Women in Science
Lessons from the Baby Boom

Scott Kim, Wharton
Petra Moser, NYU, NBER and CEPR

Women are severely underrepresented in science

- 8 in 10 women and minority students who enroll in STEM drop out or switch out of STEM before finishing degree (Waldrop 2015)
- Women comprise fewer senior staff and are promoted more slowly (National Academy of Sciences 2006)
- Women are more likely to leave STEM (Shaw and Stanton 2012)

- Lack of role models among faculty (Porter and Serra 2020) and in teaching materials (Stevenson and Zlotnik 2018)
- Structural impediments
  - Discrimination at hire, glass ceiling in promotion, and inequity in salary and support (Settles et al. 1996; Sonnert and Holton 1996)

An unequal burden of parenting

- In American Time Use Survey 2018 mothers spent more 46% more time on kids and 50% more on chores
  - Married mothers working full-time spent an average of 72 min/ day caring for kids compared with 49 min for married fathers
  - In households where both spouses were working full time, mothers spent 2.1 h/day on household cooking, cleaning and other chores while fathers spent 1.4 hours
- Women do more housework and childcare even
  - if they earn more (Besen-Cassino and Cassino 2014)
  - when their husbands are unemployed (van der Lippe, Treas, Norbutas 2018)

"I'll be home late. I've joined a support group for women who need a reason to stay at work until the house is picked up and dinner is on the table."

Baby Boom 1946-64

- 4.24 million babies born per year 1946-64
  - 76 million boomers in the U.S.
  - 6 million “boomies” in Canada
- Women give birth at a younger age and have more kids
- Shift in family values
  - Youthful, suburban, prolific, and “traditional”
  - *Archives of the Institute for Human Development* (Dyer, 1960)
- Shift in the 1960s towards greater equality (Weiss 2020)

Births increase from 22.7 per 1,000 in 1943 to 25.0 per year 1946-56

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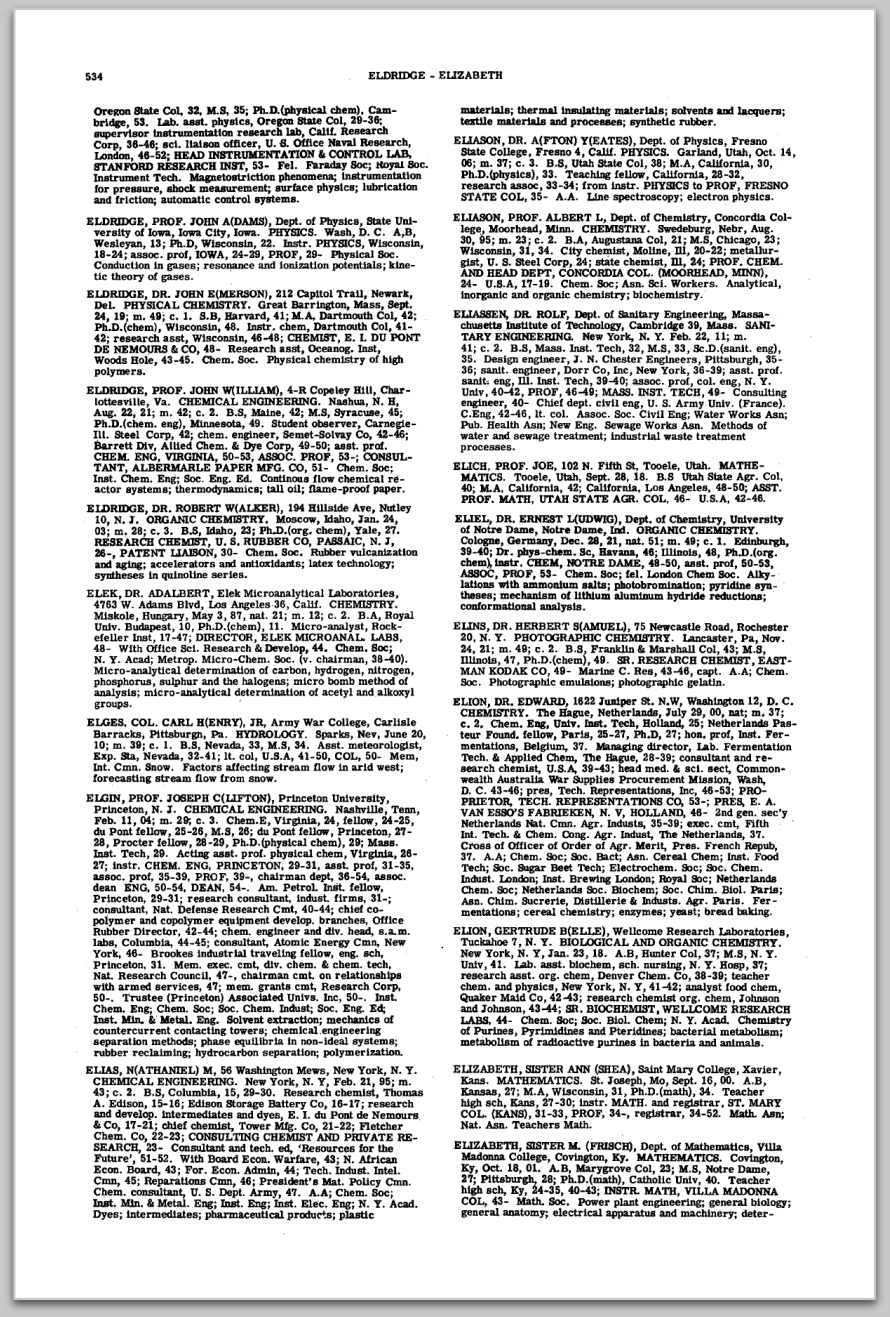
- Is there gender inequality in science?
  - In productivity and promotions
- How much is due to disparate impacts of parenting?
- Investigate differences in productivity across the life cycle
- Event study of marriage
- Do these differences lead to differences in promotions?
  - Differences in probability and speed to enter tenure track
  - Differences in probability and speed to get tenure
- Selection into parenting, fields, and survival
  - Who marries and when?
  - Do women (mothers) select into different fields
  - Match scientists with faculty directories to investigate survival
- Social costs?
  - Employment data on entry into science

Women in Science

- Historical background
- Data
  - Biographies of American scientists in 1956
  - Matched with patents
- Differential changes in productivity
  - Age-varying effects
  - Event studies of marriage
- Differences in the rate and speed of promotion
  - From undergraduate to PhD
  - From PhD to assistant professor
  - From assistant professor to tenure
- Selection
  - Into marriage and parenting
  - Into research fields
  - Into survival
- Aggregate effects on participation
  - A lost generation of baby boom mothers
- Conclusions and Next Step



534 ELDRIDGE - ELIZABETH

Oregon State Col, 32, M.S, 35; Ph.D.(physical chem), Cambridge, 53. Lab. asst. physics, Oregon State Col, 29-36; supervisor instrumentation research lab, Calif. Research Corp, 36-46; sci. liaison officer, U. S. Office Naval Research, London, 46-52; HEAD INSTRUMENTATION & CONTROL LAB, STANFORD RESEARCH INST, 53- Fel. Faraday Soc; Royal Soc. Instrument Tech. Magnetostriction phenomena; instrumentation for pressure, shock measurement; surface physics; lubrication and friction; automatic control systems.

ELDRIDGE, PROF. JOHN A(DAMS), Dept. of Physics, State University of Iowa, Iowa City, Iowa. PHYSICS. Wash, D. C. A,B, Wesleyan, 13; Ph.D, Wisconsin, 22. Instr. PHYSICS, Wisconsin, 18-24; assoc. prof, IOWA, 24-29, PROF, 29- Physical Soc. Conduction in gases; resonance and ionization potentials; kinetic theory of gases.

ELDRIDGE, DR. JOHN E(MERSON), 212 Capitol Trail, Newark, Del. PHYSICAL CHEMISTRY. Great Barrington, Mass, Sept. 24, 19; m. 49; c. 1. S.B, Harvard, 41; M.A, Dartmouth Col, 42; Ph.D.(chem), Wisconsin, 48. Instr. chem, Dartmouth Col, 41-42; research asst, Wisconsin, 46-48; CHEMIST, E. I. DU PONT DE NEMOURS & CO, 48- Research asst, Oceanog. Inst, Woods Hole, 43-45. Chem. Soc. Physical chemistry of high polymers.

ELDRIDGE, PROF. JOHN W(ILLIAM), 4-R Copeley Hill, Charlottesville, Va. CHEMICAL ENGINEERING. Nashua, N. H, Aug. 22, 21; m. 42; c. 2. B.S, Maine, 42; M.S, Syracuse, 45; Ph.D.(chem. eng), Minnesota, 49. Student observer, Carnegie-Ill. Steel Corp, 42; chem. engineer, Semet-Solvay Co, 42-46; Barrett Div, Allied Chem. & Dye Corp, 49-50; asst. prof. CHEM. ENG, VIRGINIA, 50-53, ASSOC. PROF, 53-; CONSULTANT, ALBERMARLE PAPER MFG. CO, 51- Chem. Soc; Inst. Chem. Eng; Soc. Eng. Ed. Continuous flow chemical reactor systems; thermodynamics; tall oil; flame-proof paper.

ELDRIDGE, DR. ROBERT W(ALKER), 194 Hillside Ave, Nutley 10, N. J. ORGANIC CHEMISTRY. Moscow, Idaho, Jan. 24, 03; m. 28; c. 3. B.S, Idaho, 23; Ph.D.(org. chem), Yale, 27. RESEARCH CHEMIST, U. S. RUBBER CO, PASSAIC, N. J, 26-, PATENT LIAISON, 30- Chem. Soc. Rubber vulcanization and aging; accelerators and antioxidants; latex technology; syntheses in quinoline series.

ELEK, DR. ADALBERT, Elek Microanalytical Laboratories, 4763 W. Adams Blvd, Los Angeles 36, Calif. CHEMISTRY. Miskole, Hungary, May 3, 87, nat. 21; m. 12; c. 2. B.A, Royal Univ. Budapest, 10, Ph.D.(chem), 11. Micro-analyst, Rockefeller Inst, 17-47; DIRECTOR, ELEK MICROANAL. LABS, 48- With Office Sci. Research & Develop, 44. Chem. Soc; N. Y. Acad; Metrop. Micro-Chem. Soc. (v. chairman, 38-40). Micro-analytical determination of carbon, hydrogen, nitrogen, phosphorus, sulphur and the halogens; micro bomb method of analysis; micro-analytical determination of acetyl and alkoxyl groups.

ELGES, COL. CARL H(ENRY), JR, Army War College, Carlisle Barracks, Pittsburgh, Pa. HYDROLOGY. Sparks, Nev, June 20, 10; m. 39; c. 1. B.S, Nevada, 33, M.S, 34. Asst. meteorologist, Exp. Sta, Nevada, 32-41; lt. col, U.S.A, 41-50, COL, 50- Mem, Int. Cmn. Snow. Factors affecting stream flow in arid west; forecasting stream flow from snow.

ELGIN, PROF. JOSEPH C(LIFTON), Princeton University, Princeton, N. J. CHEMICAL ENGINEERING. Nashville, Tenn, Feb. 11, 04; m. 29; c. 3. Chem.E, Virginia, 24, fellow, 24-25, du Pont fellow, 25-26, M.S, 26; du Pont fellow, Princeton, 27-28, Procter fellow, 28-29, Ph.D.(physical chem), 29; Mass. Inst. Tech, 29. Acting asst. prof. physical chem, Virginia, 26-27; instr. CHEM. ENG, PRINCETON, 29-31, asst. prof, 31-35, assoc. prof, 35-39, PROF, 39-, chairman dept, 36-54, assoc. dean ENG, 50-54, DEAN, 54-. Am. Petrol. Inst. fellow, Princeton, 29-31; research consultant, indust. firms, 31-; consultant, Nat. Defense Research Cmt, 40-44; chief copolymer and copolymer equipment develop. branches, Office Rubber Director, 42-44; chem. engineer and div. head, s.a.m. labs, Columbia, 44-45; consultant, Atomic Energy Cmn, New York, 46- Brookes industrial traveling fellow, eng. sch, Princeton, 31. Mem. exec. cmt, div. chem. & chem. tech, Nat. Research Council, 47-, chairman cmt. on relationships with armed services, 47; mem. grants cmt, Research Corp, 50-. Trustee (Princeton) Associated Univs, Inc, 50-. Inst. Chem. Eng; Chem. Soc; Soc. Chem. Indust; Soc. Eng. Ed; Inst. Min. & Metal. Eng. Solvent extraction; mechanics of countercurrent contacting towers; chemical engineering separation methods; phase equilibria in non-ideal systems; rubber reclaiming; hydrocarbon separation; polymerization.

ELIAS, N(ATHANIEL) M, 56 Washington Mews, New York, N. Y. CHEMICAL ENGINEERING. New York, N. Y, Feb. 21, 95; m. 43; c. 2. B.S, Columbia, 15, 29-30. Research chemist, Thomas A. Edison, 15-16; Edison Storage Battery Co, 16-17; research and develop. intermediates and dyes, E. I. du Pont de Nemours & Co, 17-21; chief chemist, Tower Mfg. Co, 21-22; Fletcher Chem. Co, 22-23; CONSULTING CHEMIST AND PRIVATE RESEARCH, 23- Consultant and tech. ed, 'Resources for the Future', 51-52. With Board Econ. Warfare, 43; N. African Econ. Board, 43; For. Econ. Admin, 44; Tech. Indust. Intel. Cmn, 45; Reparations Cmn, 46; President's Mat. Policy Cmn. Chem. consultant, U. S. Dept. Army, 47. A.A; Chem. Soc; Inst. Min. & Metal. Eng; Inst. Eng; Inst. Elec. Eng; N. Y. Acad. Dyes; intermediates; pharmaceutical products; plastic materials; thermal insulating materials; solvents and lacquers; textile materials and processes; synthetic rubber.

ELIASON, DR. A(FTON) Y(EATES), Dept. of Physics, Fresno State College, Fresno 4, Calif. PHYSICS. Garland, Utah, Oct. 14, 06; m. 37; c. 3. B.S, Utah State Col, 38; M.A, California, 30, Ph.D.(physics), 33. Teaching fellow, California, 28-32, research assoc, 33-34; from instr. PHYSICS to PROF, FRESNO STATE COL, 35- A.A. Line spectroscopy; electron physics.

ELIASON, PROF. ALBERT L, Dept. of Chemistry, Concordia College, Moorhead, Minn. CHEMISTRY. Swedesburg, Nebr, Aug. 30, 95; m. 23; c. 2. B.A, Augustana Col, 21; M.S, Chicago, 23; Wisconsin, 31, 34. City chemist, Moline, Ill, 20-22; metallurgist, U. S. Steel Corp, 24; state chemist, Ill, 24; PROF. CHEM. AND HEAD DEPT, CONCORDIA COL. (MOORHEAD, MINN), 24- U.S.A, 17-19. Chem. Soc; Asn. Sci. Workers. Analytical, inorganic and organic chemistry; biochemistry.

ELIASSEN, DR. ROLF, Dept. of Sanitary Engineering, Massachusetts Institute of Technology, Cambridge 39, Mass. SANITARY ENGINEERING. New York, N. Y. Feb. 22, 11; m. 41; c. 2. B.S, Mass. Inst. Tech, 32, M.S, 33, Sc.D.(sanit. eng), 35. Design engineer, J. N. Chester Engineers, Pittsburgh, 35-36; sanit. engineer, Dorr Co, Inc, New York, 36-39; asst. prof. sanit. eng, Ill. Inst. Tech, 39-40; assoc. prof, col. eng, N. Y. Univ, 40-42, PROF, 46-49; MASS. INST. TECH, 49- Consulting engineer, 40- Chief dept. civil eng, U. S. Army Univ. (France). C.Eng, 42-46, lt. col. Assoc. Soc. Civil Eng; Water Works Asn; Pub. Health Asn; New Eng. Sewage Works Asn. Methods of water and sewage treatment; industrial waste treatment processes.

ELICH, PROF. JOE, 102 N. Fifth St, Tooele, Utah. MATHEMATICS. Tooele, Utah, Sept. 28, 18. B.S Utah State Agr. Col, 40; M.A, California, 42; California, Los Angeles, 48-50; ASST. PROF. MATH, UTAH STATE AGR. COL, 46- U.S.A, 42-46.

ELIEL, DR. ERNEST L(UDWIG), Dept. of Chemistry, University of Notre Dame, Notre Dame, Ind. ORGANIC CHEMISTRY. Cologne, Germany, Dec. 28, 21, nat. 51; m. 49; c. 1. Edinburgh, 39-40; Dr. phys.-chem. Sc, Havana, 46; Illinois, 48, Ph.D.(org. chem), instr. CHEM, NOTRE DAME, 48-50, asst. prof, 50-53, ASSOC, PROF, 53- Chem. Soc; fel. London Chem Soc. Alkylations with ammonium salts; photobromination; pyridine syntheses; mechanism of lithium aluminum hydride reductions; conformational analysis.

ELINS, DR. HERBERT S(AMUEL), 75 Newcastle Road, Rochester 20, N. Y. PHOTOGRAPHIC CHEMISTRY. Lancaster, Pa, Nov. 24, 21; m. 49; c. 2. B.S, Franklin & Marshall Col, 43; M.S, Illinois, 47, Ph.D.(chem), 49. SR. RESEARCH CHEMIST, EASTMAN KODAK CO, 49- Marine C. Res, 43-46, capt. A.A; Chem. Soc. Photographic emulsions; photographic gelatin.

ELION, DR. EDWARD, 1622 Juniper St. N.W, Washington 12, D. C. CHEMISTRY. The Hague, Netherlands, July 29, 00, nat; m. 37; c. 2. Chem. Eng, Univ. Inst. Tech, Holland, 25; Netherlands Pasteur Found, fellow, Paris, 25-27, Ph.D, 27; hon. prof, Inst. Fermentations, Belgium, 37. Managing director, Lab. Fermentation Tech. & Applied Chem, The Hague, 28-39; consultant and research chemist, U.S.A, 39-43; head med. & sci. sect, Commonwealth Australia War Supplies Procurement Mission, Wash, D. C. 43-46; pres, Tech. Representations, Inc, 46-53; PROPRIETOR, TECH. REPRESENTATIONS CO, 53-; PRES, E. A. VAN ESSO'S FABRIEKEN, N. V, HOLLAND, 46- 2nd gen. sec'y Netherlands Nat. Cmn. Agr. Industs, 35-39; exec. cmt, Fifth Int. Tech. & Chem. Cong. Agr. Indust, The Netherlands, 37. Cross of Officer of Order of Agr. Merit, Pres. French Repub, 37. A.A; Chem. Soc; Soc. Bact; Asn. Cereal Chem; Inst. Food Tech; Soc. Sugar Beet Tech; Electrochem. Soc; Soc. Chem. Indust. London; Inst. Brewing London; Royal Soc; Netherlands Chem. Soc; Netherlands Soc. Biochem; Soc. Chim. Biol. Paris; Asn. Chim. Sucrerie, Distillerie & Industs. Agr. Paris. Fermentations; cereal chemistry; enzymes; yeast; bread baking.

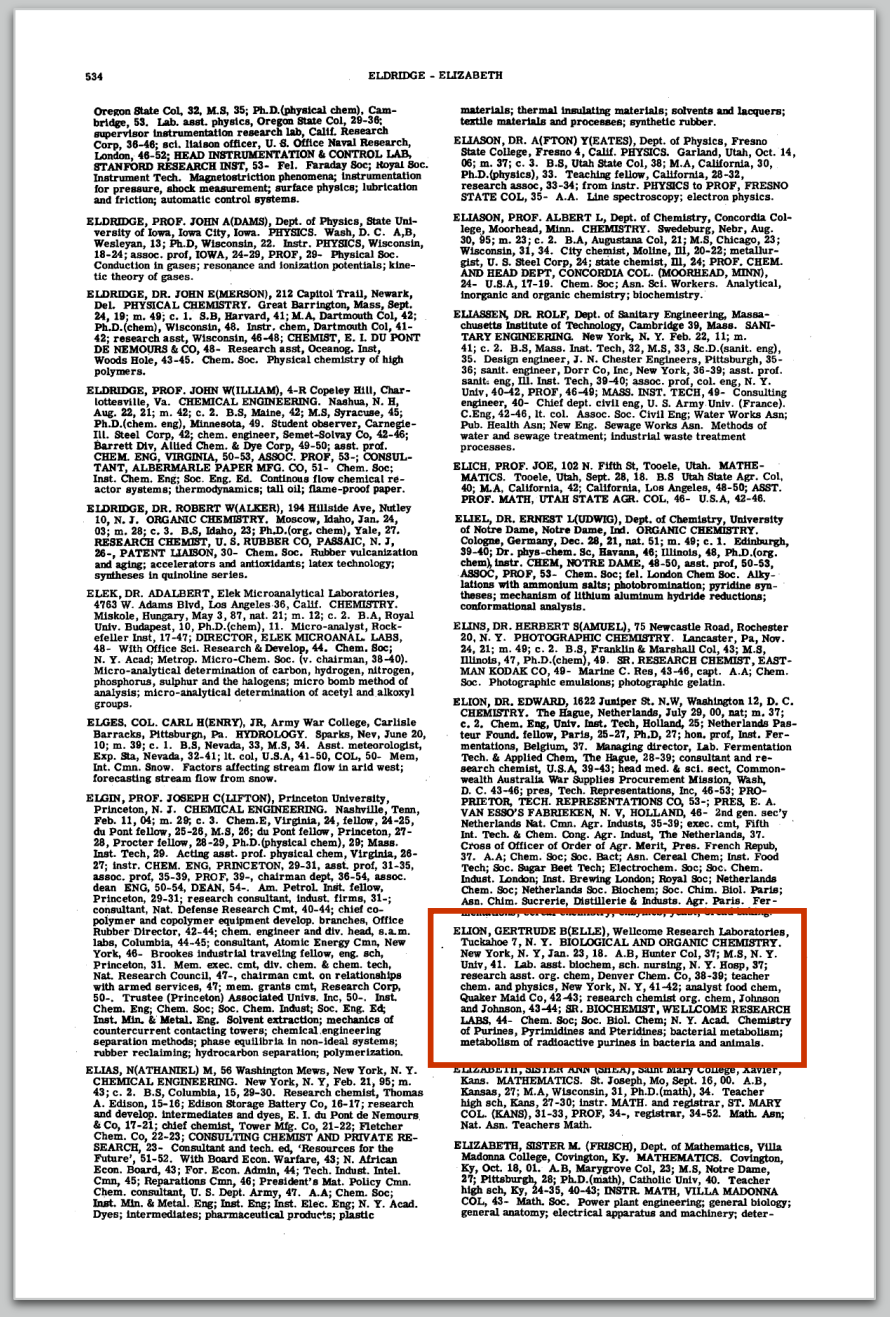
ELION, GERTRUDE B(ELLE), Wellcome Research Laboratories, Tuckahoe 7, N. Y. BIOLOGICAL AND ORGANIC CHEMISTRY. New York, N. Y, Jan. 23, 18. A.B, Hunter Col, 37; M.S, N. Y. Univ, 41. Lab. asst. biochem, sch. nursing, N. Y. Hosp, 37; research asst. org. chem, Denver Chem. Co, 38-39; teacher chem. and physics, New York, N. Y, 41-42; analyst food chem, Quaker Maid Co, 42-43; research chemist org. chem, Johnson and Johnson, 43-44; SR. BIOCHEMIST, WELLCOME RESEARCH LABS, 44- Chem. Soc; Soc. Biol. Chem; N. Y. Acad. Chemistry of Purines, Pyrimidines and Pteridines; bacterial metabolism; metabolism of radioactive purines in bacteria and animals.

ELIZABETH, SISTER ANN (SHEA), Saint Mary College, Xavier, Kans. MATHEMATICS. St. Joseph, Mo, Sept. 16, 00. A.B, Kansas, 27; M.A, Wisconsin, 31, Ph.D.(math), 34. Teacher high sch, Kans, 27-30; instr. MATH. and registrar, ST. MARY COL. (KANS), 31-33, PROF, 34-, registrar, 34-52. Math. Asn; Nat. Asn. Teachers Math.

ELIZABETH, SISTER M. (FRISCH), Dept. of Mathematics, Villa Madonna College, Covington, Ky. MATHEMATICS. Covington, Ky, Oct. 18, 01. A.B, Marygrove Col, 23; M.S, Notre Dame, 27; Pittsburgh, 28; Ph.D.(math), Catholic Univ, 40. Teacher high sch, Ky, 24-35, 40-43; INSTR. MATH, VILLA MADONNA COL, 43- Math. Soc. Power plant engineering; general biology; general anatomy; electrical apparatus and machinery; deter-

"American Men of Science. A Biographical Directory"

- "...intended as a reference list for the Carnegie Institution of Washington....But the chief service it should render is to make men of science acquainted with one another and with one another's work." (Cattell 1921)
- James McKeen Cattell
  - First US professor of psychology
  - Editor of Science for nearly 50 years
- Members of scientific societies
- Male and female scientists in Canada and United States
- Matched with patents 1910-1970
- Matched with census 1880, 1900, 1910, 1920, 1930, 1940



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ELEK, DR. ADALBERT, Elek Microanalytical Laboratories, 4763 W. Adams Blvd, Los Angeles 36, Calif. CHEMISTRY. Miskole, Hungary, May 3, 87, nat. 21; m. 12; c. 2. B.A, Royal Univ. Budapest, 10, Ph.D.(chem), 11. Micro-analyst, Rockefeller Inst, 17-47; DIRECTOR, ELEK MICROANAL. LABS, 48- With Office Sci. Research & Develop, 44. Chem. Soc; N. Y. Acad; Metrop. Micro-Chem. Soc. (v. chairman, 38-40). Micro-analytical determination of carbon, hydrogen, nitrogen, phosphorus, sulphur and the halogens; micro bomb method of analysis; micro-analytical determination of acetyl and alkoxyl groups.

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ELIAS, N(ATHANIEL) M, 56 Washington Mews, New York, N. Y. CHEMICAL ENGINEERING. New York, N. Y, Feb. 21, 95; m. 43; c. 2. B.S, Columbia, 15, 29-30. Research chemist, Thomas A. Edison, 15-16; Edison Storage Battery Co, 16-17; research and develop. intermediates and dyes, E. I. du Pont de Nemours & Co, 17-21; chief chemist, Tower Mfg. Co, 21-22; Fletcher Chem. Co, 22-23; CONSULTING CHEMIST AND PRIVATE RESEARCH, 23- Consultant and tech. ed, 'Resources for the Future', 51-52. With Board Econ. Warfare, 43; N. African Econ. Board, 43; For. Econ. Admin, 44; Tech. Indust. Intel. Cmn, 45; Reparations Cmn, 46; President's Mat. Policy Cmn. Chem. consultant, U. S. Dept. Army, 47. A.A; Chem. Soc; Inst. Min. & Metal. Eng; Inst. Eng; Inst. Elec. Eng; N. Y. Acad. Dyes; intermediates; pharmaceutical products; plastic materials; thermal insulating materials; solvents and lacquers; textile materials and processes; synthetic rubber.

ELIASON, DR. A(FTON) Y(EATES), Dept. of Physics, Fresno State College, Fresno 4, Calif. PHYSICS. Garland, Utah, Oct. 14, 06; m. 37; c. 3. B.S, Utah State Col, 38; M.A, California, 30, Ph.D.(physics), 33. Teaching fellow, California, 28-32, research assoc, 33-34; from instr. PHYSICS to PROF, FRESNO STATE COL, 35- A.A. Line spectroscopy; electron physics.

ELIASON, PROF. ALBERT L, Dept. of Chemistry, Concordia College, Moorhead, Minn. CHEMISTRY. Swedesburg, Nebr, Aug. 30, 95; m. 23; c. 2. B.A, Augustana Col, 21; M.S, Chicago, 23; Wisconsin, 31, 34. City chemist, Moline, Ill, 20-22; metallurgist, U. S. Steel Corp, 24; state chemist, Ill, 24; PROF. CHEM. AND HEAD DEPT, CONCORDIA COL. (MOORHEAD, MINN), 24- U.S.A, 17-19. Chem. Soc; Asn. Sci. Workers. Analytical, inorganic and organic chemistry; biochemistry.

ELIASSEN, DR. ROLF, Dept. of Sanitary Engineering, Massachusetts Institute of Technology, Cambridge 39, Mass. SANITARY ENGINEERING. New York, N. Y. Feb. 22, 11; m. 41; c. 2. B.S, Mass. Inst. Tech, 32, M.S, 33, Sc.D.(sanit. eng), 35. Design engineer, J. N. Chester Engineers, Pittsburgh, 35-36; sanit. engineer, Dorr Co, Inc, New York, 36-39; asst. prof. sanit. eng, Ill. Inst. Tech, 39-40; assoc. prof, col. eng, N. Y. Univ, 40-42, PROF, 46-49; MASS. INST. TECH, 49- Consulting engineer, 40- Chief dept. civil eng, U. S. Army Univ. (France). C.Eng, 42-46, lt. col. Assoc. Soc. Civil Eng; Water Works Asn; Pub. Health Asn; New Eng. Sewage Works Asn. Methods of water and sewage treatment; industrial waste treatment processes.

ELICH, PROF. JOE, 102 N. Fifth St, Tooele, Utah. MATHEMATICS. Tooele, Utah, Sept. 28, 18. B.S Utah State Agr. Col, 40; M.A, California, 42; California, Los Angeles, 48-50; ASST. PROF. MATH, UTAH STATE AGR. COL, 46- U.S.A, 42-46.

ELIEL, DR. ERNEST L(UDWIG), Dept. of Chemistry, University of Notre Dame, Notre Dame, Ind. ORGANIC CHEMISTRY. Cologne, Germany, Dec. 28, 21, nat. 51; m. 49; c. 1. Edinburgh, 39-40; Dr. phys.-chem. Sc, Havana, 46; Illinois, 48, Ph.D.(org. chem), instr. CHEM, NOTRE DAME, 48-50, asst. prof, 50-53, ASSOC, PROF, 53- Chem. Soc; fel. London Chem Soc. Alkylations with ammonium salts; photobromination; pyridine syntheses; mechanism of lithium aluminum hydride reductions; conformational analysis.

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ELION, DR. EDWARD, 1622 Juniper St. N.W, Washington 12, D. C. CHEMISTRY. The Hague, Netherlands, July 29, 00, nat; m. 37; c. 2. Chem. Eng, Univ. Inst. Tech, Holland, 25; Netherlands Pasteur Found, fellow, Paris, 25-27, Ph.D, 27; hon. prof, Inst. Fermentations, Belgium, 37. Managing director, Lab. Fermentation Tech. & Applied Chem, The Hague, 28-39; consultant and research chemist, U.S.A, 39-43; head med. & sci. sect, Commonwealth Australia War Supplies Procurement Mission, Wash, D. C. 43-46; pres, Tech. Representations, Inc, 46-53; PROPRIETOR, TECH REPRESENTATIONS CO, 53-; PRES, E. A. VAN ESSO'S FABRIEKEN, N. V, HOLLAND, 46- 2nd gen. sec'y Netherlands Nat. Cmn. Agr. Industs, 35-39; exec. cmt, Fifth Int. Tech. & Chem. Cong. Agr. Indust, The Netherlands, 37. Cross of Officer of Order of Agr. Merit, Pres. French Repub, 37. A.A; Chem. Soc; Soc. Bact; Asn. Cereal Chem; Inst. Food Tech; Soc. Sugar Beet Tech; Electrochem. Soc; Soc. Chem. Indust. London; Inst. Brewing London; Royal Soc; Netherlands Chem. Soc; Netherlands Soc. Biochem; Soc. Chim. Biol. Paris; Asn. Chim. Sucrerie, Distillerie & Industs. Agr. Paris. Fer-

ELION, GERTRUDE B(ELLE), Wellcome Research Laboratories, Tuckahoe 7, N. Y. BIOLOGICAL AND ORGANIC CHEMISTRY. New York, N. Y, Jan. 23, 18. A.B, Hunter Col, 37; M.S, N. Y. Univ, 41. Lab. asst. biochem, sch. nursing, N. Y. Hosp, 37; research asst. org. chem, Denver Chem. Co, 38-39; teacher chem. and physics, New York, N. Y, 41-42; analyst food chem, Quaker Maid Co, 42-43; research chemist org. chem, Johnson and Johnson, 43-44; SR. BIOCHEMIST, WELLCOME RESEARCH LABS, 44- Chem. Soc; Soc. Biol. Chem; N. Y. Acad. Chemistry of Purines, Pyrimidines and Pteridines; bacterial metabolism; metabolism of radioactive purines in bacteria and animals.

ELIZABETH, SISTER ANN (SHEA), Saint Mary College, Xavier, Kans. MATHEMATICS. St. Joseph, Mo, Sept. 16, 00. A.B, Kansas, 27; M.A, Wisconsin, 31, Ph.D.(math), 34. Teacher high sch, Kans, 27-30; instr. MATH. and registrar, ST. MARY COL. (KANS), 31-33, PROF, 34-, registrar, 34-52. Math. Asn; Nat. Asn. Teachers Math.

ELIZABETH, SISTER M. (FRISCH), Dept. of Mathematics, Villa Madonna College, Covington, Ky. MATHEMATICS. Covington, Ky, Oct. 18, 01. A.B, Marygrove Col, 23; M.S, Notre Dame, 27; Pittsburgh, 28; Ph.D.(math), Catholic Univ, 40. Teacher high sch, Ky, 24-35, 40-43; INSTR. MATH, VILLA MADONNA COL, 43- Math. Soc. Power plant engineering; general biology; general anatomy; electrical apparatus and machinery; deter-

"American Men of Science. A Biographical Directory"

- "...intended as a reference list for the Carnegie Institution of Washington....But the chief service it should render is to make men of science acquainted with one another and with one another's work." (Cattell 1921)
- James McKeen Cattell
  - First US professor of psychology
  - Editor of Science for nearly 50 years
- Members of scientific societies
- Male and female scientists in Canada and United States
- Matched with patents 1910-1970
- Matched with census 1940

Full name (with middle name)

- Assign gender
- Match with US patents

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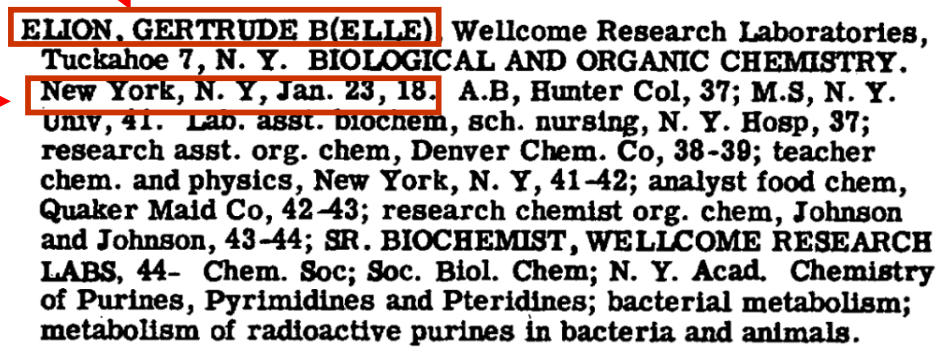
- Assign gender
- Match with US patents

Birthplace and date
- Age
- Birth cohort
- US- vs foreign-born
- Match with US census (w Anna Airoldi)



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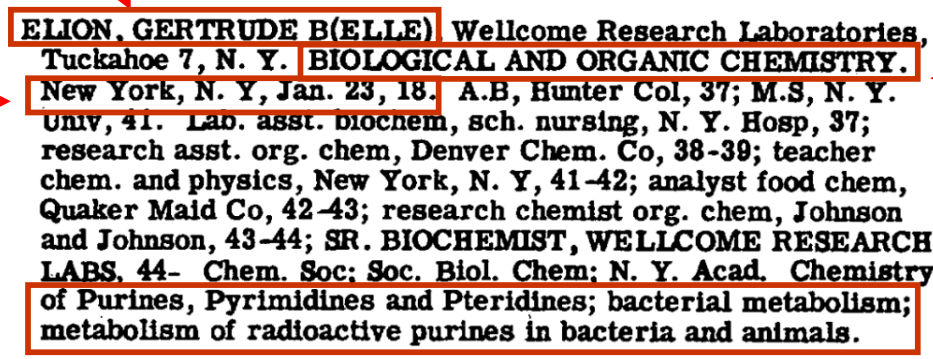

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Discipline and research topics
- Assign scientists to fields using k-means clustering (Moser and San 2020)
- Control for variation in patenting across fields
- Investigate selection into fields

Example: Helene Wallace Toolan

BS 1929, PhD 1946, Assistant Professor 1953

TOOLAN, PROF. HELENE WALLACE, 151 W. 86th St, New York 24, N.Y.
EXPERIMENTAL PATHOLOGY. Chicago, Ill, Feb. 7, 12; m. 30; c. 3; m. 45. B.S, Chicago, 29; Ph.D.(path), Cornell, 46. Research asst, med. col, CORNELL, 46-50, ASST. PROF, SLOAN-KETTERING DIV, 53-; asst, SLOAN-KETTERING INST, 50-53, ASSOC, 53-. A.A; Soc. Path. & Bact; Asn. Cancer Research; Soc. Exp. Biol; Harvey Soc. Heterologous transplantation of human tissues, both normal and malignant; immunology.

Year of undergraduate degree 1929 (age 17)

Helene Toolan, 80, Cancer Researcher And Institute Head

By WOLFGANG SAXON

Dr. Helene Wallace Toolan, a cancer researcher, died on Sunday at Southwestern Vermont Hospital Center in Bennington. She was 80 years old and lived in Old Bennington, Vt.

She died of congestive heart failure after a long illness, her family said.

Dr. Toolan, a native of Chicago, graduated with honors from the University of Chicago at the ageof 17 and received a Ph.D. in pathology from Cornell Medical Center. She was on the staff of the Sloan-Kettering Institute for Cancer Research in New York from 1950 until 1964.

Dr. Toolan did basic research on the transplantation of human tumors and tissues into laboratory animals. In 1955 she received the Sloan Award for her work.

Linked Cancers to Virus

She also studied the relationship between viruses and human cancer cells, leading a team of researchers that succeeded in linking viruses to eight types of human cancer in 1960. Previously only leukemia, a cancer affecting the blood, had been linked to a virus.

In 1964 Dr. Toolan moved to Bennington to direct the newly established Putnam Memorial Institute for Medical Research. In 1987 the institute was renamed the Helene W. Toolan Institute for Medical Research. She became director emeritus and senior scientist of the institute in 1978 and director emeritus and trustee in 1985.

Dr. Toolan was also an avid gardener, horticulturist and ornithologist, and participated in a project to beautify downtown Bennington in the early 1970's. The Garden Club of America gave her its Horticulural Award in 1982.

Her first husband, Dr. Edward Wallace, died in 1943. She later married Dr. James M. Toolan, who survives her. Also surviving are two sons, Robin Wallace of Gainesville, Fla., and Alan Wallace of Las Vegas, Nev.; four grandchildren, and two great-grandchildren.

NY Times, Obituary, Dec. 3, 1992

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PhD in 1946 (age 34, 17 years after undergrad)

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Assistant professor 1953
7 years after PhD
Academic scientist ("asst. prof")

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NY Times, Obituary, Dec. 3, 1992

- Example: Dr. Giuliana C. Tesoro
  - Born in Venice 1921
  - Jewish, not allowed to attend University in Italy under Fascist Racial Laws
  - Moved to Switzerland first and to US in 1939
  - Yale PhD in organic chemistry in 1943
- Married Victor Tesoro in 1943
  - Following her marriage, Tesoro worked part-time in summer job for Calco Chemical Company 43-44
  - Took a job as research chemist with Onyx Oil 1944
  - Promoted to Head of Organic Synthesis Dept. 1946
- 2 children by 1956
- 89 US patents
  - Including patent for flame-retardant fiber

Year of marriage & number of children

TESORO, DR. GIULIANA C, 278 Clinton Ave, Dobbs Ferry, N. Y.
ORGANIC CHEMISTRY. Venice, Italy, June 1, 21, nat. 46; m. 43; c. 2. Ph.D.(org. chem), Yale, 43. Research chemist, Calco Chem. Co, N. J, 43-44; ONYX OIL & CHEM. CO, 44-46, HEAD ORG. SYNTHESIS DEPT, 46- Chem. Soc; N. Y. Acad. Synthesis of pharmaceuticals, textile chemicals, germicides and insecticides; synthesis and rearrangement of glycols in the hydrogenated naphthalene series.

Who was a female scientist?

This sounds more trivial than it is. We compared 4 different ways

- Manual assignment
  - Data typists assign gender based on their perception of gender
  - Problem: Based on perception of names today
- Algorithm using frequencies of male and female names in US census 1940
  - Uses historical perception of names in 1940
  - Assign gender based on % female in census of 1940
- Attendance at women's college
  - Built a list of women's colleges, w dates when they admitted men
- US Social Security Administration data, 1880-2011
  - Frequencies of male and female first names
  - Python module "gender-detector"

Use patents to measure productivity

- Systematic measure for changes in productivity over time
- Match scientists with patents
  - Match using first, middle, and last names
    - Levenstein distance measure, allowing 1 letter to be different
  - Use age to reduce false positives
    - Patent applications when the scientists was a kid (0-18 years)
  - Best match quality in the physical sciences
    - Physical, biological, and social sciences
  - Frequent names get many false positives
    - Drop the top 20 percent of frequent names
- Propensity to patent varies across fields (Moser 2012)
  - Solution: Control for fields

Women in Science

- Historical background
- Data
  - Biographies of American scientists in 1956
  - Matched with patents
- Differences in productivity
  - Differences in productivity by gender and parenting status
  - Age-varying effects
  - Event studies of marriage
- Differences in the rate and speed of promotion
  - From undergraduate to PhD
  - From PhD to assistant professor
  - From assistant professor to tenure
- Selection
  - Into marriage and parenting
  - Into research fields
  - Into survival
- Aggregate effects on participation
  - A lost generation of baby boom mothers
- Conclusions and Next Step

Women patent 67% less compared with men (-5.9/8.8)

Mothers patent 77% less compared with fathers (-5.9-0.9/8.8)

Mothers patent 9% *more* than other women (1.8-0.9/8.8)

TABLE 2 – EFFECTS OF PARENTING ON THE PRODUCTIVITY OF MALE AND FEMALE SCIENTISTS, US PATENTS 1930-70

	Patents per 100 scientists per year				
	(1)	(2)	(3)	(4)	(5)
Female	-5.870***	-5.627***	-5.245***	-4.108***	-3.730***
	(0.173)	(0.174)	(0.156)	(0.068)	(0.061)
Parent	1.772***	1.898***	1.675***	1.606***	1.495***
	(0.135)	(0.138)	(0.125)	(0.068)	(0.062)
Female*Parent	-0.912**	-1.090***	-1.293***	-1.548***	-1.614***
	(0.389)	(0.391)	(0.366)	(0.123)	(0.114)
Year FE	Yes	Yes	Yes	Yes	Yes
Birth year FE	Yes	No	Yes	Yes	Yes
Age FE	No	Yes	No	No	No
Field FE	Yes	Yes	Yes	No	No
Disciplines	Physical sciences	Physical sciences	Physical sciences	All	All
Scientists' age	18-65	18-65	18-80	18-65	18-80
N (scientists x years)	1,204,592	1,204,592	1,298,053	2,391,179	2,591,524
Pre-baby boom mean	8.811	8.811	8.752	4.606	4.579

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This may be due to selection, if only exceptionally productive mothers "survive"

- We examine selection using faculty directories in 1940s matched with census in 1940 (to identify mothers) and with MoS (1956) to identify survivors

The first child carries the largest productivity penalty for mothers

(consistent with Danish registry data on earnings today, Klevens, Landais, Soogard 2019)

TABLE A2 – EFFECTS OF HAVING MORE CHILDREN ON THE PRODUCTIVITY OF MALE AND FEMALE SCIENTISTS

	Patents per 100 scientists per year				
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1 Child	1.669***	1.822***	1.558***	1.624***	1.494***
	(0.185)	(0.186)	(0.171)	(0.098)	(0.090)
2 Children	1.838***	1.950***	1.717***	1.687***	1.565***
	(0.160)	(0.165)	(0.149)	(0.082)	(0.076)
3+ Children	1.781***	1.886***	1.712***	1.496***	1.410***
	(0.168)	(0.166)	(0.157)	(0.085)	(0.079)
Female*1 Child	-2.284***	-2.589***	-2.664***	-1.724***	-1.758***
	(0.374)	(0.386)	(0.347)	(0.132)	(0.122)
Female*2 Children	0.535	0.490	0.127	-1.267***	-1.319***
	(0.763)	(0.761)	(0.730)	(0.232)	(0.218)
Female*3+ Children	-1.316***	-1.582***	-1.539***	-1.902***	-2.027***
	(0.331)	(0.349)	(0.306)	(0.107)	(0.010)
Year FE	Yes	Yes	Yes	Yes	Yes
Birth Year FE	Yes	No	Yes	Yes	Yes
Age FE	No	Yes	No	No	No
Field FE	Yes	Yes	Yes	No	No
Disciplines	Physical sciences	Physical sciences	Physical sciences	All	All
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For men, productivity increases with each child

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2 Children	1.838***	1.950***	1.717***	1.687***	1.565***
	(0.160)	(0.165)	(0.149)	(0.082)	(0.076)
3+ Children	1.781***	1.886***	1.712***	1.496***	1.410***
	(0.168)	(0.166)	(0.157)	(0.085)	(0.079)
Female*1 Child	-2.284***	-2.589***	-2.664***	-1.724***	-1.758***
	(0.374)	(0.386)	(0.347)	(0.132)	(0.122)
Female*2 Children	0.535	0.490	0.127	-1.267***	-1.319***
	(0.763)	(0.761)	(0.730)	(0.232)	(0.218)
Female*3+ Children	-1.316***	-1.582***	-1.539***	-1.902***	-2.027***
	(0.331)	(0.349)	(0.306)	(0.107)	(0.010)
Year FE	Yes	Yes	Yes	Yes	Yes
Birth Year FE	Yes	No	Yes	Yes	Yes
Age FE	No	Yes	No	No	No
Field FE	Yes	Yes	Yes	No	No
Disciplines	Physical sciences	Physical sciences	Physical sciences	All	All
Scientists' age	18-65	18-65	18-80	18-65	18-80
N (scientists x years)	1,204,592	1,204,592	1,298,053	2,391,179	2,591,524
Pre-baby boom mean	8.811	8.811	8.752	4.606	4.579

Women in Science

- Historical background
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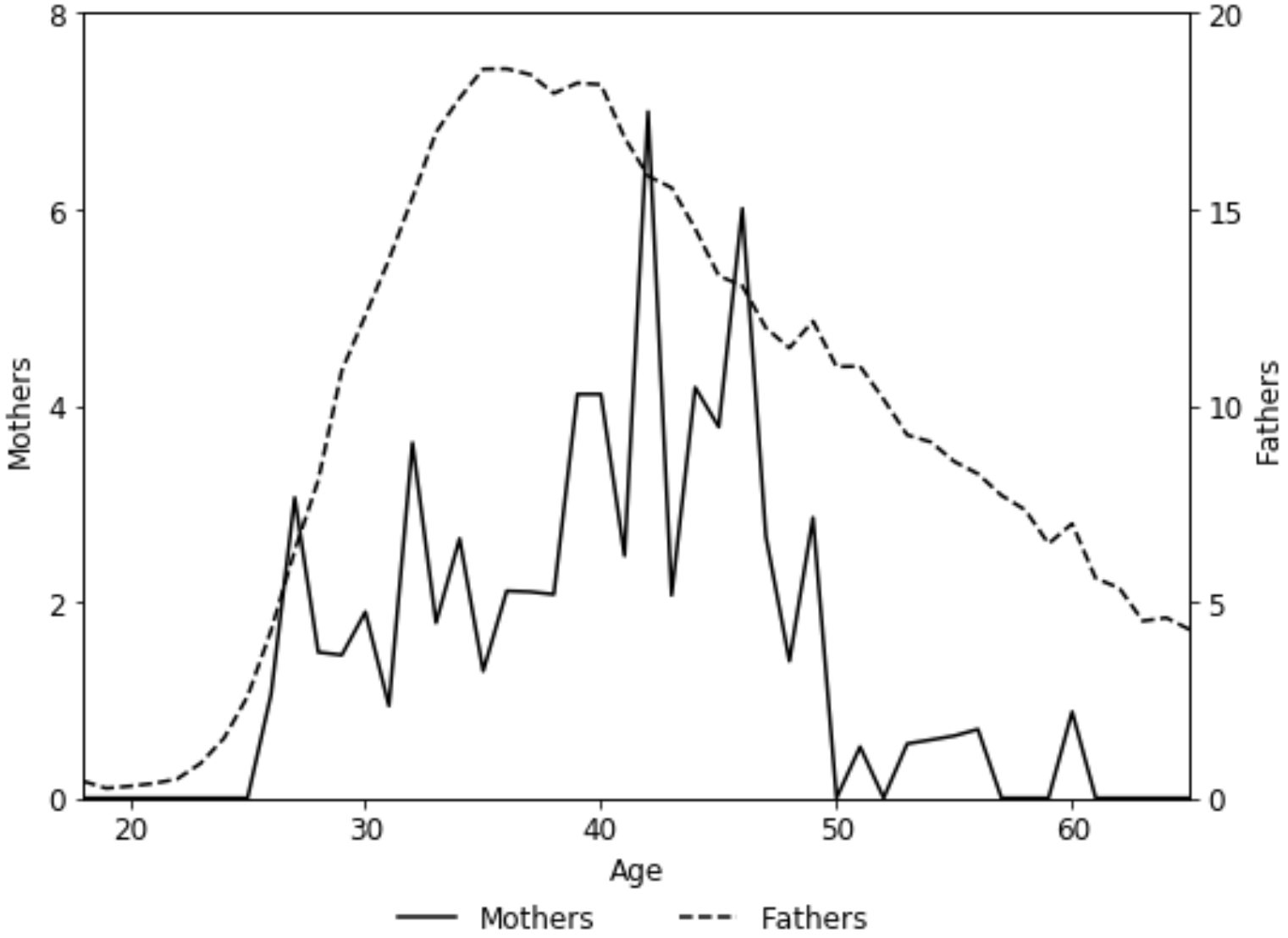
- Differences in productivity
  - Differences in productivity by gender and parenting status
  - Age-varying effects
  - Event studies of marriage
- Differences in the rate and speed of promotion
  - From undergraduate to PhD
  - From PhD to assistant professor
  - From assistant professor to tenure
- Selection
  - Into marriage and parenting
  - Into research fields
  - Into survival
- Aggregate effects on participation
  - A lost generation of baby boom mothers
- Conclusions and Next Step

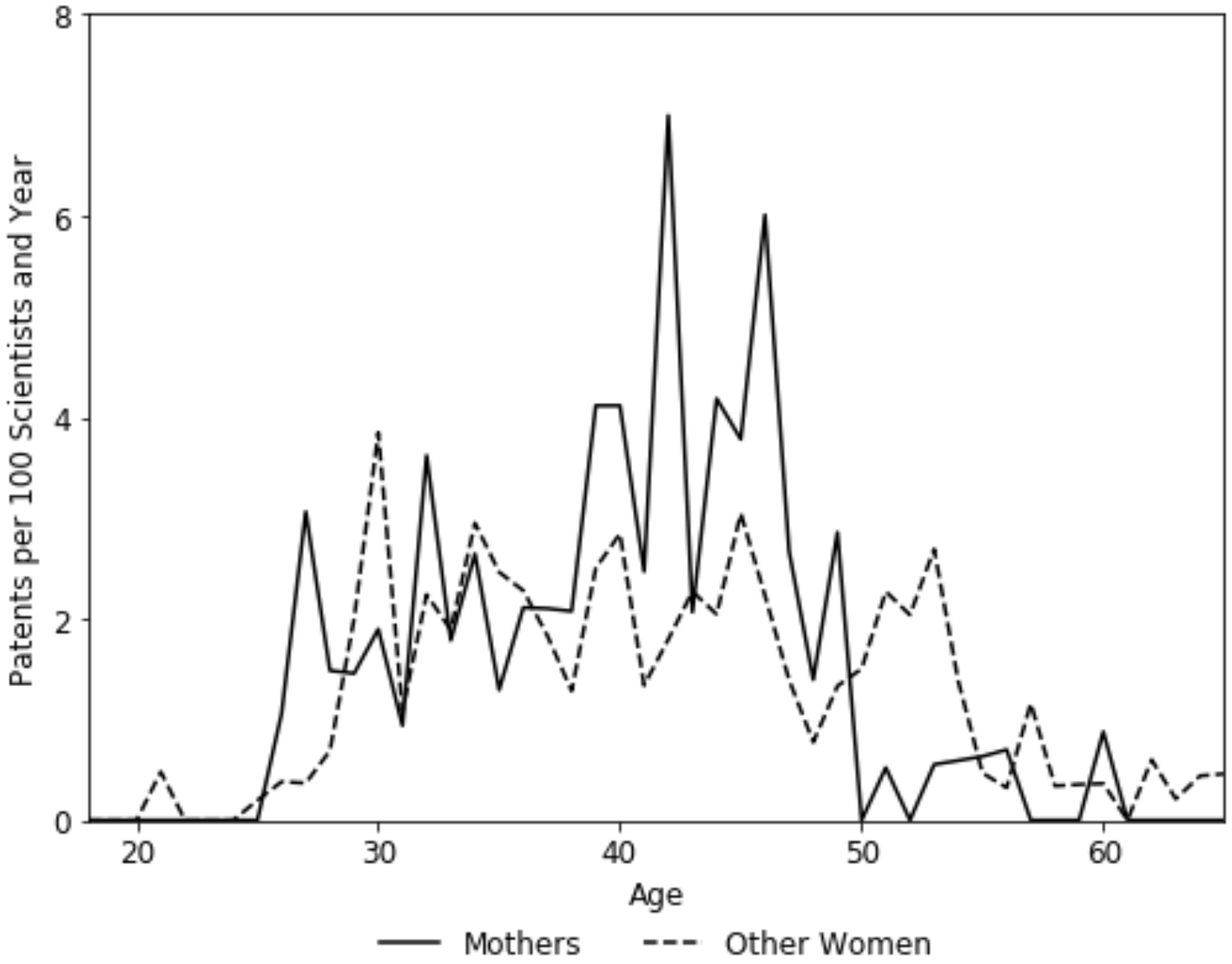
Mother's productivity peaks much later than fathers

Figure A2, Panel A: Mothers vs Fathers



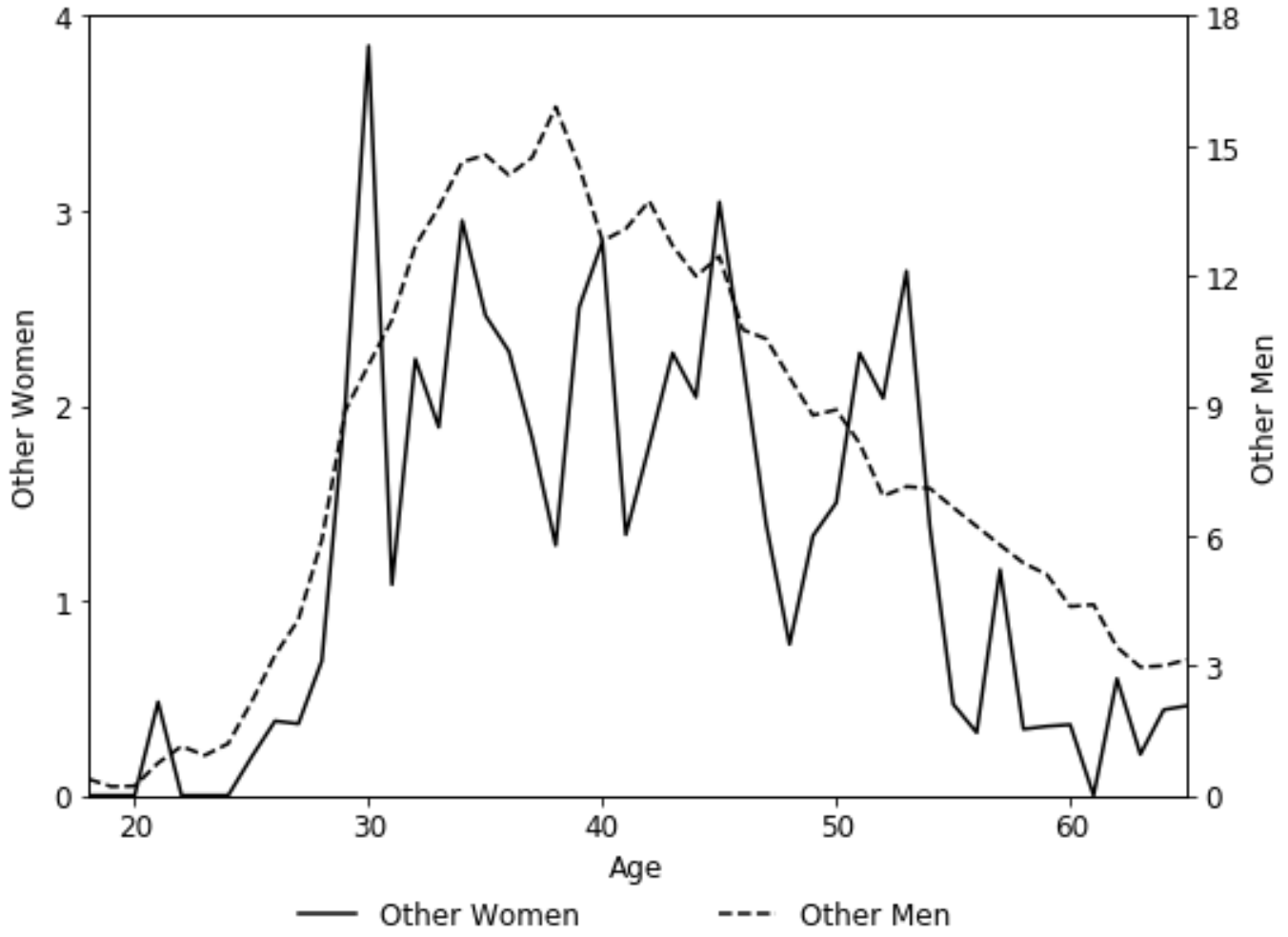
Mothers became more productive than other women after age 38

Figure A2, Panel C: Mothers vs Other Women



Distributions across age similar for men and women w/o kids

Figure A2, Panel B: Male vs. Female Scientists w/o Children



Differential changes in productivity across the life cycle by gender and parenting status

Estimate OLS separately for demographic groups *d:* mothers, fathers, women w/o kids, men w/o kids

$$y_{ia}^{d} = \beta_{a}^{d} Age_i + \delta_t + \pi_y + \mu_f + \epsilon_{it}$$

y_{ia}^{d}	patents by scientists i of demographic *d* at age *a*
δ_t	year fixed effects
π_y	birth year fixed effects
μ_f	field fixed effects
	20 is excluded age group

Mothers become more productive after age 35

Figure 2: Age-Varying Effects of Parenting and Gender on Patenting

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Event study to investigate impact of marriage/parenting

- Understand impact of parenting on gender inequality in science
  - Ideal experiment would randomize fertility
- Event study of marriage (first child)
  - While choice to have children is not exogenous, event of marriage (first child) generates sharp change in productivity
  - Arguably orthogonal to unobserved determinants of productivity that evolve more smoothly over time
  - Trace out long-run trajectory of productivity after marriage
- Today, event study of marriage
  - MoS (56) lists year of marriage but not first child
  - In a few weeks: Add event study of first child
  - Requires hand-matching women in matching MoS (1956) with census records

Differential changes in productivity across the life cycle of scientists

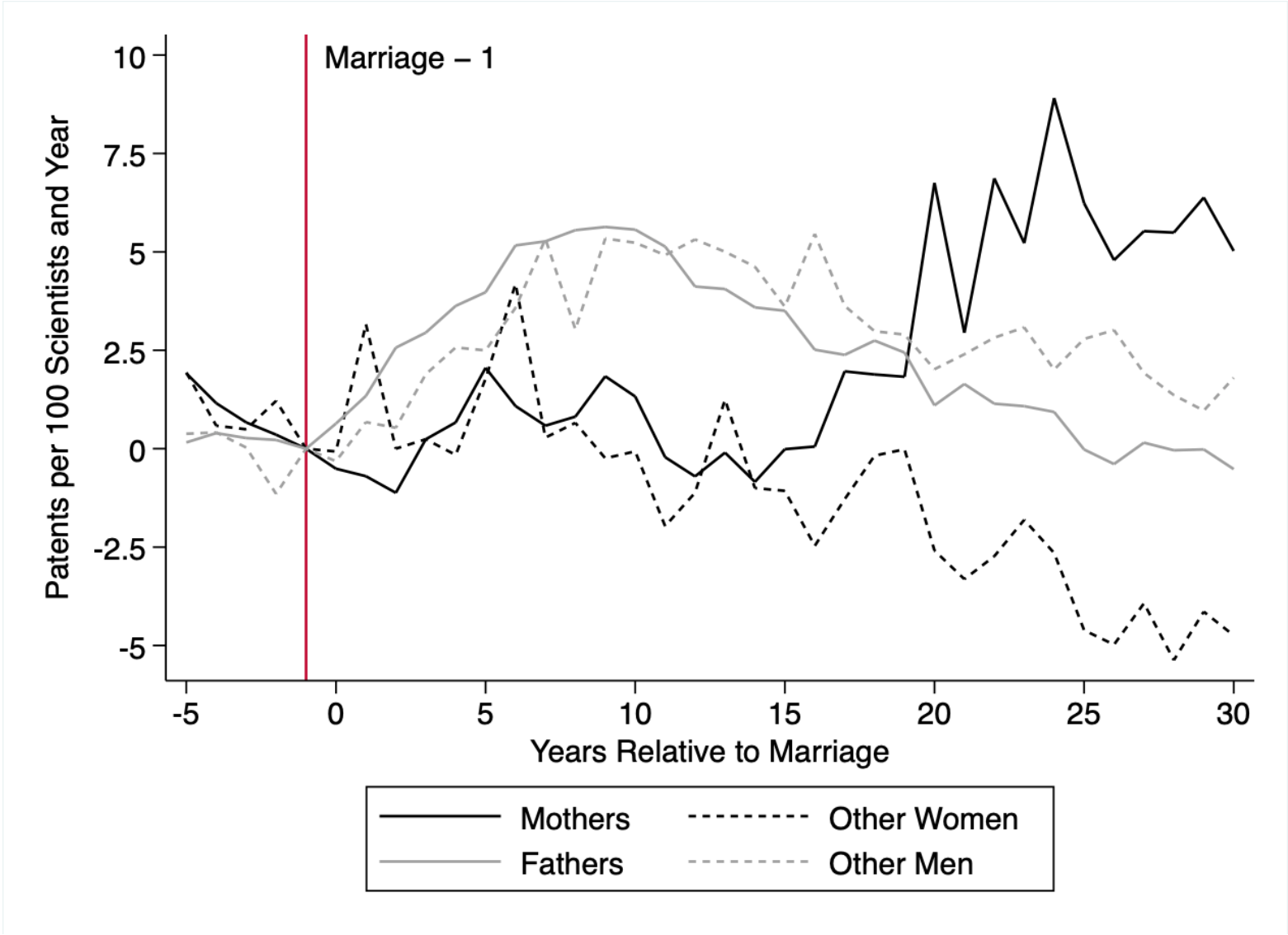
Estimate differential changes in productivity after marriage for mothers, fathers, women without kids, and men without kids

$$y_{iy}^{d} = \beta_{y}^{d} EventTime_i + \delta_t + \alpha_a + \mu_f + \epsilon_{it}$$

y_{iy}^{d}	patents by scientists i in demographic d and year y after marriage
δ_t	year fixed effects
π_y	birth year fixed effects
μ_f	field fixed effects
	Marriage -1 is excluded period

Mothers' productivity increases dramatically 15 years after year of marriage

Figure 3: Event Study Estimates of Changes in Patenting After Marriage



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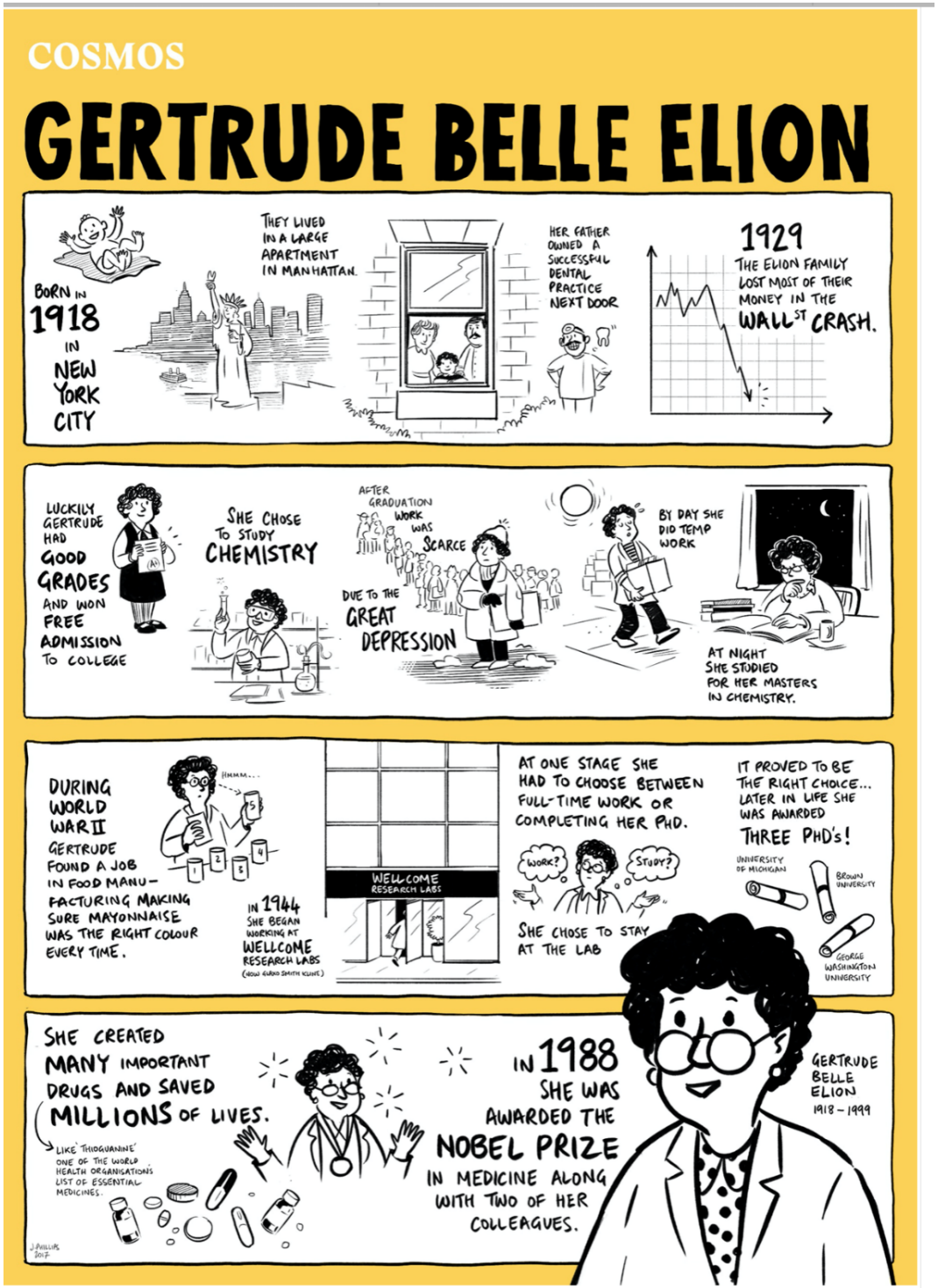

Many examples of exceptional women leaving academic science

Gertrude Belle Elion, Nobel 1988

Gertrude Elion as student at Hunter College, which she attended from 1933 to 1937 (Courtesy of Gertrude B. Elion Foundation)

Women may have less incentive to invest in human capital that is valued by labor market, such as PhD

- If women expect to spend less time in the labor market, they may have less of an incentive to invest in skills that are valued in the labor market
- Expectations of discrimination may further reduce incentive to invest

=> Female scientists should be less likely to have a PhD

- Or, in the presence of labor-market discrimination, women have to be more qualified to get the same jobs

=> Female scientists more likely to have a PhD

Formal and informal barriers made it difficult for women to earn PhDs

- Example, Joan Steitz, “Queen of RNA”
  - Interaction of the ribosome and messenger RNA, via complementary base pairing
  - Discovery of small nuclear ribonuclearproteins (snRNPs) whose function is essential to RNA transcription
  - Diagnosis and treatment of lupus
- At Harvard in the 1960s turned down by professor she asked to be her advisor: “but you are a woman, and you’ll get married, and you’ll have kids, and what good will a PhD have done?”
- Married classmate Tom Steitz, 1 child
  - 2009 Nobel Prize in Chemistry (w Venkatraman Ramakrishnan and Ada Yonath) "for studies of the structure and function of the ribosome”

Female academic scientists were *more* likely to have PhD

TABLE 3 – COMPARISON OF MEANS FOR WOMEN AND MEN IN ACADEMIA

			Women		Men	
	Women	Men	with children	w/o children	with children	w/o children
N	4,032	66,198	892	3,140	48,987	17,211
Share academic	87.7%	74.6%	84.5%	88.6%	73.8%	77.1%
Share PhD	84.1%	77.5%	83.2%	84.4%	76.6%	79.8%
Share assist. prof.	42.7%	45.5%	35.9%	44.6%	45.4%	45.9%
Share tenured	41.7%	47.7%	26.8%	45.7%	47.8%	47.2%

84% of female academic scientists had PhD

78% of male academic scientists had PhD

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Many accomplished women “fell off” the tenure track

- Example, Dr. Esther Lederberg
- Microbiology and genetics
- Discovery of lambda phage in 1951
  - Temperate virus that infects E. coli bacteria, and lives for some side inside a cell
  - Model for animal viruses that have similar life cycles, including tumor and herpes viruses
  - Widely used tool for studying genetic recombination and gene regulation
- Collaborated with husband, Joshua Lederberg
  - Developed a technique of replica plating in 1952, still widely used in genetics labs
  - Joshua won the 1958 Nobel Prize for Physiology or Medicine for discoveries on how bacteria mate
- In 1959, Esther became a research associate at Stanford’s School of Medicine
  - Joshua became the chair of the Department of genetics

LEDERBERG, DR. ESTHER M(ARILYN), Dept. of Genetics, University of Wisconsin, Madison 6, Wis. GENETICS. New York, N.Y, Dec. 18, 22; m. 46. A.B, Hunter Col, 42; M.A, Stanford, 46; U.S. Pub. Health Serv. fellow, 47-49; fellow, Wisconsin, 49-50; Ph.D,(genetics), 50. PROJ. ASSOC. GENETICS, WISCONSIN, 50- A.A; Genetics Soc; Soc. Gen. Microbiol. Gt. Britain. Genetics of microorganisms; lysogenicity; bacterial recombination.

LEDERBERG, PROF. JOSHUA, Dept. of Genetics, University of Wisconsin, Madison 6, Wis. BIOLOGY. N.J, May 23, 25. B.A, Columbia Col, 44; Ph.D. (microbiol), Yale, 47. Asst. prof. GENETICS, WISCONSIN, 47-50, assoc. prof, 50-54, PROF, 54- U.S.N.R, 43-45. Genetics.

36% of mothers became assistant professors compared with 45% of fathers and other women

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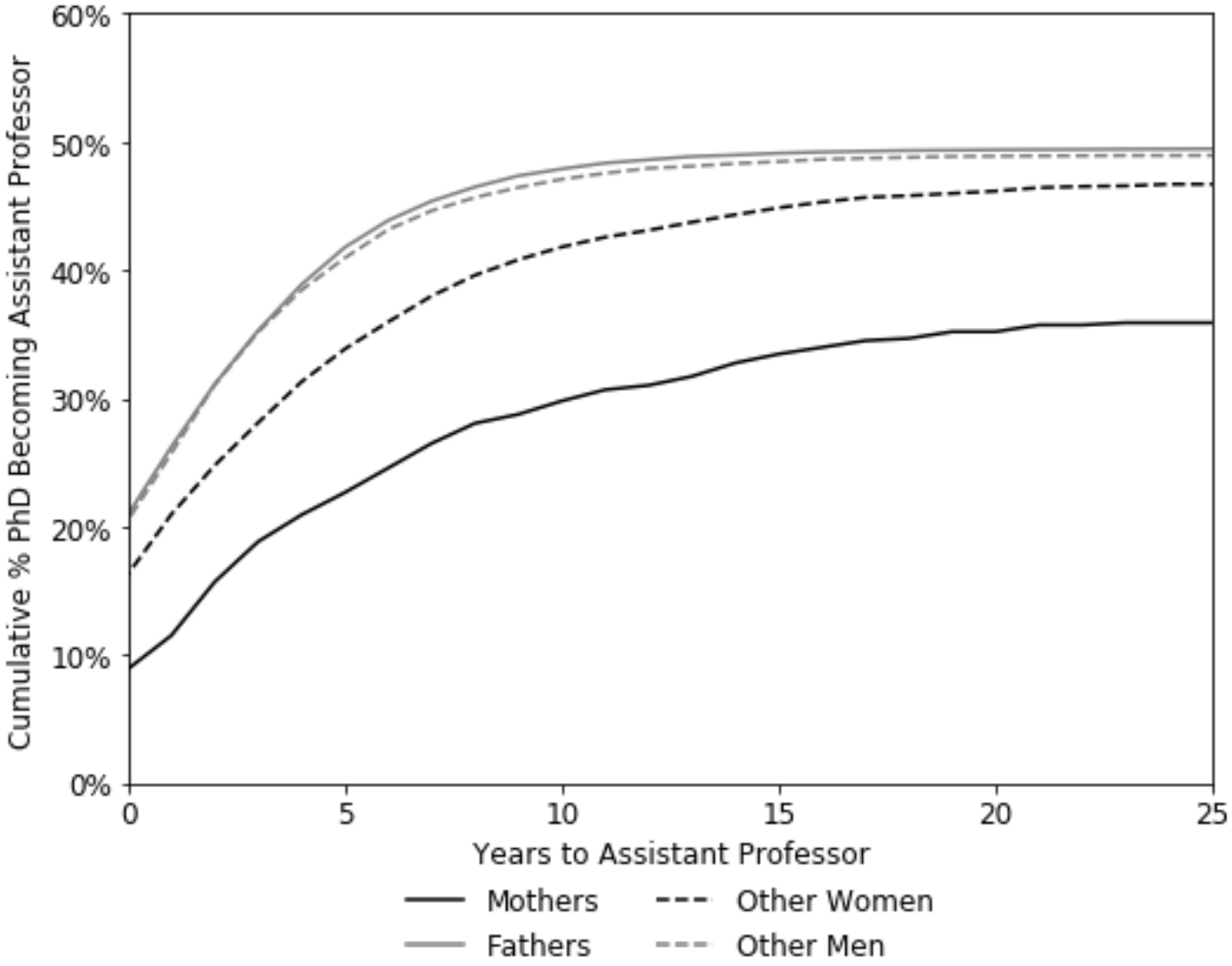
Share assist. prof.	42.7%	45.5%	35.9%	44.6%	45.4%	45.9%
Share tenured	41.7%	47.7%	26.8%	45.7%	47.8%	47.2%

Mothers took 4.4 years to get first tenure track job compared with 1.3 for fathers and 2.8 for other women

Figure 4: Years from PhD to Assistant Professor



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  - Assistant professors
  - Tenure
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Mothers who were academic scientists were 21% less likely to get tenure than fathers, 19% less likely than other women

TABLE 3 – COMPARISON OF MEANS FOR WOMEN AND MEN IN ACADEMIA

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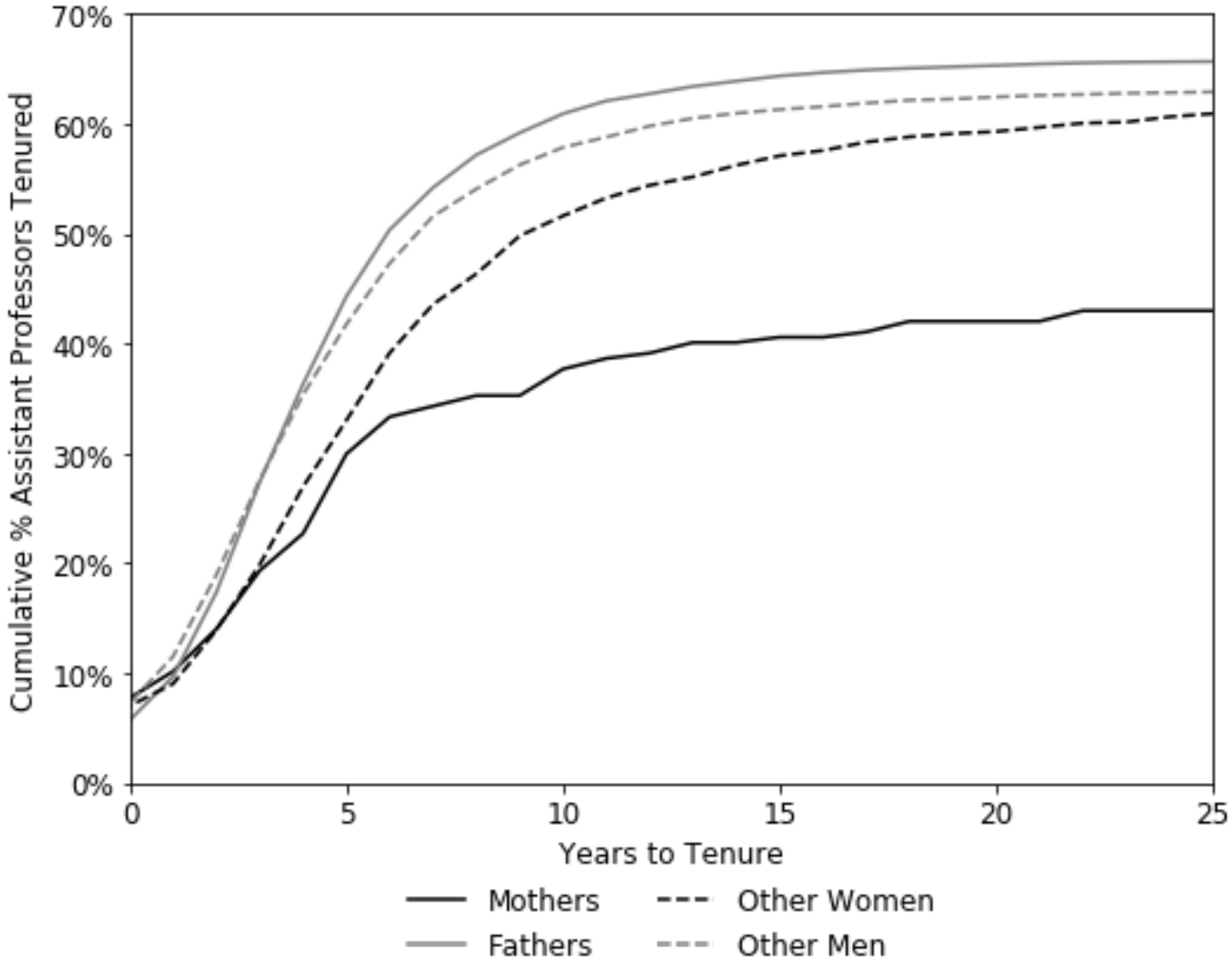
Share assist. prof.	42.7%	45.5%	35.9%	44.6%	45.4%	45.9%
Share tenured	41.7%	47.7%	26.8%	45.7%	47.8%	47.2%

27% of mothers got tenure

- 19% less than 46% of other women
- 21% less than 48% of fathers

Differences in timing of productivity had important implications for promotions

Figure 5: Years from PhD to Assistant Professor



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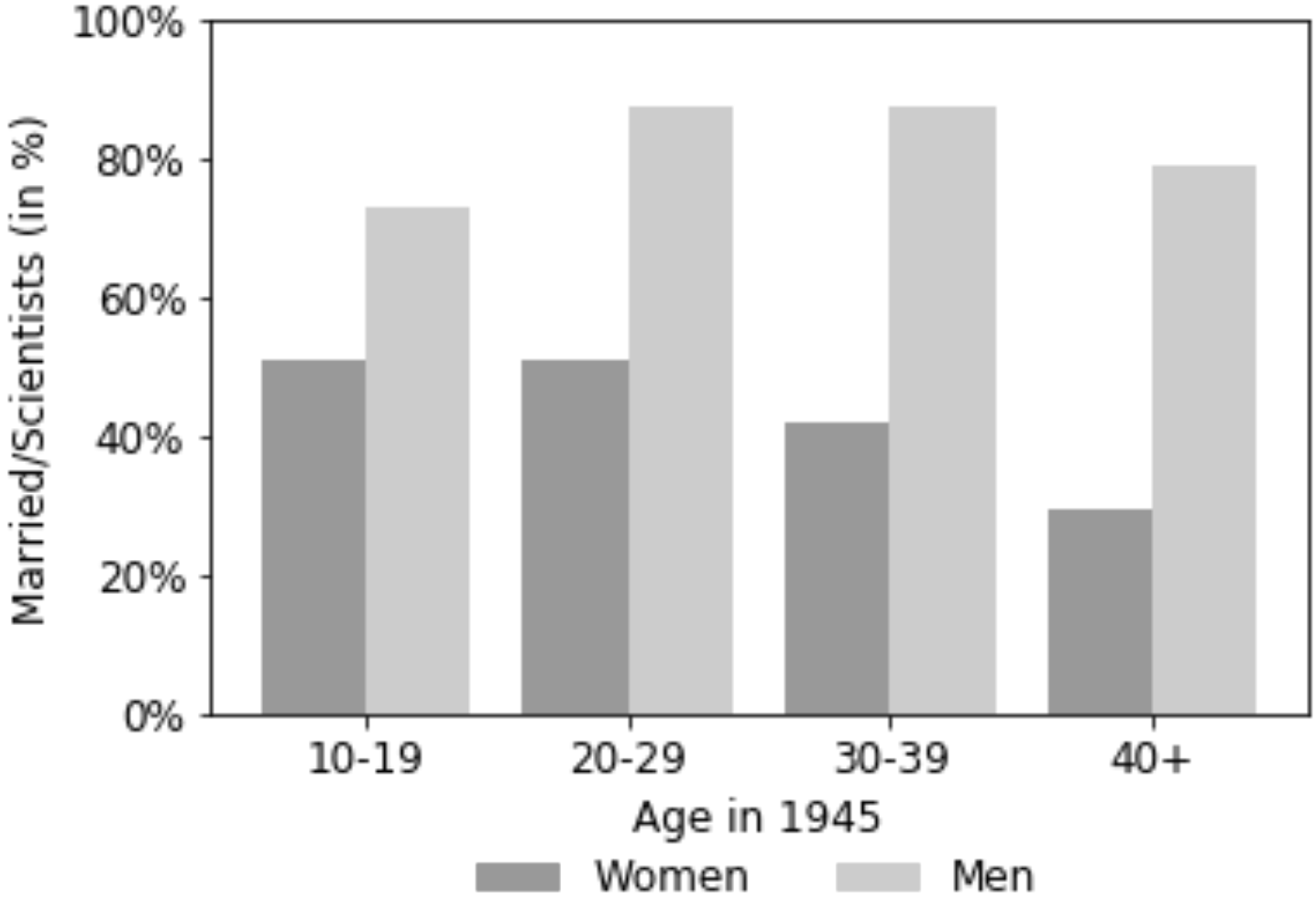
- Conclusions

Female scientists were less than half as likely to marry

40% of female scientists married, compared with 80% of men

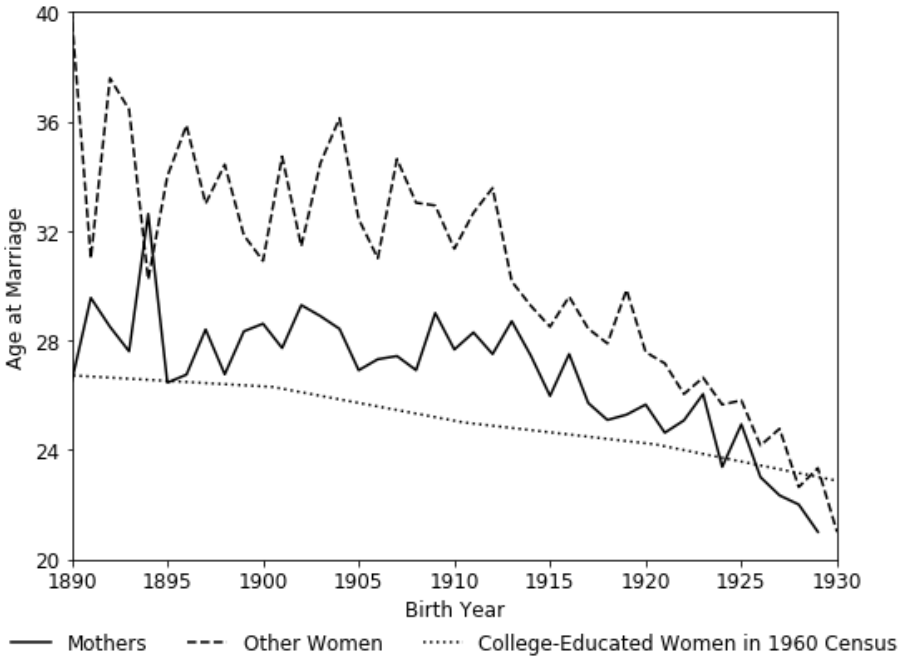
Figure 6, Panel B: Share of Married Scientists



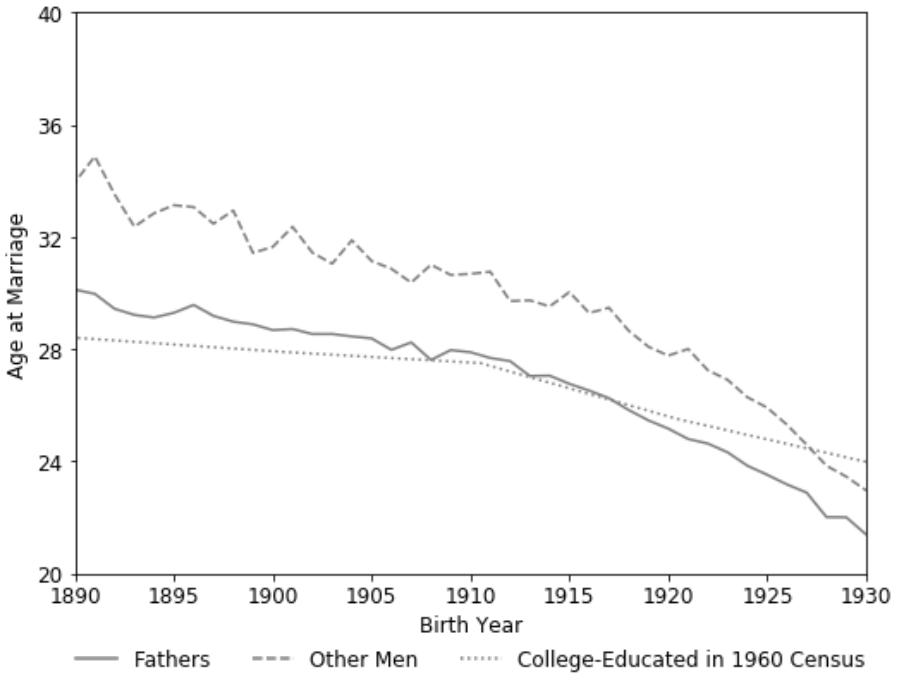
Female scientists married much later than population

Figure A6: Mean Age at Marriage by Birth Year

Women

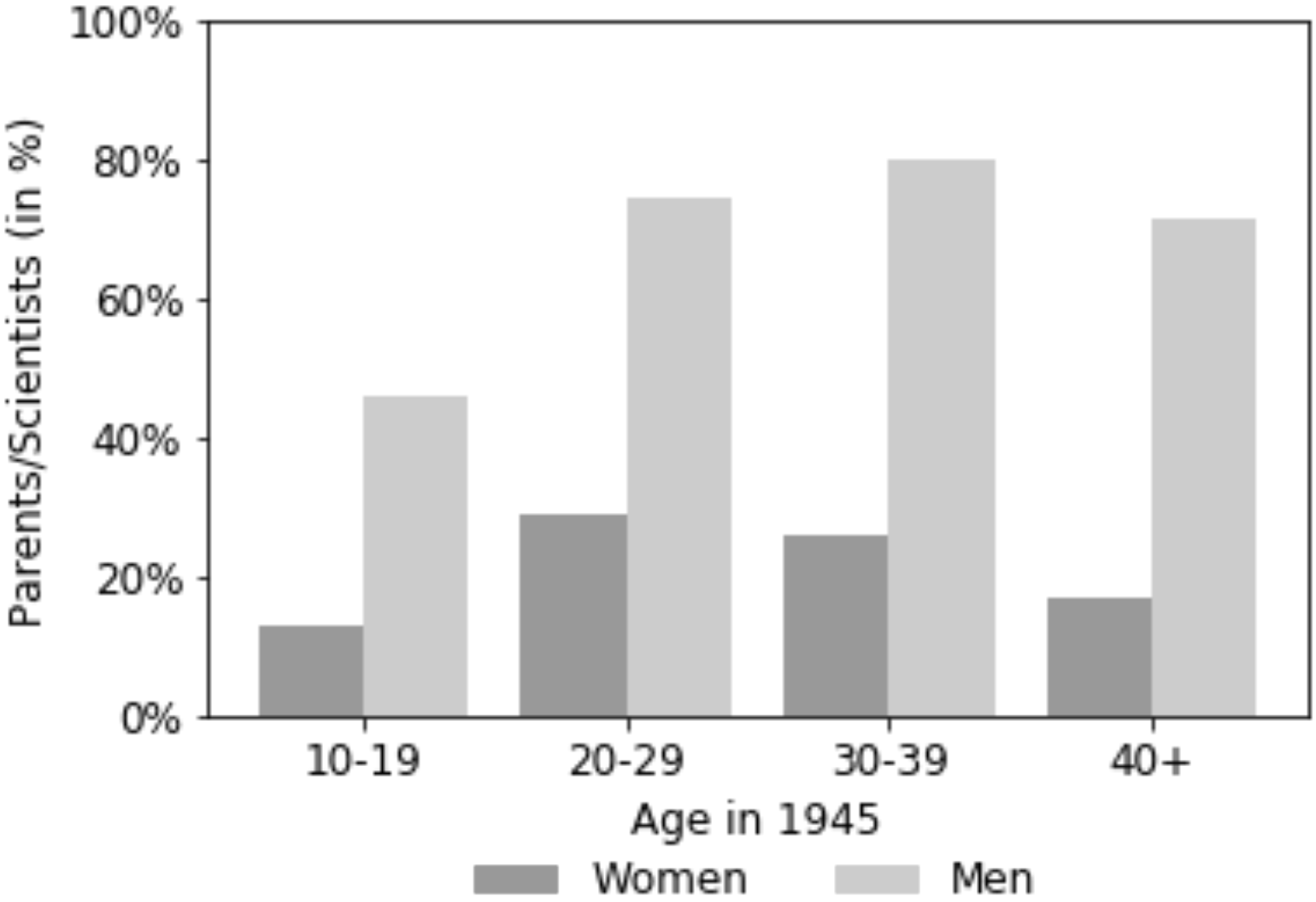


Men



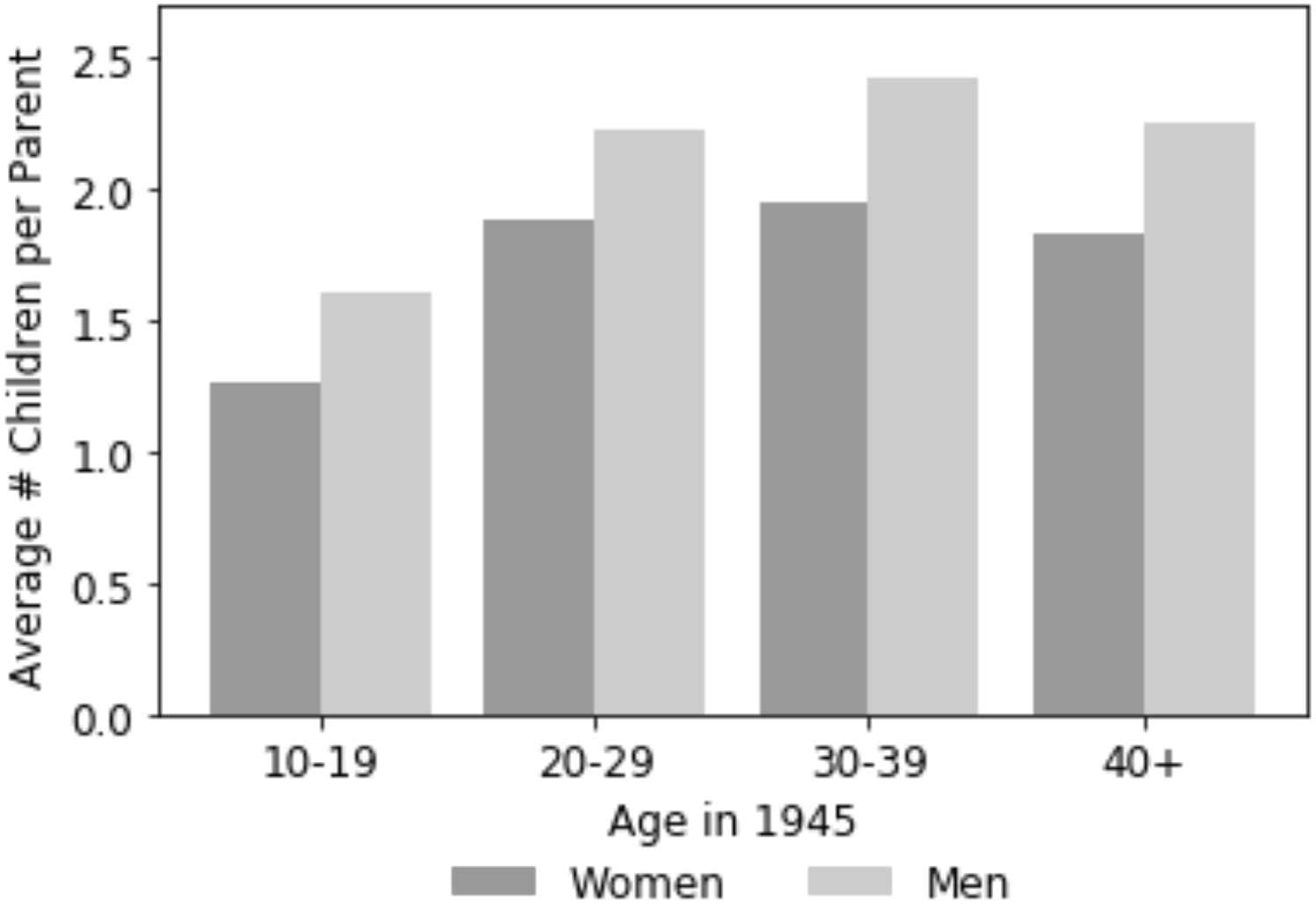
22% of female scientists had children, compared with 74% of men

Figure 6, Panel A: Share of Parents



Mothers had 1.9 children compared with 2.3 for fathers

Figure 6, Panel D: Number of Children per Parent



Mothers may have been positively or negatively selected
Less likely to have 1+ patents but more patents on average

TABLE 1 – COMPARISON OF MEANS FOR WOMEN AND MEN

	Women	Men	Women		Men	
			with children	w/o children	with children	w/o children
N	4,032	66,198	892	3,140	48,987	17,211
Share married	38.8%	84.2%	93.3%	23.4%	95.6%	51.9%
Age at marriage	28.8	27.6	27.1	30.8	27.2	29.8
	(6.55)	(5.21)	(5.01)	(7.48)	(4.78)	(6.60)
Share parents	22.1%	74.0%	-	-	-	-
N children	0.41	1.69	1.88	0.0	2.28	0.0
	(0.88)	(1.35)	(0.89)		(1.05)	
Share patentees	3.4%	22.3%	3.1%	3.5%	23.8%	18.3%
N patents	0.16	1.97	0.19	0.16	2.14	1.47
	(1.95)	(8.71)	(3.09)	(1.47)	(9.31)	(6.69)

3.1% of mothers had 1+ patent
- 3.5% of other women

Mothers had 19 patents/100 scientists
- 16 patents per 100 for other women

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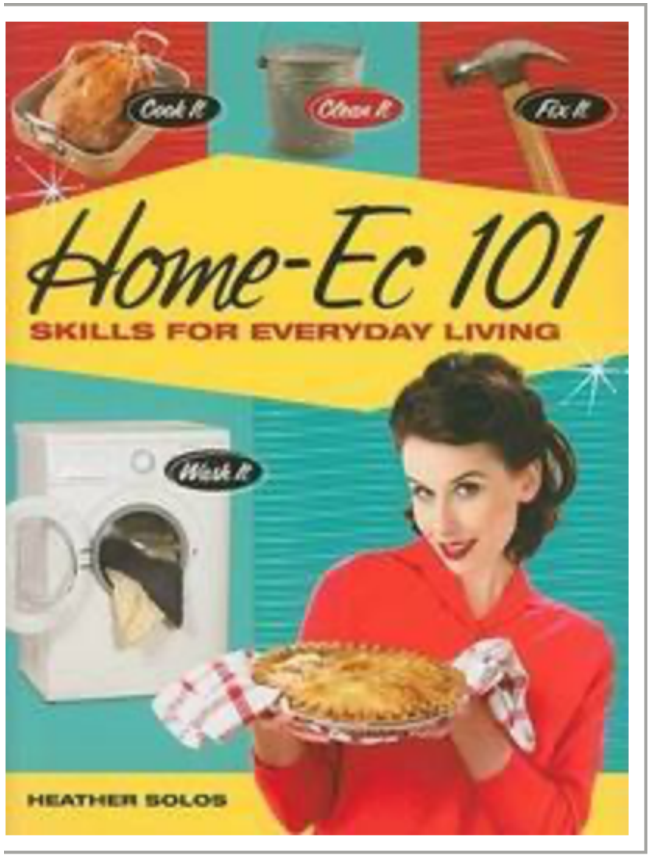
Selection into research fields

- Women may select into more family-friendly firms and occupations (e.g. Goldin 2004, Goldin and Katz 2016)

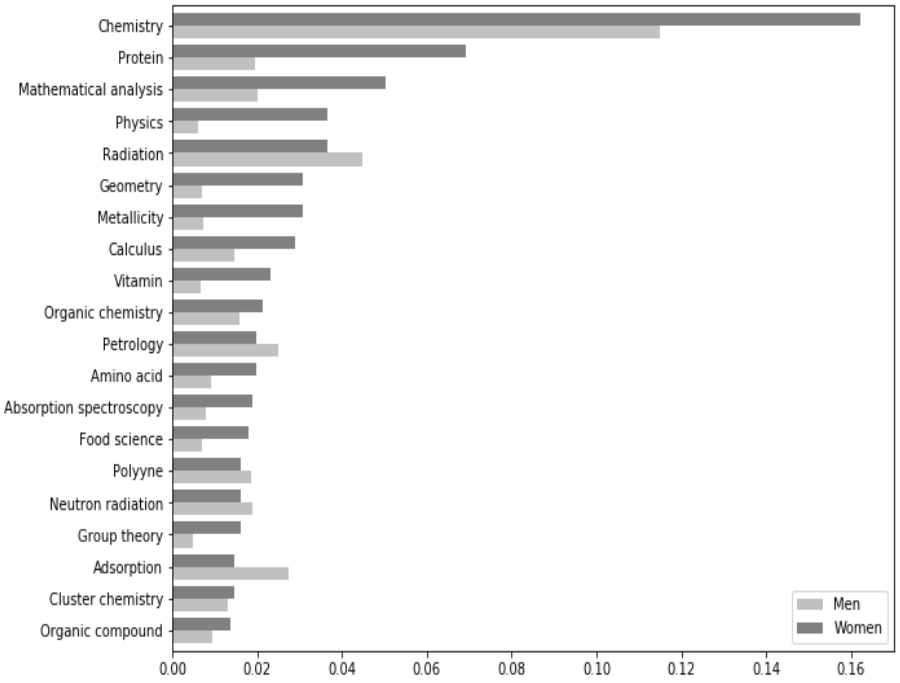
- Kevles, Daniel J (1978, 1995,) *The Physicists: The History of a Scientific Community in Modern America*
  - …professionally oriented women still aspired to the more "womanly" professions.
  - Classes in high-school chemistry, which could open the door to careers in such fields as home economics, nutrition, or nursing, enrolled almost as many girls as boys; in physics courses, boys outnumbered girls three to one



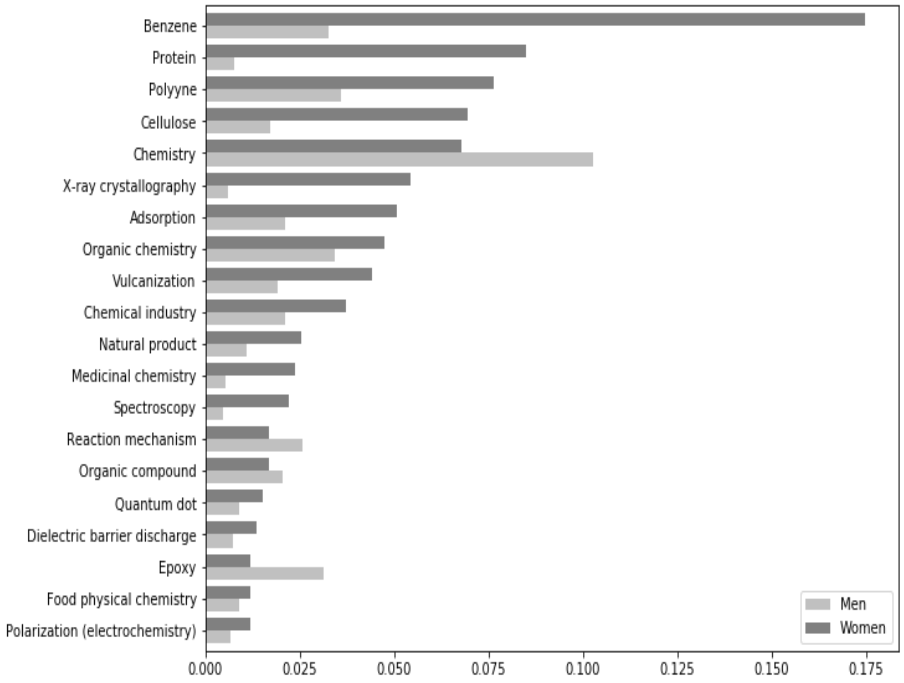
Women were more likely to do chemistry, protein (more patents), mathematical analysis and physics (fewer patents)

Use field FE to control for such variation

Share of scientists (in %)



Share of patents (in %)



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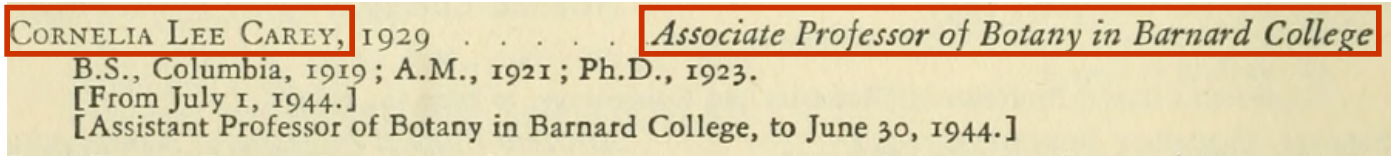
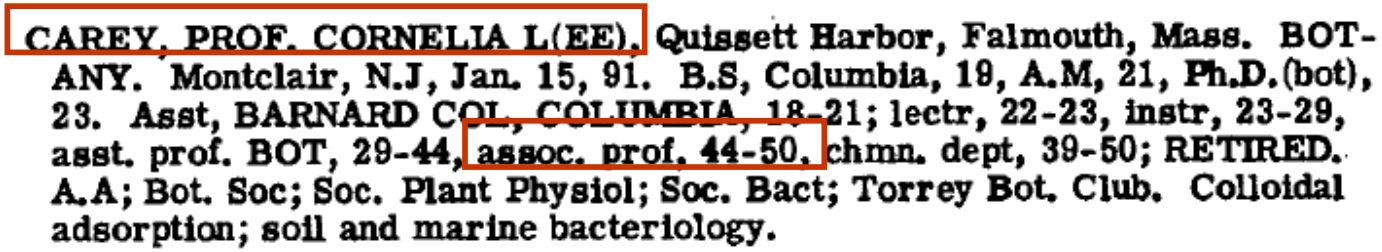
Selection into survival
Who survived to enter the MoS (1956)?

- We have digitized faculty directories of Columbia University for 1943-45


CORNELIA LEE CAREY, 1929 . . . . . *Associate Professor of Botany in Barnard College*
B.S., Columbia, 1919; A.M., 1921; Ph.D., 1923.
[From July 1, 1944.]
[Assistant Professor of Botany in Barnard College, to June 30, 1944.]

- And-matched faculty with academic scientists in MoS (1956)


CAREY, PROF. CORNELIA L(EE), Quissett Harbor, Falmouth, Mass. BOTANY. Montclair, N.J, Jan. 15, 91. B.S, Columbia, 19, A.M, 21, Ph.D.(bot), 23. Asst, BARNARD COL, COLUMBIA, 18-21; lectr, 22-23, instr, 23-29, asst. prof. BOT, 29-44, assoc. prof. 44-50, chmn. dept, 39-50; RETIRED. A.A; Bot. Soc; Soc. Plant Physiol; Soc. Bact; Torrey Bot. Club. Colloidal adsorption; soil and marine bacteriology.

- Were women less likely to survive?
- Were mothers or women in cohorts of baby boom mothers less likely to survive? Matching faculty directories with census of 1940 to add information on birth years and children

Female faculty were less likely to survive to enter MoS (1956)

Just 12% of female academic scientists from 1943-45 survived to enter MoS 1956, compared with 20% of men

TABLE 3 – COMPARISON OF MEANS FOR WOMEN AND MEN AT COLUMBIA IN 1943-1945

			Women		Men	
	Women	Men	with children	w/o children	with children	w/o children
Panel A – Faculty at Columbia in 1943-45						
N Columbia faculty 1943-5	387	1,735	-	-	-	-
Panel B – Surviving Columbia Faculty in MoS (56)						
N Columbia faculty in MoS 56	46	339	11	35	255	84
Share (in %)	11.9%	19.5%	-	-	-	-
Age in 1956	54.5	55.6	49.82	56.1	55.1	56.8
	(8.80)	(11.24)	(9.93)	(7.92)	(11.04)	(11.81)
Share married	39.1%	78.2%	90.9%	22.9%	89.4%	44.0%
Age at marriage	27.9	29.8	26.3	29.9	29.0	34.2
	(6.19)	(6.47)	(5.79)	(6.47)	(5.65)	(9.03)
N children	0.48	1.7	2.0	0.0	2.3	0.0
	(0.96)	(1.30)	(0.89)		(0.98)	

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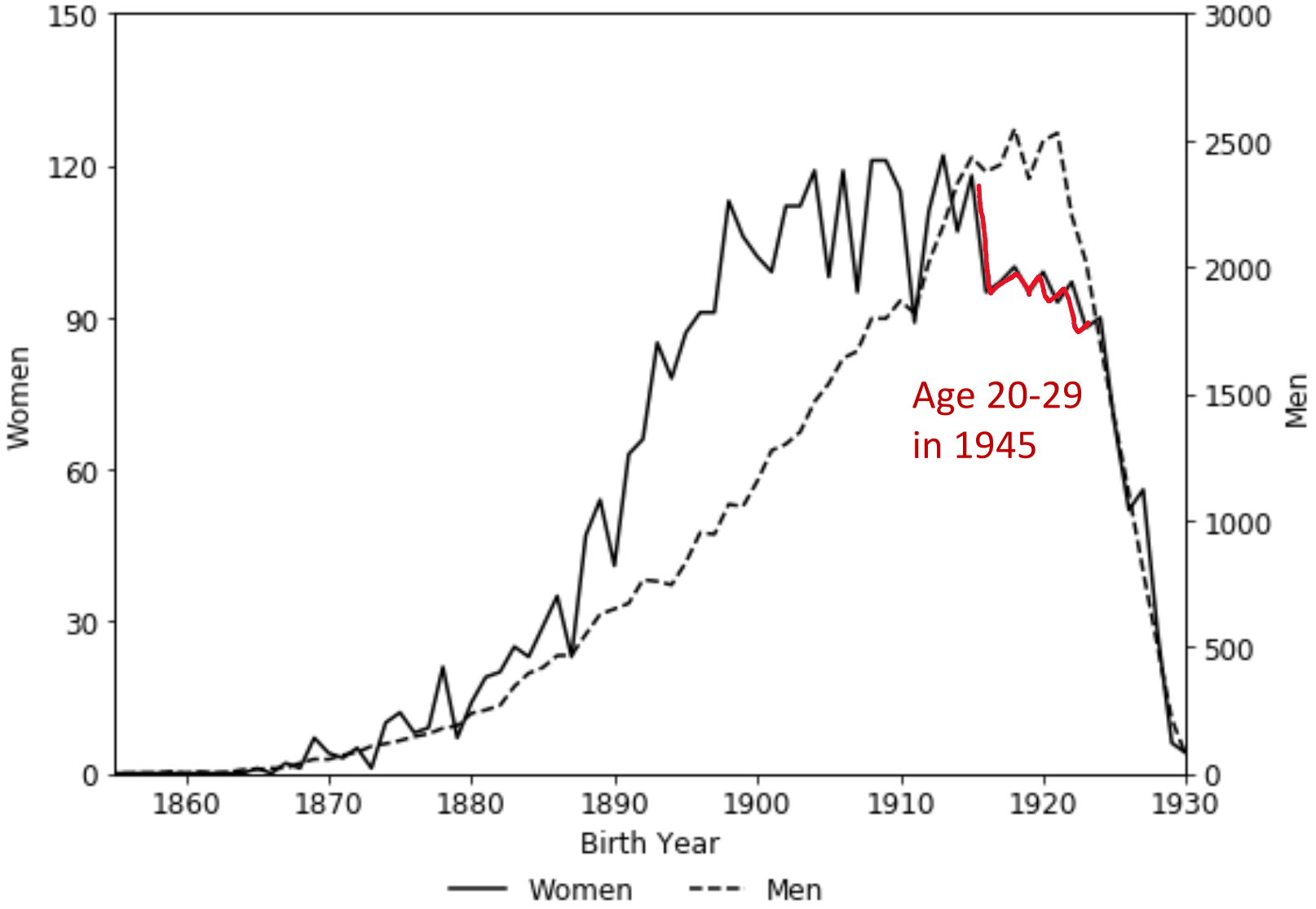
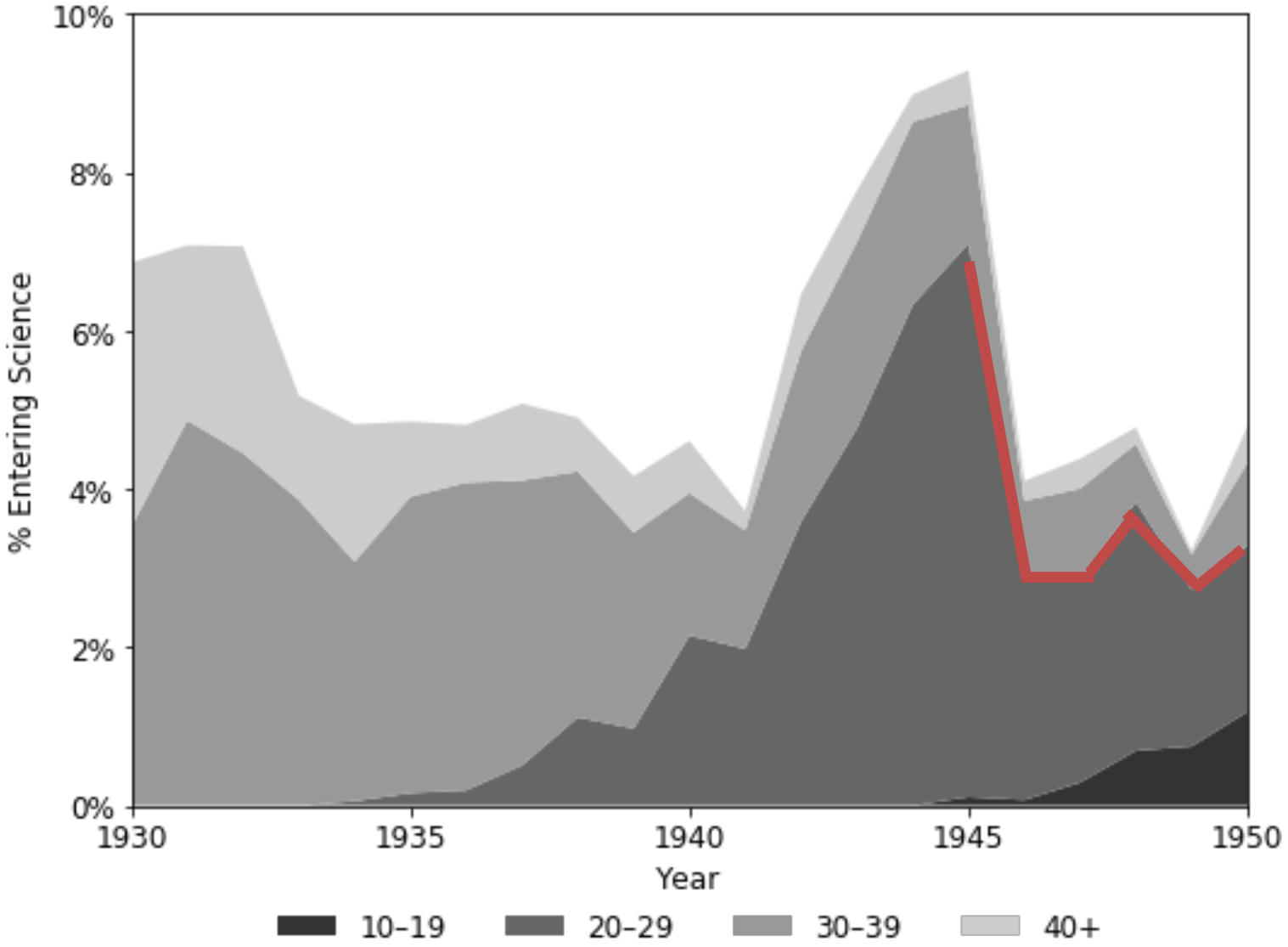
Participation by women declined by 16% from 110/year for women born 1900-15 to 92.3 for women born 1916-25

Figure 7 American Scientists in 1956 by Birth Year



Lost generation of baby boom mothers (b. 1916-25)

Share women among entrants into US science declined by 40% from 7% in 1940-45 to 4.3% per year in 1946-50



Conclusions

- Kids reduced productivity of mothers but not fathers
- Mothers have different time pattern of productivity than other scientists
  - Mothers became more productive after age 35
  - After marriage, mothers' productivity declined,recovered 15 years later
- Important implications for promotions
  - Mothers 21% less likely to get tenure compared with fathers
  - 19% less than other women
- Selection into marriage, parenting, and "survival" in science
  - Mothers were no less productive than other women
  - But female scientists married late and had fewer children
  - Women (mothers) were less likely to survive in science
- Dramatic decline in entry by women in their 20s in 1945
  - Disparate burden of parenting created a lost generation of female scientists among mothers of the baby boom