The History of Macroeconometric Modeling: An Introduction

Marcel Boumans and Pedro Garcia Duarte

> Just as islands—isolated places with unique, rich biodiversity—have relevance for the ecosystems everywhere, so does studying seemingly isolated or overlooked people and events from the past turn up unexpected connections and insights to modern life.
> —Margot Lee Shetterly, *Hidden Figures* (2016)

The practice turn, which started in the 1980s in science studies and which eventually influenced philosophy and history of science, gradually reached history of economics by changing what historians of economics considered to be the relevant subjects of their studies. As a consequence, in the past two decades some of the history of economics turned from histories of economic *ideas* or economic *thought*, focusing on the study of "theories" and "schools of thought," to histories of, for example, epistemic mediators such as "models," "experiments," "measurements," and

Correspondence may be addressed to Marcel Boumans, Utrecht School of Economics, Kriekenpitplein 21-22, 3584 EC Utrecht, Netherlands; email: m.j.boumans@uu.nl; and to Pedro Duarte, (INSPER and USP), Department of Economics (FEA-USP), Av. Prof. Luciano Gualberto, 908, São Paulo, SP, 05508-010, Brazil; email: pgduarte@usp.br. To write this introduction, we gratefully benefitted from the project description by Roger Backhouse, which we used for our grant applications. Pedro Duarte thanks the British Academy (UK) and CNPq (Brazil) for financial support.

History of Political Economy 51:3 DOI 10.1215/00182702-7551828

"observations."[1] This change of perspective has the obvious result that other elements now become to be seen, become visible. A "practice" is populated by people other than only those whose names have become familiar to us through their appearances in books and journal articles, and is not furnished with bookcases alone.

In a recent paper, Thomas Stapleford (2017) suggests an alternative perspective to writing the history of economic thought, namely, by looking "through the lens of practice." He defines practices as "collections of behavior that are teleological, subject to normative evaluation by broader groups, and exhibit regularities across people in a constrained portion of time and space" (118). A focus on practice will take us beyond the text and thus extend the range of possible investigations a historian may pursue: "we might consider pedagogy and training; the form and style of personal interactions; the practices that sustain hierarchies and institutional roles; the hours, organization, and division of labor; and many other behavioral patterns that comprise the communal production of knowledge" (119).

A change of perspective does not always happen because of good academic reasons, but—as we guess—more usually because of an event which simply cannot be ignored. One such event was when in April 2014 the Board of Governors of the Federal Reserve System released the model equations, coefficients, data, and sample simulation programs for the FRB/US model, one of the models the Fed uses (since 1996 in its modern version) for forecasting and policy analysis (Brayton, Laubach, and Reifschneider 2014). As Beatrice Cherrier (2017, 1) notes, because the optimizing model consisted of a large number of equations with many endogenous and exogenous variables and shocks, allowing the user to choose characterizations of the expectation-formation process alternative to rational expectations, "many observers came to the realization that non-Lucasian types of modeling had survived the rational-expectations revolution, and were actively pursued, if not in the academia, at least in central banks." They were surprised because it did not match the "standard historical narrative" circulating among macroeconomists:[2]

1. This change of perspective is evidenced by the topics of the annual conference supplements to *History of Political Economy* (*HOPE*). See also "Contemporary Historiography of Economics: A Symposium," a special issue of *History of Political Economy*, edited by Till Düppe and E. Roy Weintraub (2018), and the related book (Düppe and Weintraub 2019), for more detailed discussions of modern historiographies.

2. Valadkhani 2004, 273. For a sketch of the standard narrative and its limitations, see Duarte and Lima 2012b.

> In the 1950s and 1960s, macroeconometric modeling flourished as many teams across the country developed their models and softwares (Brookings, Wharton, MIT-Penn, Saint Louis, Liu). The rise of rational expectations, the Lucas critique and the theoretical search and empirical estimation for "deep structural parameters" and forecasting inadequacies brought about mounting criticisms, with the consequence that the profession switched to DSGE modeling. (Cherrier 2017, 1)

The surprising discovery could have happened much earlier, given that the modelers at the Fed published a paper describing the many versions of the FRB model up to the newest developed in 1996 (Brayton et al. 1997). The hidden history, however, is that governments and central banks actually continued with their large-scale models, and that their development took place at these nonacademic sites including econometric consulting houses. Other accounts showed how active the research on macroeconometric models was after Lucas (1976): take, for instance, the book edited by Lawrence Klein (1991) on model comparison (or its detailed book review by Kenneth Wallis 1993), or the article by another Fed researcher, Roy Webb (1999). But such accounts were invisible to the standard narrative that is organized around major theoretical developments.

Besides the standard histories of macroeconomics, popular among current macroeconomists, such as Blanchard 2000, 2009; Mankiw 2006; and Woodford 2009; and histories of macroeconomics written in terms of theories, schools, and programs, such as De Vroey 2016, a satisfactory history of macroeconometric modeling, though essential for the history of macroeconomics, has not yet been written. The reason is that, with a few exceptions, historians of postwar macroeconomics have paid insufficient attention to the practice of macroeconometric modelling, focusing instead on theoretical endeavors, such as the new classical macroeconomics (Hoover 1988), the IS-LM model (De Vroey and Hoover 2004), the real business cycle models (Young 2014), and the search for microfoundations (Young, Leeson, and Darity 2004; Duarte and Lima 2012a; King 2012; Backhouse and Boianovsky 2013). Historians of econometrics (Morgan 1990; Boumans, Dupont-Kieffer, and Qin 2011) have also focused on issues other than large-scale models. They have covered the development of the structural estimation method and its critics (Epstein 1987; Qin 1993), and on the burgeoning of new techniques from the 1970s onward: calibration and simulation, structural econometrics or (structural) vector autoregression (Qin 2013). Econometric modeling is not completely absent

from such accounts but treatment of large-scale econometric modeling remains unsystematic in comparison with the details in which theory is discussed in both the macroeconomics and econometrics literatures.

The result is that the history of macroeconometric modeling has been left to the practitioners themselves. The only book-length coverage is *A History of Macroeconometric Model-Building,* edited by Ronald G. Bodkin, Lawrence R. Klein, and Kanta Marwah (1991). The editors' explicit goal was to "tap the memories of many participants of the past few decades" (xiv). They claimed that

> the history of macroeconometric model building is one of slow, steady progress rather than quantum leaps or paradigm change . . . fads come and go, but many ideas that looked extremely promising when they were first introduced have turned out to be a flash in the pan (quite unimportant) or else a modest addition to the macroeconometric model-builder's intellectual capital. (Bodkin, Klein, and Marwah 1991, 527)

Chapters in this book reviewed the American experience by decades, then turned to a range of other countries, and proposed future prospects, all with the aim of presenting "a very impressive outpouring of work . . . [that] continues to flow at a rapid pace" (xv). They highlighted the continuing development of models in the 1970s, by individuals such as Ray Fair, Ta-Chung Liu, Erh-Cheng Hwa, Bert Hickman, and Robert Coen, the development of collective endeavor such as regional accounting or the multicountry project LINK, and point to the ties with central banks, in particular through the MPS or Saint Louis models.[3] They emphasized that the history of macroeconometrics does not restrict itself to academia—central banking and private companies matter a lot—and they pointed out that it was a story about not only macroeconomics and econometrics but also computation, data gathering and storage, software design, and the standardization of model comparisons. However, despite the expertise of the book's editors, the book's narrative, in which macroeconometric modeling grew steadily, undisturbed by the rise of new classical economics, the Lucas critique and DSGE modeling is problematic. For example, one reviewer, Carl Christ (1992), regretted that little was said in the book about the failure of these models to predict stagflation and that the authors quickly dismissed the Lucas critique as "essentially inapplicable to their 'mainstream econometric models'" (Christ 1992, 110).

3. MPS stands for Massachusetts Institute of Technology (MIT), University of Pennsylvania, and Social Sciences Research Council (SSRC).

The volume's neglect of the failure to predict stagflation in the 1970s and its dismissal of the Lucas critique are far from being details and point to a historiographical flaw, common in histories written by practitioners who are too close to their subject matter. On the other hand, the narratives so far constructed by historians of economics are inadequate. Because historians of macroeconomics and of econometrics focus on their own fields, insufficient attention has been paid to the place where they overlap, the place of large-scale macroeconometric modeling.

To come to a more systematic history focused on macroeconometric modeling, Roger Backhouse, Marcel Boumans, Beatrice Cherrier, Pedro Duarte, and Kevin Hoover gathered in January 2016 at Nuffield College, University of Oxford, to discuss the prospects of such a project.[4] Our conjecture was that when fuller historical analysis is undertaken, the history of macroeconometric modeling will turn out to be far more central to the history of macroeconomics than has previously been recognized. Many leading figures were involved in large-scale models, as well as many doctoral students, and there appears to have been important feedback between theorizing and modeling. For example, the experience with the MIT-Penn-FRB model they were building caused Franco Modigliani and Albert Ando to modify their theories of consumption, and their decision to build the model appears to have been a response to the inconclusiveness of their debates with monetarists. We were also convinced that when the history is examined more carefully, some widely accepted beliefs will turn out to be either wrong or oversimplified. For example, although the Lucas critique was undoubtedly significant, two aspects are hidden in current historiography of macroeconomics. First, several macroeconomists, including Klein and many others, resisted the criticism by questioning its empirical importance. Second, the Lucas critique was not the first attack on the macroeconometric models. Serious doubts were being raised about the coherence of large-scale modeling efforts much earlier. Some years before Lucas's critique, in 1971, Robert Hall gave a lecture at the MIT urban seminar on his "experience with large econometric models in macro."[5] He warned Jerome Rothenberg and Robert Engle, who were building a large-scale model of the Boston area, that "nice looking equations grouped together don't necessarily make a good model" (quoted in

4. This meeting was partially funded by the Newton Advanced Fellowship (AF140063; British Academy) awarded to Duarte.

5. Although Lucas published his critique in 1976, it was already circulating widely in 1973. See Goutsmedt et al. in this issue.

Cherrier 2017, 2), giving as his example that although every equation in the MPS and Brookings models looked good individually, they gave nonsensical results when grouped together.

To investigate our Oxford conjecture, we arrived at a list of topics we hoped would be challenging and appealing enough to attract enough interesting papers to organize a two-day conference in Utrecht:

1. The role played by macroeconometric modeling in the history of macroeconomics as a whole: the share of the profession (researchers and graduate students) involved in macroeconometric modeling or conducting alternative empirical investigations; its history in textbooks; etc.
2. Relationships between theoretical and applied work: the cross-fertilization of macro modeling and econometrics; the shaping of the theoretical agenda; policymakers' engagement with these types of macroeconomics; etc.
3. Technology and computation: the relationships between macroeconomists, econometricians, and software developers; IT progress shaping macroeconometric modeling; etc.
4. Places and communities: the institutional basis of models; relationships between universities, central banks, consultancy firms, and others producing macro models. Was there convergence among the agendas and methods pursued by academics and central banks and if so what form did it take?
5. Modelers and their clients: How did modelers engage with their clients?

And they did their job. This special issue is based on this Utrecht conference, held on April 6–7, 2017.[6]

Most of the articles discuss one or more concrete, identifiable objects, such as a model, a test, or a function, often considered to work as a "tool." That is to say that the tools they discuss have names: "Klein model III" (Chao), "Klein-Goldberger model" (Pinzón-Fuchs; Chao; Rancan), "MIT-Fed-Penn [MPS] model" (Acosta and Rubin; Backhouse and Cherrier; Rancan), "Brookings model" (Acosta and Rubin; Backhouse and Cherrier; Rancan), "naive model test" (Chao), "Cassel model" (Dupont-Kieffer), "Phillips curve" (Goutsmedt et al.), "Solow residual" (Saïdi), "St.

6. This conference was sponsored by the Descartes Centre for the History and Philosophy of the Sciences, the European Society for the History of Economic Thought (ESHET), the Koninklijke Nederlandse Akademie van Wetenschappen (KNAW), and the U.S.E. Research Institute.

Louis model" (Rancan; Acosta and Rubin), "vector autoregression (VAR)" (Salazar and Otero), and "DSGE model" (Backhouse and Cherrier; Salazar and Otero). These tools were often designed and constructed at particular sites, in- and outside of academia, as their names indicate, and relate more generally with other developments made in other sites: the Brookings Institution, the Federal Reserve Bank of St. Louis, the Social Science Research Council, the Massachusetts Institute of Technology, the University of Michigan, the University of Pennsylvania, the Wharton School, the Cowles Commission, the University of Chicago, the Bureau of the Budget, the Department of Commerce, the Office of Price Administration, and the Office of War Mobilization and Reconversion. In such sites, one can perhaps identify some national traditions or traits eventually coming together, with those of the United States, France, Sweden, and the Netherlands being the most salient in some of the articles.

What these contributions show is that practices are "embodied." According to Stapleford (2017, 120), practices "draw our attention to the materiality of knowledge and to the artifacts that are studied, created, and used when generating knowledge." This has the implication that practices are located in time and space, "they take place."

The locations, the sites, where these practices take place, are "fields." Fields, in contrast with such sites as laboratories, are not exclusively scientific domains; they are populated not only by scientists but also by other people going about other sorts of business, such as politicians and businessmen. But this does not mean that a field is science in the "wild." The site is "cultivated," institutions, networks, or organizations are installed to enable a specific practice (see Boumans 2015).

These cultivations are similar to what has come to be called "big science" (Backhouse and Cherrier; Pinzón-Fuchs) in the sense of large-scale research involving different disciplinary teams where division of expertise is necessary. The building of macroeconometric models required the cooperation of people with different expertise, ranging from economic theory to computers, mathematics, and data.

But practices and artifacts, as Stapleford (2017) observes, travel through time and space and are sustained by relations to other practices (Backhouse and Cherrier). The building and continued refining of the large-scale macroeconometric models instantiates exactly this: starting with Jan Tinbergen in the Netherlands and for the League of Nations in the 1930s, then being updated by Klein at the Cowles Commission at Chicago (taking into account Trygve Haavelmo's probabilistic contributions) in the early 1950s, then

moving to such places as the Fed, MIT, the University of Pennsylvania, the Wharton School, and consulting firms over the decades that followed. Moreover, practices can actually travel rather far outside science, not only to policy domains such as the Committee on Economic Stability of the Social Science Research Council and the Fed's Board of Governors (Acosta and Rubin; Rancan), the US Congress and Treasury, and the League of Nations, but also to places such as the Vatican's Pontifical Academy of Sciences (Dupont-Kieffer). Sometimes it is a person who travels, such as Klein (Pinzón-Fuchs), Ando (Backhouse and Cherrier), or Ragnar Frisch (Dupont-Kieffer), sometimes it is an artifact, such as Modigliani's model (Rancan) or the Phillips curve (Goutsmedt et al.), or yet the Solow residual (Saïdi), by which relationships between different practices are established.

Another historiographical relevant consequence of looking through the lens of practice is that "practices may have different chronologies from what we commonly label as 'theories' and 'ideas'" (Stapleford 2017, 119). Some contributions indeed show a difference between the chronology of the "standard narrative" and their own account with respect to the influence of the Lucas critique (Goutsmedt et al.), the VAR approach (Salazar and Otero), Keynesian models (Acosta and Rubin; Backhouse and Cherrier; Rancan), and the Solow residual (Saïdi).

The contributions do provide an excellent start at answering the aforementioned questions. Three articles (Backhouse and Cherrier; Acosta and Rubin; Rancan) show the relevance of taking the MPS model and its messier practices into account to enrich the history of macroeconomics. Another four articles (Chao; Dupont-Kieffer; Pinzón-Fuchs; Salazar and Otero) make clear that the history of macroeconomics cannot be separated from the crucial episodes in the history of econometrics. The relevance of the developments in technology and computation is acknowledged by Acosta and Rubin, Backhouse and Cherrier, and Pinzón-Fuchs. But perhaps the most striking result, confirmed by most of the articles, is to see how much of the history of macroeconometric modeling took place outside universities, mainly at central banks (Acosta and Rubin; Backhouse and Cherrier; Rancan), serving mainly if not only nonacademic clients (Acosta and Rubin; Backhouse and Cherrier; Chao; Dupont-Kieffer; Goutsmedt et al.; Rancan). New connections become visible, while unknown and rather anonymous model builders, such as Frank de Leeuw, come to be (better) known (Acosta and Goulvin; Backhouse and Cherrier; Rancan).

The articles in this special issue show that a change of perspective in historical analysis toward the practice of macroeconometric modeling will enrich the history of macroeconomics. The history of macroeconom-

ics is not only a history of ideas, but includes also histories of tools, especially macroeconometric models. These models are never built by one person, but require close cooperation of multiple teams, each from a specific discipline, while their workplaces are not necessarily located at universities. Unlike theories, a tool is designed and made for a specific purpose and to have clients. This shift of focus from macroeconomic theories to macroeconometric models will perhaps give as a better understanding of the unfolding of modern economics.

References

Backhouse, Roger E., and Mauro Boianovsky. 2013. *Transforming Modern Macroeconomics. Exploring Disequilibrium Microfoundations, 1956–2003.* New York: Cambridge University Press.

Blanchard, Olivier. 2000. "What Do We Know about Macroeconomics that Fisher and Wicksell Did Not?" *Quarterly Journal of Economics* 115 (4): 1375–1409.

———. 2009. "The State of Macro." *Annual Review of Economics* 1:209–28.

Bodkin, Ronald G., Lawrence R. Klein, and Kanta Marwah. 1991. *A History of Macroeconometric Model-Building.* Aldershot: Edward Elgar.

Boumans, Marcel. 2015. *Science outside the Laboratory: Measurement in Field Science and Economics*. New York: Oxford University Press.

Boumans, Marcel, Ariane Dupont-Kieffer, and Duo Qin, eds. 2011. *Histories on Econometrics*. Supplemental issue to vol. 43 of *History of Political Economy.* Durham, N.C.: Duke University Press.

Brayton, Flint, Thomas Laubach, and David Reifschneider. 2014. "The FRB/US Model: A Tool for Macroeconomic Policy Analysis," FEDS Notes. Washington: Board of Governors of the Federal Reserve System, April 3, 2014. doi.org /10.17016/2380-7172.0012.

Brayton, Flint, Andrew Levin, Ralph Tryon, and John Williams. 1997. "The Evolution of Macro Models at the Federal Reserve Board." *Carnegie-Rochester Conference Series on Public Policy* 47 (1997): 43–81.

Cherrier, Beatrice. 2017. "Why and How to (Re)Write the History of Postwar Macroeconometric Modeling?" Working paper. CREM, University of Caen.

Christ, Carl F. 1992. Review of *A History of Macroeconometric Model-Building* by Ronald G. Bodkin, Lawrence R. Klein, and Kanta Marwah. *Journal of the History of Economic Thought* 14 (1): 110–12.

De Vroey, Michel. 2016. *A History of Macroeconomics from Keynes to Lucas and Beyond*. New York: Cambridge University Press.

De Vroey, Michel, and Kevin D. Hoover, eds. 2004. *The IS-LM Model: Its Rise, Fall, and Strange Persistence*. Supplemental issue to vol. 36 of *History of Political Economy.* Durham, N.C.: Duke University Press.

Duarte, Pedro Garcia, and Gilberto Tadeu Lima, eds. 2012a. *Microfoundations Reconsidered: The Relationship of Micro and Macroeconomics in Historical Perspective.* Cheltenham, UK: Edward Elgar.

———. 2012b. "Introduction: Privileging Micro over Macro? A History of Conflicting Positions." In Duarte and Lima 2012a, 1–18.

Düppe, Till, and E. Roy Weintraub, eds. 2018. "Contemporary Historiography of Economics: A Symposium." *History of Political Economy* 50 (3): 549–634.

———, eds. 2019. *A Contemporary Historiography of Economics*. London: Routledge.

Epstein, R. J. 1987. *A History of Econometrics*. Amsterdam: North-Holland.

Hoover, Kevin D. 1988. *The New Classical Macroeconomics: A Sceptical Inquiry*. Oxford: B. Blackwell.

King, John E. 2012. *The Microfoundations Delusion: Metaphor and Dogma in the History of Macroeconomics*. Cheltenham, UK: Edward Elgar.

Klein, Lawrence, ed. 1991. *Comparative Performance of U.S. Econometric Models*. Oxford: Oxford University Press.

Lucas, Robert E. 1976. "Econometric Policy Evaluation: A Critique." In *The Phillips Curve and Labor Markets*, edited by K. Brunner and A. H. Meltzer. Amsterdam: North-Holland.

Mankiw, Gregory. 2006. "The Macroeconomist as Scientist and Engineer." *Journal of Economic Perspectives* 20 (4): 29–46.

Morgan, Mary S. 1990. *The History of Econometric Ideas*. Cambridge: Cambridge University Press.

Qin, Duo. 1993. *Formation of Econometrics: A Historical Perspective*. Oxford: Oxford University Press.

———. 2013. *A History of Econometrics: The Reformation from the 1970s*. Oxford: Oxford University Press.

Shetterly, Margot Lee. 2016. *Hidden Figures. The Untold Story of the African American Women who Helped Win the Space Race*. London: William Collins.

Stapleford, Thomas. 2017. "Historical Epistemology and the History of Economics: Views through the Lens of Practice." *Research in the History of Economic Thought and Methodology* 35A:113–45.

Valadkhani, Abbas. 2004. "History of Macroeconometric Modelling: Lessons from Past Experience." *Journal of Policy Modeling* 26 (2): 265–81.

Wallis, Kenneth F. 1993. "Comparing Macroeconometric Models: A Review Article." *Economica* 60 (238): 225–37.

Webb, Roy H. 1999. "Two Approaches to Macroeconomic Forecasting." *Federal Reserve Bank of Richmond Economic Quarterly* 85 (3): 23–40.

Woodford, Michael. 2009. "Convergence in Macroeconomics: Elements of the New Synthesis." *American Economic Journal: Macroeconomics* 1 (1): 267–79.

Young, Warren. 2014. *Real Business Cycle Models in Economics*. London: Routledge.

Young, Warren, Robert Leeson, and William Darity, Jr. 2004. *Economics, Economists, and Expectations—Microfoundations to Macroapplications*. London: Routledge.