

## **Karl Shell: *Curriculum Vitae***

### **Business Address:**

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### **Earned Degrees:**

A.B., Princeton University, 1960  
Ph.D., Stanford University, 1965

### **Current Positions:**

Thorne Professor of Economics, Cornell University, since 1986.  
Editor, *Journal of Economic Theory*, since 1968 (jointly with Alessandro Lizzeri since 2005).

### **Past Positions:**

Assistant Professor of Economics, Massachusetts Institute of Technology, 1964-1967.  
Associate Professor of Economics, Massachusetts Institute of Technology, 1967-1968.  
Associate Professor of Economics, University of Pennsylvania, 1968-1970.  
Professor of Economics, University of Pennsylvania, 1970-1987.

### **Visiting and Temporary Positions:**

Systems Analyst, Procter and Gamble Company, Cincinnati, Summer 1959.  
Staff Economist, Council of Economic Advisers, Washington DC, Summer 1962.  
Acting Instructor in Economics, Stanford University, 1962-1963.  
Visiting Professor of Economics, Stanford University, 1972-1973.  
Adjunct Researcher, CEPREMAP and Centre National de la Recherche Scientifique, Paris, 1977-1978  
Adjunct Professor, Université Paris XII, May 1979.  
Adjunct Professor, Université Paris I, May 1981.  
Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford CA, 1984-1985.  
Co-director, Center for Analytic Research in Economics and the Social Sciences, University of Pennsylvania, 1975-1986.  
Visiting Professor of Economics, Università Commerciale Bocconi, Milan, May 1990.  
Visiting Professor, Université de Paris I, May 1991.  
Consultant, Research Department, Federal Reserve Bank of Minneapolis, July 1991.  
Director, Center for Analytic Economics, Cornell University, 1987-1992.  
Visiting Professor of Economics, University of California, San Diego, Fall 1992.  
By-Fellow, Churchill College, Cambridge, UK, May 1995.  
Visiting Professor of Economics, Doshisha University, Kyoto, Japan, May 1996  
Visiting Professor of Economics, New York University, 1999-2000.  
Tan Chin Tuan Professor of Money and Banking, National University of Singapore, August 2005

Visiting Professor of Economics, Southern Methodist University, Spring 2008.

**Honors:**

International Telephone and Telegraph Prize Scholarship, 1959.  
The Society of the Sigma Xi Research Prize, 1960.  
Honors in Mathematics, Princeton University, 1960.  
Woodrow Wilson Foundation National Fellowship, 1960-1961.  
Woodrow Wilson Foundation Dissertation Fellowship, 1963-1964.  
Ford Foundation Faculty Research Fellowship, 1967-1968.  
M.A. (Hon.), University of Pennsylvania, 1971.  
Fellow of the Econometric Society, since 1972.  
John Simon Guggenheim Memorial Foundation Fellowship, 1977-1978.  
Fellow, Center for Advanced Study in the Behavioral Sciences, 1984-1985.  
Miguel Sidrauski Memorial Lecturer, IXth Latin American Meeting of the Econometric Society, Santiago, Chile, "Sunspot Equilibrium," August 1989.  
Fulbright Scholar, Institut d'Analisi Economica, CSIC, Universitat Autònoma Barcelona, June 1989.  
Invited Speaker, Jacob Marschak Colloquium in the Social Sciences, UCLA, Los Angeles, "Sunspot Equilibria," November 13, 1992.  
The Inaugural L. Edwin Smart Lecturer, The Ohio State University, Columbus, "Robustness of Sunspot Equilibria," October 15, 1993.  
Institute for Policy Analysis Distinguished Speaker, Canadian Economic Theory Conference, University of Toronto, Toronto, Canada, "Robustness of Sunspot Equilibria," May 27, 1994.  
Overseas Fellow, Churchill College, Cambridge, UK, elected for Easter Term 1995.  
Lecture, "Applications of General-Equilibrium Theory to Macroeconomics: The Overlapping-Generations Model" and Round Table Participant, "The Future of Macroeconomics," Università Degli Studi di Cagliari, Cagliari, Sardinia, Italy, February 9, 1996.  
Keynote Speaker, Third Midwest Macroeconomics Conference, The Pennsylvania State University, State College, "Technological Evolution," April 26, 1997.  
Lecture, The Lippincott Symposium on Political Economy, "Economic Effects of Restrictions on Government Budget Deficits", University of Minnesota, May 13, 1998.  
Plenary Lecture, "Sunspot Equilibrium," XVII Latin America Meeting of the Econometric Society, Cancún, México, August 1999.  
Keynote Speaker, International Conference on Money, Growth, and Distribution, Academia Sinica, Taipei, "Equilibrium Bank Runs", September 5-9, 2001.  
Invited Speaker, *Singapore Economic Review* Conference, "Capital Gains: Red and Blue Machines", Singapore, August 5, 2005.  
Invited Speaker, The I.W. Arthur Memorial Seminar, "Capital Gains", Iowa State University, February 12, 2007.  
Invited Speaker, Rice University Economics Seminar, "Sunspot Equilibrium, Lottery Equilibrium, and Correlated Equilibrium", March 27, 2008.  
Invited Speaker, Southern Methodist University Economics Seminar, "3 Stochastic Equilibrium Concepts", April 18, 2008.

**Professional Activities:**

Consulting Editor, Academic Press (including series on Economic Theory, Mathematical Economics, and Econometrics), 1968-1994.

Co-director, International Summer School on Mathematical Methods in Investment and Finance, Venice, Italy, September 1971.

Program Chairman, North American Meeting of the Econometric Society, New York, 1972.

Co-organizer, Mathematical Social Science Board seminars on the Structure of Dynamical Systems Arising in Economics, Holderness N.H. and Philadelphia, 1975-1977.

Reviewer, Mathematical Reviews, 1976-1993.

Co-director, Workshop on Intertemporal Economics, Cornell University, August 1981.

Co-organizer, IMSSS All-Day Workshop on Correlated Equilibrium and Sunspot Equilibrium, Stanford University, July 16, 1985.

Co-organizer, International Symposium on Economics, Conference on Economic Complexity: Chaos, Sunspots, Bubbles, and Nonlinearity, Austin, Texas, 1987.

Co-organizer, Workshop on Economic Theory and Advanced Computation, Cornell University, May 12-14, 1989.

Co-organizer, Workshop on the Mathematical Theory of Modern Financial Markets, Cornell University, July 19-22, 1989.

Co-director (with Neil Wallace), Cornell/Penn State Semi-annual Macro Workshop, 1997 –present.

#### **Books:**

- *Essays on the Theory of Optimal Economic Growth* (Editor), Cambridge, Massachusetts: MIT Press (hardcover and softcover), 1967.
- *The Economic Theory of Price Indices: Two Essays on the Effects of Taste, Quality, and Technological Change* (with Franklin M. Fisher), New York: Academic Press, 1972. ISBN: 0122577505.
- *Mathematical Methods in Investment and Finance* (Editor with Giorgio P. Szegö), Amsterdam: North-Holland, 1972. ISBN: 0720430674 (North-Holland), 044410395 (American Elsevier).
- *The Hamiltonian Approach to Dynamic Economics* (Editor with David Cass), New York: Academic Press, 1976. ISBN: 012163650X.
- *Economic Complexity: Chaos, Sunspots, Bubbles, and Nonlinearity* (Editor with William A. Barnett and John Geweke), New York: Cambridge University Press, 1989. ISBN: 052135563X.
- *Economic Analysis of Production Price Indexes* (with Franklin M. Fisher), New York: Cambridge University Press (hardcover, ISBN 0521554160, and softcover, ISBN 0521556236), 1998.

#### **Articles:**

- "Toward a Theory of Inventive Activity and Capital Accumulation" *American Economic Review*, Vol. 56(2), May 1966, 62-68.
- "Comparative Statics for the Two-Sector Model", *Metroeconomica*, Vol. 18(2), May/August 1966, 117-124.

- "Optimal Programs of Capital Accumulation for an Economy in which there is Exogenous Technical Change" in *Essays on the Theory of Optimal Economic Growth*, (K. Shell, ed.), Cambridge, Massachusetts: MIT Press, 1967, Chapter I, 1-30.
- "A Model of Inventive Activity and Capital Accumulation" in *Essays on the Theory of Optimal Economic Growth* (K. Shell, ed.), Cambridge, Massachusetts: MIT Press, 1967, Chapter IV, 67-85.
- "The Allocation of Investment in a Dynamic Economy" (with Joseph E. Stiglitz) *Quarterly Journal of Economics*, Vol. 81(325), November 1967, 592-609.
- "Taste and Quality Change in the Pure Theory of the True Cost-of-Living Index" (with Franklin M. Fisher) in *Value, Capital and Growth* (J.N. Wolfe, ed.), Edinburgh: Edinburgh University Press, 1968, 97-139. Reprinted in *Price Indexes and Quality Change* (Z. Griliches, ed.), Cambridge, Massachusetts: Harvard University Press, 1971, 16-54, and in *Value, Capital and Growth* (J.N. Wolfe, ed.), Chicago: Aldine Transaction, 2006, 97-140. Also appears as Essay I in the *Economic Theory of Price Indices: Two Essays on the Effects of Taste, Quality and Technological Change* (by Franklin M. Fisher and Karl Shell), New York: Academic Press, 1972, 1-48.
- "The Educational Opportunity Bank: An Economic Analysis of a Contingent Repayment Loan Program for Higher Education" (with Franklin M. Fisher, Duncan K. Foley, Ann F. Friedlaender and in association with James J. Behr, Stanley Fischer, and Ran D. Mosenson), *National Tax Journal*, Vol. 21, No. 1, March 1968, 2-45.
- "Technological Knowledge and Economic Growth" in *Planning for Advanced Skills and Technologies, Industrial Planning and Programming Series No. 3*, United Nations, New York: United Nations Industrial Development Organization, 1969, 79-90.
- "Applications of Pontryagin's Maximum Principle to Economics" in *Mathematical Systems Theory and Economics, I* (H.W. Kuhn and G.P. Szegö, eds.), Berlin: Springer Verlag, 1969, 241-292. (The "Varena Lectures.")
- "Capital Gains, Income, and Saving" (with Miguel Sidrauski and Joseph E. Stiglitz), *The Review of Economic Studies*, Vol. 36(1) No. 105, January 1969, 15-26.
- "Public Debt, Taxation, and Capital Intensiveness" (with Edmund S. Phelps), *Journal of Economic Theory*, Vol. 1(3), October 1969, 330-346. See also "Erratum," *Journal of Economic Theory*, Vol. 2(2), June 1970, 209. Reprinted in *Studies in Macroeconomic Theory*, Vol. 2, Redistribution and Growth (E.S. Phelps, ed.), New York: Academic Press, 1980, 24-45.
- "Optimal Fiscal and Monetary Policy, and Economic Growth" (with Duncan K. Foley and Miguel Sidrauski), *Journal of Political Economy*, Vol. 77(4), Part II, July/August 1969, 698-719 Appears in Italian as "La Politica Monetaria e Fiscale per lo Sviluppo Economico Ottimale" (translated by D. Martellato), in *Lo*

*sviluppo economico ottimale: teoria della pianificazione* (I. Musu, ed.), Milano: Franco Angeli Editore, 1974, 238-264.

- "A New Approach to the Financing of Medical Education", *Harvard Medical Alumni Bulletin*, Vol. 43(3), Winter 1969, 2-4.
- "Notes on the Educational Opportunity Bank", *National Tax Journal*, Vol. XXIII(2), June 1970, 214-220.
- "An Exercise in the Theory of Heterogeneous Capital Accumulation" (with Christopher Caton), *The Review of Economic Studies*, Vol. 37(1), No. 113, January 1971, 13-22.
- "Notes on the Economics of Infinity" *Journal of Political Economy*, Vol. 79(5), September/October 1971, 1002-1011. Reprinted in *Growth Theory* (R. Becker and E. Burmeister, eds.), The International Library of Critical Writings in Economics 10, London: Edgar Elgar Publishing, 1991, Vol. III (Equilibrium Growth Theories), Chapter 1, 3-12. Appears in Spanish as "Notas sobre las economías del infinito" (translated by M. Santos), *Cuadernos Economicos de I.C.E.*, Vol. 35(1), 1987, 31-39.
- "The Pure Theory of the National Output Deflator" (with Franklin M. Fisher), MIT Working Paper, August 1970; appears as Essay II in *The Economic Theory of Price Indexes: Two Essays on the Effects of Taste, Quality, and Technological Change* (by Franklin M. Fisher and Karl Shell), New York: Academic Press, 1972, 49-113.
- "Selected Elementary Topics in the Theory of Economic Decision Making Under Uncertainty" in *Mathematical Methods in Investment and Finance* (G.P. Szegö and K. Shell, eds.), Amsterdam: North-Holland, 1972, 65-75.
- "Financial Instruments in the Dynamic Theory of Aggregate Investment Allocation", in *Mathematical Methods in Investment and Finance* (G.P. Szegö and K. Shell, eds.), Amsterdam: North-Holland, 1972, 234-243.
- "On Competitive Dynamical Systems" in *Differential Games and Related Topics* (H.W. Kuhn and G.P. Szegö, eds.), Amsterdam: North-Holland, 1972, 449-476.
- "Inventive Activity, Industrial Organization and Economic Growth" in *Models of Economic Growth* (J.A. Mirrlees and N. Stern, eds.), London: Macmillan, and New York: Halsted (John Wiley & Sons), 1973, 77-100.
- "On Optimal Taxation with Costly Administration" (with Walter P. Heller), *American Economic Review*, Vol. 64(2), May 1974, 338-345.
- "The Theory of Hamiltonian Dynamical Systems, and an Application to Economics" in *The Theory and Application of Differential Games* (J.D. Grote, ed.), Dordrecht-Holland: D. Reidel Publishing Company, 1975, 189-200.

- "Demand for Money in a General Portfolio Model in the Presence of an Asset that Dominates Money" (with Albert K. Ando), Appendix to Chapter 12 in *The Brookings Model: Perspective and Recent Developments*, (G. Fromm and L.R. Klein, eds.), Amsterdam: North-Holland, 1975, 560-563.
- "Comment on Altruism and Egoism" in *Altruism, Morality and Economic Theory* (E.S. Phelps, ed.), New York: Russell Sage Foundation (Basic Books), 1975, 141-146.
- "Neoclassical Growth Models" in *Modern Economic Thought* (S. Weintraub, ed.), Philadelphia: University of Pennsylvania Press, 1976, 347-367.
- "Introduction to Hamiltonian Dynamics in Economics" (with David Cass), *Journal of Economic Theory*, Vol. 12(1), February 1976, 1-10. Reprinted as Essay I in *The Hamiltonian Approach to Dynamic Economics* (D. Cass and K. Shell, eds.), New York: Academic Press, 1976, 1-10.
- "The Structure and Stability of Competitive Dynamical Systems" (with David Cass), *Journal of Economic Theory*, Vol. 12(1), February 1976, 31-70. Reprinted as Essay III in *The Hamiltonian Approach to Dynamic Economics* (D. Cass and K. Shell, eds.), New York: Academic Press, 1976, 31-70.
- "In Defense of a Basic Approach" (with David Cass) in *Models of Monetary Economies*, (J. Kareken and N. Wallace, eds.), Minneapolis: Federal Reserve Bank of Minneapolis, 1980, 251-260.
- "The Overlapping-Generations Model, I: The Case of Pure Exchange without Money" (with Yves Balasko), *Journal of Economic Theory*, Vol. 23(3), December 1980, 281-306. Appears in Spanish as "El modelo de generaciones sucesivas, I: el caso de intercambio puro sin dinero" (translated by M. Santos), *Cuadernos Economicos de I.C.E.*, Vol. 35(1), 1987, 67-92.
- "Existence of Competitive Equilibrium in a General Overlapping-Generations Model" (with Yves Balasko and David Cass), *Journal of Economic Theory*, Vol. 23(3), December 1980, 307-322.
- "The Overlapping-Generations Model, II: The Case of Pure Exchange with Money" (with Yves Balasko), *Journal of Economic Theory*, Vol. 24(1), February 1981, 112-142. See also "Erratum," *Journal of Economic Theory*, Vol. 25(3), December 1981, 471.
- "The Overlapping-Generations Model, III: The Case of Log-Linear Utility Functions " (with Yves Balasko), *Journal of Economic Theory*, Vol. 24(1), February 1981, 143-152.
- "Les tâches solaires ont-elles de l'importance?" (with David Cass), *Cahiers du séminaire d'économétrie*, 24, 1982, 93-127. (This version is slightly more general than the *JPE* article.)
- "Do Sunspots Matter?" (with David Cass), *Journal of Political Economy*, Vol. 91(2), April 1983, 193-227. Reprinted in *General Equilibrium Theory* (G.

Debreu, ed.), *The International Library of Critical Writings in Economics* 67, London: Edgar Elgar Publishing, 1996, Vol. I, Chapter 17, 295-329.

- "On Taxation and Competitive Equilibria" (with Yves Balasko) in *Optimalité et Structures: Mélanges en Hommage B Edouard Rossier* (G. Ritschard and D. Royer, eds.), Paris: Economica, 1985, 69- 83.
- "Lump-Sum Taxes and Transfers: Public Debt in the Overlapping-Generations Model" (with Yves Balasko) in *Essays in Honor of Kenneth J. Arrow, Vol. II: Equilibrium Analysis* (W. Heller, R. Starr, and D. Starrett, eds.), New York: Cambridge University Press, 1986, Chapter 5, 121-153.
- "Sunspot Equilibrium" in *The New Palgrave: A Dictionary of Economics* (J. Eatwell, M. Milgate, and P. Newman, eds.), Vol. 4, New York: Macmillan, 1987, 549-551 Reprinted in *The New Palgrave: General Equilibrium* (J. Eatwell, M. Milgate, and P. Newman, eds.), New York: Macmillan, 1989, 274-280.
- "Hamiltonians" in *The New Palgrave: A Dictionary of Economics* (J. Eatwell, M. Milgate and P. Newman, eds.), Vol. 2, New York: Macmillan, 1987, 588-590.
- "Sunspot Equilibrium in an Overlapping-Generations Economy with an Idealized Contingent-Commodities Market" (with David Cass), Part 1, Chapter 1 in *Economic Complexity: Chaos, Sunspots, Bubbles, and Nonlinearity* (W. Barnett, J. Geweke, and K. Shell, eds.), New York: Cambridge University Press, 1989, 3-20.
- "On the Nonequivalence of the Arrow-Securities Game and the Contingent-Commodities Game" (with James Peck), Part 1, Chapter 4 in *Economic Complexity: Chaos, Sunspots, Bubbles, and Nonlinearity* (W. Barnett, J. Geweke, and K. Shell, eds.), New York: Cambridge University Press, 1989, 61-85.
- "Liquid Markets and Competition" (with James Peck), *Games and Economic Behavior*, Vol. 2(4), December 1990, 362-377.
- "Market Uncertainty: Correlated and Sunspot Equilibria in Imperfectly Competitive Economies" (with James Peck), *The Review of Economic Studies*, Vol. 58(5), October 1991, 1011-1029.
- "Overlapping-Generations Model and Monetary Economics" (with Bruce D. Smith), in the *New Palgrave Dictionary of Money and Finance* (J. Eatwell, M. Milgate, and P. Newman, eds.), Vol. 3, London: Macmillan, 1992, 104-109.
- "Sunspot Equilibrium" (with Bruce D. Smith), in the *New Palgrave Dictionary of Money and Finance* (J. Eatwell, M. Milgate, and P. Newman, eds.), Vol. 3, London: Macmillan, 1992, 601-605.
- "The Market Game: Existence and Structure of Equilibrium" (with James Peck and Stephen E. Spear), *Journal of Mathematical Economics*, Vol. 21(3), May 1992, 271-299.

- "Indivisibilities, Lotteries, and Sunspot Equilibria" (with Randall D. Wright), *Economic Theory*, Vol. 3(1), January 1993, 1-17.
- "Sunspot Equilibrium", Jacob Marschak Colloquium at UCLA, November 13, 1992, abstract in *Mathematical Social Sciences*, Vol. 26, July 1993, 101.
- "Lump-Sum Taxation: The Static Economy" (with Yves Balasko) in *General Equilibrium, Growth, and Trade: The Legacy of Lionel McKenzie, II* (R. Becker, M. Boldrin, R. Jones and W. Thomson, eds.) New York: Academic Press, 1993, 168-180.
- "Market Participation and Sunspot Equilibria" (with Yves Balasko and David Cass), *The Review of Economic Studies*, Vol. 62(3), No. 212, July 1995, 491-512. Reprinted in *Equilibrium* (D. A. Walker, ed.), *Critical Ideas in Economics Volume 3*, London: Edward Elgar, 2000, 591-615.
- "When Sunspots Don't Matter" (with Aditya Goenka), *Economic Theory*, Vol. 9(1), January 1997, 169-178.
- "Robustness of Sunspot Equilibria" (with Aditya Goenka), *Economic Theory*, Vol. 10(1), July 1997, 79-98.
- "Price Level Volatility: A Simple Model of Money Taxes and Sunspots" (with Joydeep Bhattacharya and Mark Guzman), *Journal of Economic Theory*, Vol. 81(2), August 1998, 401-430. (doi: 10.1006/jeth.1997.2632)
- "The Production Recipe Approach to Modeling Technological Innovation: An Application to Learning by Doing" (with Phil Auerswald, Stuart Kauffman, and José Lobo), *Journal of Economic Dynamics and Control*, Vol. 24(3), December 1999, 389-450.
- "The Economic Effects of Restrictions on Government Budget Deficits" (with Christian Ghiglino), *Journal of Economic Theory*, Vol. 94(1), September 2000, 106-137. (doi: 10.1006/jeth.1999.2628)
- "Growth Dynamics and Returns to Scale: A Bifurcation Analysis" (with Gaetano Antinolfi and Todd Keister), *Journal of Economic Theory*, Vol. 96(1), January 2001, 70-96. (doi:10.1006/jeth.1999.2632)
- "Equilibrium Prices when the Sunspot Variable is Continuous" (with Rod Garratt, Todd Keister, and Cheng-Zon Qin), *Journal of Economic Theory*, Vol. 107(1), November 2002, 11-38. (doi:10.1006/jeth.1999.2634)
- "Introduction to Sunspots and Lotteries" (with Edward C. Prescott), *Journal of Economic Theory*, Vol. 107(1), November 2002, 1-10. (doi:10.1006/jeth.1999.2634)
- "Equilibrium Bank Runs" (with James Peck), *Journal of Political Economy*, Vol. 111(1), February 2003, 103-123.

- "The Economic Effects of Restrictions on Government Budget Deficit: Imperfect Private Credit Markets" (with Christian Ghiglino), *Economic Theory*, Vol. 21(2-3), March 2003, 399-421. Reprinted in *Assets, Beliefs, and Equilibria in Economic Dynamics: Essays in Honor of Mordecai Kurz* (C.D. Aliprantis, K.J. Arrow, P.J. Hammond, F. Kubler, H.M. Wu, and N.C. Yannelis, eds.), Berlin: Springer-Verlag, 2004, 213-235. (doi: 10.1007/s00199-002-0288-5)
- "Comparing Sunspot Equilibrium and Lottery Equilibrium Allocations: The Finite Case" (with Rod Garratt and Todd Keister), *International Economic Review*, Vol. 45(2), May 2004, 351-386. (doi: 10.1111/j.1468-2354.2004.00129.x)
- "Comments on Bruce Smith's Work" (with David K. Levine and Arthur J. Rolnick), *Economic Theory*, Vol. 24(4), November 2004, 733-739. (doi: 10.1007/s00199-004-0513-5)
- "Capital Gains: Blue Machines and Red Machines" (with Luís Francisco Aguiar-Conraria), *Singapore Economic Review*, Vol. 50 (Special Issue No. 1), 2005, 437-448.
- "Capital Gains" (with Luís Francisco Aguiar-Conraria), *International Journal of Economic Theory*, (doi:10.1111/j.1742-7363.2006.0039.x), Vol. 2(3-4), September/December 2006, 331-349.
- "General Equilibrium with Nonconvexities, Sunspots and Money" (with Guillaume Rocheteau, Peter Rupert and Randall Wright), *Journal of Economic Theory*, (doi: 10.1016/j.jet.2006.07.011), 2007.
- "Sunspots Equilibrium", forthcoming in *The New Palgrave: A Dictionary of Economics*, L. Blume and S. Durlauf (eds), Macmillan,

#### Reviews:

- Review of "Elementary Mathematics of Price Theory by Clark Lee Allen, Belmont, California: Wadsworth, 1962" in *American Economic Review*, Vol. 53(1), March 1963, 176-177.
- Review of "Recent Developments in Information and Decision Processes, ed. by Robert E. Machol and Paul Gray, New York: Macmillan, 1962" in *Econometrica*, Vol. 32(4), October 1964, 710.
- Review of "Colloquium on Applications of Mathematics to Economics (Budapest, 1963), ed. by András Prékopa, Budapest: Akadémiai Kiadó, 1965," in *Journal of the American Statistical Association*, Vol. 62(318), June 1967, 708-710.
- Review of "Cours d'automatique théoretique by R. Pallu de la Barrière, Paris: Dunod, 1966" in *Econometrica*, Vol. 36(2), April 1968, 430-431.
- Review of "The Costs of Economic Growth by Ezra J. Mishan, New York: Frederick A. Praeger, 1967" in *Journal of Finance*, Vol. 24(3), June 1969, 56.

## Interviews:

- "Karl Shell — interviewed by Stephen E. Spear and Randall Wright", *Macroeconomic Dynamics*, Vol.5(5), November 2001, 701-741.
- "Hirofumi Uzawa — interviewed by Masahiro Okuno-Fujiwara and Karl Shell", *Macroeconomic Dynamics*, forthcoming.

## Unpublished Research:

- "Integral Solutions to Linear Programs," Junior Paper, Department of Mathematics, Fine Hall Library, Princeton University, Princeton, New Jersey, May 1959. (Supervised by Ralph E. Gomory.)
- "Some Topics in Modern Decision Theory," Senior Thesis, Department of Mathematics, Fine Hall Library, Princeton University, Princeton, New Jersey, May 1960. (Supervised by Harold W. Kuhn.)
- "Untied Aid and the Balance of Payments" (with Richard N. Cooper), 4memorandum of the Council of Economic Advisers, mimeo., Washington, D.C., June 1962. (This memo is cited and described in the Appendix to Chapter VI of the volume *The United States Balance of Payments in 1962* by Emile Despres, Lawrence B. Krause, Alice M. Rivlin, Walter A. Salant, and Lorie Tarshis, The Brookings Institution: Washington D.C., 1963, 275-277.)
- "Patterns of Technical Change and Capital Accumulation," Ph.D. Dissertation, Stanford University: Stanford, April 1965. (Supervised by Hirofumi Uzawa and Kenneth J. Arrow.)
- "A New Variant of the Educational Opportunity Bank Designed for Stability and Ease of Administration in 'Small-Scale' Application" (with Richard Berner and Michael B. Johnson), a report supported by Contract OS-70-155, U.S. Department of Health, Education and Welfare, Washington, D.C., mimeo., October 1972.
- "Some Reflections on the Theoretical Underpinnings of Price Indexes of the WPI-Type," mimeo., University of Pennsylvania, Philadelphia, prepared for the Bureau of Labor Statistics round-table discussion of the industrial price program (held in Washington, D.C. on October 17, 1975), October 3, 1975.
- "Monnaie et allocation intertemporelle" [title and abstract in French, text in English] mimeo, Séminaire Roy-Malinvaud, Centre National de la Recherche Scientifique, Paris, November 21, 1977. Forthcoming as Vintage Unpublished Paper in *Macroeconomic Dynamics* under the title "Money and Intertemporal Allocation: Sunspots".
- "The Theory of Price Indices and Subindices for Output and Input Deflation: Progress Report" (with Franklin M. Fisher), Working Paper 79-02, Center for Analytic Research in Economics and the Social Sciences, University of Pennsylvania, Philadelphia, February 1979.

- "Output Price Indices" (with Franklin M. Fisher), Working Paper #81-05, Center for Analytic Research in Economics and the Social Sciences, University of Pennsylvania, Philadelphia, February 28, 1981.
- "Market Uncertainty: Sunspot Equilibria in Imperfectly Competitive Economies" (with James Peck), Working Paper 85-21, Center for Analytic Research in Economics and the Social Sciences, University of Pennsylvania, Philadelphia, July 1985. (This version is more complete than the version in *RES*.)
- "Asymmetric Information and Sunspot Equilibria: A Family of Simple Examples" (with Robert J. Aumann and James Peck), Working Paper 88-34, Center for Analytic Economics, Cornell University, Ithaca, October 1988.
- "Further Evidence of the Necessity of Sunspots" (with Rod J. Garratt), Working Paper in Economics 6-93, Department of Economics, University of California, Santa Barbara, April 1993.
- "Bank Portfolio Restrictions and Equilibrium Bank Runs" (with James Peck), Working Paper 99-07, Center for Analytic Economics, Cornell University, Ithaca, July 1999. Revised February 25, 2005.
- "Irrelevance of Government Debt with Heterogeneous Credit Restrictions," (with Christian Ghiglino), November 2, 2005.

#### **Research in Progress:**

- "Optimal Taxation with Restrictions on the Government Budgets," (with Christian Ghiglino), presented at the SAET meeting in Vigo, Spain, June 28, 2005.
- "Sunspot Equilibrium," a monograph that attempts to unify the subject.
- "3 Stochastic Equilibrium Concepts".