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## Lucas Islands game in intermediate macroeconomics

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### ABSTRACT

The authors of this article demonstrate how Hazlett's (1996) adaptation of the Lucas Islands model can be integrated into an intermediate macroeconomics course to strengthen student learning. In the classroom game, students act as workers making labor supply decisions under imperfect information about the aggregate price level, thus generating real-time data on forecasts and labor choices. A structured post-game lecture then uses these data to show how individual price-expectation errors produce a short-run supply relationship consistent with the Lucas supply curve. The instructor can use these results to connect theoretical predictions with empirical testing. The authors argue that this interactive approach is associated with greater confidence in macroeconomic modeling and self-reported understanding of theory while enhancing engagement with both theoretical and empirical aspects of macroeconomics.

### KEYWORDS

Active learning; classroom game; intermediate macroeconomics; Lucas Islands model; Phillips curve; rational expectations; real business cycles

### JEL CODES

A22; E31; E32

In intermediate-level undergraduate macroeconomics courses, students are often introduced to highly stylized models that rely on simplified relationships among aggregate variables and abstract concepts, such as rational expectations, to explain complex real-world phenomena. While these models are pedagogically useful, their abstract nature can leave students skeptical of their practical relevance, particularly with respect to policy applications. Classroom games can bridge this gap between stylized theoretical models and real-life economic dynamics by allowing students to engage actively with the mechanisms underlying these models.

In this article, we describe one such game, which builds on a specific macroeconomic model: the Lucas Islands model (Lucas 1972) and show how this form of interactive learning can be integrated with a specially structured follow-up lecture to supplement the standard textbook material. This game was first described in Hazlett (1996) as a set of rules and classroom setup aimed at discussing the effects of an unanticipated monetary policy. In the game, students assume the roles of workers who observe nominal wages, predict prices, and determine labor supply responding to economic shocks and policy announcements. Their individual decisions collectively generate aggregate outcomes, illustrating key macroeconomic concepts such as the real business cycles, the interplay of adaptive and forward-looking expectations, and the effects of monetary policies. We add a follow-up lecture to this game, in which we present the students with an analysis of the data generated during the game. Specifically, we explain how the results can be interpreted as a Phillips curve and the formation of expectations, linking the students' individual decisions to broader macroeconomic outcomes. Our extended framework illustrates that the Lucas Islands classroom game can be used naturally to explain a much wider set of economic concepts than originally intended in Hazlett—including the Phillips curve and rational expectations.

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We argue that adding a follow-up lecture with a data analysis presentation enhances the pedagogical value of the game by demonstrating how macroeconomic research operates in connecting theoretical models with empirical data. By actively participating in the model's mechanics and observing how their collective behavior generates recognizable macroeconomic patterns, students gain a deeper understanding of how micro-level behavior translates into macro-level phenomena. This experiential approach not only enhances their understanding and confidence in the relevance of macroeconomic theory but also mirrors the function of role-playing games, which prepare participants to better navigate and understand real-world scenarios. As a pedagogical tool, this approach effectively demonstrates the practical utility of theoretical models while developing a more intuitive insight into their mechanisms.

Classroom games<sup>1</sup> are a well-established type of learning activity beneficial for students and teachers. By placing students in decision-making roles, games make economic concepts more engaging and improve knowledge retention. Parker (1995) argues that such activities enhance students' ability to recall material, while Emerson and Taylor (2004) show that active learning exercises improve standardized test scores in economics. Similarly, Durham, McKinnon, and Schulman (2007) report that participation in experiments can increase average scores by 3.24 percent on microeconomic topics and by up to 9.63 percent on macroeconomic topics.

Most classroom games described in the literature focus on microeconomics, where students can easily relate to individual decision-making. In contrast, macroeconomics examines aggregate relationships and the role of policymakers, who cannot observe or control each individual agent. This distinction makes it more difficult for students to connect macroeconomic theory to personal experiences (see Ewing, Kruse, and Thompson 2004). As a result, existing macroeconomic classroom games either tend to focus on introductory topics, such as the money demand (e.g., Chen 2018), or offer specialized, higher-level simulations of economic behavior (e.g., policymaking in Duffy and Jenkins 2019).<sup>2</sup> While these are valuable resources, they appear to target either the first-year curriculum or niche areas of macroeconomic policy, leaving fewer options that directly integrate with a broader intermediate-level macroeconomics course.

By contrast, the Lucas Islands game provides a flexible and powerful way to illustrate several core macroeconomic concepts, from short-run fluctuations and rational expectations to the role of policy credibility. Originally introduced in Lucas (1972) and discussed in texts such as Sargent (1996), the Lucas Islands model is often used to illustrate why anticipated policy interventions lose effectiveness when agents form rational expectations. While textbook treatments of this model are often mathematically demanding, Hazlett (1996) developed a classroom game that simulates an environment of imperfect information, where participants make labor supply decisions under uncertainty. In this setup, if participants fail to predict the aggregate price accurately, their real wage calculations will be incorrect, leading to suboptimal labor supply or consumption. Over multiple rounds, the participants update their forecasts based on observed economic conditions and announced policy changes, thereby uncovering how expectations evolve and why unanticipated policy shocks can affect real activity.

Although Hazlett's original work provides detailed instructions for running the game, few studies have evaluated its effectiveness as a teaching tool or explored how it can be integrated into a course to maximize learning outcomes. Burdekin and Langdana (1995) and Langdana (1994) introduce alternative classroom games focused on macroeconomic decision-making, but their designs differ substantially from the one in Hazlett (1996) and do not systematically link the outcomes to a broader set of macroeconomic theories. Our approach fills this gap by combining the game with a structured follow-up lecture that explicitly connects the game's results to several key theoretical constructs. Additionally, we collect pre- and post-game surveys from participants to understand their perceptions of the game's impact on their learning. Hazlett (2006) highlights the importance of debriefing discussions in reinforcing lessons from classroom games, and we build on this insight by offering a comprehensive framework for integrating the Lucas Islands game into the intermediate macroeconomics curriculum.

In what follows, we describe how we implement Hazlett's (1996, 2006) Lucas Islands game, how we frame its key outcomes in a follow-up lecture, and how we analyze the students' perceptions before and after the activity using surveys.

Overall, we argue that Hazlett's game setup, when combined with additional discussions of data analysis results, can make a valuable contribution to students' learning of macroeconomic concepts, thereby narrowing the gap between theory and real-world applications in teaching and learning.

## Game design and implementation

In this section, we describe the Lucas Islands game, which is constructed to introduce students to key macroeconomic concepts. We begin by justifying the transformation of the original production-based framework into a labor market setting and discussing how this adaptation retains the model's core insights while enhancing engagement. We then outline the implementation details of the classroom game, including its structure, timing within the course, and practical considerations. The section also details the pre- and post-game surveys designed to assess students' perceptions of macroeconomic modeling and concludes with a discussion of the collected data and ethical considerations.

### *Labor market interpretation of the Lucas Islands model*

The original Lucas Islands model (Lucas 1972) describes firms making production decisions under imperfect information about aggregate prices. Firms observe their own nominal prices but cannot immediately identify whether a price increase reflects a change in inflation or a shift in their relative competitiveness. As a result, they may mistakenly adjust output, leading to short-run fluctuations in aggregate supply. This mechanism underpins the Lucas supply curve, which relates unexpected changes in the price level to variations in real output.

Hazlett (1996) adapted this framework to a classroom game where students act as workers making labor supply decisions, rather than firms choosing production levels. The shift from production to the labor market setting is natural because both versions of the model share the same essential mechanism: the agents form expectations about the aggregate price level and make decisions based on their perceived real price or real wage. In the labor supply version, students observe nominal wages and forecast prices to determine their labor supply. The aggregation of these individual decisions produces a relationship between unexpected inflation and total hours worked, analogous to the original Lucas supply curve. This transformation is particularly useful in an educational setting, as students may find an individual labor supply decision more intuitive than a firm's production choice.

A key feature of this game design is that the participants' labor supply always meets the labor demand—there is no labor market friction or unemployment risk. This ensures that the observed relationship between price expectations and labor supply maps directly onto the theoretical aggregate supply function. Since participants make decisions using a standard labor supply rule, the resulting aggregate supply (AS) curve exhibits a near-perfect fit to the theoretical prediction. However, the fit is not exact, as students make individual-level expectation errors. The design of the game influences the extent of these errors—modifications such as introducing time delays between policy actions and their effects on prices, or increasing the prominence of idiosyncratic shocks, can amplify forecasting mistakes and generate greater deviations from the theoretical curve.

In a more general setting, deviations from the theoretical AS curve could also arise if labor market imperfections were introduced. For instance, if labor demand were constrained, workers' supply decisions might not always translate into actual employment, weakening the empirical relationship. This is analogous to the factors, such as inventory adjustments or demand fluctuations, that could distort the direct link between price expectations and output in the original Lucas Islands model with firms making production choices. Educators can explore how distortions, such as labor market frictions or demand-side constraints, affect the estimated aggregate supply relationship by modifying the game accordingly. These considerations can serve as discussion points in the follow-up lecture, encouraging students to reflect on how aggregate outcomes depend not only on the expectation errors but also on institutional and structural factors shaping the labor and product markets.

### *Implementation of the classroom game*

The Lucas Island game is best suited for an intermediate macroeconomics course. At the University of Glasgow, this course (ECON2002) meets four times per week for 50-minute teaching sessions (lectures). The game and its subsequent discussion occupy two consecutive teaching sessions, typically in the 5th

or the 6th week of teaching, with at least one day (or a weekend) in between. The first session is used to conduct the game, while the second session is dedicated to discussing the outcomes.

The game is scheduled after the lectures introducing students to the Phillips curve and its refinements,<sup>3</sup> so they know about the important role of the expectation formation in the Phillips curve. The students would be familiar with the existence of different assumptions about expected inflation: whether the forecast is based solely on past inflation values, or whether it is affected by any other variables and promises, such as the central bank's inflation target. However, we usually conduct this game before lectures on monetary policy and its credibility, which feature the role of rational expectations. This is because, as we argue in the next section, our follow-up lecture provides an introduction to expectation formation, which lays the groundwork for later discussions on rational expectations and policy credibility.

We share the rules and instructions with students several days in advance, including the *Student Information Sheet* reproduced in [appendix A](#).<sup>4</sup> The sheet explicitly states that each student's objective in the game is to achieve the best balance between consumption and leisure by choosing labor hours based on their forecast of the aggregate price level. A price forecast defines hours of work, and its accuracy improves the labor-supply choice, leading to a better balance; systematic forecast errors cause over- or underworking. This framing gives students a clear goal and links the forecasting exercise to tangible outcomes within the game.

The game typically contains between 10 and 15 rounds, called “days,” and can be completed within a single 50-minute session. At the beginning of the game, students are assigned to islands, typically according to the row in which they sit. Each “day,” the students receive the following information. In the “morning,” they see a table displaying the nominal wages for this day across all islands, including the wage assigned to their own island. Thus, each participant notes the wage on their own island and can also see the full distribution of wages across all islands. Additionally, students receive a verbal message that provides qualitative information about the state of the economy and policy decisions. These messages include updates on the aggregate conditions (e.g., rising inflation or unemployment), policy measures (e.g., changes in the interest rates), and island-specific demand shifts.<sup>5</sup> The messages are consistent with the data-generating process for wages; therefore, if participants carefully process the wage distribution, they may find some verbal messages redundant. This setup allows us to observe whether students rely more on direct numerical data or qualitative announcements when forming their expectations.

After viewing their island's nominal wages, each student records in an instructor-provided worksheet their individual forecast for the aggregate price level and their individual labor supply choice calculated based on their expected real wage. In the “evening” of the same day, the true realized aggregate price is released, and the students record it in the same worksheet. Thus, by the beginning of the next round, participants are able to see the series of aggregate prices, island-specific wages, and individual forecasts from all previous rounds.

We typically ask students to use a paper worksheet rather than an electronic form. We noticed that this not only increases the participation rate, as the lecturer can observe the students' engagement, but also leads to discussions among students and thus facilitates learning from peers (see Carter and Emerson 2012). However, processing paper answer sheets is time-consuming. To offer an electronic alternative, the [Online Appendix](#) provides an Excel answer sheet template and step-by-step instructions for collecting submissions via Dropbox and compiling a single workbook ready for import into Stata, R, or Python.

At the end of the session, the teaching team collects the worksheets to process the data for the follow-up lecture, described in the next section. Practical advice on how to proceed if students are uncertain in the first rounds or if the data appear noisy is provided in [appendix A](#).

### **Pre- and post-game surveys**

To assess the effect of the Lucas Islands game and its subsequent discussion on students' understanding of macroeconomic concepts and their perceptions of economic modeling, we administer surveys before and after the game. These surveys are designed to identify possible shifts in the students' attitudes toward macroeconomic models, their perceived realism, and their confidence in applying theoretical tools to real-world scenarios. Both surveys are conducted anonymously on paper to encourage candid responses and maximize participation.

The pre-game survey is conducted during one of the teaching sessions before the game. It includes a set of statements for which the students are asked to express their level of agreement on a 5-point Likert scale, ranging from “strongly disagree” (1) to “strongly agree” (5). The survey captures the students’ initial perspectives on macroeconomic models, including whether they view such models as overly simplistic, only useful for building intuition, or applicable to real-world problems. Additionally, it assesses their confidence in using macroeconomic frameworks to analyze economic dynamics.

The post-game survey, administered in the session following the game, repeats the core questions from the pre-game survey to enable direct comparison of the participants’ attitudes before and after playing the game. Additionally, it includes targeted questions about the experience, such as whether the game clarified the connection between individual decisions and aggregate outcomes or strengthened interest in studying macroeconomic models. Comparing the pre- and post-game survey answers, we assess the game’s value as a teaching tool and explore how it reshapes students’ views of macroeconomics.

### **Data collection and ethical considerations**

All data used in this article were collected from classroom activities at the University of Glasgow. The dataset includes (1) a panel of students’ price forecasts and implied labor supply decisions,<sup>6</sup> (2) responses to repeated questions in the pre- and post-game surveys, and (3) qualitative feedback on the learning experience. Ethics approval for using this dataset in research was obtained from the University of Glasgow (approval reference: 400240023). In accordance with the conditions of this approval, access to the raw data was restricted to authors affiliated with the University of Glasgow. The study fully complies with the university’s research ethics guidelines and data protection policies.

### **Aggregate supply and rational expectations: A follow-up lecture**

In this section, we describe how we revisit the Lucas Islands game in a follow-up lecture. We link the discussion to two important topics: (1) the Phillips curve framework, which students already know from the previous lectures on the labor market and the wage-setting/price-setting model (as presented, e.g., in Blanchard 2020), and (2) the formation of expectations and rationality. The analysis of the data generated by the game is central for discussion of each topic. For each topic, we show the students how the data generated in the game can be analyzed within the corresponding framework. In this way, the follow-up lecture is used to explain the theoretical concepts and, at the same time, to introduce students to the basic tools of empirical macroeconomic research.

### **Recap of the game**

We begin the follow-up lecture by reminding the students of the game setup. In the game, each student acts as a resident of an isolated “island,” who, observing only their own nominal wage, attempts to forecast the overall price level and makes labor supply decisions based on the forecast. This design captures the “imperfect information” nature of the Lucas Islands model. During this recap, we transition from the largely lay language of the instructions to more formal economic terminology, emphasizing that the game participants face incomplete information regarding the aggregate price level. This step helps students connect their personal decisions to a broader macroeconomic theory.

We show the students the extent to which their predictions of the aggregate price level were accurate using two plots of the data. The first plot displays the series of actual aggregate price,  $P_t$ , and the average expected price,  $P_t^e$ . The second plot recasts these series as the rates of inflation,  $\pi_t$ , and expected inflation,  $\pi_t^e$ , using percentage changes in prices from each round to the next. The transformed series often reveals a shrinking gap after the first few rounds, suggesting that the participants adapt their inflation forecasts more rapidly after they have observed the actual price movements a sufficient number of times. We encourage them to compare the size of early forecast errors with those in later rounds, highlighting how

ongoing learning shapes expectation formation. This sets up the stage for the formal data analysis and its interpretation.

### Linking the game to the Phillips curve

The first main objective of the follow-up lecture is to connect the game to the Phillips curve or, more generally, to the AS relationship, which students typically encounter in earlier teaching sessions. We emphasize that the Phillips curve is best seen as a *reduced-form relationship* linking inflation (or the price level) to the real activity, once wage- and price-setting behavior and expectations are taken into account.

We focus our explanation on the fact that the Phillips curve can be derived from different approaches. One approach is the already familiar wage- and price-setting model. An alternative approach, as the game has demonstrated, is the Lucas Islands framework, where producers (or workers) misinterpret changes in the general price level as changes in their own relative price. Both approaches yield a short-run positive correlation between unexpected price increases (or inflation rate increases) and aggregate output.

### Illustrating imperfect information

In the game, students often fail to distinguish between changes in the overall price level and changes in their individual island's relative price. This confusion arises from incomplete information about the economy-wide price level, and it has a direct effect on their individual labor supply decisions. When a participant observes a higher nominal wage, that participant may interpret it as an increase in the relative price of their island's output, leading to a greater labor supply. Alternatively, the participant might suspect that the general price level rose to the same extent, leaving the real wage effectively unchanged and the labor supply close to its previous level. Consequently, the model predicts that whenever the actual price,  $P$ , exceeds the expected price,  $P^e$ , workers increase their labor supply, and aggregate output rises above its natural level. This relationship can be written as

$$Y = Y_n + \beta(P - P^e),$$

showing how price surprises lead to short-run fluctuations in output.

### Understanding "inverse causality"

Having obtained the supply curve in this framework, the first thing to do is to ask if the students recognize this relationship. Through that lecture, students will have been exposed to the AS relationship obtained as an equilibrium condition in the wage- and price-setting model. We remind them of the AS relationship derived in Blanchard (2020):  $P = P^e (1 + m)F(Y, z)$ , where  $m$  and  $z$  determine the natural rate of output. Testing the empirical validity of this relationship often yields a linear version, either in levels or in differences, known as the Phillips curve:

$$P = P^e + \varphi(Y - Y_n), \pi = \pi^e + \psi(Y - Y_n).$$

By comparing these expressions to the imperfect-information relationships observed in the game,

$$Y - Y_n = \beta(P - P^e), \quad Y - Y_n = \delta(\pi - \pi^e),$$

we illustrate why different macroeconomic models attribute causality in opposite directions. This exercise helps students critically assess the model assumptions and better understand why short-run fluctuations in output and inflation can be interpreted through different theoretical lenses. In the wage- and price-setting framework, real activity, such as a tight labor market, pushes wages and prices upward, the causality running from the strong demand for labor to an increase in the nominal wages and, ultimately, in the overall price level. In the Lucas Islands view, an unanticipated rise in the aggregate price causes workers

to supply more labor if they perceive it as a higher relative price for their own output. Here, the causality runs from the inflation surprise to real activity. We emphasize that despite these contrasting narratives, both frameworks yield a short-run Phillips curve that is best viewed as a reduced-form correlation between unanticipated price (or inflation) changes and real output, rather than a single structural equation with a fixed direction of causality.

### Empirical results from the game

Having established a theoretical link between price surprises and output, we turn to the data collected during the game. The dataset reflects heterogeneity in the participants' expectations and labor supply behavior.

We explain to the students how we define the key variables and how they appear in our plots and regression equations. Let  $P_t$  be the actual aggregate price at time  $t$ , and let  $P_t^{k,e}$  be the price forecast produced by participant  $k$  at the beginning of round  $t$ . We compute the aggregate expected price  $P_t^e = \frac{1}{N} \sum_{k=1}^N P_t^{k,e}$ , where  $N$  is the number of participants. For the labor decisions, we proceed as follows: Let  $W_t^k$  be the nominal wage that student  $k$  observes at time  $t$ , and let  $h_t^k$  be the hours of labor that participant  $k$  chooses to supply at time  $t$ . Students are already familiar with the concept of labor supply and its positive dependence on the real wage, so we remind them that they were asked to use the formula

$$h_t^k = 0.8 \times \frac{W_t^k}{P_t^{k,e}}$$

(In our setup, the coefficient 0.8 is a scale factor that translates the perceived real wage into a practical number of hours.) Summing up these hours across the participants yields the total output,  $Y_t = \sum_{k=1}^N h_t^k$ , which captures the aggregate time spent in production and, thus, represents the aggregate output.

Following these steps, the students learn that building a macroeconomic model might involve specifying individual behavior (microfoundations), collecting data that reflect each individual's decisions, and aggregating the data to obtain a measure of the economy-wide output.

We present a plot of the price surprise ( $P_t - P_t^e$ ) against the aggregate output  $Y_t$  (see [appendix B](#)). The graph shows that whenever the realized price exceeds the participants' (average) collective expectations, aggregate labor supply surpasses its normal level. This correlation supports the Lucas Islands idea that unexpected price changes can drive short-run output fluctuations. We confirm this more formally by estimating the parameters in

$$Y_t = \alpha + \beta (P_t - P_t^e), Y_t = \gamma + \delta (\pi_t - \pi_t^e),$$

where  $\pi_t$  is the actual inflation and  $\pi_t^e$  denotes the average inflation forecast.<sup>7</sup> As expected in this game setting, the least-squares estimates of  $\beta$  and  $\delta$  are typically positive and highly significant, showing that a higher excess of price or inflation rate above expectation tends to be observed together with higher output. We stress that this finding mirrors the core insight of the imperfect information model: when the actual price exceeds what people expected, they interpret it as a relative price increase and work more.

We emphasize that this data analysis is also an illustration of how economists build and test macroeconomic models. All steps, from defining variables and collecting observations to identifying the key theoretical relationships and estimating these relationships using the regression analysis tools, reflect the standard analytical steps in macroeconomic research. We also stress that heterogeneity among participants does not prevent us from observing a clear aggregate effect. Some students may systematically overestimate prices, some others may systematically underestimate them, and different students adjust forecasts at different speeds. Taken together, their individual choices still yield a robust aggregate pattern—a feature that helps students see how macro-level relationships can emerge from diverse micro-level behaviors.

Finally, we discuss implications for policy: if policymakers can generate price surprises, these can influence real outcomes in the short run. This will also prompt us to ask how successful policymakers are likely to be when trying to shape the expectations of the private sector. This naturally leads to the second part of the lecture, which looks into the formation of expectations.

### **Examining expectation formation and model-building**

After linking the price surprises to the output, we shift our focus to how students form and update their price forecasts from one round to the next over the duration of the game. We note that modeling expectations is crucial in macroeconomic theory and that our classroom dataset provides a concrete illustration of the challenges. Each participant submits a price forecast each round, allowing us to track how these predictions evolve. Therefore, we can ask how we can best understand the participants' forecast formation; in other words, how we can connect their decision process to the information available to them.

We remind the students of the basic expectation formation framework discussed in class, where purely adaptive inflation expectations are represented by  $\pi_t^e = \pi_{t-1}$ . When the analysis turns to a more forward-looking behavior, the standard approach assumes that, if the central bank's policy is credible, expected inflation simply equals the central bank's target,  $\pi_t^e = \bar{\pi}$ . Rational expectations are often summarized by the statement that “on average, people do not make systematic mistakes,” although the formal underpinnings of rational behavior are not always spelled out in the intermediate undergraduate macroeconomics course.

This game helps students engage with the formation of expectations in macroeconomic models, reinforcing the distinction between adaptive and rational expectations through a structured classroom discussion. We note that if current (rather than past) variables matter in forecasting, this suggests forward-looking behavior. In other words, once students consider contemporary policy or economic signals, their approach to forming expectations moves beyond a purely backward-looking rule.

We use the data to estimate a panel regression in which a student's forecast revision depends on a range of observable factors: the participant's previous forecast errors, changes in the nominal wages, and announcements about economic conditions or monetary policy (for instance, “inflation is rising” or “contractionary policy”). By focusing on how each participant updates their forecast from the previous period, we capture the dynamic nature of expectation formation. We present and explain the estimation results and show how they can be interpreted as if the participants partially correct prior errors—showing an adaptive element—while at the same time reacting to macro signals in a forward-looking way. [Appendix C](#) provides selected discussion points and the preferred regression model, along with the estimation results obtained for the 2024–25 Glasgow cohort.

We point out to the students that the steps the teaching team has taken using the data from the game—defining variables, specifying hypotheses, estimating regression equations, and interpreting the results—closely mirror the approach economists use when analyzing real-world macroeconomic data. By seeing how their own forecasts and labor supply decisions translate into measurable empirical relationships, students gain a tangible sense of how researchers test and refine macroeconomic models. This hands-on experience not only reveals to students where their decisions in the game align with or diverge from the theory but also forms an essential part of their education in economic research. Through this exercise, they learn how rational, adaptive, or hybrid expectations can be operationalized empirically and why no single rule can perfectly capture every context. In this way, the classroom game offers a miniature illustration of how economists incorporate heterogeneity among individuals and incomplete information when constructing and testing macroeconomic models.

For instructors who prefer to avoid regression output altogether, the same ideas can be conveyed by plotting forecast errors over time and relating them to key events in the game. This visual approach still allows discussion of “history dependence” and “reaction to new information” without requiring students to interpret formal estimation results. For example, as rounds progress, the size of the errors typically shrinks, providing a visual indication that students are adjusting their forecasts toward the realized prices. Jumps in forecast errors after key events, such as policy announcements or demand shocks, might be superimposed on this convergence. An “inflation is rising” message may trigger positive errors as students raise price expectations, while “unemployment is high” or “interest rates raised” may produce negative errors if they expect price falls that are greater than those that occur.

### **Concluding the lecture and linking to future topics**

We conclude the follow-up lecture by reiterating that the Lucas Islands game exemplifies how nominal price changes can exert short-run real effects under imperfect information. We remind students that this

is just one possible explanation of the short-run Phillips curve, which complements the more familiar stories of wage and price rigidity. We then emphasize that the positive coefficient on the price or inflation surprise in our estimated regression equations, combined with evidence of heterogeneous and imperfectly adjusted forecasts, reflects the differences between the short-run fluctuations and the longer-run equilibria.

At this point in the lecture, we give a short preview of the following lectures, which concentrate on the implications of rational expectations and policy credibility. We explain that if agents become sufficiently skilled at anticipating the policy actions behind the changes in the price level, the effectiveness of any attempts to boost real output via unexpected inflation diminishes over time. By integrating the findings from our classroom game with further material, students see directly how learning, heterogeneity in forecasts, and revised expectations can disrupt persistent real effects of nominal shocks, ultimately shaping the design and credibility of monetary policy.

In this way, the discussion seamlessly transitions into a broader theme of the course: the role of expectations in modern macroeconomics. The game serves as both a tangible demonstration of the logic of the Lucas Islands framework and a valuable illustration of how economists construct, estimate, and refine the models of aggregate phenomena based on the individual-level data.

## Student feedback

### Perception of macroeconomic models

Figure 1 presents the results of a pre- and post-game survey, where students were asked about their perceptions of macroeconomic models before participating in the game and again afterward.<sup>8</sup>

Before the game, students generally held favorable views toward macroeconomic models, seeing them as useful for building intuition and testing theoretical insights using data. The majority did not consider models too unrealistic and did recognize their role in understanding economic relationships. However, despite this positive outlook, many students lacked confidence in applying models to real-world problems. The responses suggest that while students appreciated the value of formal modeling, they were less certain

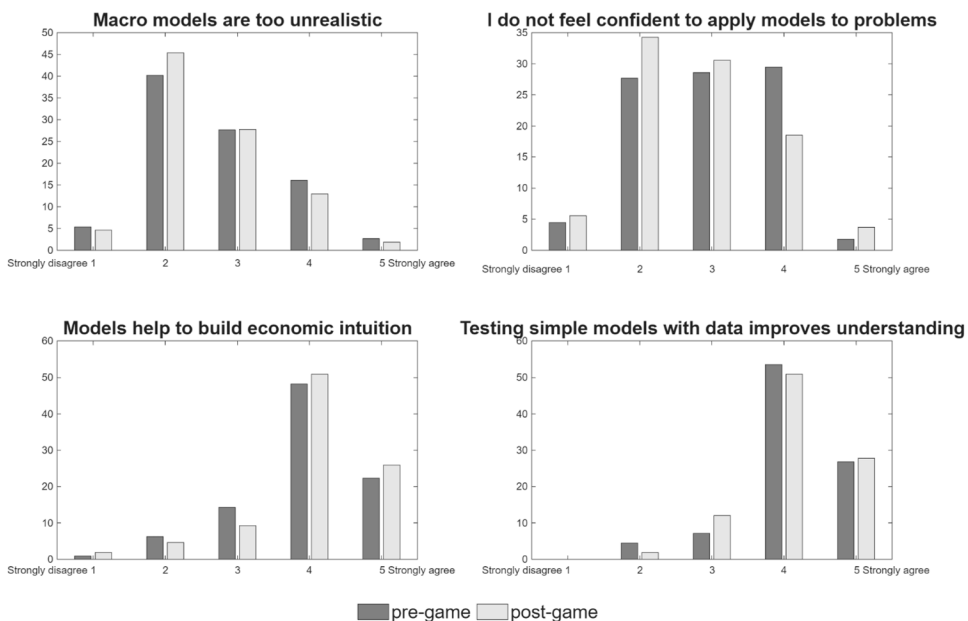


Figure 1. Pre- and post-game survey responses on modeling skills and intuition.

about their ability to use these tools effectively, indicating a gap between theoretical understanding and practical application.

The first subplot suggests that some students softened their skepticism about macroeconomic models lacking realism, although the overall distribution of responses has not changed much. The game does not appear to have dramatically shifted the perceptions of macroeconomic models being too simplistic but seems to have reinforced the view that, despite simplifications, these models are valuable.

The second subplot suggests that responses after the game indicate a reported higher confidence in applying macroeconomic models. Before the game, the responses were almost evenly distributed in the mid-range, but afterward, more students disagreed with the statement, indicating a greater level of confidence. This suggests that participating in the game helped the students see how simple models could be applied in practice.

The third subplot indicates that students already viewed macroeconomic models as helpful for building economic intuition, and the game reinforced this belief. While there was no major shift in perception, the game may have strengthened students' appreciation for how abstract models clarify key economic mechanisms, even when they omit real-world details.

The final subplot shows that the students were already convinced of the value of testing simple models using data, with only a modest further shift after the game. Even though the change is small, its direction is consistent with the other results and reinforces our conclusion that empirical validation of theoretical models enhances understanding.

### Evaluation of the game

Figure 2 presents the results of the post-game survey, capturing students' views on how the game and the follow-up lecture influenced their understanding of macroeconomic concepts, their interest in the subject, and their perception of the classroom game as a learning tool.

The first subplot suggests that the game effectively demonstrated how individual decisions translate into aggregate outcomes. A large majority of the students agreed with this statement, indicating that they found the hands-on experience useful in clarifying the link between microlevel behavior and macroeconomic patterns.

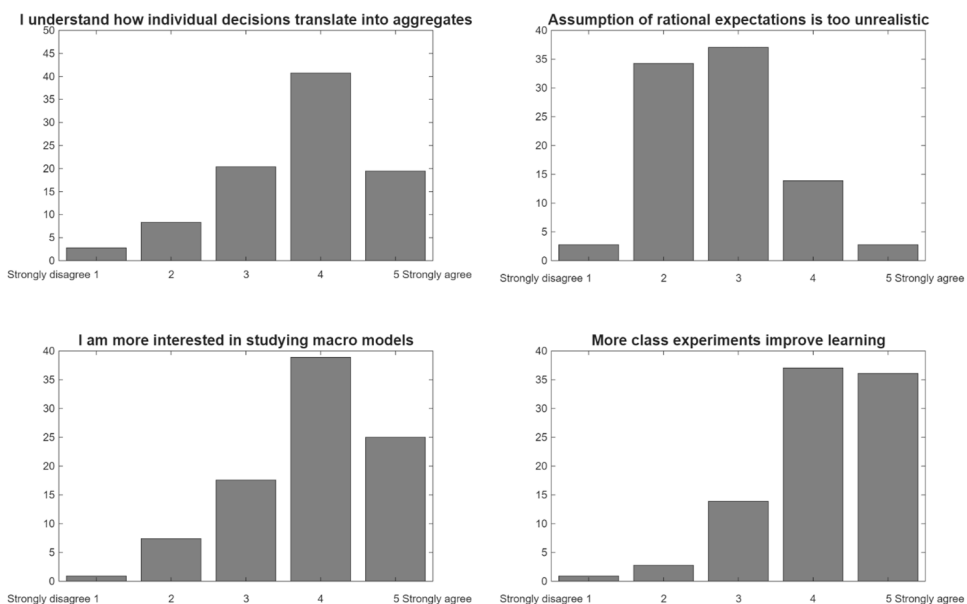


Figure 2. Survey responses on attitudes toward macroeconomic modeling and classroom learning.

The second subplot measures skepticism toward the rational expectations assumption, with the statement that it is “too unrealistic.” The responses are concentrated around moderate agreement, suggesting that, while many students remain critical of the assumption, their skepticism is not extreme. The wording of the question, particularly the word “too,” may have led students to provide more cautious responses, as they may see rational expectations as a useful simplification rather than something entirely unrealistic.

The third subplot indicates that the game increased students’ interest in studying macroeconomic models. Most students responded positively, suggesting that engaging with theory through an interactive approach made the material more appealing.

The final subplot highlights strong support for classroom games as a learning tool. The overwhelming majority of students agreed that more games (or experiments) like this would improve learning, reinforcing the value of interactive teaching methods in developing intuition and applying theoretical concepts.

## Conclusion

We demonstrate in this article that the Lucas Islands game, when combined with a structured follow-up lecture, offers a powerful tool for teaching intermediate macroeconomics. By placing students in the role of decision makers under imperfect information, the game illustrates how individual forecast errors can aggregate into observed macroeconomic outcomes—such as the short-run Phillips curve relationship—and how expectations evolve over repeated rounds. A presentation of the analysis of the game-generated data allows students to see how theoretical models align with empirical patterns, reinforcing their understanding of expectation formation and macroeconomic fluctuations.

Crucially, the pre- and post-game surveys provide further insight into students’ perceptions of the game’s effect. The survey results show that, after the activity, students reported greater confidence in applying macroeconomic models and that their perceptions of the realism and usefulness of the models were positively reinforced. In other words, students reported that the activity helped them see how aggregate outcomes can emerge from individual decisions, and many expressed a more favorable attitude toward macroeconomic modeling—bridging the gap between theory and applications.

Overall, our findings suggest that combining a classroom game with structured follow-up discussions and empirical analysis enhances students’ ability to apply theoretical macroeconomic models to the real-world phenomena. By engaging with their own forecasts and labor supply decisions, students gain deeper insight into expectation formation, information frictions, and the mechanisms that shape short-run economic fluctuations. These insights also serve as a foundation for later discussions on policy credibility and its role in macroeconomic stabilization. Beyond this immediate application, the Lucas Islands game serves as a flexible pedagogical tool that can be adapted to other areas of the macroeconomics curriculum, enriching students’ learning experiences and reinforcing the value of empirical validation in economic modeling.

## Notes

1. We refer to the interactive activity as a classroom game to distinguish it from a classroom experiment. The former is designed to engage students in a hands-on way with the purpose of experiential learning, whereas the latter is a formal data-collection activity conducted in a controlled environment with the purpose of hypothesis testing. In much of the cited literature, experiments appear to be, in fact, games in this sense.
2. For a variety of macroeconomic “classroom experiments,” see Denise Hazlett’s website: <https://www.whitman.edu/academics/majors-and-programs/economics/faculty/denise-hazlett>.
3. Chapter 8 in Blanchard (2020).
4. We post the information on the course website; other delivery methods can also be used.
5. Online Appendix (available at doi: 10.5525/gla.researchdata.2077) includes a set of slides used in 2024–2025.
6. In 2024–2025, 81 participants returned the form, leading to 1300 observations from 15 rounds of the game.
7. Prices and output can be used in levels or transformed into logarithms. Regression in levels might be preferred for consistency with the model equations in the textbook.
8. The full text of the survey questions is available upon request. The titles of the subplots show the short version of some questions.

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## Appendix A

### Lucas Islands classroom game

The design of this classroom game follows closely the format developed by Denise Hazlett (1996), reproduced here in adapted form with the author's permission.

This appendix provides all the materials needed to run the Lucas Islands classroom game as implemented in our 2024–25 cohort. The setup follows the basic logic of Hazlett but differs in important respects: (i) the information set and news announcements were slightly modernized, and (ii) the data-generating process exhibited less trend in wages and prices.

For the purposes of this article, we also prepared updated, self-contained instructions and answer sheets so that instructors can replicate the game without consulting the original source. In addition to the printed *paper* answer sheet given to students, we also provide an Excel version in the [Online Supplementary Material](#), which automates the real-wage and hours calculations and facilitates data entry for large classes.

### Information provided to students before the game

Before the start of the game, students receive a *Student Information Sheet* containing the objective, setup, and sequence of play. This page also includes a preview of the answer sheet with the first few lines completed as an example, so that students understand exactly what to enter in each column during the game. The full 15-line answer sheet (paper or Excel) used in the game has the same column layout as the preview shown here.

## Student Information Sheet

### Setup

- There are 10 islands.
- You live on one of them. You have a family: a worker (who produces a good on the island) and a shopper (who buys goods across islands). You control both roles.
- Each island has a factory—producing a unique good—where your worker works.
- You want to buy goods from all islands, and you buy them every day.
- You know the price of goods on your island, but you need to send your shopper to visit other islands to learn prices there. Only at the *end of the day* when your shopper returns will you know all prices.
- You need to send your worker to work every *morning* and tell the worker **how many hours to work today**.

### Objective

You want to get the best balance between *consumption* (what you can buy) and *leisure* (your free time). Working more hours gives you more income to spend but leaves you with less time to relax. Each day, you must decide how many hours to work.

Your decision depends on the *expected real wage*—the pay you think you'll get once prices are taken into account. In the morning, you do not know the *overall price level* in the economy for that day (the *aggregate price level*), you need to predict it first. Then, the expected real wage is calculated as your nominal wage (the number of dollars you're offered per hour) divided by your predicted price level. The more accurate your price forecast, the better you can balance work and leisure; if your forecast is consistently wrong, you may end up working too much or too little.

### How many hours to work?

You need to think about **real wage**, not **nominal wage**:

- The **nominal wage**  $w$  is the number of dollars per hour you are offered.
- The **real wage**,  $w / P$ , measures the purchasing power of 1 hour of work, adjusting for the price level  $P$ .
- Because  $P$  is unknown in the morning, with only  $w$  known, you form an estimate  $P^e$  and compute the *expected real wage*  $w / P^e$ .
- The number of hours to work is proportional to your expected real wage, i.e., you have an upward-sloping labor supply curve:

$$\text{Hours to work} = 0.8 \times w / P^e.$$

### Examples

- If  $w = 10$  and  $P^e = 1.0$ , then hours =  $0.8 \times 10 / 1.0 = 8$ .
- If  $w = 11$  and  $P^e = 1.0$ , then hours =  $0.8 \times 11 / 1.0 = 8.8$ .
- If  $w = 11$  and  $P^e = 1.1$ , then hours =  $0.8 \times 11 / 1.1 = 8$  (no change from the baseline).

### Practical task in the game

In summary, you want to get the best balance between consumption and leisure.

To do so, *given nominal wage*  $w$  and *news about the state of the economy*, **you need to predict the aggregate price level,  $P^e$ , accurately**. Accurate predictions lead to better decisions; systematic forecast errors lead to working too much or too little.

### Why nominal wages change

- A change in  $w$  could signal higher or lower *relative demand* for your island's good—affecting your real wage.
- Or it could reflect a *general change in all prices* (inflation/deflation), leaving your real wage unchanged.
- Your task is to use the news each morning to help distinguish these cases.

### Daily sequence

1. **Morning:** Learn your island's nominal wage  $w$  (record it in column 2) and hear the daily news announcement.
2. **Forecast:** Make a guess  $P^e$  and record it (column 3).
3. **Decision:** Calculate  $w / P^e$  (column 4) and the hours to work (column 5). If the answer sheet is electronic, Excel's built-in formulas will calculate values in columns 4 and 5.
4. **Evening:** Learn  $P$ , record it (column 6), and **compute** your actual real wage  $w/P$  (column 7). If the answer sheet is electronic, Excel's built-in formulas will calculate values in column 7.

### Preview of answer sheet (first 3 lines)

The zero line shows what happened yesterday, before you start the game. The actual price level was 1, and the wage in your island was 10, so the real wage was 10. When we play, you start filling from line one.

| Island name: |                  |                      |                         |                            |                  |                     |         |
|--------------|------------------|----------------------|-------------------------|----------------------------|------------------|---------------------|---------|
| Day          | Nominal wage $w$ | Expected price $P^e$ | Expected real $w / P^e$ | Hours $0.8 \times w / P^e$ | Actual price $P$ | Actual real $w / P$ | Notes   |
| (1)          | (2)              | (3)                  | (4)                     | (5)                        | (6)              | (7)                 | (8)     |
| 0            | 10.00            |                      |                         |                            | 1.00             | 10.00               | History |
| 1            |                  |                      |                         |                            |                  |                     |         |
| 2            |                  |                      |                         |                            |                  |                     |         |
| 3            |                  |                      |                         |                            |                  |                     |         |

In the game, the complete sheet contains one row per day (typically for 15 days). The layout is identical to this preview.

**Table A1.** News announcements by day.

---

|    |  |
|----|--|
| 1  | ...according to leading economic indicators (LEI) the economy is growing at a steady rate. Unemployment and inflation are within the target range.   |
| 2  | ...the newest craze is for goods produced on islands B and F.  |
| 3  | ...jobs are harder to find—unemployment figures are rising.  |
| 4  | ...the economy is still slowing and unemployment figures are higher than expected.   |
| 5  | ...unemployment is no longer a problem yet inflation figures are higher than those forecast for the year.  |
| 6  | ...This morning the news announcer states that it will air regular reports from the Federal Reserve Bank. Today you hear that the Fed met, announced concern about the high rates of inflation and raised the interest rate.   |
| 7  | ...the Fed met and indicated that after looking at leading economic indicators this afternoon it will decide how successful the battle against inflation has been.<br>They stated that they will take no action for the time being.  |
| 8  | ...the Fed met and reported that it feels inflation is no longer a threat, but it is concerned with high unemployment. The Fed decided to reduce the interest rate to stimulate the economy.   |
| 9  | ...the Fed met and expressed a continued concern with the high levels of unemployment. The chair announced that the Fed will continue to stimulate the economy and so reduced the interest rate. You also learn that people are finding factories A's, E's, G's and J's widgets defective. |
| 10 | ...leading economic indicators suggest that unemployment is no longer a problem. The Fed did not meet today. The problems at factories A, E, G, and J are fixed but demand for their products is still low.  |
| 11 | ...the chair of the Federal Reserve was replaced today. Leading economic indicators suggest slower than predicted growth; unemployment is high.  |
| 12 | ...Leading Economic Indicators show continued high unemployment rates.<br>The Fed has lowered the interest rate.   |
| 13 | ...LEIs indicate that the economy is stabilizing.  |
| 14 | ...the Fed met and announced a concern with inflation: it is too high.   |
| 15 | ...the Fed Chair thinks inflation is totally unacceptable. In the future, he will attempt to raise the interest rate.  |

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**Table A2.** Island-specific wages and aggregate price.

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|    | A    | B    | C    | D    | E    | F    | G    | H    | I    | J    | P    |
|----|------|------|------|------|------|------|------|------|------|------|------|
| 0  | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 1    |
| 1  | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 1    |
| 2  | 9    | 12   | 9    | 10   | 9    | 12   | 10   | 9    | 10   | 10   | 1    |
| 3  | 8.5  | 11   | 9    | 9.5  | 8.5  | 11   | 9.5  | 9    | 9.5  | 9.5  | 0.95 |
| 4  | 8    | 10   | 9    | 9    | 8    | 10   | 9    | 9    | 9    | 9    | 0.9  |
| 5  | 9    | 11   | 10   | 10   | 9    | 11   | 10   | 10   | 10   | 10   | 1    |
| 6  | 10   | 11   | 10.5 | 10.5 | 10   | 11   | 10.5 | 10.5 | 10.5 | 10.5 | 1.05 |
| 7  | 10   | 11   | 10.5 | 10.5 | 10   | 11   | 10.5 | 10.5 | 10.5 | 10.5 | 1.05 |
| 8  | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 1.05 |
| 9  | 8.5  | 10.5 | 11   | 11   | 8.5  | 11   | 9    | 10.5 | 11   | 9    | 1    |
| 10 | 9    | 10.5 | 10.5 | 10.5 | 9    | 10.5 | 9.5  | 10.5 | 11   | 9    | 1    |
| 11 | 9    | 10.5 | 10   | 9.5  | 9    | 10   | 9    | 10   | 10   | 9    | 0.95 |
| 12 | 9.5  | 9.5  | 9.5  | 9.5  | 9.5  | 10   | 9    | 9.5  | 10   | 9    | 0.95 |
| 13 | 9.5  | 9.5  | 9.5  | 9.5  | 9.5  | 9.5  | 9.5  | 9.5  | 9.5  | 9.5  | 0.95 |
| 14 | 10   | 10   | 9.5  | 10   | 10   | 10   | 10   | 10.5 | 10   | 10   | 1    |
| 15 | 10.5 | 10.5 | 10.5 | 10.5 | 10   | 10.5 | 10.5 | 10.5 | 11   | 10.5 | 1.05 |

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Notes: Compared to Hazlett's (1996) original, our data-generating process has less drift in the aggregate price level. Idiosyncratic island-specific demand shocks—described in the announcements—reallocate demand across islands without changing the aggregate price. Students who overreact to these idiosyncratic shocks typically make larger forecast errors.

### Information for the instructor

This subsection provides the full set of news announcements, the nominal wage schedule for each island, and guidance on using the record sheets. These materials are not shown to students in advance but are used by the instructor to run the game and to facilitate post-game analysis.

### News announcements and wages

The news messages we used remain close to those in Hazlett (1996) but have been lightly updated for clarity and to reflect our modified data-generating process. Table A1 lists the day-by-day announcements, and table A2 reports the nominal wages for each island and the aggregate price level.

Table A2 reports the wages and the aggregate price for all rounds. As the day progresses from morning to evening, the aggregate price—consistent with the average wage—rises when inflation is announced to be increasing or when interest rates are lowered. In contrast, it falls when unemployment is rising or when the interest rate is raised.

In addition to these aggregate shocks and policy interventions, the game includes idiosyncratic shocks that, by construction, do not influence the aggregate price. When demand for goods in certain islands increases, it declines in other

islands, reflecting the reallocation of household resources. Such shocks are designed to dissipate gradually in subsequent periods, again without affecting the overall price level.

Thus, on day 2, there is a small island-specific demand increase, which strongly affects two islands and has only a minor impact on the remaining eight. In contrast, on days 9 and 10, there is a significant and prolonged negative demand shock in four islands, which, by implication, leads to an increase in demand in the remaining six islands.

Island-specific shocks play an important role in this game. If students ignore these shocks, their aggregate price forecasts tend to be more accurate. However, when they react to these shocks, they further increase forecasting errors, which impact their labor supply decisions.

### Record sheets and data collection

The complete paper record sheet used in class contains 15 rows (one per day played) with the same column layout as the preview shown in the Student Information Sheet. The final row reports *total hours worked* (sum of column 5). The Excel version, provided in the [Online Appendix](#), contains identical fields but automatically calculates the real-wage and hours columns once the nominal wage, expected price, and actual price are entered. This facilitates data entry and analysis for larger classes.

### Instructor note

Under perfect forecasts, the total hours worked equals  $8 \times$  the number of rounds (15). At the end of the game, we announce this benchmark and highlight the student(s) whose total is closest, explaining that they likely matched labor supply to real wages without over- or underworking.

If students have questions or appear unsure in the first round or two, the instructor can briefly pause to clarify the objectives and, the link between price forecasts and labor supply before continuing. During the game itself, it is not possible to tell whether the intended patterns are emerging; these become clear only when the data are examined afterward, and, in our own experience, they have always been sufficiently clear to support both the aggregate supply and expectation-formation discussions. Nevertheless, if results appear noisy in a particular class, the key ideas can still be illustrated by focusing on a consistent subset of rounds, or, if needed, by drawing on the illustrative figures reported in this article.

## Appendix B

### Aggregate supply relationship

As discussed in the main text, the game generates data that support a Lucas-Islands-style supply function, where output (or labor supply) responds positively to unexpected price changes (price surprises) or inflation surprises. Below, we present the detailed regression results for both specifications.

The data were collected from a 15-round game conducted during the 2024–25 academic year with Intermediate Macroeconomics (ECON2002) students at the University of Glasgow. Eighty-one paper forms with game data were collected.

Figure B1 summarizes the aggregated forecast data. The top panels show that students as a whole quickly adjusted their expected price back to the actual price level, and their inflation forecasts were similarly accurate in the aggregate. The initial errors were largely corrected within four or five rounds, after which the students predicted the effects of policy announcements with reasonable accuracy. This rapid improvement in forecasting performance may be attributed to the nature of the scenario, where there was no strong aggregate trend in prices and wages, and wage movements were highly consistent with the information provided in the announcements. The bottom panel demonstrates a strong correlation between aggregate price surprises and aggregate output changes.

We estimate the aggregate supply relationship in two forms,

$$Y_t = \alpha + \beta (P_t - P_t^e) + \varepsilon_t \quad (\text{AS})$$

$$Y_t = \gamma + \delta (\pi_t - \pi_t^e) + \varepsilon_t \quad (\text{PC})$$

where  $Y_t$  is the aggregate output proxy (i.e., average hours of labor),  $P_t$  is the actual aggregate price in round  $t$ , and  $P_t^e$  is the average expected price. The second regression uses inflation surprises instead of price-level surprises. Table B1 reports the estimated coefficients and their associated 95 percent confidence intervals.

These findings, discussed in the section on the follow-up lecture in the main text, confirm that unexpected increases in prices or inflation are positively correlated with higher aggregate output in the short run.

Note that the extremely strong significance of all the estimated coefficients in table B1 generated in this particular game is a consequence of the relatively strong correlation of individual mistakes with idiosyncratic shocks, as opposed to aggregate shocks, as we discuss in appendix C. To generate a positive dependence, we need only the labor supply curve and the aggregation of individual decisions. The labor supply relationship in this game is a simple linear relationship, one

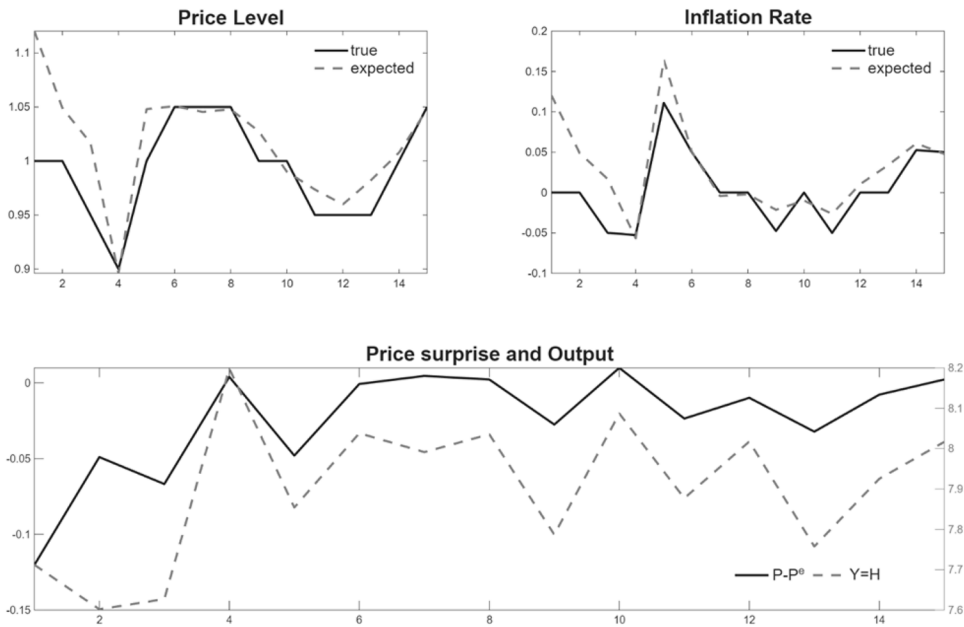


Figure B1. Summary of the forecast data.

Table B1. Aggregate supply regressions.

|                        | AS                      | PC                      |
|------------------------|-------------------------|-------------------------|
| Intercept              | 7.99***<br>[7.92, 8.07] | 7.99***<br>[7.93, 8.07] |
| Expectation error      | 3.95***<br>[2.25, 5.65] | 3.91***<br>[2.21, 5.61] |
| Number of observations | 16                      | 16                      |
| $F(1,14)$              | 24.71                   | 24.29                   |
| Prob > F               | 0.0002                  | 0.0002                  |
| R-sq                   | 0.64                    | 0.63                    |
| Adj. R-sq              | 0.61                    | 0.61                    |

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

for all students, and therefore the positive relationship between forecast errors and output (which is equal to labor supply) will always be detected. One can discuss further, in a macroeconomics course, whether this relationship can weaken because of some other factors affecting the labor supply or labor demand relationships; for example, the presence of large unemployment risk may prompt workers to increase their labor supply even if the perceived real wage falls. We also noted that with a less transparent data-generating process on the aggregate level, the AS relationship, while remaining highly significant, gives less precise estimates of the natural rate of output and elasticities than presented in table B1.

## Appendix C

### Empirical model of expectation formation

We now examine how students form their price and inflation expectations in each round. Instructors using this class game should expect to obtain similar empirical results, allowing them to analyze the data quickly and use the findings in the follow-up lecture.

Each morning, students have access to the following information:

1. Their island-specific nominal wage  $W_t^k$ .
2. Verbal announcements regarding the economy and policy measures ( $X_{j,t}$ ).
3. Their own forecast and realized aggregate prices from previous rounds.

In the morning, the students forecast *individual price*  $P_t^{k,e}$ , and at the end of the day, they observe *true aggregate price*  $P_t$ , enabling them to compare their forecasts with actual outcomes.

This allows them to learn from past forecast errors and adjust their expectations accordingly.

We model expectation formation using the following panel regression:

$$\begin{aligned} \Delta \log P_t^{k,e} = & \theta_0 + \theta_1 (\log P_{t-1}^{k,e} - \log P_{t-1}) + \theta_2 \Delta \log P_{t-1}^{k,e} + \theta_3 \Delta \log P_{t-1} \\ & + \psi_0 \Delta \log W_t^k + \psi_1 X_{1,t} + \dots + \psi_M X_{M,t} + \varepsilon_{k,t}, \end{aligned}$$

where  $\log P_{t-1}^{k,e} - \log P_{t-1}$  is the previous forecast error and  $\Delta$  is time difference.

The above model suggests that students revise their past forecasts based on how successful they were in the previous round (captured by  $\log P_{t-1}^{k,e} - \log P_{t-1}$ ), while also considering new information revealed at the start of day  $t$ . First, the lagged forecast error reflects a classic “adaptive” mechanism: if a student overestimated prices in the past, they correct downward, and vice versa. Second, the terms  $\Delta \log W_t^k$  and  $X_{j,t}$  allow for broader feedback from observed nominal wages and policy or economic signals, thus capturing a more “forward-looking” or information-driven element of expectation formation. In addition, the short-run changes in both actual and expected prices from the previous period ( $\Delta \log P_{t-1}$  and  $\Delta \log P_{t-1}^{k,e}$ ) help capture any momentum or partial reversal in price forecasts beyond the main error-correction term. Taken together, these components allow us to examine how different sources of information—past mistakes, wage growth, and announcements—jointly shape participants’ price forecasts in each round of the game.

Under purely adaptive expectations, the participants would revise forecasts only in response to their own mistakes—these terms are associated with coefficients  $\theta_j$ . In such a case, the effect of the additional explanatory variables would be insignificant (i.e.,  $\psi_j = 0$ ).

With more forward-looking or data-driven behavior, participants will use at least some information in  $X_{j,t}$  and  $W_t^k$ . The set  $X_{j,t}$  includes signals from news announcements.

We coded the in-game announcements as a set of binary indicators that capture the key signals participants could plausibly extract, although the announcements were often more nuanced or descriptive. In particular, we focus on four broad categories:

1. **Inflation signals:**  $E_t^i = 1$  when the announcement in round  $t$  stated or implied that “inflation is rising,” “inflation is high,” or “inflation is above target.” Conversely, if the announcement suggested that inflation was not a concern, or stable,  $E_t^i = 0$ . We did not use statements that inflation is below target. This applies in days 5, 6, 14, 15.
2. **Unemployment signals:**  $E_t^u = 1$  if the announcement in round  $t$  mentioned “unemployment is high,” “unemployment is rising,” or “jobs are harder to find.” Otherwise,  $E_t^u = 0$ . We did not use statements that unemployment is low or falling. This applies in days 3, 4, 8, 9, 11, 12.
3. **Interest-rate moves:**  $M_t^c = 1$  and  $M_t^e = 0$  whenever announcement in round  $t$  mentioned that the Federal Reserve “raised the interest rate,” and  $M_t^c = 0$  and  $M_t^e = 1$  when it “lowered the interest rate.” If no rate change was announced in round  $t$ , both variables are zero.  $M_t^c = 1$  in day 6 only, and  $M_t^e = 1$  in days 8, 9, and 12.
4. **Island-specific demand signals:** Some announcements indicated positive or negative shifts in demand on specific islands. Thus,  $N_{i,t}^b = 1$  ( $N_{i,t}^r = 1$ ) if in round  $t$  the announcement stated that “demand on island  $i$  goes up (down).” In all other cases,  $N_{i,t}^b = N_{i,t}^r = 0$ . The increase in demand ( $N_{i,t}^b = 1$ ) was observed in islands 2 and 6 in day 2, and reduction in demand was observed in islands 1, 5, 7, and 10 in day 9.

For instance, an announcement such as

“Today you hear that the Fed met, announced concern about high rates of inflation and raised the interest rate.”

contains two main pieces of information: (i) inflation is high, and (ii) interest rates are going up.

Hence, we set  $E_t^i = 1$  and  $M_t^c = 1$ . Similarly, if an announcement specifies

“...the newest craze is for goods produced on islands B and F”

we set the corresponding island indicators for *positive demand shock* ( $N_{B,t}^b, N_{F,t}^b$ ) to 1, with other indicators remaining at 0 unless additional signals are mentioned.

Hence, our final regression specification is:

$$\begin{aligned} \Delta \log P_t^{k,e} = & \theta_0 + \theta_1 (\log P_{t-1}^{k,e} - \log P_{t-1}) + \theta_2 \Delta \log P_{t-1}^{k,e} + \theta_3 \Delta \log P_{t-1} \\ & + \psi_0 \Delta \log W_t^k + \psi_1 E_t^i + \psi_2 E_t^u + \psi_3 M_t^c + \psi_4 M_t^e + \psi_5 N_{i,t}^b + \psi_5 N_{i,t}^r + \varepsilon_{k,t}. \end{aligned}$$

Table C1 presents the results for the expectation-formation model, estimated using a fixed-effects panel regression, as indicated by the Hausman specification test.

**Table C1.** Model of expectation formation, dependent variable is  $\Delta \log P_t^{k,e}$ .

|                                     | (1)                        | (2)                        | (3)                        | (4)                        |
|-------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Intercept                           | 0.02***<br>[0.009, 0.03]   | 0.01***<br>[0.007, 0.02]   | 0.02***<br>[0.01, 0.03]    | 0.02***<br>[0.009, 0.03]   |
| $\log P_{t-1}^{k,e} - \log P_{t-1}$ | -1.13***<br>[-1.22, -1.05] | -1.12***<br>[-1.21, -1.03] | -1.13***<br>[-1.22, -1.04] | -1.14***<br>[-1.23, -1.05] |
| Prices, $\Delta \log P_{t-1}^{k,e}$ | -0.13***<br>[-0.18, -0.07] | -0.13***<br>[-0.18, -0.08] | -0.13***<br>[-0.18, -0.07] | -0.12***<br>[-0.18, -0.07] |
| Prices, $\Delta \log P_{t-1}$       | -0.12<br>[-0.33, 0.08]     | 0.18**<br>[0.02, 0.33]     | -0.05<br>[-0.26, 0.15]     | -0.16<br>[-0.36, 0.04]     |
| Wages, $\Delta \log W_t^k$          | 0.10<br>[-0.04, 0.23]      | 0.48***<br>[0.39, 0.58]    | 0.21***<br>[0.09, 0.33]    | -                          |
| Economy, $E_t^i$                    | 0.05***<br>[0.03, 0.07]    | -                          | 0.04***<br>[0.02, 0.06]    | 0.05***<br>[0.04, 0.07]    |
| Economy, $E_t^u$                    | -0.06***<br>[-0.08, -0.04] | -                          | -0.05***<br>[-0.07, -0.03] | -0.06***<br>[-0.08, -0.04] |
| Policy, $M_t^c$                     | 0.003<br>[-0.03, 0.04]     | -                          | -0.003<br>[-0.04, 0.03]    | 0.006<br>[-0.03, 0.04]     |
| Policy, $M_t^e$                     | 0.03***<br>[0.01, 0.05]    | -                          | 0.02**<br>[0.003, 0.04]    | 0.04***<br>[0.02, 0.06]    |
| Demand, $N_{i,t}^b$                 | 0.04<br>[-0.03, 0.10]      | -                          | -                          | 0.06*<br>[-0.006, 0.12]    |
| Demand, $N_{i,t}^r$                 | -0.06***<br>[-0.09, -0.02] | -                          | -                          | -0.06***<br>[-0.09, -0.04] |
| Obs.no.                             | 1134                       | 1134                       | 1134                       | 1134                       |
| R-sq: within                        | 0.73                       | 0.71                       | 0.73                       | 0.73                       |
| R-sq: between                       | 0.65                       | 0.63                       | 0.63                       | 0.65                       |
| R-sq: overall                       | 0.69                       | 0.67                       | 0.69                       | 0.69                       |
| F test                              | 285.3                      | 656.4                      | 352.0                      | 316.6                      |
| Prob > F                            | 0.000                      | 0.000                      | 0.000                      | 0.000                      |

Note: Ninety-five percent confidence intervals are in square brackets.

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Consider the regression results in column (1). The estimated coefficient on the lagged forecast error, ( $\log P_{t-1}^{k,e} - \log P_{t-1}$ ), is approximately  $-1.12$ , suggesting mild over-correction: when the expected price is above the realized (observed) aggregate price, students revise their price expectations down (up) at a slightly higher rate, on average, than the rate at which their expectation exceeded (fell short of) the realized price in the previous period. That is, the estimated values of the coefficients in this dynamic system imply alternating convergence of the individual price forecast toward the aggregate price, with eigenvalues inside the unit circle. In our experience, the degree of over-correction tends to be smaller when participants face a stronger inflation trend, although the results may vary depending on the data-generating process used by the instructor.

Statistical significance of estimated coefficients on additional explanatory variables (beyond the past forecast error) suggests that expectations are not purely adaptive. One can interpret this as a hint that the participants use some forward-looking information, consistent with broader rational-expectations arguments.

Columns (2)–(4) contain several specifications of these regressions to investigate the extent to which the rate of growth in wages,  $\Delta \log W_t^k$ , influences the participants' decisions. As discussed in the main text, in each round of the game, students observe their individual wage. In addition, they also see wages in all other islands, as all period- $t$  wages are communicated to the group in a single table. They can, if they wish so, make conclusions about the wage distribution. A noticeably uneven distribution might serve as an additional strong signal about substantially lower or higher demand in particular islands, meaning that some information could be duplicated. Indeed, column (2) shows that removing the announcement dummies makes past wages and past aggregate price highly significant. Column (3) indicates that reintroducing the aggregate shocks partly subsumes the signal from past prices, while column (4) suggests that the distributional wage effects are captured by the idiosyncratic demand shocks.

These results suggest that, although idiosyncratic island-specific demand shocks—whether directly communicated as news or inferred from wage information—do not affect the aggregate price; they have a statistically significant impact on

individual price forecasts. In the 2024–25 cohort game, students made forecasting errors, predominantly caused by idiosyncratic shocks, leading to suboptimal labor supply decisions. As a result, we obtained strong empirical evidence for the aggregate supply relationship, as discussed in [appendix B](#).

It is noteworthy that the game scenario introduced a negative idiosyncratic shock later than the positive one, with the negative shock persisting at full strength for at least two periods.

The results in columns (1) and (4) indicate that this negative shock was a significant driver of forecasting errors. This likely reflects students' partially overlooking the earlier positive shock due to confusion in the initial rounds, rather than any learning process reducing the impact of the later negative shock.

In conclusion, the flexible design of this classroom game allows instructors to modify the scenario to induce different patterns in students' responses. The opportunity to present empirical results immediately in the follow-up lecture helps sustain students' interest in macroeconomic modeling and deepens their understanding of the underlying mechanisms of observed economic relationships.