

**Department of Political Science  
UNIVERSITY OF TORONTO**

**The Political Economy of Technology:  
From the Auto-Industrial to the Digital Age**

**POL 409S/2307S  
Winter, 2020-2021**

Wednesday, 2:00 – 4:00 pm  
Course Offered Online through BB Collaborate  
Office Hours: Wednesday, 4:00 – 5:30 pm

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This course surveys a broad range of issues concerning the relationship between technological change and social and political development from a theoretical, historical, and comparative perspective. The principal objectives are to explore the growing centrality of science and technology in political affairs generally, and its current significance for public policy in particular; to examine the conceptual tools that political economy brings to bear on an analysis of the nature of technological change; and to assess the implications of the development of social and political institutions at the national and international level for the process of technological innovation in the current period and the policy implications of that relationship.

The course will be based on a seminar format. Assignments for the course will consist of seminar participation and a major paper. The exact format for the conduct of the seminars will be discussed and agreed upon at the first class. Essays should be chosen from the topics outlined for each term. Variations upon these themes will be considered at the instructor's prerogative. Undergraduate essays are to be 4,000 words long and graduate essays 6,000 words long. Undergraduates must submit a five-page outline and annotated bibliography before reading week. Each will count for 10% of the final grade. Essays are due the final week of the term. The paper will count for 70% of the final grade (60 % for undergraduates). Seminar participation and presentations will be worth 30%.

Required readings for each week are marked with an (\*). Students are encouraged to read as many of the required readings for each week as possible.

Recommended Text:

Manuel Castells, *The Rise of the Network Society*, Vol. 1, rev. ed.

POL 409S/2307S Course Readings available online through Quercus.

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## COURSE POLICIES

### *Office hours:*

If you have questions about the readings, seminar discussions, or assignments, office hours are best. No appointment is needed. If you cannot make office hours but would like to meet, I can often chat for a few minutes after the class and can sometimes schedule another meeting time on the spot. Otherwise, contact me by emails to schedule a mutually agreeable alternative time.

### *Email:*

Email is an effective way to communicate for short, quick questions, but extended conversations are best conducted face to face during office hours or in a special appointment.

### *Keep copies:*

Students are advised to keep copies of all their draft work and hard copies of their assignments, including drafts of their assignments, until the marked assignments have been returned.

### *Plagiarism:*

Make sure that the information in your essays and on your tests is presented in your own words. PLAGIARISM is a serious academic offence at the University of Toronto and will be treated according to the rules in the university's Code of Behaviour.

For further clarification and information, please see the University of Toronto's policy on Plagiarism at <http://www.utoronto.ca/writing/plagsep.html>. This course uses Turnitin.com (as described in the next section on Essays below).

### *Extensions:*

Under extraordinary circumstances, consideration will be given to granting an extension based on an official medical note from a doctor or from the University specifying extreme family circumstances.

### *Accessibility Needs:*

The University of Toronto is committed to accessibility. If you require accommodations or have any accessibility concerns, please visit <http://studentlife.utoronto.ca/accessibility>.

**TOPICS: First Term**

1. Introduction to the course and discussion of outlines
2. What is Technology?
3. Long Waves and Technological Change
4. Technology, Institutions and Socio-Political Change
5. Science and Technology in the Fourth Kondratiev
6. The IT Revolution – A New Techno-Economic Paradigm?
7. The Algorithmic Revolution or “Why Software is Eating the World”
8. Technology and Globalization (including something on the role of IT in GPNs)
9. AI, Robotics and the Future of Employment
10. Innovation Systems and Innovation Policy for the IT Paradigm
11. The State of the Digital Economy and Innovation Policy in Canada
12. The IT Paradigm and the Future of Economic Growth

## Readings by Topic

Readings marked by an asterisk (\*) are required readings on each topic.

### 1. Introduction to the course and discussion of outlines

### 2. What is Technology?

\*W. Brian Arthur, *The Nature of Technology: What It is and How It Evolves*, ch. 2, 9

\*Robert L. Heilbroner, "Do Machines Make History?" *Technology and Culture* 8 (July 1967)

\*Joel Mokyr, "Evolution and the Dynamics of Technological Change," in *The Lever of Riches*, pp. 273-99.

\*Giovanni Dosi and Marco Grazzi, "On the nature of technologies: knowledge, procedures, artifacts and production," *Cambridge Journal of Economics* 34 (2010): 173-84.

\*Nathan Rosenberg, "Schumpeter and Marx: how common a vision," in *Technology and the Human Prospect: Essays in Honour of Christopher Freeman*, ed. Roy MacLeod, pp. 197-213.

Bill Buxton, "The Long Nose of Innovation," *Business Week*, Jan. 2, 2008.

J. David Bolter, *Turing's Man: Western Culture in the Computer Age*, ch. 2

Jean-Jacques Salomon, "What is Technology? The Issue of its Origins and Definitions," *History and Technology* 1 (1984)

Nathan Rosenberg, "The Historiography of Technical Progress," in *Inside the Black Box*

Lewis Mumford, *Technics and Civilization*

Donald Mackenzie, "Marx and the Machine," *Technology and Culture* 25 (July 1984)

### 3. Long Waves and Technological Change

\*Giovanni Dosi, "Technological Paradigms and Technological Trajectories," in *Long Waves in the World Economy*, ed. C. Freeman, pp. 78-101.

\*C. Freeman and F. Louca, "Introduction: Technological Change and Long Waves in Economic Development," in *As Time Goes By: From the Industrial Revolutions to the Information Revolution*, pp. 139-151.

\*Carlota Perez, “Technological revolutions and techno-economic paradigms,” *Cambridge Journal of Economics* 34 (2010): 185-202.

\*Thomas P. Hughes, “The Dynamics of Technological Change,” in *Technology and Enterprise in Historical Perspective*, ed. G. Dosi, R. Giannetti and P.A. Toninelli, pp. 97-117.

William R. Thompson, “Long waves, technological innovation, and relative decline,” *International Organization* 1990: 44:2 (Spring): 201-33.

N. von Tunzelmann, F. Malerba, P. Nightingale and S. Metcalfe, “Technological paradigms: past, present and future,” *Industrial and Corporate Change* (17:3): 467-84.

Giovanni Dosi and Richard R. Nelson, “Technical Change and Industrial Dynamics as Evolutionary Processes,” in B.H. Hall and N. Rosenberg, eds, *Handbook of the Economics of Innovation*, Vol. II, pp. 51-127.

Carlota Perez, *Technological Revolutions and Financial Capital*, pp. 3-32.

C. Freeman and C. Perez, “Structural Crises of Adjustment: Business Cycles and Investment Behaviour,” in Dosi, ed., *Technical Change and Economic Theory*, pp. 38-66.

Chris Freeman, “The Economics of Technological Change,” *Cambridge Journal of Economics* 1994: 463-514.

Andrew Tylecote, *The Long Wave in the World Economy*, ch. 1, pp. 7-27.

J.J. Van Duijn, *The Long Wave in Economic Life*

Luc Soete, “Technical Innovation and long waves: an inquiry into the nature and wealth of Christopher Freeman’s thinking,” in *Technology and the Human Prospect*, ed. Roy Macleod

C. Freeman, J. Clark, and L. Soete, *Unemployment and Technical Innovation*, ch. 2-4

George Modelski and William R. Thompson, *Leading Sectors and World Powers*

Joseph Schumpeter, *Capitalism, Socialism and Democracy*, esp. ch. 7

Christopher Freeman, ed., *Long Waves in the World Economy*

#### **4. Technology, Institutions and Socio-Political Change**

\*Björn Johnson, “Institutional Learning,” in *National Systems of Innovation*, ed. Bengt-Åke Lundvall, pp. 23-44

\*J. Rogers Hollingsworth, "Doing institutional analysis: implications for the study of innovations," *Review of International Political Economy* 7:4 (Winter 2000): 595-644.

\*John Zysman, "Institutions and Economic Development in the Advanced Countries," in *Organization and Strategy in the Evolution of the Enterprise*, ed. G. Dosi and F. Malerba, pp. 410-455.

\*Giovanni Dosi and Alessandro Nuvolari, "Introduction: Chris Freeman's 'History, Co-Evolution and Economic Growth: an affectionate reappraisal,'" *Industrial and Corporate Change* 29:4 (2020): 1021-1034.

\*David A. Wolfe and Meric S. Gertler, "Innovation and Social Learning: An Introduction," in *Innovation and Social Learning*, ed. Meric S. Gertler and David A. Wolfe, pp. 1-24.

Charles Edquist and Björn Johnson, "Institutions and Organizations in Systems of Innovation," in *Systems of Innovation: Technologies, Institutions and Organizations*, ed. C. Edquist.

K. Neilson and B. Johnson, *Institutions and Economic Change: New Perspectives on Markets, Firms and Technology*

Richard R. Nelson, "What enables rapid economic progress: What are the needed institutions?" *Research Policy* 37 (2008): 1-11.

Richard R. Nelson and Bhaven Sampat, "Making Sense of Institutions as a Factor Shaping Economic Performance," *Journal of Economic Behaviour and Organization* 44 (2001): 31-54.

J. Rogers Hollingsworth and Robert Boyer, eds, *Contemporary Capitalism: The Embeddedness of Institutions*

Dani Rodrik, *One Economics, Many Recipes: Globalization, Institutions and Economic Growth*, Part B: Institutions

Jerald Hage and Marius Meeus, eds, *Innovation, Science and Institutional Change: A Research Handbook*

## 5. Science and Technology in the Fourth Kondratiev

\*C. Freeman and F. Louca, *As Time Goes By*, pp. 272-300

\*Richard R. Nelson and Gavin Wright, "The Rise and Fall of American Technological Leadership," *Journal of Economic Literature* 30 (December 1992)

or

\*Richard R. Nelson, "US Technological Leadership: Where did it come from and where did it go?" *Research Policy* 19 (1990)

\*Linda Weiss, *America Inc.? Innovation and Enterprise in the National Security State*, ch. 2

\*National Research Council of the National Academies, *Innovation in Information Technology*, ch. 1

Mowery, D.C. and Langlois, R. 1996. "Spinning Off and Spinning On (?): The Federal Government Role in the Development of the U.S. Computer Software Industry," *Research Policy* 25: 947-966.

David C. Mowery and Nathan Rosenberg, *Technology and the Pursuit of Economic Growth*

Donald E. Stokes, *Pasteur's Quadrant: Basic Science and Technological Innovation*

Henry Ergas, "Does Technology Policy Matter?" in *Technology and Global Industry*, ed. Bruce R. Guile and Harvey Brooks

David Mowery and Nathan Rosenberg, *Paths of Innovation: Technological Innovation in 20<sup>th</sup> Century America*

C. Freeman, J. Clark, and L. Soete, *Unemployment and Technical Innovation*, ch. 6, 7, 8

OECD, *Technical Change and Economic Policy*

David. M. Hart, *Forged Consensus: Science, Technology and Economic Policy in the United States, 1921-1953*

Daniel L. Kleinman, *Politics on the Endless Frontier: Postwar Research Policy in the United States*

Harvey Brooks, "National Science Policy and Technological Innovation," in *The Positive Sum Strategy: Harnessing Technology for Economic Growth*, ed. R. Landau and N. Rosenberg

## **6. The IT Revolution – A New Techno-Economic Paradigm?**

\*Manuel Castells, *The Rise of the Network Economy*, ch. 1

\*C. Freeman and F. Louca, *As Time Goes By*, pp. 301-335

\*Carlota Perez, *Technological Revolutions and Financial Capital*, pp. 36-59.

\*Manuel Castells, *The Internet Galaxy*, ch. 3

Richard N. Langlois, "Organizing the Electronic Century," in Giovanni Dosi et al, eds, *The Third Industrial Revolution in Global Business*, pp. 119-167.

David Mowery and Timothy Simcoe, "The Internet," in Benn Steil, et al., *Technological Innovation and Economic Performance*

National Academies of Sciences, Engineering and Medicine, *Continuing Innovation in Information Technology*, 2016.

Alexander J. Field, "The Information Technology Boom," ch. 5 of *A Great Leap Forward: 1930s Depression and U.S. Economic Growth*.

Paul A. David, "Computer and Dynamo: The Modern Productivity Paradox in a Not-Too-Distant Mirror," in OECD, *Technology and Productivity: The Challenge for Economic Policy*

C. Freeman and L. Soete, *Work for all or Mass Unemployment: Computerized Technical Change in the 21<sup>st</sup> Century*

Daniel E. Sichel, *The Computer Revolution: An Economic Perspective*

Gregory Tasse, "Strategic Shifts in the IT Economy," ch. 7 of *The Technology Imperative*

Roger Alcala, *The New Economy*, ch. 1, 2 (pp. 52-60)

Peter F. Cowhey and Jonathan D. Aronson, *Transforming Global Information and Communication Markets*.

Erik Brynjolfsson and Adam Saunders, *Wired for Innovation: How Information Technology is Reshaping the Economy?*

Martin Fransman, *Telecoms in the Internet Age: From Boom to Bust to ...*

Dan Schiller, *Digital Capitalism: Networking the Global Market System*

National Research Council, *The Internet's Coming of Age*

OECD, *A New Economy: The Changing Role of Innovation and Information Technology in Growth*

## **7. The Algorithmic Revolution or "Why Software is Eating the World"**

\*Marc Andreessen, "Why Software is Eating the World," *Wall Street Journal*, Sept. 11, 2011.  
Available online:  
<http://www.wsj.com/articles/SB10001424053111903480904576512250915629460/>



\*Martin Kenney and John Zysman, “The Rise of the Platform Economy,” *Issues in Science and Technology* (Spring 2016)

\*John Zysman et al. “Services with Everything: The ICT-Enabled Digital Transformation of Services,” in Dan Breznitz and John Zysman, eds, *The Third Globalization*

\*Shih, Willy. 2015. “Does Hardware Even Matter Anymore?” *Harvard Business Review*, 9 June, <https://hbr.org/2015/06/does-hardware-even-matter-anymore?>

\*K. Sabeel Rahman and Kathleen Thelen, “The Rise of the Platform Business Model and the Transformation of Twenty-First-Century Capitalism, *Politics and Society* 47:2 (2019): 177–204.

Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Better Future at the New Frontier of Power*

Marc Andreessen and Ben Horowitz, “Software Programs the World,” Podcast available online: <http://a16z.com/2016/07/10/software-programs-the-world/>

Erik Brynjolfsson and Andrew McAfee, *Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*

Andrew McAfee and Erik Brynjolfsson. “Human Work in the Robotic Future: Policy for the Age of Automation.” *Foreign Affairs*, July/August 2016.

Brie-IGCC E-economy Project, *Tracking a Transformation: E-Commerce and the Terms of Competition in Industries*

John Zysman and Abraham Newman, eds, *How Revolutionary was the Digital Revolution?*

Steven Weber, *The Success of Open Source*

## 8. IT and the Globalization of Production

\*Manuel Castells, *The Rise of the Network Society*, ch. 2 (pp. 92-147)

\* Gernot Grabher and Erwin van Tuijl, “Uber-production: From global networks to digital platforms,” *Environment and planning A: Economy and Space* (2020) DOI: 10.1177/0308518X20916507

\*Philip Cooke, “Qualitative Analysis and Comparison of Firm and System Incumbents in the New ICT Global Innovation Network,” *European Planning Studies* 21:9 (2013): 1323-1340.

\*Juan Alcácer, John Cantwell and Lucia Piscitello, "Internationalization in the information age: A new era for places, firms and international business networks," *Journal of International Business Studies* 47 (2016): 499-512.

\*C. Binz and B. Truffer, "Global Innovation Systems – A conceptual framework for innovation dynamics in transnational contexts," *Research Policy* 46 (2017): 1284-1298.

Greg Linden, Jason Dedrick and Kenneth L. Kraemer, "Innovation and Job Creation in a Global Economy: The Case of Apple's iPod," *Journal of International Commerce & Economics*

James Manyika et al. *Digital Globalization: The New Era of Global Flows*, McKinsey Global Institute, 2015, pp 1-41.

National Research Council, *Rising to the Challenge: U.S. Innovation Policy for the Global Economy*, ch. 1, pp. 23-41.

Gregory Tasse, "The Globalization of Technology," ch. 1 of *The Technology Imperative*

Keith Smith, "Globalisation and Innovation Systems: Policy Issues," in Ruud E. Smits et al., eds, *The Theory and Practice of Innovation Policy*

Michael Borras and John Zysman, "Globalization with Borders: The Rise of Wintelism as the Future of Global Competition," *Industry and Innovation*: (December 1997)

OECD, "Technology and Globalisation," ch. 10 in *Technology and the Economy: The Key Relationships*

Henry Wai-chung Yeung, *Strategic Coupling: East Asian Industrial Transformation in the New Global Economy*

Parrilli, M.D., Nadvi, K. and Yeung, H.W., 2013. "Local and Regional Development in Global Value Chains, Production Networks and Innovation Networks: A Comparative Review and the Challenges for Future Research," *European Planning Studies* 21(7): 967-988.

John Cantwell and Grazia Santangelo, "The new geography of corporate research in Information and Communications Technology (ICT)," *Journal of Evolutionary Economics* 12 (2002): 163-97.

Danny Mackinnon, "Beyond strategic coupling: reassessing the firm-region nexus in global production networks," *Journal of Economic Geography* 12 (2012): 227-45.

Eric Thun, "The Globalization of Production," in John Ravenhill, ed., *Global Political Economy*, 2<sup>nd</sup> ed.

Martin Kenney and Richard Florida, eds, *Locating Global Advantage: Industry Dynamics in the International Economy*

## 9. AI, Robotics and the Future of Employment

\*Eric Brynjolfsson and Andrew McAfee, "Will Humans Go the Way of Horses?" *Foreign Affairs* 94:4 (July/August 2015): 8-14.

\*Wim Naude, *The Race against the Robots and the Fallacy of the Giant Cheesecake*, IZA Institute of Labor Economics, Discussion Paper Series, March 2019.

\*M. Kenney and J. Zysman, "Work and Value Creation in the Platform Economy," ch. 1 in *Work and Labor in the Digital Age: Research in the Sociology of Work* 33 (2019): 13-41

\*MIT Task Force on the Work of the Future, *The Work of the Future: Building Better Jobs in an Age of Intelligent Machines* available online: <https://workofthefuture.mit.edu/> Introduction and ch. 3

E.L. Groshen, S. Helper, J. P. MacDuffie and C. Garson, *Preparing US Workers and Employers for an Autonomous Vehicle Future*, available online: <https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Groshen-et-al-Report-June-2018-1.pdf>

Manuel Castells, *The Rise of the Network Society*, ch. 4

David Autor, "Work of the Past, Work of the Future," National Bureau of Economic Research, Working Paper 25588

D. Munro, V. Vu and C. Lamb, *Better, Faster, Stronger: Maximizing the Benefits of Automation for Ontario's Firms and People*, Toronto, Brookfield Institute, 2018.

M. Muro, R. Maxim and J. Whiton, *Automation and Artificial Intelligence: How Machines are Affecting People and Places*. Washington, DC: Brookings Institution, 2019.

David G. Blanchflower, *Not Working: Where Have All the Good Jobs Gone?* Princeton, NJ: Princeton University Press, 2019.

Daron Acemoglu & Pascual Restrepo. "Robots and Jobs: Evidence from Labor Markets." National Bureau of Economic Research Working Paper 23285, March 2017.

James Bessen, "Automation and Jobs: When Technology Boosts Employment". Boston University School of Law: Law & Economics Working Paper No. 17-09, March 2017.

**10. Innovation Systems and Innovation Policy for the IT Paradigm**

\*Dan Breznitz, *Innovation and the State: Political Choices and Strategies for Growth in Israel, Taiwan and Ireland*, ch. 1.

\*Patries Boekholt, “The Evolution of Innovation Paradigms and their Influence on Research, Technological Development and Innovation Policy Instruments,” in Ruud E. Smits et al., eds, *The Theory and Practice of Innovation Policy*, pp. 333-359.

\*Mariana Mazzucato, *The Entrepreneurial State*, ch. 5

\*David C. Mowery and Richard R. Nelson, “Explaining Industrial Leadership,” in *Sources of Industrial Leadership*, eds. D. C. Mowery and R. R. Nelson, pp. 359-382.

\*Mark Zachary Taylor, *The Politics of Innovation: Why Some Countries are Better than Others at Science and Technology*, ch. 9.

Gregory Tasse, “Globalization of technology-based growth: the policy imperative,” *Journal of Technology Transfer* 33 (2008):560–578

Gregory Tasse, “Beyond the business cycle: The need for a technology-based growth strategy,” *Science and Public Policy* 40 (2013, 3): 293-315.

John Zysman, “Creating Value in a Digital Era: How Do Wealthy Nations Stay Wealthy?” in John Zysman and Abraham Newman, eds, *How Revolutionary was the Digital Revolution?*

National Research Council of the National Academies, *Innovation Policies for the 21<sup>st</sup> Century*, “Introduction,” pp. 3-37

Mario Cimoli, Giovanni Dosi, Richard Nelson and Joseph E. Stiglitz, “Institutions and Policies Shaping Industrial Development: An Introductory Note,” in Mario Cimoli et al., eds. *Industrial Policy and Development: The Political Economy of Capabilities Accumulation*, pp. 19-38.

Alice Lam and Bengt-Åke Lundvall, “The Learning Organization and National Systems of Competence Building and Innovation,” in *How Europe’s Economies Learn*, eds E. Lorenz and B.-Å. Lundvall, pp. 109-139.

Henry Ergas, “Does Technology Policy Matter?” in *Technology and Global Industry*, eds B. R. Guile and H. Brooks, pp. 191-245.

Dan Breznitz, “Scaling up and sustaining experimental innovation policies with limited resources: Peripheral Schumpeterian development agencies,” in Mark A Dutz, et al, eds, *Making Innovation Policy Work: Learning from Experimentation*, OECD, pp. 247-78.

National Research Council of the National Academies, *Innovation Policies for the 21<sup>st</sup> Century: Report of a Symposium*

OECD, *Governance of Innovation Systems: Vol. 1: Synthesis Report*

P. Larédo and P. Mustar, *Research and Innovation Policies in the New Global Economy*.

B. Steil, D. Victor and R.R. Nelson, eds, *Technological Innovation and Economic Performance*.

## 11. The State of the Digital Economy and Innovation Policy in Canada

\*David A. Wolfe, “A Digital Strategy for Canada: The Current Challenge,” IRPP Insight Paper, available online: <https://irpp.org/research-studies/a-digital-strategy-for-canada/>

\*Peter Nicholson, “Facing the Facts: Reconsidering Business Innovation Policy in Canada,” IRPP Insight Paper, available online: <https://irpp.org/wp-content/uploads/2018/10/Facing-the-Facts-Reconsidering-Business-Innovation-Policy-in-Canada.pdf>

and

\*Council of Canadian Academies, *Competing in the Global Innovation Economy: The Current State of R&D in Canada*, ch. 6-7. Available online: [scienceadvice.ca](http://scienceadvice.ca)

\*ISED, *Report from Canada's Economic Strategy Tables: The Innovation and Competitiveness Imperative*, especially the one on Digital Industries. Available online: [https://www.ic.gc.ca/eic/site/098.nsf/eng/h\\_00020.html](https://www.ic.gc.ca/eic/site/098.nsf/eng/h_00020.html)

\*Deloitte, *Canada's Age of Disruption*, Toronto.

Innovation, Science and Economic Development Canada, *Building a Nation of Innovators*, Ottawa.

Bruce Smardon, *Asleep at the Switch*, Montreal and Kingston, McGill-Queens University Press.

Council of Canadian Academies, *Paradox Lost: Explaining Canada's Research Strengths and Innovation Weakness* available online at: [scienceadvice.ca](http://scienceadvice.ca)

Peter W.B. Phillips and Aaron Hertes, “The New Innovation Agenda,” in *How Ottawa Spends, 2018-2019*, ed. Katherine Graham and Allan Maslove.

Science Technology and Innovation Council, *State of the Nation 2014*

Council of Canadian Academies, *Innovation and Business Strategy: Why Canada Falls Short*, 2009.

Expert Panel on Federal Support to Research and Development, *Innovation Canada: A Call to Action*, Ottawa, 2011.

G.B. Doern, D. Castles and P.W.B. Phillips, *Canadian Science Technology and Innovation Policy*, Montreal and Kingston, McGill-Queens University Press.

## 12. The IT Paradigm and the Future of Economic Growth

\*Robert Gordon, “Is U.S. Economic Growth Over? Faltering Innovation Confronts The Six Headwinds,” CEPR Policy Insight No. 63, September. 2012. Online

and

\*Daniel Sichel, “Review of Gordon,” and Robert Gordon, “Comment on Sichel,” *International Productivity Monitor* (Fall 2016)

\*J. Mokyr, C. Vickers and N.L. Ziebarth, “The History of Technological Anxiety and the Future of Economic Growth: Is This Time Different,” *Journal of Economic Perspectives* 29 (Summer 2015): 31-50.

\*Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age*, ch. 2, 15

and

\*Carlota Perez, “Second Machine Age or Fifth Technological Revolution, Parts 1 to 9”, <http://beyondthetechnologicalrevolution.com/second-machine-age-or-fifth-technological-revolution>

\*William Janeway, *Doing Capitalism in the Innovation Economy*, 2<sup>nd</sup> ed. (2018), “Conclusion” and “Coda”.

\*Dan Breznitz and John Zysman, “Introduction: Facing the Double Bind, Maintaining a Healthy and Wealthy Economy in the 21<sup>st</sup> Century,” in D. Breznitz and J. Zysman, *The Third Globalization: Can Wealthy Nations Stay Rich in the 21<sup>st</sup> Century*

\*Johan Schot and Laur Kanger, “Deep transitions: Emergence, acceleration, stabilization and directionality,” *Research Policy* 47 (2018): 1045-1059.

Carlota Perez, “Capitalism, Technology and a Green Global Golden Age,” in Michael Jacobs and Mariana Mazzucato, eds, *Rethinking Capitalism*, pp. 191-217.

Robert J. Gordon, *The Rise and Fall of American Economic Growth*, ch. 17

Robert Boyer, “The long-term historical outlook after the Internet bubble,” ch. 7 of *The Future of Economic Growth: As New Becomes Old*

William Lazonick, *Sustainable Prosperity in the New Economy*