

## S. Rao Aiyagari: My Student and My Teacher

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### **Abstract**

This essay briefly reviews the professional life and work of economist S. Rao Aiyagari, who died after a heart attack on May 20, 1997, at the age of 45. Aiyagari is described as “one of the ablest economists of his generation.” The essay is accompanied by a complete list of Aiyagari’s published work and reprints of three of his articles in the *Federal Reserve Bank of Minneapolis Quarterly Review*: “Deflating the Case for Zero Inflation” (Summer 1990), “On the Contribution of Technology Shocks to Business Cycles” (Winter 1994), and “Macroeconomics With Frictions” (Summer 1994).

*The views expressed herein are those of the author and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.*

In 1976, when S. Rao Aiyagari applied to the University of Minnesota graduate program in economics, I was in charge of admissions. As I reviewed his application, I remember being impressed by the fact that he had already published a paper in physics: “On the Equivalence of the Einstein-Mayer and Einstein-Cartan Theories for Describing a Spinning Medium” (Aiyagari and Mahanta 1975). Minnesota accepted Rao as a graduate student in economics, and he did not disappoint us; he was one of the stars of the program. Although I was Rao’s adviser, he worked independently, and I remember thinking then that I could learn a lot more from him than he from me. That judgment held firm the rest of his life, as he finished his thesis and we became colleagues and friends.

Rao’s first published economics paper, which grew out of his thesis, was entitled “Observational Equivalence of the Overlapping Generations and the Discounted Dynamic Programming Frameworks for One-Sector Growth” (Aiyagari 1985). The similarity in titles between this and his physics paper suggests that Rao was applying to economics the scientific method that he had used in physics. This, indeed, was his approach, and he used it throughout his career.

Rao’s first position after graduate school was in the Economics Department at the University of Wisconsin, Madison. In 1986, after five years there, he left to join the Research Department at the Federal Reserve Bank of Minneapolis. He remained there until about a year ago.

Rao’s first substantial body of research work in economics, begun at Wisconsin and completed during the first few years of his stay at the Minneapolis Fed, was a far more general treatment of the topic of his first economics paper, the relationship between models of overlapping generations and models of infinitely lived people. Among the questions he addressed were whether the two models become similar if the length of life of each generation and the period of overlap are sufficiently great or if the generations are linked through altruism between parents and children. Rao’s fundamental theoretical work in this area may be his most important legacy to the economics profession. (See Aiyagari 1987, 1988, 1989, 1992a, and 1992b; and Aiyagari and Peled 1991.)

Around 1990, Rao turned primarily toward applied work. He wanted to solve outstanding quantitative puzzles, like the extent to which the average real yield on equities exceeds that on U.S. Treasury bills (the equity premium puzzle). And he wanted to provide the most convincing possible analyses of important policy issues. (See Aiyagari 1994a, 1994b, and 1995; Aiyagari and Gertler 1991; and Aiyagari and Peled 1995.) The three *Quarterly Review* articles reprinted in this issue reflect that shift in his work. The first reprinted article, “Deflating the Case for Zero Inflation” (p. 5), is based largely on the research of others, but it illustrates how Rao went about analyzing an important policy issue, one that remains controversial today. The article applies to that issue a much wider range of perspectives than such analyses usually include, and it reaches a conclusion that can hardly be called popular. The second reprinted article, “On the Contribution of Technology Shocks to Business Cycles” (p. 15), displays the highly original way Rao was able to bring evidence to bear on theories. That article makes new and important points about the kinds of models that can hope to simulta-

neously explain the cyclical patterns of the average real wage and aggregate labor productivity. The third reprinted article, “Macroeconomics With Frictions” (p. 28), plays a special role in this memorial issue; besides being a masterful introduction to a large body of work, it contains strong hints about where Rao thought his—and the profession’s—future research efforts should be concentrated.

Despite Rao’s turn toward applied work around 1990, I convinced him about this time to join me in exploring models of money related to the 1989 work of Nobuhiro Kiyotaki and Randall Wright, models which are not directly applicable to current policy issues. Our collaboration and later work which grew from it have been my main research ever since. Rao was an excellent theorist, and in the course of working with him, I learned a great deal. I continue to explore ideas that we discussed but were not able to pursue at the time. After several years, however, Rao concluded that the models we were studying were not fruitful enough, and he abandoned our work. Mutual friends tell me that he found it extremely difficult to tell me that he felt that way. I regret that I never told him how much I had gained from our collaboration. (See Aiyagari and Wallace 1991, 1992, and 1997; and Aiyagari, Wallace, and Wright 1996.)

Many who knew Rao well viewed him, as I did, as one of the ablest economists of his generation. In the early 1990s, we thought that he was not getting the recognition that he deserved. Fortunately, the situation began to change about three years ago. Rao began to receive many invitations to present his work at seminars and conferences at leading economics departments and research institutes, both here and abroad. (Rao loved to travel, and travel seemed to be one of the few casual subjects he liked to talk about. I remember his great enthusiasm after returning from New York City, Israel, Italy, Russia, and Turkey.) During this time, Rao also became the leading organizer of economic research conferences sponsored by the Minneapolis Fed. He scored his greatest success—both as a conference organizer and as a forecaster—by holding a conference in 1995 in honor of the 25th anniversary of the date Robert E. Lucas, Jr., submitted for publication what turned out to be an extremely influential paper. (The paper was submitted in 1970 and published in 1972.) Just a few months after the conference, Lucas was awarded the Nobel Prize for work for which that paper is the centerpiece.

The main recognition Rao sought, however, was the offer of a position at a leading academic economics department. That came last year when he was invited to become a full professor in the Economics Department at the University of Rochester, New York, one of the strongest departments in macroeconomics in the country. The offer came after Rao had spent the autumn of 1995 visiting the Rochester department; when it came, he accepted it immediately.

Rao made no secret of the fact that he was thrilled by his professorial appointment. He went so far as to describe it as the culmination of his career. It certainly represented a long-deserved recognition of his ability and accomplishments. While his family, his friends, and his colleagues can take solace in his great happiness during what turned out to be his brief tenure at Rochester, his colleagues do not agree with Rao that he had reached the culmination of his career. Our view, which readers of this issue are likely

to share, is that Rao was bursting with ideas and with the energy and skill required to pursue them fruitfully. We will always wonder what more he would have accomplished.

\*Here, as has been true with most of my writing for the *Quarterly Review*, I have received invaluable help from Kathy Rolfe. Her help is especially appropriate and welcome in the preparation of my introduction to this memorial issue of the *Quarterly Review* because Kathy also worked closely with Rao.

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