Teaching Piketty to Undergraduates

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Thanks to Frank M. Howland for helping me understand Piketty.

Abstract

The primary ideas in Piketty's *Capital* should be incorporated into the economics curriculum. Unfortunately, its theoretical foundation—the Solow Model—when conventionally taught with a Solow diagram or analytical solution, is beyond the reach of the typical undergraduate. The model, however, can be effectively presented via simulation, with steady-state and comparative statics properties directly observed. A single, standalone, macro-enhanced Excel workbook, *Capital.xlsm*, is all that is needed to teach the main ideas in Piketty's *Capital*. Download it here www.depauw.edu/learn/econexcel or from this direct link: www.depauw.edu/learn/econexcel/Capital.xlsm

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The English translation of Thomas Piketty's *Capital in the Twenty-first Century* was a stunning success in 2014—the best-selling book in the history of Harvard University Press and the focus of intense debate. The Piketty phenomenon was notable in that both academics (including non-economists) and popular media were consumed by his analysis of inequality in the distribution of income and wealth. Piketty even made an appearance on Comedy Central's *The Colbert Report* (www.cc.com/video-clips/e301vf/the-colbert-report-thomas-piketty)—quite an accomplishment for an economics professor! I participated in a three-day conference at the University of Chicago in February 2016 that was devoted exclusively to presentations and discussions of the book.

Surprisingly, many (and perhaps the vast majority) of the people talking about Piketty (2014) did not actually finish the book. At almost 700 pages and with a treasure trove of supporting Excel files, it is not an easy book to read. Kindle data showed that the average reader made it to page 26. Surely this was one of the most-discussed and least-read books of all time (Ellenberg, 2014).

But Piketty and others working on inequality have an interesting and important story to tell. They have amassed extensive, carefully compiled data and made it freely available at the World Top Incomes database (wid.world). The historical record shows how inequality has evolved over time. In *Capital*, Piketty presents many ideas and arguments, but the fundamental claim is that inequality is not an accident of capitalism, but deeply baked into its DNA. To truly understand the argument, however, a strong background in growth theory is needed. This prerequisite makes the book unsuitable for undergraduate classroom use.

My contribution is a macro-enhanced Excel workbook, *Capital.xlsm*, that makes Piketty's argument accessible to a typical undergraduate. It displays data on the capital-income ratio and income inequality in a few countries and implements the Solow Model in Excel. Simulation and direct observation of results provides a platform from which to understand Piketty's view of the rising inequality observed in rich countries around the world. The workbook is standalone—no other materials are required. It includes text and videos that explain the data and solves the Solow Model without any math. Download it here www.depauw.edu/learn/econexcel or from this direct link: www.depauw.edu/learn/econexcel/Capital.xlsm

This short paper is neither a reader's guide, an abridged version, nor a shortcut to avoid reading the book. It is meant for an Economics professor familiar with the material who wants to teach Piketty (2014), but realizes that simply assigning pages to be read is an absurd exercise in futility.

The next section explains what is in *Capital.xlsm* and it is followed by a few ideas on how to use the workbook to teach Piketty's *Capital*.

The Contents of *Capital.xlsm*

The workbook has several sheets that are initially hidden and displayed as the reader proceeds through the material, clicking on buttons that change charts and watching short videos (a few minutes long) that float above the spreadsheet. The user can follow along and make changes as the video plays. This active engagement, with strong visuals, is a key pedagogical advantage of this approach (Barreto, 2015; 2016).

The *Intro* sheet includes software requirements and has a video titled *Piketty's Problem* that is used to make sure that the user's computer is functioning properly. The video explains that Piketty's focus is on inequality and that inequality is getting worse. But Piketty has a problem in a second sense in that the argument for rising inequality requires understanding growth theory.

At the bottom of the *Intro* sheet, the reader clicks the *Start* button and a new sheet, *Def*, is displayed. It briefly explains capital (*K*) and income (*Y*). Emphasis is placed on capital (which is synonymous with wealth) as a stock and income as a flow.

Next, the *Data* sheet is revealed. This contains a longer, three-part presentation. First, the *K/Y* ratio, β, is explained and a chart with Piketty's *K/Y* data for several countries is shown. A video, *Understanding Beta*, offers further explanation of this critical variable. Second, Piketty's data on income inequality are displayed on a chart. Like the *K/Y* chart, the user can change the country displayed, and, in addition, can display Top 10%, Top 1% and Top 0.1% shares. Finally, the third part connects the *K/Y* ratio and income inequality. It ends with a video featuring a clip from *Downton Abbey*, a drama about the life of an aristocratic British family and their servants. This is used to bring Piketty's concept of Patrimonial Capitalism to life.

Instead of directly proceeding to the simulation, the next sheet, *Cycle*, presents the essential logic of the Solow Model in a flow diagram and with a series of buttons that the reader clicks. The emphasis is on the cyclical mechanics of the process. For those interested in a more formal presentation, the **Show Math** button displays the *Algebra* sheet, which includes a step-by-step derivation of the model's solution.

The reader then proceeds to the *Model* sheet, which contains the full-scale simulation. It features several videos which are actually screencasts—voice-over narration of the computer screen. The first one explains how the steady-state is reached when *K/Y* does not change. Other videos demonstrate the effects of capital destruction and how low *g* and *n* could produce Piketty's nightmare of a highly unequal society. These screencasts show how the simulation works and ask the reader to make changes on the spreadsheet while directly observing the results.

The last sheet, *Final*, summarizes Piketty's argument and points out that the future path of *K/Y* and inequality depends heavily on *g*—a parameter that we do not understand well.

Teaching with *Capital.xlsm*

Professors should keep in mind that the most important concept to explain to students is the *K/Y* ratio. It really is all about β because a high β is associated with a greater inequality. To teach Piketty, β must be explained and emphasized. Solow (2014) points out how clever it is to use β: it allows us to compare France in 1850 to the United States a century later. This point is made in the first part of the *Data* sheet and in the video on *Understanding Beta*.

Of course, β also lies at the heart of the Solow growth model. The steady-state solution is found when the capital-output ratio, β, is constant. In other words, *K/Y* is like price and quantity in a supply and demand graph—an endogenous variable that is determined by forces in the model. The first screencast in the *Model* sheet says exactly this.

The obvious way to use this workbook is to assign it before class, and then ask a series of questions for class discussion that mirror the material in *Capital.xlsm*, such as:

- What is Piketty's Problem?
- What is capital and how is it different from income?
- What is β?
- Which values of β are considered high?
- Why is high β a problem?
- What does the historical record of Top 10% income shares show?
- What is Patrimonial Capitalism?
- How does the Solow Model function? Where does it start and what happens next?
- What is a steady-state?
- Do the initial values of *L* and *K* matter? Why or why not?
- What role does β play in the Solow Model?
- What does capital destruction do to β?
- Does the model match the historical record of β?
- How do *s*, *n*, and *g*, affect steady-state β?
- Why is Piketty concerned about the future of income inequality?

Another approach is to use the workbook as a paper or extended homework assignment. Any or some of the questions above could be used or one could try a more open-ended prompt such as, "Explain Piketty's case for rising income inequality in the 21st century."

If portions of the book are being assigned, point out in class that Piketty (2014) presents three equations: two fundamental laws of capitalism (although the first one is an identity):

1) $\alpha = r \times \beta$
2) $\beta = s/g$

and a fundamental force for divergence

3) $r > g$.

After students work with *Capital.xlsm*, the professor can lead discussion on each of these equations, probing for areas that remain unclear. Keep in mind that Piketty (2014) defines the variables so that his *g* includes *n* and *s* contains δ(depreciation) so that in the Excel version of the model, $\beta = s/(\delta + n + g + ng)$.

Instead of having students work on the file outside of class, the professor could project the workbook in class, walking through the material and taking questions as the lecture proceeds. This can also be done in a computer lab setting, with students following along. The videos could be played on the projected screen so everyone watches it at the same time. Of course, one could assign *Capital.xlsm* before class, then walk through it together as a form of repeated practice. Students would be more comfortable asking questions having already seen the material.

Conclusion

Piketty's *Capital* is an important contribution to economics. It deserves to be integrated into the mainstream economics curriculum, but it must be translated and presented in a more user-friendly way if it is to be used in the undergraduate classroom.

I am not the first person to notice this. Roine (2017, p. 7) says he wrote *Pocket Piketty* because there is a need: "to give an introduction to all of those for whom the original text was too much." He offers succinct, clear explanations that are tied closely to Piketty (2014). But even the best written presentation cannot convey the true meaning of β. After describing how *L* and *K* generate *Y* and then savings are added to the *K* stock, Roine (2017, p. 90) offers as an aside, "(Those familiar with economic growth theory will recognize this as the basis for the so called Harrod-Domar and Solow models.)" This is followed by the second fundamental law of capitalism, which "simply states" that $\beta = s/g$. The equation itself may be simple, but truly understanding that β is an endogenous variable which must be constant in the steady-state is anything but simple. And many of those "familiar" with the Solow Model do not truly understand it.

Capital.xlsm offers a clear explanation of the main ideas, data, and model that form the foundation of Piketty's world view. Unlike conventional teaching methods relying on chalk-and-talk with a Solow diagram, which cannot possibly explain β's role in the argument to the typical undergraduate, simulation provides true access to non-experts, enabling Piketty's work to reach a much larger audience.

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