemployment, and monetary policy.
5. Monetary and fiscal policy.	14. Unemployment and fiscal policy. 15. Inflation, unemployment, and monetary policy.
6. Money, banks, and debt.	10. Banks, money, and the credit market. Note that the part on intertemporal choice and credit markets is in *The Economy* 2.0: *Microeconomics.*
7. Structural instability: Financial and environmental crises.	New.
8. A century of growth, fluctuations and crises: Applying the models.	16. Technological progress, employment, and living standards in the long run.
9. Creative destruction, the labour market, and the future of work.	17. Capstone: The Great Depression, Golden Age, and global financial crisis.
10. Global growth and inequality.	New.