Affidavit #1 of Joseph Henrich
Sworn July 15th, 2010

No. S-097767
Vancouver Registry

IN THE SUPREME COURT OF BRITISH COLUMBIA

IN THE MATTER OF:

THE *CONSTITUTIONAL QUESTION ACT*, R.S.B.C. 1996, C.68

AND IN THE MATTER OF:

THE *CANADIAN CHARTER OF RIGHTS AND FREEDOMS*

AND IN THE MATTER OF:

A REFERENCE BY THE LIEUTENANT GOVERNOR IN COUNCIL SET OUT IN ORDER IN COUNCIL NO. 533 DATED OCTOBER 22, 2009 CONCERNING THE CONSTITUTIONALITY OF S. 293 OF THE CRIMINAL CODE OF CANADA, R.S.C. 1985, c. C-46

AFFIDAVIT

Ministry of Attorney General
Legal Services Branch
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Facsimile: 604 660-6797

CRAIG JONES
Barrister and Solicitor

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IN THE SUPREME COURT OF BRITISH COLUMBIA

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AFFIDAVIT

I, Joseph Henrich of Vancouver, British Columbia, MAKE OATH AND SAY AS FOLLOWS:

1. I hold a Tier 1 Canada Research Chair in Culture, Cognition and Evolution at the University of British Columbia, where I am co-director of the Centre for Human Evolution, Culture, and Cognition. I am a member of the departments of Economics and Psychology, and was also awarded tenure in Anthropology. I have published in leading journals in all three fields, as well as in biology.

2. Prior to my arrival at UBC in 2006 I was a faculty member at Emory University in the Department of Anthropology and in the University of Michigan's Department of Organizational Behavior. I was also a fellow at the Institute for Advance Study (*Wissenshaftskolleg*) in Berlin during 2001-2002.

3. My areas of specialization and interest include the study of the coevolution of human behaviour with cultural norms and social organization. I have received a number of awards for my interdisciplinary work, including from UBC (Killam, 2010), the Human Behavior and Evolution Society (Distinguished Scientific Contribution, 2009) and the President of the United States (Award for Early Career Scientists and Engineers, 2004).

4. My educational background includes two Bachelors' degrees from Notre Dame (B.A. in Anthropology and B.S. in Aerospace Engineering, both with high honors), and a Master's and Ph.D. in Anthropology from UCLA. My full CV is attached as **Exhibit "A"** to this Affidavit.

5. I was contacted in March of 2010 by Craig Jones of the British Columbia Ministry of Attorney General. Mr. Jones described the Reference case to me and asked if I would be interested in studying the question of polygamy and its purported harms and preparing a report. Mr. Jones emphasized to me, and I understand, that my duty in preparing the report and, if called upon, in testifying, is to assist the Court and not be an advocate for any party. Mr. Jones emphasized that I should follow the evidence where it leads and draw those conclusions I consider merited. He asked that if there were issues upon which scientific opinion diverged, I should note the dissenting views.

6. I have prepared a Report which is attached as **Exhibit "B"** to this Affidavit. It is based on extensive review of the available literature in science and the social sciences, conducted over a period of four months by myself and my research

assistant. I am solely responsible for its content.

7. Although the questions I address in my Report fit very well within my professional interdisciplinary expertise, I have never before written or published on polygamy. To the extent that I have formed any views on the social policy questions involved in this case, this has occurred as a consequence of the study and thought I have given to the matter since taking on this project in March.

SWORN BEFORE ME at the City of Vancouver, in the Province of British Columbia, this 15th day of July, 2010.

A Commissioner for taking Affidavits for British Columbia

Craig E Jones
Print Commissioner's name

Barrister & Solicitor
Title

(604) 660-5476
Phone Number

JOSEPH HENRICH

This is Exhibit " A " referred to in the
affidavit of JOSEPH HENRICH
sworn before me at VANCOUVER
in the Province of British Columbia this
15 Th day of JULY 20 10

A Commissioner for taking Affidavits
within the Province of British Columbia

June 2010

Joseph Henrich

Canada Research Chair in
Culture, Cognition and Coevolution (Tier 1)
Associate Professor
Department of Psychology
Department of Economics
University of British Columbia

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University Education

Ph.D. Anthropology, University of California at Los Angeles, 1999

MA. Anthropology, University of California, Los Angeles, 1995

BS. Aerospace Engineering, University of Notre Dame, 1991 (high honors)

BA. Anthropology, University of Notre Dame, 1991 (high honors)

Major Awards and Fellowships

2010 UBC Killam Research Prize

2009 Early Career Award for Distinguished Scientific Contributions bestowed by the *Human Behavior and Evolution* Society

2007 Canada Research Chair in *Culture, Cognition and Evolution* (Tier 1)

2007 Senior Early Career Scholar Peter Wall Institute

2006 Canada Research Chair in *Culture, Cognition and Evolution* (Tier 2)

2004 Presidential Early Career Award for Scientists and Engineers (United States)

2001 Fellow at the Institute for Advanced Study, Berlin (Wissenschaftskolleg), in the research group on *Social Norms and Economic Behavior* (convened by Ernst Fehr)

1999 Society of Scholars Fellow at the University of Michigan

1997 William J. Fulbright Scholarship

1996 Harold K. Schneider Prize for best paper in Economic Anthropology, graduate division, Society for Economic Anthropology

Major Grants (≥ 10K)

2010 Hampton Grant, UBC, Teaching in Cross-cultural Perspective (2 year, 30K). PI.

2009 National Institutes of Health (NIH), Measuring Cultural Variation (2 years, 633K). PI and co-PI are Robert Boyd and Joseph Henrich

2007 Peter Wall Institute for Advanced Studies, University of British Columbia, Exploratory Workshop Grant for *Integrating Science and the Humanities* ($25,000; w/ C$27,000 matching funds from numerous Departments. PI and co-PI are Edward Slingerland and Joseph Henrich.

2007 Senior Early Career Scholar Peter Wall Institute

2007 Social Science Research Council (SSHRC), Folksociology: A cross-cultural and developmental investigation of how groups influence thinking about individuals (3 years, 118K)

2007 Hampton Research Grant, Ciguatera Toxin & the Evolution of Cultural Practices (2 years, 39K)

2006 Canada Foundation for Innovation (CFI: 312K for laboratory development)

2004 John D. and Catherine T. MacArthur Foundation Grant through the "Preferences Network": *Origins of Prosocial Sentiments*, with Silk (PI) and Povenilli (3 years, 279K)

2003 Early Career Development Grant from the National Science Foundation (CASE): *Building an Interdisciplinary Program in Culture and Cognition* (5 years, 420K)

2002 National Science Foundation Grant (NSF) from Anthropology, Economics & Decision Science: *The Roots of Human Sociality: An Ethno-Experimental inquiry in 16 small-scale societies*. PI and co-PI are Jean Ensminger and Joseph Henrich (3 years, 475K)

1997 National Science Foundation (NSF) Dissertation Improvement Grant (12K)

1997 Organization of American States Fellowship (10K)

1997 International Studies and Overseas Program Graduate Dissertation Fellowship (10K)

1994 National Science Foundation (NSF) Graduate Fellowship (3 year award)

Positions Held and Work Experience

2006- Pres. **Associate Professor (tenure) in the Departments of Psychology and Economics at the University of British Columbia**

- Teaching and advising graduate and undergraduates
- Committees: Search (Psychology & Economics), Awards (Psychology), Tenure Review (Psychology), Peer evaluation (Economics)
- Co-director of the Centre for Human Evolution, Culture, and Cognition

2002-2007 **Assistant & Associate (tenure) Professor of Anthropology at Emory University**

- Teaching and advising graduate and undergraduates
- Committee work, including graduate admissions, senior faculty search, honors committee and departmental speakers series.
- Founded and co-administer the Evolution and Human Behavior Seminar Series
- Designing a curriculum for Culture and Cognition at Emory

2001-2002 **Fellow at the Institute for Advanced Study (*Wissenschaftskolleg*)**, Berlin
An interdisciplinary Research Group on Social Norms and Economic Decision-making convened by Ernst Fehr

1999-2002 **Visiting Assistant Professor and Post Doctoral Research Fellow**
University of Michigan Business School, Department of Organizational Behavior

- Teaching graduate seminars in the Culture & Cognition Program, an interdisciplinary program between psychology and anthropology.
- Participating faculty member in the Undergraduate Research Opportunity Program

1999 **University Teaching Fellow**
Department of Anthropology, University of California at Los Angeles
- Designed interdisciplinary undergraduate seminar
- Lectured and led discussions; designed examination questions

1996 **Reader** for the ***Evolution of Human Societies*** (taught by Allen Johnson)
Department of Anthropology, University of California at Los Angeles
- Graded essays, prepared examination questions, guest Lectures

1995-96 **Teaching Assistant** for ***Human Evolution*** (taught by Silk and Manson)
Department of Anthropology, University of California at Los Angeles
- Prepared and delivered review lectures and led discussions
- Designed examination questions and tutored students and assigned grades

1991-93 **Test and Evaluation Systems Engineer**
General Electric Aerospace/ Martin Marietta, Springfield, VA
- Performed real time command, control and analysis of all ground and on-orbit assets.
- Performed operations using large scale hardware and software systems in an IBM MVS/XA environment.
- Executed contingency responses dictated by system anomalies on either ground or vehicle components.

Publications and Forthcoming Contributions[1]

Edited Volume

Henrich, J., R. Boyd, S. Bowles, H. Gintis E. Fehr, C. Camerer (editors) (2004) *Foundations of Human Sociality: Ethnography and Experiments in 15 small-scale societies.* Oxford University Press.

Book

Henrich, N. and J. Henrich (2007) *Why Humans Cooperate: A cultural and evolutionary explanation.* Oxford University Press.

Forthcoming Journal Articles

1) Henrich, J.and Henrich, N. (forthcoming) The Evolution of Cultural Adaptations: Fijian taboos during pregnancy and lactation protect against marine toxins. *Proceedings of the Royal Society: Biological Sciences.*

1) Cheng, J. J. Tracy and J. Henrich (forthcoming) Pride, Personality, and the Evolutionary Foundations of Human Social Status. *Evolution and Human Behavior*

2) Gervias, Will and J. Henrich (forthcoming) The Zeus Problem. *Journal of Cognition and Culture.*

[1] Underlined names were students or post-doc working with me at the time of the research.

3) Shariff, A.F., Tracy, J.L, Cheng, J.T. & Henrich, J. (forthcoming). Further thoughts on the evolution of pride's two facets: A response to Clark. Emotion Review. (author response to commentaries)

4) Broesch, T., T. Callaghan, J. Henrich, and P. Rochat (forthcoming) Cultural Variations in Children's Mirror Self-Recognition. *Journal of Cross-Cultural Psychology.*

Published Journal Articles

5) Henrich, J., S. Heine and A Norenzayan (2010) Most People are not WEIRD. *Nature*, 446: 29.

6) Henrich, J., S. Heine and A. Norenzayan (2010) The Weirdest People in the World. *Behavioral and Brain Sciences* [Target Article], 33, 1-23.

7) Henrich, J., S. Heine and A. Norenzayan (2010) Beyond WEIRD: Towards a Broad-based Behavioral Sciences *Behavioral and Brain Sciences* [Reply], 33: 51-75.

8) Atran, S. and J. Henrich (2010) The Evolution of Religion. *Biological Theory: Integrating Development, Evolution and Cognition,* 5(1): 18-30.

9) Richerson, P. J., R. Boyd, and J. Henrich (2010) Gene-Culture Coevolution in the Age of Genomics. *Proceedings of the National Academy of Science of the United States*, 107, 8985-8992.

10) Henrich, J., J. Ensminger, R. McElreath, A. Barr, H. C. Barrett, A. Bolyanatz, J. Camilo Cardenas, M. Gurven, E. Gwako, N. Henrich, C. Lesorogol, F.W. Marlowe, D. Tracer, J. Ziker (2010) Markets, religion, community size and the evolution of fairness and punishment, *Science,* 327: 1480-1484..

11) Henrich, J. (2009) The evolution of costly displays, cooperation, and religion. *Evolution and Human Behavior* 30, 244-260.

12) Brosnan, S., J. Silk, J. Henrich, et. al. (2009) Chimpanzees (*Pan troglodytes*) do not develop contingent reciprocity in an experimental task. *Animal Cognition* 12, 317-322.

13) Henrich, J. and R. Boyd (2008) Division of Labor, Economic Specialization, and the Evolution of Social Stratification. *Current Anthropology*, 49 (4): 715-724.

14) O'Gorman, R., J. Henrich and M. Van Vugt (2008) Constraining free riding in public good games: designated solitary punishers can sustain human cooperation. *Proceedings of the Royal Society—Biological Sciences*, 1-7.

15) Gintis, H., J. Henrich, S. Bowles, R. Boyd, & E. Fehr (2008) Strong reciprocity and the roots of human morality. *Social Justice Research,* 21(2): 241-253.

16) Henrich, J., R. Boyd, and P. Richerson (2008) Five Misunderstandings about Cultural Evolution, *Human Nature*, 19:119-137.

17) Heine, S., T. Takemoto, S. Moskalenko, J. Lasaleta, and J. Henrich (2008) Mirrors in the head: Cultural variation in objective self-awareness. *Personality* and *Social Psychology Bulletin* 34:879-887.

18) Vonk, J., S. F. Brosnan, J. B. Silk, J. Henrich, A. Richardson, S.P. Lambeth, S. Schapiro, D. J. Povinelli (2008) Chimpanzees do not take advantage of very low cost opportunities to deliver food to unrelated group members. *Animal Behavior* 75: 1757-1770.

19) Marlowe, F. W., J. C. Berbesque, A. Barr, J. Ensimger, H. C. Barrett, A. Bolyanatz, J. C. Cardenas, M. Gurven, E. Gwako, J. Henrich, N. Henrich, C. Lesorogol, D. Tracer (2008) More 'altruistic' punishment in larger societies, *Proceedings of the Royal Society—Biology*, 275, 587-590.

20) Henrich, J. (2007) Behavioral Data, Cultural Group Selection, and Genetics, *Psychological Inquiry*, 18 (1): 36-37.

21) Henrich, J., R. McElreath, A. Barr, J. Ensimger, H. C. Barrett, A. Bolyanatz, J. Camilo Cardenas, M. Gurven, E. Gwako, N. Henrich, C. Lesorogol, F.W. Marlowe, D. Tracer, J. Ziker (2006) Costly Punishment Across Human Societies, *Science*, 312: 1767- 1770.

22) Henrich, J. and N. Henrich (2006) Culture, Evolution, and the Puzzle of Human Cooperation. *Cognitive Systems Research*, 7: 220-245.

23) Henrich, J. (2006) The Evolution of Cooperative Institutions: Tacking the Problem of Equilibrium Selection, *Science* [Perspectives], 312: 60-61.

24) Silk, J.., S.F. Brosnan, J. Vonk, J. Henrich, D.J. Povinelli, S. Shapiro, A. Richardson, S.P. Lambeth & J. Mascaro (2006) Chimpanzee choice and prosociality (reply). *Nature, 440.*

25) Hrushka, D. and J. Henrich (2006). Friendship, cliquishness, and the emergence of cooperation. *Journal of Theoretical Biology*, 239 (1): 1-15.

26) Henrich, J. (2006) Understanding Cultural Evolutionary Models: A Reply to Read's Critique. *American Antiquity*, 71 (4).

27) McCauley, R. and J. Henrich (2006). Susceptibility to the Muller-Lyer Illusion, Theory-Neutral Observation, and the Diachronic Penetrability of the Visual Input System. *Philosophical Psychology*, 19 (1): 1-23.

28) Henrich, J., R. Boyd, S. Bowles, H. Gintis, E. Fehr, C. Camerer, R. McElreath, M. Gurven, K. Hill, A. Barr, J. Ensminger, D. Tracer, F. Marlow, J. Patton, M. Alvard, F. Gil-White and N. Smith (2005) "Economic Man" in cross-cultural perspective: Behavioral experiments from 15 small-scale societies. *Behavioral and Brain Sciences*, 28: 795-815 (Target Article includes 23 commentaries).

29) Henrich, J., R. Boyd, S. Bowles, H. Gintis, E. Fehr, C. Camerer, R. McElreath, M. Gurven, K. Hill, A. Barr, J. Ensminger, D. Tracer, F. Marlow, J. Patton, M. Alvard, F. Gil-White and N. Smith (2005) Models of decision-making and the evolution of social preferences (Authors' Response). *Behavioral and Brain Sciences*, 28: 838-855.

30) Silk, J. B., S. F. Brosnan, J. Vonk, J. Henrich, D. J. Povinelli, A. Richardson, S. P. Lambeth, J. Mascaro, & S. Shapiro (2005) Chimpanzees are indifferent to the welfare of unrelated group members. *Nature*, 437, 1357-1359.

31) Henrich, J. (2004) Demography and Cultural Evolution: Why adaptive cultural processes produced maladaptive losses in Tasmania. *American Antiquity*, 69 (2): 197-214.

32) Henrich, J. (2004) Cultural Group Selection, coevolutionary processes and large-scale cooperation. At target article in *Journal of Economic Behavior and Organization*, 53: 3-35.

33) Henrich, J. (2004) Reply. *Journal of Economic Behavior and Organization*, 53: 127-143.

34) Henrich, J. (2004) Inequity Aversion in Capuchins? *Nature,* 42:139.

35) Henrich, J. & R. McElreath (2003) The Evolutionary Foundations of Cultural Evolution. *Evolutionary Anthropology,* 12(3): 123-135.

36) Henrich, J. & R. Boyd (2002) On Modeling Cognition and Culture: Why replicators are not necessary for cultural evolution. *Journal of Cognition and Culture*, 2(2): 87-112.

37) Henrich, J. & R. McElreath (2002). Reply to Kuznar's comment on our "Are Peasants Risk Averse Decision-Makers. *Current Anthropology*, 43 (5): 788-789.

38) Henrich, J. & R. McElreath (2002) Are Peasants Risk Averse Decision-Makers. *Current Anthropology*. 43(1): 172-181.

39) Henrich, J. (2001) Cultural Transmission and the Diffusion of Innovations: Adoption dynamics indicate that biased cultural transmission is the predominate force in behavioral change and much of sociocultural evolution. *American Anthropologist,* 103: 992-1013.

40) Henrich, J., R. Boyd, S. Bowles, C. Camerer, H. Gintis, R. McElreath and E. Fehr (2001) In search of Homo economicus: Experiments in 15 Small-Scale Societies. *American Economic Review*, 91(2), 73-79.

41) Henrich, J. and R. Boyd (2001) Why people punish defectors: conformist transmission stabilizes costly enforcement of norms in cooperative dilemmas. *Journal of Theoretical Biology,* 208, 79-89.

42) Henrich, J. (2001) On Risk Preferences and Curvilinear Utility Curves: A comment on Kuznar's piece, *Current Anthropology,* 42(5): 711.

43) Henrich, J. & F. Gil-White (2001) The Evolution of Prestige: freely conferred status as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior*, 22, 1-32.

44) Henrich, J. (2001) Challenges for everyone: real people, deception, one-shot games, social learning, and computers. Commentary on Hertwig and Ortmann for *Behavioral and Brain Sciences*, 24 (3).

45) Henrich, J. (2000). Does culture matter in economic behavior? Ultimatum game bargaining among the Machiguenga. *American Economic Review*, 90(4): 973-979.

46) Henrich, J. and R. Boyd (1998). The evolution of conformist transmission and between-group differences. *Evolution and Human Behavior,* 19: 215-242.

47) Henrich, J. (1997). Market Incorporation, Agricultural Change and Sustainability among the Machiguenga Indians of the Peruvian Amazon. *Human Ecology*, 25(2): 319-351.

Republications of earlier journal articles

48) Henrich, J., R. Boyd, S. Bowles, H. Gintis, E. Fehr, C. Camerer, R. McElreath, M. Gurven, K. Hill, A. Barr, J. Ensminger, D. Tracer, F. Marlowe, J. Patton, M. Alvard, F. Gil-White and N. Smith (forthcoming) "Economic Man" in cross-cultural perspective: Behavioral experiments from 15 small-scale societies. Republished in *Data Collection.* Edited by W. Paul Vogt as part of the SAGE Benchmarks in Social Research Methods series. (Previous published in *Behavioral and Brain Sciences*, 28: 795-815).

49) Henrich, Joseph and Robert Boyd (forthcoming August 2010) On modeling cognition and culture: Why cultural evolution does not require replication of representations. *The Evolution of Culture*. Edited by Stefan Linquist. The International Library of Essays on Evolutionary Thought. (Previously published in the *Journal of Cognition and Culture* 2:87-112).

50) Henrich, Joseph and Francisco Gil-White (forthcoming August 2010), The evolution of prestige: freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *The Evolution of Culture*. Edited by Stefan Linquist. The International Library of Essays on Evolutionary Thought. (Previously published in *Evolution and Human Behavior*, Volume 22(3): 165 – 196).

51) Figure 1 from Henrich, J. (2000) Does culture matter in economic behavior? Ultimatum Game Bargaining among the Machiguenga of the Peruvian Amazon. *American Economic Review* 90 (4), 2000: 973-979. In Ackert (2009) Behavioral Finance: Psychology, Decision-Making, and Markets, Cengage Learning

52) Henrich, J. (2009) Cultural Group Selection, coevolutionary processes and large-scale cooperation. *Darwinism and Economics*. Edited by Geoffrey M. Hodgson. The International Library of Critical Writings in Economics. (Previously published in the *Journal of Economic Behavior and Organization*, 53: 3-35).

53) Henrich, J., R. Boyd, S. Bowles, C. Camerer, H. Gintis, R. McElreath and E. Fehr (2009) In search of Homo economicus: Experiments in 15 Small-Scale Societies. *Darwinism and Economics*. Edited by G. M. Hodgson. The International Library of Critical Writings in Economics. (Previously published in *American Economic Review*, 91(2), 73-79).

54) Henrich, J., R. Boyd, S. Bowles, H. Gintis, E. Fehr, C. Camerer, R. McElreath, M. Gurven, K. Hill, A. Barr, J. Ensminger, D. Tracer, F. Marlowe, J. Patton, M. Alvard, F. Gil-White and N. Smith (2009). "Economic Man" in cross-cultural perspective: Behavioral experiments from 15 small-scale societies. *Judgment and Decision-making*. Edited by Nick Chater. Sage Publications. (Previously published in *Behavioral and Brain Sciences*, 28: 795-815).

55) Henrich, J., R. Boyd, S. Bowles, H. Gintis, E. Fehr, C. Camerer, R. McElreath, M. Gurven, K. Hill, A. Barr, J. Ensminger, D. Tracer, F. Marlowe, J. Patton, M. Alvard, F. Gil-White and N. Smith (2007). "Economic Man" in cross-cultural perspective: Behavioral experiments from 15 small-scale societies. *Recent Developments in Behavioral Economics*. Edited by Shlomo Maital. International Library of Writings in Economics. (Previously published in *Behavioral and Brain Sciences*, 28: 795-815).

56) Henrich, J., R. Boyd, S. Bowles, C. Camerer, H. Gintis, R. McElreath and E. Fehr (2007) In search of Homo economicus: Experiments in 15 Small-Scale Societies. *New Developments in Experimental Economics*. Edited by Enrica Carbone and Chris Starmer. The International Library of Critical Writings in Economics. Edward Elgar Publishers. (Previously published in *American Economic Review*, 91(2), 73-79)

57) Henrich, J., R. Boyd, S. Bowles, C. Camerer, H. Gintis, R. McElreath and E. Fehr (2008) In search of Homo economicus: Experiments in 15 Small-Scale Societies. *Selecting*

Research Methods. Sage Publications. (Previously published in *American Economic Review*, 91(2), 73-79).

Book Chapters

1) Shariff, A.F., A. Norenzayan, J. Henrich (2009). The Birth of High Gods: How the cultural evolution of supernatural policing agents influenced the emergence of complex, cooperative human societies, paving the way for civilization. In Evolution, culture and the human mind, edited by M. Schaller, A. Norenzayan, S. Heine, T. Yamagishi, & T. Kameda. Lawrence Erlbaum Associates.
2) Henrich, J. (2009) The Evolution of Innovation-Enhancing Institutions. In Innovation in Cultural Systems: Contributions from Evolutionary Anthropology, edited by Michael O'Brien and Stephen Shennan. MIT Press.
3) Henrich, J. (2008) A Cultural Species. In Explaining Culture Scientifically, edited by Melissa Brown. University of Washington Press.
4) Henrich, J. and R. McElreath (2007) Dual Inheritance Theory: The Evolution of Human Cultural Capacities and Cultural Evolution. In Oxford Handbook of Evolutionary Psychology, edited by Robin Dunbar and Louise Barrett. Oxford University Press.
5) McElreath, R. and J. Henrich (2007) Modeling Cultural Evolution. In Oxford Handbook of Evolutionary Psychology, edited by Robin Dunbar and Louise Barrett. Oxford University Press.
6) Henrich, J., R. Boyd, S. Bowles, C. Camerer, E. Fehr, H. Gintis and R. McElreath (2004) Introduction and Guide to the Volume (pp. 1-7). In Foundations of Human Sociality: Ethnography and Experiments in 15 small-scale societies, edited by J. Henrich, R. Boyd, S. Bowles, H. Gintis, E. Fehr and C. Camerer. Oxford University Press.
7) Henrich, J., R. Boyd, S. Bowles, C. Camerer, E. Fehr, H. Gintis and R. McEleath (2004) Overview and Synthesis (pp. 8-54). In Foundations of Human Sociality: Ethnography and Experiments in 15 small-scale societies, edited by J. Henrich, R. Boyd, S. Bowles, H. Gintis, E. Fehr and C. Camerer. Oxford University Press.
8) Henrich, J. & N. Smith (2004) Comparative experimental evidence from Machiguenga, Mapuche, Huinca & American populations shows substantial variation among social groups in bargaining and public goods behavior (pp. 125-167). In Foundations of Human Sociality: Ethnography and Experiments in 15 small-scale societies, edited by J. Henrich, R. Boyd, S. Bowles, H. Gintis, E. Fehr and C. Camerer. Oxford University Press.
9) Henrich, J., P. Young, E. Smith, S. Bowles, P. Richerson, A. Hopfensitz, K. Sigmund and F. Weissing (2003) The Culture and Genetic Origins of Human Cooperation. In Genetic and Culture Evolution of Cooperation, edited by Peter Hammerstein. MIT Press.
10) Richerson, P., Boyd R., and J. Henrich (2003) The Cultural Evolution of Cooperation. In Genetic and Culture Evolution of Cooperation, edited by Peter Hammerstein. MIT Press.
11) Fehr, E. and J. Henrich (2003) Is Strong Reciprocity a Maladaptation. In Genetic and Culture Evolution of Cooperation, edited by Peter Hammerstein. MIT Press.

12) Henrich, J. (2002). Decision-making, cultural transmission and adaptation in economic anthropology. In Theory in Economic Anthropology edited by J. Ensminger. AltaMira Press, 251-295.

13) Henrich, J., W. Albers, R. Boyd, G. Gigerenzer, K. McCabe, A. Ockenfels, H. P. Young (2001). What is the Role of Culture in Bounded Rationality? In Bounded Rationality: The Adaptive Toolbox, edited by G. Gigerenzer and R. Selten. MIT Press.

Student's Presentations and Posters

1) Cheng, J. T., Tracy, J. L., & Henrich, J. (2010, January). Are dominance and prestige distinct strategies for attaining social status? Poster presented at the annual meeting of the Society for Personality and Social Psychology. Las Vegas, Nevada.

2) Cheng, J. T., Tracy, J. L., & Henrich, J. (2010, January). Are dominance and prestige distinct strategies for attaining social status? Poster presented at the Society for Personality and Social Psychology Pre-Conference on Evolutionary Psychology. Las Vegas, Nevada.

3) Chudek, M., Heller, S. Birch, S. & Henrich, J. (2009, February). The fidelity of gossip - A cross-cultural universal? Poster presented at the Society for Personality and Social Psychology Pre-Conference on Cultural Psychology. Tampa, Florida.

4) Chudek, M., Mesoudi, A. & Henrich, J. (2009, February). Prestige bias - Evidence of adaptation for culture. Poster presented at the Society for Personality and Social Psychology Pre-Conference on Evolutionary Psychology. Tampa, Florida.

5) Cheng, J. T., Tracy, J. L., & Henrich, J. (2009, February). Pride as an evolutionary adaptation to status attainment. Poster presented at the Society for Personality and Social Psychology Pre-Conference on Evolutionary Psychology. Tampa, Florida.

6) Cheng, J. T., Tracy, J. L., & Henrich, J. (2009, February). Pride as an evolutionary adaptation to status attainment. Poster presented at the Society for Personality and Social Psychology Pre-Conference on Evolutionary Psychology. Tampa, Florida.

7) Broesch, Tanya, James Broesch, Joseph Henrich, Ann Bigelow, Philippe Rochat (2008, March). Contingency and Affective Mirroring in Fijian and Canadian mother-infant dyads. Poster presented at the International Infant Studies Conference, Vancouver, B.C.

8) Cheng, J. T., Tracy, J. L., & Henrich, J. (2008, May). Why are you so proud? Pride as an evolutionary adaptation to status attainment. Poster presented at the Society for Interpersonal Theory and Research's 11th Annual Convention. Tempe, Arizona.

Series Editor for these books at UC Press

- Hruschka, D. J. (in press) *Friendship: Development, Ecology and Evolution of a Social Relationship*. In the Origins of Human Behavior and Culture Series. Series editors Monique Borgerhoff Mulder and Joseph Henrich. University of California Press.

- Marlowe, F. W. (2010) *The Hadza Hunter-Gatherers of Tanzania*. In the Origins of Human Behavior and Culture Series. Series editors Monique Borgerhoff Mulder and Joseph Henrich. University of California Press.

- Shennan, Stephen (2009) *Pattern and Process in Cultural Evolution.* In Origins of Human Behavioral and Culture Series. Series editors Monique Borgerhoff Mulder and Joseph Henrich. University of California Press.
- Kennett, Douglas and Bruce Winterhalder (2006) *Behavioral Ecology and the Transition to Agriculture.* In the Origins of Human Behavior and Culture Series. Series Editors Monique Borgerhoff Mulder and Joseph Henrich. University of California Press.

Draft Manuscripts[2]

Edited Volume

Henrich, J. and Jean Ensminger. *Fairness and Punishment in Cross-Cultural Perspective.* Under consideration at Russell Sage Press.

For Journals

1) Boyd, R, J.P. Richerson, J. Henrich. Rapid cultural adaptation can facilitate the evolution of large-scale cooperation (under review)
2) Henrich, J. and N. Henrich. The evolution of cultural adaptations and how it created pregnancy and lactation food taboos that protect against marine toxins.
3) Barr, A., C. Wallace, J. Ensminger, J. Henrich, H. C. Barrett, A. Bolyanatz, J. C. Cardenas, M. Gurven, E. Gwako, C. Lesorogol, F. W., R. McElreath, D. Tracer, and J. Ziker. Homo Æqualis: A Cross-Society Experimental Analysis of Three Bargaining Games.
4) Chudek, M., S. Heller, S. Birch, and J. Henrich Prestige Biased Transmission in Children: Attention from others as a cue for social learning.
5) Richerson, P. and J. Henrich Tribal Social Instincts and the Cultural Evolution of Institutions to Solve Collective Action Problems.

Book Chapters

1) Henrich, J. and N. Henrich. Fairness without Punishment: Behavioral Experiments in the Yasawa Islands, Fiji. In Fairness and Punishment in Cross-Cultural Perspective. Edited by J. Henrich and J. Ensminger.
2) Henrich, J. and J. Ensminger. Chapter 2: Theoretical Foundations—The Coevolution of Social Norms, Intrinsic Motivation, Markets, and the Institutions of Complex Societies. In Fairness and Punishment in Cross-Cultural Perspective. Edited by J. Henrich and J. Ensminger.
3) Ensminger, J. and J. Henrich. Chapter 3: Cross-Cultural Experimental Methods, Sites, and Variables. In Fairness and Punishment in Cross-Cultural Perspective. Edited by J. Henrich and J. Ensminger.
4) Henrich, J. and J. Ensminger. Chapter 4: Empirical Results—Markets, Community Size, Religion and the Nature of Human Sociality, In Fairness and Punishment in Cross-Cultural Perspective. Edited by J. Henrich and J. Ensminger.

[2] Most draft manuscripts are available at http://www.psych.ubc.ca/~henrich/home.html#papers.

Invited Lectures

Keynotes, Plenaries, and Invitations with Honoraria

1) On the Origins of a Cultural Species: How social learning shapes human evolution. *The Evolution of Brain, Mind and Culture*. Center for Mind, Brain and Culture. Emory University. November 13, 2009.

2) Why Humans Cooperate. Invited lecture in the *Human Uniqueness Series*. Arizona State University. Tempe, AZ. September 24, 2009

3) The Evolution of Cultural Adaptations. Keynote at *Cognition 2009: Cultures and Cognition in Evolution*. Institute of Cognitive Science. UQAM. Montreal, Canada. June 4, 2009.

4) Culture-Gene Coevolution and the Origins of Human Sociality. Plenary at the *Human Behavior and Evolution Conference*. Fullerton, CA. May 28, 2009

5) The Evolution of Norms and Institutions (including cooperative ones): ethnographic and experimental evidence from Fiji. Invited speaker series at the *IPEM Seminar Series* in the IGERT Program in Evolutionary Modeling. University of Washington. February 21, 2008.

6) On the Nature of Human Sociality: Behavioral Experiment and Ethnography in 15 small-scale societies. *Foundations of Human Social Behavior.* University of Zurich. June 20, 2008

7) The Evolution of Cultural Adaptations: Fijian food taboos prevent fish poisoning during pregnancy and lactation. *Cultural Evolution and Health Series*. Northwestern University. January 29, 2007.

8) Culture and the Nature of Human Sociality. Plenary address at the *American Accounting Association Annual Meeting (Imagined Frontiers in Accounting)*. Chicago. August 6, 2007.

9) Cultural Learning, Sociality and the Coevolution of human institutions. Invited lecture at the *Cultural and Adaptive Bases of Human Sociality*. International House of Japan, Tokyo. September 9-10, 2006.

10) The Coevolutionary Origins of Human Sociality. Keynote address at the *Conference on Collective Intentionality*, Siena, Italy. October 14, 2004.

11) Cross-Cultural Variations in Economic Decision-Making. Invited lecture at the *AFOSR (Air Force) Workshop: Culture and Personality in Models of Adversarial Decision-Making*. Tysons Corner, VA. November 13, 2003.

12) The Cultural Origins of Social Preferences. Invited presentation at *Field Experiment in Economics*, Middlebury College's 24th Annual Economics Conference. April 26, 2003.

13) The Nature and Origin of Social Preference. Invited lecture at the World Bank, Washington D.C. March 5, 2003.

Invited Lectures away from my Home University

14) Theorizing and Studying Culture: A culture-gene coevolutionary perspective. Culture Preconference to the Society of Personality and Social Psychology Meetings. Las Vegas, January 28, 2010.

15) A Culture-Gene Coevolutionary Perspective on Emotions. Emotion Preconference to the Society of Personality and Social Psychology Meetings. Las Vegas, January 28, 2010.

16) Tribal Social Instincts and the Cultural Evolution of Institutions to Solve Collective Action Problems. *Context and the Evolution of Mechanisms for Solving Collective Action Problems*. Workshop in Political Theory and Policy Analysis, Bloomington, IN. May 2, 2009.

17) The Evolution of Cultural Adaptations: Fijian food taboos protect against dangerous marine toxins. Invited lecture for the *Behavior, Evolution and Culture (BEC) Series*, UCLA. April 6, 2009.

18) The Evolution of Norms. Invited lecture at the Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany. March 12, 2009.

19) The evolution of cultural adaptations in Fiji. Invited lecture in the Seminar Series in Ecology and Evolution, University of California Davis. Feb 12, 2009.

20) Norms, Institutions, and the Coevolution of Human Sociality. Invited lecture at the Wenner-Gren Foundation's *International Symposium on Human Evolution*, Stockholm. November 6, 2008.

21) Culture and the Coevolutionary Origins of Human Behavior. Invited lecture in the *Institute of Social and Cultural Anthropology Lecture Series*. Oxford University. October 20, 2006.

22) The Evolution of Moral Norms: Evidence from Fiji. Invited Speaker at the *Norms and Moral Psychology Workshop in Culture and Mind Project*. University of Sheffield, Sheffield, England. October 20, 2007.

23) Why societies vary in their rates of innovation: The Evolution of Innovation-Enhancing Institutions. Invited lecture at *Innovation in Cultural Systems: Contributions from Evolutionary Anthropology*. Altenberg Workshops in Theoretical Biology, Konrad Lorenz Institute, Altenberg, Austria. September 15, 2007.

24) The Cultural Origins of Human Sociality. Invited in the *Cognition and Culture, and Evolution and Human Adaptation Program*. University of Michigan. February 10, 2006.

25) Why Big Men are generous. Invited lecture at *Pattern and Process in Cultural Evolution*. Centre for the Evolutionary Analysis of Cultural Behavior (University College London), London. September 14-16, 2005.

26) Cultural Group Selection and Human Sociality. *Foundations of Accounting Conference*. Goizueta Business School. Emory University. March 23, 2005.

27) Culture and the Evolution of Human Altruism. Invited lecture at the *Society of Cross-Cultural Research* (invited by SETI). February 26, 2005.

28) On the Nature of Human Sociality. Department of Economics. University of British Columbia. February 4, 2005.

29) The Evolution of Culture and Human Sociality. Department of Psychology. University of Toronto. January 26, 2005.

30) Prosociality in Cross-Cultural Perspective. Invited presentation at the *LUCE Conference*, Pennsylvania State University. April 13, 2003.

31) Understanding a Cultural Species. Invited presentation at the *Innateness Workshop*, University of Maryland, Washington, D.C. March 8, 2003.

32) The Nature of Human Sociality. Invited lecture at the National Science Foundation, Alexandria, VA. March 6, 2003.

33) A Cultural Species. Invited presentation at *Towards a Scientific Concept of Culture*, Stanford University, Palo Alto. January 25, 2003.

34) Rapporteur Summary for the "Cooperation in Human Societies" Group at the Dahlem Conference on the Genetic and Culture Evolution of Cooperation, Berlin, Germany. March 2002.

35) Ethnography and Experiments in 15 small-scale societies. Invited presentation at the Max Planck Institute for Human Development (ABC group), Berlin, Germany. February 23, 2002.

36) Modeling Cultural Evolution. Invited presentation at the *Innateness Workshop*, Sheffield University, Sheffield, England. November 7, 2002

37) Cultural Differences in Risk Preferences (with R. McElreath). Invited paper at the *Human Behavior & Evolution Society Conference*. Salt Lake City, Utah. June 4 1999.

38) Cultural Differences in Risk Preferences (with R. McElreath). Invited paper at the Risk Initiative in Salt Lake City. June 2, 1999.

39) Rapporteur Summary for the "Bounded Rationality and Cultural Change" Group at the Dahlem Conference on Bounded Rationality, Berlin, Germany. March 1999.

40) Cross-Cultural Differences in Risk Preferences. Invited paper at the MacArthur Foundation's Preferences Network Conference, Chicago. December 1998.

41) The problem of culture and decision-making in economic anthropology. Invited paper at the *Society of Economic Anthropology*, Guadalajara, Mexico. April 1997.

Invited Lectures at Home University

42) The Cultural Brain Hypothesis: Implications for learning and development. *Workshop in Development Psychology*, University of British Columbia. April 8, 2009.

43) On the Origins of Faith. *Panel Discussion on Religion.* Green College, University of British Columbia. March 30, 2009.

44) Culture, Social Norms and the Nature of Human Sociality (Or, Why Ethnographers Need Experiments, Game Theory, and Evolution). *Green College Principal's Series*. February 24, 2009.

45) Dual Inheritance Theory: The Evolution of Human Cultural Capacities and Cultural Evolution. *UBC Institute of Mental Health Colloquium*. February 5, 2009.

46) On the Nature of Human Sociality: Behavioral Experiments and Ethnography from 15 Small-scale Societies. *UBC/SFU Distinguished Speaker Series,* OBHR Division, University of British Columbia. February 1, 2008

47) The evolution of cultural adaptations in Fiji. *Culture in Evolutionary Perspective*. Green College at the University British Columbia. April 14, 2007

48) Prestige and Cultural Learning. Invited presentation at the *Cognition and Development Seminar*, Department of Psychology, Emory University. November 4, 2003.

49) Foundations of Human Social Preferences. Department of Economics, Emory University. May 2003.

50) The Origins of Human Prosociality. Invited presentation at the *Evolution and Human Adaptation Program Lecture Series*. February 23, 20001.

51) Cross-cultural Experimental Economics. Invited presentation at in the *Hosmer Series* at the University of Michigan Business School. February 15, 2000.

52) The Evolution of Prestige. Invited paper at the *Culture & Cognition Colloquium* series at the University of Michigan. December 10, 1999.

53) Cross-cultural Experimental Economics. Invited paper at the MacArthur Foundation's *Preferences Network* Conference, Los Angeles. December 4, 1999.

54) Ultimatum and Public Goods Games among the Mapuche and Machiguenga. Invited paper at the MacArthur Foundation's *Cross-Cultural Initiative* Conference, Los Angeles. November 1999.

55) Ultimatum Game Bargaining and the Machiguenga. Invited paper at the MacArthur Foundation's *Preferences Network* Conference, Los Angeles. January 1997.

Other Fellowships, Grants, Honors & Awards (those not listed above under 'Major')

Fellowships and Awards

1998 Graduate Division Fellowship at the University of California, Los Angeles (1 year)
1998 Collegium of University Teaching Fellows at the University of California, Los Angeles
1994 Teaching Assistantship in the Dept. of Anthropology, UCLA, for the 1994-95 year.
1993 Government Award for Outstanding Achievement in support of Mission Activities.
1993 Martin Marietta Peer Recognition Award for Outstanding Performance as voted by fellow team members.
1992 General Electric Peer Recognition Award for Outstanding Performance as voted by fellow team members
1991 Raymond W. Murray Award for the Outstanding Senior in the Department of Anthropology, Notre Dame, IN
1991 John J. Reilly Scholarship for excellence in the Arts & Letters/Engineering Double Degree Honors Program at the University of Notre Dame

Research Grants (less than 10K), Minor Fellowships and Awards

2008 HSS Symposium Grant: Integrating science and the humanities ($5K)
2002 Committee for Teaching Initiative Fund: Building an Indexed Database for Teaching Resources in Anthropology ($800).
1994 Center for International Business Education grant to study social development and cultural capital among Mapuche and non-Mapuche in Chile ($7K)
1994 Risk Initiative Grant for studying risk among the Mapuche ($5K)
1999 Preferences Network Grant for Common-Pool Resources experiments among UCLA and University of Michigan undergraduates ($2.4K)
1999 Preference Network Grant for risk control experiments among UCLA undergraduates ($1.2K)
1998 MacArthur Foundation Grant for Experimental Economics Research with Mapuche ($6.4K)
1996 MacArthur Foundation Grant for Ultimatum Game Research at UCLA ($3K)
1996 Ford Foundation-ISOP Interdisciplinary Program for Developing Areas Grant ($1.3K)
1996 Latin American Center Small Grants Award ($2.5K)
1994 National Science Foundation Master's Improvement Research Grant (through UCLA, $2.3K)
1994 Tinker Foundation for Latin American Studies Research Grant ($1.5K)
1994 Teaching Assistantship in the Department of Anthropology, UCLA, for the 1994-95 year.
1993 Government Award for Outstanding Achievement in support of Mission Activities.
1993 Martin Marietta Peer Recognition Award for Outstanding Performance as voted by fellow team members.
1992 General Electric Peer Recognition Award for Outstanding Performance as voted by fellow team members

Classes Taught

Undergraduate

- Introduction to Anthropology (Anthro 101, Emory)
- Psychological Anthropology (Anthro 260, Emory)
- Cultural Change: An Interdisciplinary Approach (Anthro 385, Emory)
- Culture, Cognition and Evolution (Psychology 205, UBC)
- Evolutionary Psychology (Psychology 358, UBC)
- Wealth and Poverty of Nations (Economics 234, UBC)
- Understanding Humans (ASTU 204a, UBC)

Graduate

- Field and Analytical Methods in Anthropology (Anthro 585, Emory)
- Biocultural Seminar (Anthro 520R, Emory)
- Culture and Mind (Anthro 508, Emory)
- Culture and Cognition (Anthro and Psych, Michigan)
- Decision-making, rationality, and the nature of human morality and social behavior (Econ 590 and Psych 529, UBC)
- Modeling the Evolution of Social Behavior (Economics 590 and Psych 529, UBC)

- Understanding Humans: Integrating the Sciences and Humanities (ASTU 204, UBC)

Honor Societies

- Phi Beta Kappa
- Tau Beta Pi –National Engineering Honor Society
- Sigma Gamma Tau –National Aerospace Engineering Honor Society
- Lambda Alpha- National Anthropology Honor Society

Service Highlights

- Advisory Board for AHRC Culture and the Mind Project. PI Stephen Laurence.
- Series co-editor for *Origins of Human Behavior and Culture* at the University of California Press.
- Panelist for the National Science Foundation's *Human Social Dynamics* Review (2004).

Field Work Experience

2009 Yasawa Island, Fiji. Moral Intuitions and Reproductive History (1 month, June-July)

2007 Yasawa Island, Fiji. Folksociology and Poison Fish (1 month, Nov)

2006 Yasawa Island, Fiji. Ontogeny of Cultural Knowledge (3 months)

2005 Yasawa Island, Fiji. Ontogeny of Cultural Knowledge (1 month)

2004 Yasawa Island, Fiji, Ontogeny of Cultural Knowledge (1 month)

2003 Yasawa Island, Fiji, Behavioral Experiments and Cultural Knowledge (3 months)

2000 Mapuche, Southern Chile, Risk Economic Behavior (1 month)

1997 Mapuche, Southern Chile, Economic Decision-making (9 months)

1997 Machiguenga, Peruvian Amazon, Agricultural Change and Decision-making (1 month).

1996 Machiguenga, Peruvian Amazon, Agricultural Change and Decision-making (2 months).

1995 Machiguenga, Peruvian Amazon, Agricultural Change and Decision-making (1 month).

1994 Machiguenga, Peruvian Amazon, Agricultural Change and Decision-making (2.5 months).

Reviewer for these Journals, Institutions and Presses

National Science Foundation (U.S.)

- Cultural Anthropology
- Archaeology
- Social Dynamics

General Science Journals

- Nature
- Science

- Proceedings of the National Academy of Science
- Proceedings of the Royal Academy: Biology
- Philosophical Transactions of the Royal Society B
- Behavioral and Brain Sciences
- Current Zoology

Anthropology, Archaeology and Evolution Journals

- Current Anthropology
- American Antiquity
- Human Nature
- Evolutionary Anthropology
- Behavioral Ecology and Sociobiology
- Journal of Theoretical Biology
- Evolution and Human Behavior
- Human Biology

Economics and Business Journals

- American Economic Review
- Econometrica
- Economic Journal
- Journal of Economic and Organizational Behavior
- Experimental Economics
- Academy of Management Journal
- American Economics Journal: Applied Economics

Psychology Journals

- Cognition
- Developmental Science
- Psychological Science
- Trends in Cognitive Science
- Evolution of Communication

Sociology and Philosophy Journals

- Rationality and Society
- European Review of Philosophy

Presses

- University of California
- University of Chicago Press
- University of Michigan Press

This is Exhibit " B " referred to in the
affidavit of JOSEPH HENRICH
sworn before me at VANCOUVER
in the Province of British Columbia this
15th day of JULY 2010

A Commissioner for taking Affidavits
within the Province of British Columbia

Polygyny in Cross-Cultural Perspective: Theory and Implications

Joseph Henrich, Canada Research Chair in Culture, Cognition, and Coevolution
University of British Columbia

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I. Introduction and Summary

A. Content and Structure

The goals of this Report are both to provide background information on the nature of polygyny and to examine the implications of its increased practice in a modern Western society. I do this by developing a theoretical framework using principles drawn from evolutionary biology, and by reviewing evidence regarding mating and marriage from psychology, anthropology, sociology, and economics, as well as material from other disciplines. Summarizing, these diverse lines of evidence indicate that:

- A non-trivial increase in the incidence of polygyny, which is quite plausible if polygyny were legalized given what we know about both male and female mating preferences, would result in increased crime and antisocial behaviour by the pool of unmarried males it would create.
- Greater degrees of polygyny drive down the age of first marriage for (all) females on average, and increase the age gap between husbands and wives. This generally leads to females marrying before age 18, or being "promised" in marriage prior to age 18.
- Greater degrees of polygyny are associated with increased inequality between the sexes, and the relationship may be causal as men seek more control over women when women become scarce.
- Polygynous men invest less in their offspring both because they have more offspring and because they continue to invest in seeking additional wives. This implies that, on average, children in a more polygynous society will receive less parental investment.
- Greater degrees of polygynous marriage may reduce national wealth (GDP) per capita both because of the manner in which male efforts are shifted to obtaining more wives and because of the increase in female fertility.

This Report is structured as follows: First, I distinguish mating psychology and mating systems from marriage norms and marriage systems. Humans, like other animals, have an evolved mating psychology that gives rise to species-level patterns in mating. However, unlike other animals, humans also acquire and enforce (formally and informally) culturally-transmitted social norms that motivate and regulate social behaviour. Here I give some background on what culturally-evolved norms are, and discuss how they influence our evolved psychology for decision-making.

Second, drawing on work from primatology, psychology and anthropology, I present a brief synthesis of what we know about both human mating psychology and male parental investment. As part of this, human marriage patterns are presented in a broad anthropological perspective. Key implications are that both males and females possess evolved mating psychologies that favour polygynous marriage and mating systems (except under situations of economic equality among males) in which males will limit parental investment in offspring in favour of obtaining more mates/wives. Historical material is then summarized showing that the emergence of modern monogamous marriage systems (rooted in systems

of norms and laws), which are now widespread, is principally the product of the particular cultural evolutionary trajectory of Western societies.

Third, I review the available evidence that tests for the predicted associations between polygyny and various social outcomes, including increases in criminal and antisocial behaviour, the targeting of progressively younger females as brides, increased efforts to control women by men (resulting in greater male-female inequality), and negative consequences associated with reduced male parental investment in children.

Finally, I speculate that the spread of monogamous marriage, which represents a kind of sexual egalitarianism, may have created the conditions for the emergence of democracy and political equality, including women's equality.

B. Summary

Two sets of theoretical ideas from evolutionary biology underpin the empirical evidence presented here. First, like other animals, human males and females have different mating strategies rooted in the nature of primate sexual reproduction. Females are limited in their direct reproduction to the number of offspring they can rear to maturity in their lifetimes, and are necessarily committed to high levels of investment, at least in the form of providing the egg, gestation, and lactation. In contrast, with little investment (sperm and a small effort), males can potentially have thousands of offspring that they can decide to invest in, or not, based on the costs of obtaining additional mates vs. the impact of additional investment for their offspring. Because human offspring benefit from the investment of both parents (at least in ancestral human societies) females seek to form pair-bonds with those males who are best able to invest in their offspring (males possessing high social status, wealth, and valued skills). A female does not generally benefit from establishing simultaneous pair-bonds with multiple males because (1) she can only have one pregnancy at a time (so lots of sex with different males does not increase her reproductive success), (2) this brings males into conflict (sexual jealousy) and (3) this creates confusion regarding male paternity (and greater paternity confidence increases paternal investment). In contrast, males benefit both from pursuing additional pair-bonds with different females at the same time, and from additional extra-pair copulations (short-term sexual relationships).

Second, while these different evolved mating strategies influence human mating patterns, humans also acquire and enforce (formally and informally) culturally-transmitted social norms (which are sometimes codified into laws) that motivate and regulate social behaviour. In this instance, human societies have culturally evolved marriage systems that consist of sets of social norms that aim to regulate and motivate certain kinds of behaviour (while suppressing other kinds of behaviour). Norms make human marriages different from primate pair-bonds because in marriages uninvolved third parties (other community members) care about whether a married pair is obeying the local norms (about inheritance, residence, dowries, child rearing, sexual exclusivity, etc.). Because third parties may take action when norms are violated, humans worry about their reputation for adhering to local norms and this affects both their behaviour and their motivations.

Many forces shape the cultural evolution of systems of social norms, including our evolved psychology, but one important force is inter-group competition. Societies possessing norms that more effectively shape, harness, re-enforce, and suppress aspects of our evolved psychology in ways that benefit the group as a whole in competition with other societies spread at the expense of societies possessing fewer group-beneficial norms. Over centuries, this leads to the spread, often without anyone's conscious awareness of the underlying causal process, of social norms (including laws and institutions) that create societal-level benefits that favour success in competition with other groups.

The anthropological record of marriage systems, as well as the record of mating patterns in non-human primates, reflects the basic differences in female and male mating strategies.

- Marriage systems in most human societies permit polygynous marriage to some degree (85%). Nearly all foraging societies, for example, permit successful, high-status males to take multiple wives.
- In polygynous societies, taking additional wives is always associated with skill, status, wealth, or nobility.
- In the smallest scale human societies that dominated most of our evolutionary history, polygyny was necessarily mild, as few males could ever generate sufficient resources to attract more than one wife.
- But, as human societies grew in size and complexity (and especially in male inequality), levels of polygyny intensified, reaching extremes in despotic empires in which rulers controlled harems of hundreds of women and girls.
- Other forms of marriage aside from monogamy and polygyny are rare. Only 1% of societies have ever been considered "polyandrous",[1] and even this is deceptive as in most (but not all) of those societies, polyandry co-occurs with both monogamy and polygyny. Indeed, researchers have long argued that polyandry is a response to a specific set of economic circumstances involving quite limited resources and certain constraints. Group marriage is rarer still, and in the anthropological record it is safe to say that nearly all human polygamous marriages have been (and continue to be) polygynous.

Given our evolved mating psychology, the puzzle is not why societies are polygynous; it's why any society is monogamous, especially one in which males are highly unequal (like ours). Many of the reported monogamous marriage systems in the smallest-scale societies are probably "ecologically monogamous," which means they are monogamous because resources are scarce and relatively equally divided among men. Thus, what is puzzling is the emergence of monogamy in the most successful and competitive of ancient civilizations. One possibility (detailed below) is that—perhaps by chance, whim, or insight—some ancient societies began to impose monogamy, and they consequently began to prosper and spread because of the group-beneficial effects of monogamy (evinced below).

[1] Polyandrous marriage involves one female marrying multiple males.

Modern monogamy,[2] which arrived recently in places like China, Japan, and Turkey, can be traced back to the Greek city states, where Athens and Sparta instituted early versions of monogamy laws to galvanize internal solidarity and compete more effectively with other city states. This tradition passed into Rome, where Augustus and other Emperors further sought to fortify monogamous marriage, with the notion that this would strengthen Rome. From Rome, monogamy infused into Christianity, where it was mixed with Greek stoicism by the early church fathers (note that monogamy is not preached in the gospels, and the Old Testament implicitly endorses polygyny). Over a long period, the Church gradually managed to compel the European aristocracy, who were initially polygynous, to adopt monogamous marriage. This system spread to the rest of the world during the European expansion after 1500 AD, and continues to spread to this day.

To understand the success of societies that adopted monogamy, it is useful to consider how allowing polygyny vs. imposing monogamy affects male mating psychology. If permitted to obtain as many wives as possible, males will deploy their efforts and resources toward this end. Even if women are completely free to choose their husbands, the high-status, wealthy males will obtain a disproportionate share of the available women. This has a number of predictable effects:

1) It will increase the pool of unmarried men psychologically primed to take risks and compete fiercely with other males to obtain reproductive opportunities (this increases crime and risky behaviour);
2) The increased competition for female mating partners places a pressure on the recruitment of younger and younger 'brides' into the marriage market;
3) Intense competition for females in a scarce 'marriage market' causes males (as fathers, husbands, and brothers) to seek to exercise more control over the choices of women (in sex, dating, dress, etc.), increasing male-female inequality and undermining women's autonomy and rights. This is further exacerbated by the fact that the age gap between husbands and wives increases in both polygamous and monogamous relationships in polygynous societies.
4) Men will reduce investment in wives and offspring as they both spread more thinly across larger (in many cases several times larger) families, and increasingly channel these resources into obtaining more wives.

Later in this document I explore the available evidence for each of these effects, including economic models showing how this diversion of male efforts and resources can explain the low saving rates, high fertility, and low GDP per capita of highly polygynous countries.

Now consider how imposing monogamy affects the same outcomes. Even wealthy males can only have one wife, so instead of investing heavily in seeking more wives, more investment goes into each wife and offspring. At the other end of the economic spectrum, because high-status males are limited to a single wife, low status men will be able to obtain a wife and invest in offspring, instead of being part of a

[2] By "modern monogamy" I refer to the complex of norms and institutions surrounding monogamy as it developed in the Western tradition. Not all "imposed monogamy" is the same. For example, as noted, Greek monogamy was imposed but permitted men to keep (foreign) concubines.

pool of unmarried men engaging in risky behaviour. This is good both for these men, and for society, since a pool of unmarried men will increase the rate of murder, rape, and property crime. Of course, males—and especially high status males—will often still engage in all manner of extramarital sexual activity, and serial monogamy. But this activity does not create the ill effects of polygynous marriage because the same number of women is still available to other males. Monogamy may have spread, and continue to spread, because monogamous societies are more competitive: monogamy seems to re-direct male motivations in ways that generate lower crime rates, greater wealth (GDP) per capita, and better outcomes for children.

Finally, I speculate that the spread of monogamous marriage, which represents a kind of sexual egalitarianism, may have created the conditions for the emergence of democracy and political equality, including women's equality. Within the anthropological record there is a strong statistical linkage between democratic institutions and monogamy, though monogamy precedes the development of democracy and notions of female equality in Europe. Monogamy may foster the emergence of democratic governance and female equality by:

- Imposing the same rules on the king and peasant (each can only have one wife), which established a first foothold on the principles of equality among men.
- Reducing the competition for females, which decreases the tendency for males to tightly control their wives and daughters—that is, imposing monogamy (on males and females) reduces patriarchal motivations in males by reducing the competition for females, which may in turn permit more egalitarianism in the household.
- Dissipating the pool of unmarried males that were previously harnessed by rulers in wars of aggression.

In this sense, the anthropologically peculiar institutions of imposed monogamous marriage may be one of the foundations of Western civilization, and may explain why democratic ideals and notions of human rights first emerged as a Western phenomenon.

II. Human Mating Strategies and Marriage Systems

A. Distinguishing Marriage from Mating Systems

Central to understanding marriage norms is recognizing the difference between these and our evolved mating psychology which, uninfluenced by culturally evolved marriage norms, would give rise directly to a human mating system. Humans, like all primates (with which I will draw occasional comparisons), possess an evolved psychology (preferences, motivations, biases) that influences our choices regarding mates, mating, reproduction, and parental investment. For well-established evolutionary reasons, male and female mating psychologies differ in important ways. As in other primates, these mating psychologies yield a mating system, as individuals cooperate and compete under different kinds of ecological and economic circumstances. Non-human primates are characterized by distinct mating systems (see below).

Marriage systems[3] are distinct from mating systems. Humans, unlike other species, are heavily reliant on cultural learning for acquiring all manner of behaviours and practices, including social behaviour. Because humans also acquire the standards by which we judge and evaluate others as part of this process, cultural evolution gives rise to social norms (Henrich and Henrich 2007). Social norms are shared standards of behaviour. Failure to meet minimal standards results in reputation damage, loss of status, and both formal and informal sanctions. Some norms also incentivize excess performance by providing reputational benefits and perhaps rewards for actions that are above and beyond the normative standard (Henrich 2004). As we will see, in some societies having more wives is both a signal and a source of status and prestige for males. It is only in cases of marriage systems based on normative (imposed) monogamy that adding wives beyond the first is viewed negatively (this is true even in systems in which polyandry is common).

Marriage systems represent collections of social norms that interact with our evolved psychology for forming long-term pair-bonds (see below). Marriage norms, for example, govern such arenas as (1) who one can marry (e.g., exogamy, incest taboos), (2) who pays for the marriage ritual, (3) who gets paid for the marriage (dowry or brideprice[4]), (4) whether or not the groom has to perform a service for the bride's family, (5) who gets the children in the event of the groom's (or bride's) death, (4) the economic responsibilities of the bride, groom, and their kinfolk, (5) inheritance rights by specifying who is a "legitimate" heir, and (6) where the new couple will reside (patrilocal, matrilocal, avunculocal, neolocal).

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[3] Here I use the anthropological meaning of "marriage." A marriage is long-term pair-bond between two people that is recognized and sanctioned by the couple's community. Being married comes with economic, social, and sexual expectations, prescriptions, and prohibitions (norms) for both parties, who are accordingly judged—formally or informally—by the community. Marriage may or may not be sanctioned by formal laws, and marriage certainly existed long before formal laws or even writing. Public rituals usually mark the commencement of a marriage. "Cohabitation," a term I use later and distinguish from marriage, does not carry the set of shared expectations, prohibitions, and prescriptions, as judged by *a community*, that marriage does. The key to understanding marriage is recognizing the role of a community in defining, sanctioning, and enforcing it.

[4] A dowry is a payment from the bride's family to the groom and/or his family. A brideprice is a payment from the groom's family to the bride's family. Payments can be in the form of cash, jewellery, animals (e.g., cows, chickens), or other items that have value within the culture.

For our purposes, marriage norms also specify rules about partner number, and arrangement of partners (e.g., no group marriages). A *marriage system* is the collection of marriage norms in a society.

Marriage norms are certainly not independent of our mating psychology, nor can they entirely replace or subvert our mating psychology. They can, however, strongly influence behavioural patterns in two ways. First, humans readily internalize social norms, at least partially. This means a social norm can internalize itself such that adhering to the norm is intrinsically rewarding. Recent work in neuroscience has shown both how adhering to local norms and punishing norm violators activates the brain's reward circuitry (Fehr and Camerer 2007). Second, the fact that other people acquire and internalize norms means that they are willing to punish norm violators, even at a cost to themselves. This means that independent of any internalization, norms impose real costs on norm violators. An underappreciated difference between marriage systems and mating systems is that in marriages many people are concerned that the norms are followed, not only the mating pair and their families. This third-party concern is unknown in other primates—other primates have monogamous mating and cohabitation, but not marriage.

Perhaps it goes without saying, but the marriage system (sets of norms) and the actual mating patterns in human societies never quite match up. Consider that some societies possess marriage norms specifying that each man and woman shall marry once in their lifetime, to only one person. After this marriage they shall never seek any sexual or romantic relationship with anyone else, ever, and all material resources must be devoted to the good of the household. These social rules capture some of the marriage norms for some societies. Of course, this never quite works out, as our evolved mating psychology gives rise to broad societal level patterns of infidelity, lack of paternity, divorce, prostitution, etc. But there is little doubt that marriage systems shape and influence the resultant mating patterns, as well as patterns of parental investment.

B. Human Mating Psychology

The first step in understanding human *mating* psychology, and in particular the differences between male and female mating psychology, is to recognize the quite different evolutionary pressures on males versus females. The mating psychologies of men and women reveal the tradeoffs inherent in the different strategies that will maximize their reproductive success. An essential difference in male and female mating psychology arises from basic facts about primate (and mammalian) physiology: (1) females invest heavily in the egg compared to the paltry investment that males make in the sperm, and this asymmetric investment only increases as females subsequently must invest in gestation, lactation, and parenting if their offspring is to survive, and (2) females are limited in their lifetime reproductive output (their direct fitness) to the number of babies they themselves can carry to term and rear to adulthood. Meanwhile, males can potentially father thousands of offspring and invest nothing other than sperm. This difference spawns another pattern that will be relevant below: the variance in reproductive success is much lower for females compared to males. Females will have typically at most 18 offspring,[5] and this number was much lower for most of our evolutionary history, probably more like

[5] There are a variety of aberrant cases that dramatically exceed this numerical guideline. The highest recorded number of children born to one woman is 69 (in Russia between 1725 and 1765). This involved 27 pregnancies

8. For males, offspring production can range from zero to thousands (Daly and Wilson 1983; Barrett et al. 2002; Buss 2007). At the top end, some males (e.g., Genghis Khan) had so many reproductively successful offspring that their impact is measurable in the human genome (Cochran and Harpending 2009). At the bottom end, low-status males have often been routinely shut out from successful reproduction.

The same logic predicts a difference in "choosiness" with regard to mates (differences in willingness to have sex). Because females can produce only a limited number of offspring, and each requires substantial investment of time and energy, female mating psychology favours selectively mating with high quality mates based on genetic quality and access to resources (for rearing the offspring). Any sexual encounter could result in two decades of intense investment. Males, who can potentially invest very little, should be less choosy, and focus mostly on the fertility and genetic quality of potential mates. This means, at the low end of reproductive success, almost any female can manage to get pregnant because some males are always willing to make the minimal investment necessary. In contrast, males that are both low-status and low genetic quality could easily end up leaving no offspring since females are choosy about whom they mate with. Substantial empirical evidence from diverse societies supports these differences in mating preferences (Buss 1989; Kenrick and Keefe 1992; Kenrick and Keefe 1992; Barrett et al. 2002). For our purpose, these data show specifically that women prefer males with more resources and greater social status (Cashdan 1996), while men prefer younger, more attractive, women[6] (more on mating strategies below).

This makes males the "risky" sex, and predicts they have a corresponding psychology. A male who finds himself without access to females should be dramatically more likely to take substantial risks aimed at increasing his opportunities for sex (e.g., theft, murder, etc.). Ample empirical evidence indicates that males have a much greater propensity for taking risks of all kinds, especially when status is at stake (Daly and Wilson 1983; Daly and Wilson 1988; Daly and Wilson 1990; Buss 2007). This means that social factors that severely limit or restrict the reproductive options for low-status males will shift them into this risk-taking mode.

Evolutionary logic also leads to predictions about male and female parental investment (Barrett et al. 2002). Females, including most mammals and all primates, must invest in their offspring for the offspring to survive, though they may preferentially invest in some more than others. Offspring of females who do not invest generally don't survive at all in most species, and certainly do not do well in humans. Male parental investment is much more variable, since males can invest either in their children or in gaining additional matings. From a fitness point of view, the fitness maximizing situation is to have

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resulting in 16 pairs of twins, 7 sets of triplets, and 4 sets of quadruplets. Some have questioned the veracity of this claim. The important point is that even this extreme case does not compare to Genghis Khan, who was so prolific that he seems to have left an imprint on the human genome.

[6] There is much important cross-cultural variation in the relative strength of these preferences. Interestingly, consistent with evolutionary predictions, some of the variation in the importance of attractiveness (relative to other attributes) is predicted by the prevalence of pathogens and parasites in the environment. When pathogens and parasites are more dangerous, genetic quality (as indicated by attractiveness) is relatively more important because this predicts a resistance to pathogens and parasites (Gangestad and Buss 1993).

many matings and have other males invest heavily in rearing their offspring (cuckold other males). However, since low-status males of low genetic quality will have limited mating prospects, they should shift toward long-term pair-bonding and parental investment. Higher-status males should shift the balance toward parental investment as their mating prospects diminish or become too costly. Social factors that (1) make mates available to low status males (who would otherwise not have them) and (2) increase the costs for higher status males of obtaining additional mates (either long or short-term mates) will increase overall parental investment by males.

To get a sense of mating systems in broad perspective, Table 1 summarizes data on primate mating systems. Under the column "Mating System," in "Multi-male polygyny" groups of males defend access to groups of females. Here there are no long-term mating-related associations between males and females (no pair-bonds). Within these groups, males still compete for access to females when females become sexually receptive (that is, when they can get pregnant). Females typically signal their entry into this period with changes in colouration, or by presenting their hind quarters to males. Competitions and consequent social rank determine the frequency of mating with receptive females, although within-group males of lower rank are still given some access. A receptive female chimpanzee, for example, may end up mating at least once with most adult males in a group. Such multi-male groups contrasts with "Single-male polygyny," which means that some individual males successfully associate with, and limit access to, groups of females. Other males have no access to these females. Gorillas, for example, live scattered in small groups with one dominant male who defends (or guards) several adult females, and their offspring. Bands of subordinate "bachelors" also roam these forests, occasionally challenging dominant males. Beginning with humans, the first column orders these categories according to their phylogenetic distance from humans. Humans are a type of Great Ape, and most closely related to chimpanzees, then gorillas and orangutans. Gibbons are a type of Lesser Ape which share a common ancestor with all the Great Apes. All apes are equally distant from Old World Monkeys.

Table 1: Primate Mating Systems			
#	Primate	Phylogenetic category	Mating system
0	Humans	Great Ape	see below
1	Common chimpanzee	Great Apes	Multi-male polygyny (no pair-bonds)
2	Gorilla	Great Apes	Single-male polygyny (pair-bonds)
3	Orangutan	Great Apes	Single-male polygyny (pair-bonds)
4	Gibbons	Lesser Apes	Monogamous (pair-bonds)
5	Colobines (from multiple genera)	Old World Monkeys	Single-male polygyny (pair-bonds)
5	Old world monkeys (from multiple genera)	Old World Monkeys	Multi-male (no pair-bonds)
5	Hamadryas and gelada baboons	Old World Monkeys	Single male polygyny (pair-bonds)
6	New world monkeys (from multiple genera)	New World Monkeys	Multi-male polygyny
6	New world monkeys	New World Monkeys	Monogamous (pair-bonds)
6	Marmoset/tamarin	Callitrichidae (New World Monkeys)	Monogamous and sometimes polyandrous (pair-bonds)

Putting the complicated question of humans aside, there are no Great Apes that mate monogamously or polyandrously (Boyd and Silk 1997; Chapais 2008). Gibbons, a Lesser Ape, do pair-bond monogamously, and together defend territories with their mates. Otherwise, only a few groups of New World Monkeys pair-bond monogamously. Saddleback tamarins are highly variable, and include groups that are monogamous and polyandrous, with some that are even multi-male. While active parental investment by males in offspring is extremely rare in primates, when it does occur it is always closely associated with monogamous mating systems. Monogamous male primate species invest in their offspring, unlike all other primates. Similar patterns hold in birds (Barash and Lipton 2009).

Central to understanding human mating and mating psychology is to recognize that humans, like some primates, form lasting pair-bonds. Gorillas, for example, form lasting pair-bonds in which males "mate guard" to both prevent other males from gaining sexual access to their partners, and protect their offspring—which they know are "theirs" if they have done a good job of mate guarding previously. However, unlike gorillas, human males in pair-bonds care—to varying degrees—for the offspring of their partners. This has been observed even in the smallest scale human societies, especially among foraging

populations (Hewlett 2000). Human males, much more than all other primates, invest in at least some of their offspring for many years.[7]

Efforts to reconstruct the pre-cultural (pre-marriage norms) mating systems of human ancestors are necessarily speculative. The most recent and comprehensive effort (Chapais 2008) suggests that the common ancestor to chimpanzees and humans probably had a single-male mating system, like gorillas (who happen to share a common ancestor with humans and chimpanzees). In different ecological conditions, males will be limited in the number of females that they can defend access to. If resources are widely scattered and scarce, single-male mating systems can turn into a mixture of groups, some involving monogamous pair-bonds and others involving one male and multiple females. Pair-bonding initially started out as mate guarding but as our lineage's brains began to expand, paternal contributions to subsistence and cultural transmission became increasingly crucial. The idea is that now human males possess psychological mechanisms both for mate guarding (to ensure paternity) and for regulating investment in offspring while considering both their paternity certainty and the cost of additional mating opportunities (Marlowe 2003; 2007).

For human males this creates two different kinds of reproductive strategies, one based on developing long-term pair-bonds and one based on seeking short-term (very short, usually) mating opportunities (extra-pair copulations). The selection pressures for the two strategies are somewhat different. For short-term mating, males should focus principally on females showing cues of fertility (ovulation) and health. For selecting long-term mates, to mother the offspring that the male will invest in, males should desire females who are young, healthy, fertile, emotionally stable, motherly, hard-working, and of suitable and compatible personal characteristics. Since a male's desire to invest in offspring is strongly related to his beliefs about his paternity, males in long-term pair-bonds should be concerned with the sexual fidelity of their females—but they should be most concerned when intra-sexual competition is fierce and some males have quite limited reproductive opportunities. Both strategies can be operative at the same time, although the decision to invest in offspring and in pair-bonding necessarily shifts attention, resources, and affective commitments (including hormonal shifts) away from seeking short-term mates. Substantial evidence from psychological experiments supports these predictions (Thornhill et al. 2003; Marlowe 2004; Gangestad et al. 2006; Rucas et al. 2006; Buss 2007). It is important to realize that all marriage systems tend to reinforce the long-term pair-bonding strategy, though there is nothing about the long-term strategy that limits a male to a single long-term partner. Societies like the Na in China, who traditionally lacked a marriage system, do without paternal investment entirely (Hua 2001).

Female mating psychology also has two strategies, but they are different from males' strategies in crucial ways. Successful reproduction, at least in ancestral human societies, required pair-bonding with a male, establishing his beliefs about paternity, and obtaining as much of his investment in her and her

[7] Note, the term "pair-bond" does NOT mean monogamy. A male gorilla can pair-bond with multiple females, especially if he invests less in each offspring. Each of these is an independent durable relationship that facilitates the safe rearing of offspring.

offspring as possible.[8] In long-term mates, females look for a combination of the ability to invest in the form of resources and skills/abilities, a willingness to invest, physical size, and high genetic quality. Extra-pair copulations do not improve a female's fitness in the same dramatic way they do a male's fitness. As noted, females have a limited number of times they can be pregnant in their lives, and they "want" (from a fitness perspective) to make each one count (get a high quality offspring). Once pair-bonded, it is more important for a female to appear chaste, since hints of sexual infidelity will reduce a male's paternity certainty and his investment in offspring.

Human females' other mating strategy comes into play when extra-pair copulations provide an opportunity to obtain higher quality genetic material (i.e., sperm), or other direct investment, while still obtaining investment from their current partner. Much recent evidence supports this by showing how women's mate preferences shift during ovulation. Around the time of ovulation women's relative preferences for high genetic quality increases and their interest in resources decreases, and they are also more interested in sex with men besides their long-term partner (Haselton and Gangestad 2006; Haselton and Miller 2006; Pillsworth and Haselton 2006).

Points relevant to the issue at hand:

- Within the context of marriage systems, which reinforce long-term bonds, male mating psychology strongly favours long-term pair-bonds with multiple partners. Males, like many primates, should seek to pair-bond with as many females as they can attract and support. Their ability to attract long-term partners will depend on many factors, but a major factor will be their resources and social status.
- Male psychology is generally highly averse to sexually sharing a female with another male. The evolutionary reasons for this involve paternity uncertainty. Males want to invest in their own offspring, not those of another male. Female ovulation is generally concealed from males, so males have no independent way to figure out which offspring are theirs—except by policing the fidelity of their mates (putting aside the recent development of paternity testing, which is irrelevant to evolved behaviours).
- It is also the case that males should respond to a shortage of females by more fiercely guarding their mates, and controlling their behaviour through force. This is especially true for resource-rich males because women pair-bonded with such men will still be drawn to the so-called "good-genes guys" to obtain better genetic material, to combine with the resources and investment from their pair-bonded mate. Of course, as noted, it is generally to the females' advantage to keep a male's paternity certainty high, otherwise he will likely invest less.
- Females are not particularly advantaged by pair-bonding with multiple males, unless resources are extremely tight, or there is some economic or ecological reasons why males cannot remain home regularly. I will describe the marriage and mating patterns surrounding the rare cases of polyandry (one female, multiple males) below.

[8] If males lack confidence in their paternity of offspring, they tend to invest less (Daly and Wilson 1988; Daly and Wilson 1999).

C. Nature and Variation in Norms Regarding Spousal Number

To examine the nature and variation in patterns of human mating, and particularly in marriage patterns, we will need to examine the anthropological record of extant and historically known societies. The most extensive database of such information across diverse human societies is the *Ethnographic Atlas*[9], which currently includes information on marriage for 1231 societies. These data, summarized in Table 2, show that exclusive monogamy occurs in about 15.1% of the sample, polygyny in 84.6% of these societies, and polyandry in less than 1%.

The problem with using all these data straight from the *Ethnographic Atlas* is that the data points are non-independent. That is, many of these societies are probably related historically and have splintered off over centuries from older societies. This leads to the worry that certain traits might be common because certain societies happened to spread. To mitigate this problem, cross-cultural researchers use the Standard Cross-Cultural Sample (Murdock and White 1969). This is a sample of 186 preindustrial societies from across the globe that have been selected both to avoid these historical connections (which create non-independence) and because of the rich quality of material available for them. Table 3 shows that using this sample we find that the frequency of monogamous, polygynous, and polyandrous societies is 34%, 65%, and 1%, respectively.

Table 2. Marriage Systems in Cross-cultural Perspective

Type	Ethnographic Atlas N = 1231 societies (Gray 1998)
Monogamous	15% (186)
Occasional polygyny	37% (453)
Frequent polygyny	48% (588)
Polyandry	0.3% (4)

Table 3. Marriage Systems in the Standard Cross Cultural Sample[10]	Count (%) N = 176
Polyandry	2 (1.1%)
Monogamy	27 (15%)
Monogamy with occasional polygyny	33 (19%)
Polygyny preferred (but <20% of male engage)	54 (31%)
Polygyny preferred (> 20% of males engage)	60 (34%)

For our purposes, one problem with these data is that they represent merely ethnographic observations about how marriage systems actually operate on the

[9] The *Ethnographic Atlas* was first published by Yale anthropologist George Peter Murdock in a series of installments beginning in 1962 and ending in 1980 (published as the *Atlas of World Cultures* in 1980). It represents the single largest coded anthropological database of world cultures. The codes were derived from collections of ethnographic and historical materials on each culture. In 1998, Patrick Gray produced an updated and corrected version (Gray 1998). The *Standard Cross Cultural Sample*, developed by both Doug White and Murdock, is a subsample of the best known cultures, selected so as to maximize historical independence of the cultures contained in it.

[10] Data is drawn from White (1988). This work cross-checks and verifies earlier coding efforts.

ground. For monogamy, they do not separate *normative or imposed monogamy* from *ecological monogamy*.[11] By normative or imposed monogamy I mean groups that possess marriage norms that prescribe monogamy and punish violations. Ecological monogamy describes situations in which there are no prohibitions against having different marital arrangements, but the economic or ecological circumstances are such that males are not sufficiently different from one another to attract more than a single wife. Some small-scale societies have strong sharing norms that demand the equitable division of economic surpluses across the group. Such levelling will sometimes reduce polygyny to just monogamy, at least during periods of scarcity. Alexander et. al. (1979) argued that many small-scale societies described as monogamous are really only ecologically monogamous.

Table 4. Cultural Norms	Count (%) N = 183
Monogamy prescribed (offspring of non-wives do not inherit)	27 (15%)
Monogamy preferred but some polygyny	32 (17%)
Polygyny for exceptional males (leadership, skills)	45 (25%)
Polygyny for men of wealth, nobility, etc.	33 (18%)
Polygyny preferred for most men. Most older men should have 2+ wives.	46 (25%)

In a detailed study of polygyny, White (1988) tried to distinguish the cultural rules of a society from their practices by re-coding the Standard Cross-Cultural Sample looking to distinguish cultural norms from the marriage-mating system. He distinguished cases of (1) norm-prescribed monogamy, (2) monogamy preferred but some polygyny, and (3) various degrees of polygyny—see Table 4. The coding for prescribed monogamy is strict in the sense of focusing on the existence of penalties for extra-marital offspring. Monogamy is prescribed in 15% of these societies, and preferred in another 17%. Where monogamy is only "preferred", polygyny inevitably creeps in.

Table 5: Household Arrangements	
Marriage Arrangements	Ethnographic Atlas % (N = 1267)
Independent nuclear, monogamous	14.6% (186)
Independent nuclear, polygyny	35.7% (453)
Preferentially sororal, cowives in same dwelling	5.4% (69)
Preferentially sororal, cowives in separate dwellings	1.4% (18)
Non-sororal, cowives in separate dwellings	27% (344)
Non-sororal, cowives in same dwellings	12.4% (157)
Independent polyandrous families	0.32% (4)
Missing data	2.8% (36)

[11] Alexander et. al. (1979) distinguishes "Socially Imposed Monogamy" from "Ecologically Imposed Monogamy". Several authors have picked up and supported or expanded on this distinction.

Polygynous marriage systems are composed of many parts and much variation exists within the category. White's comprehensive statistical analysis empirically distinguishes two major kinds, or clusters, and one minor category. The major clusters distinguish sororal polygyny from general polygyny. In sororal polygyny there is substantial normative pressure for a male to marry real or classificatory sisters (who are typically some kind of cousin). This partially solves a major problem with polygynous households: conflict among co-wives over access to the husband and his resources. When co-wives are relatives they can more easily cooperate (humans have an evolved psychology for helping blood relatives), and tend to live in the same house. See Table 5.

Under general polygyny (meaning non-sororal), the other major type, wives are rarely sisters and may be quite different in age. Because of conflict among co-wives, each wife often maintains a separate household, or at least a separate hearth. It is under general polygyny that differences in the numbers of wives for each man can get extreme. Globally, sororal polygyny tends to occur in the New World (the Americas) while general polygyny tends to occur in the Old World, and remains common in Africa.

The minor cluster involves societies with sharp social stratification (classes or castes) in which only members of the high class can marry polygynously (monogamy is enforced in the lower classes by the upper classes). Realize also that ascription or assignment to the nobility or high caste is often by birth and blood, not by wealth. This means that rich traders who are of low birth status are limited to one official wife. This actually points to a coding challenge in the *Ethnographic Atlas* in which some highly stratified ancient societies like Egypt and Babylon were coded as "monogamous" although they actually practiced this class-based polygyny (Scheidel 2009).

In all polygynous societies, a man's social status, prestige, hunting skill, nobility, and wealth lead to more wives (Heath and Hadley 1998). Betzig (1982; 1993) puts a fine point on this observation by analyzing what the autocratic leaders of chiefdoms, empires, and early states did regarding wives and concubines. She reveals a strong pattern that, given the wherewithal to do so (no internalized social norms or laws to impede them), powerful men consistently assemble immense harems with 100 or more women. This ranges from High Chiefs in Tonga and Fiji to emperors in China and the Andes. Harems get bigger and bigger as the societies get larger and more complex.

As is clear from the data presented above, polyandrous marriages are quite rare. However, four other patterns are important: polyandry is (1) usually fraternal polyandry, meaning brothers marry the same woman, (2) typically found intermixed with other marriage types in the same society, including both monogamy and polygyny, (3) considered to be somewhat unstable with the youngest husbands leaving the marriage, or taking additional wives themselves (giving rise to polygynandry), and (4) principally confined to the Himalayan and, to a lesser degree, Indian regions of Eurasia, though it has been observed elsewhere, including in the Americas (Levine and Silk 1997). Many researchers have argued that polyandry emerges when sustaining a household requires the input of multiple males (Levine and Silk 1997). For example, in some places economic circumstances make it necessary for a male to travel long distances from the household while the presence of bandits requires a man to guard his family.

One sees reports of other forms of marriage in humans, such as group marriage, besides the broad categories outlined above. Many of these reports are of dubious quality. Sometimes they track to the observations of single travelers who noted a particular family arrangement (that is, one family), often with insufficient detail to judge just how well the observer had investigated. Or, non-anthropological observers have confused marriage with the custom of wife sharing or loaning, which was common in both aboriginal North America and Australia. In these societies, which were numerous (and usually polygynous), husbands controlled sexual access to their wives, and it is considered polite and honourable for them to give those "services" to close friends or honoured guests for a night or period of time. Since these other men are also often married, it might appear to a casual observer as if some kind of complicated marital arrangement exists.

Nevertheless, there may be a few societies that have some degree of group marriage, which exists alongside polyandry (Westermarck 1894). In particular, the case of the Todas in India was extensively documented by the psychologist and anthropologist W.H.R Rivers (1905). In this case, two brothers (usually) have married a single woman. When the family's economic prospects improve, a second woman is brought into the marriage, often a sister of the first wife. This suggests that some cases of group marriage exist, but nowhere do they form a stable societal pattern prescribed by social norms. After reviewing the evidence, Murdock (1949: 24) claims that group marriage has never been normative in any human society.

One feature of marriage norms is worth highlighting. As noted, marriage norms prescribe and prohibit roles and responsibilities related to economics, subsistence, child rearing, sex, and inheritance. But only 23.3% of societies in the Standard Cross-Cultural Sample (including monogamous and polygynous ones) have marriage norms that strongly condemn extra-marital sexual activity by males (Broude and Greene 1976). Meanwhile 89% of societies condemn all extra-marital sex by wives, though there are interesting exceptions in societies that believe in partible paternity (Beckerman and Valentine 2002).

III. The Emergence of Modern Monogamy

Historians and anthropologists trace the origins of modern monogamy,[12] which spread across the world with the global expansion of Europe after 1500, back through Rome to the Greek city states (e.g., Athens and Sparta), and possibly back to the root of the Indo-European expansion (Macdonald 1990; Macdonald 1995; Fortunato et al. 2006; Scheidel 2009). Under European and at times specifically Christian missionary influence, monogamy spread throughout the Americas, Australia, and Oceania, and eventually into Asia. Legal monogamy was adopted rather recently in many places: 1880 in Japan, 1955 in India, 1963 in Nepal, 1953 in China (Scheidel 2009).

[12] Here I use "modern monogamy" to refer specifically to the cultural evolutionary trajectory that produced the Western notion of monogamy that all readers will be familiar with. This means that "modern monogamy" is a subset of societies with normative or imposed monogamy.

Greek city states first legally instituted monogamy as part of many different reforms, including elements of democratic governance, which were meant to build egalitarian social solidarity among their citizenries. Prior to this, all accounts suggest polygyny was common, at least among the nobility, and monogamy was a strange "Greek idea" (instituted legally in the early sixth century BCE in Athens). While Greek monogamy limited each male citizen to a single wife, it was considered acceptable to import sex slaves, which wealthy men did. This approach is interesting because it addresses one of the fundamental social dilemmas posed by polygynous marriage systems, by keeping local women available to poor men for marriage (avoiding the problems created by poor unmarried males, see below), while at the same time allowing rich men broad sexual access to "imported" women.

It is not entirely clear, but the Romans likely inherited and further developed the monogamy of the Greeks (as they did with many Greek ideas), though Etruscan marriage norms and relative sexual equality likely had some influence. Rome outlawed polygamy and regulated this with laws about sexual behaviour, birth legitimacy, and inheritance. Bigamists could be prosecuted for adultery, and married women had to be accompanied in public (Herlihy 1995; Macdonald 1995).

Later, Augustus felt Roman morality was declining and weakening his empire, so he instituted a series of reforms in an effort to get every man from age 25 to 60 to be married. Augustus evidently believed that making sure most men were monogamously married would strengthen Rome. Legal changes included: (a) restricting married men from having extra-marital sexual relationships with women who were not registered prostitutes, (b) limiting the size of the inheritance that unmarried men could receive, (c) making divorce a formal legal process (to discourage serial monogamy), and (d) eliminating concubinage for married men and making the offspring of concubines unable to inherit wealth. A series of Roman emperors after Augustus, including Tiberius, Claudius, Hadrian and Severii, continued to reinforce these legal principles and adapt the law.[13] The evolution of this aspect of the Roman legal system is intimately intertwined with the emergence of greater sexual equality under the law (Macdonald 1990; Herlihy 1995; Scheidel 2009).

Early Christian ideas about monogamy and sexual purity are a combination of the evolving Roman ideals and notions drawn from Greek stoicism. Christian ideals solidified and eventually spread throughout Europe (which was highly polygynous in the pre-Christian era and during the early days of Christianity). These ideas do not come from Judaism (which permitted polygynous marriage until at least the 11th century), or the Christian Gospels. At best, the New Testament offers some vague recommendations for monogamy among church leaders in the Pastoral Letters (Scheidel 2009). In the Old Testament, the prophets and kings are all polygynous.

European aristocracies, which derived from clan-based tribal societies, were highly polygynous in the 5th century. However, all sought alliances with the Catholic Church, which worked vigorously to impose monogamous marriage on the aristocracy. As European kings gradually converted to Christianity, sometimes out of true belief and sometimes for political expediency, the Church increasingly controlled

[13] While supporting laws strengthening monogamous marriage (believing it was for the good of the Empire), most Roman Emperors (not all) voraciously pursued immense sexual variety in their personal lives (Betzig 1992). They were monogamously married, but mated polygynously in extravagant fashion.

their marriages, and thus their legitimate heirs (that is, they controlled who had rights to political power). Since the lower strata of these societies, who were rapidly adopting Christianity, were economically limited to monogamous marriage anyway, the main line of resistance came from the nobility. Once the nobility began to accept monogamous marriage (without the harems of their peers elsewhere in the world), general monogamy and associated laws followed (Macdonald 1995). The medieval Church continued to adjust and spread the doctrines that reinforced monogamous marriage.

Historians have argued that this was one of the great achievements of the middle ages (Herlihy 1995), to put the peasants and the nobility on the same footing with regard to marriage, and it may have been a key step in the development of modern notions of equality—both of the equality among men, and of male-female equality. Realize that norms prescribing monogamous marriage temporally preceded all of the West's eventual development of human rights, women's liberation, etc.

As noted above, modern monogamy spread out from Europe because these societies were so successful, militarily, economically, and politically (Macdonald 1990; Herlihy 1995; Macdonald 1995; Scheidel 2009). Monogamy has even now been made law in some Islamic countries (Scheidel 2009), including Turkey (1926) and Tunisia (1956). The possibility that normative (often imposed) monogamous marriage was causal in the successful global expansion of European (and European-descent) societies is something that becomes increasingly plausible when we examine the societal-level effects of monogamy.

Key points of this section are:

- Most human societies in the anthropological record permitted polygynous marriage. In all cases, additional wives are taken by wealthy or prestigious males, or by nobility.
- Much of the monogamy observed in the cross-cultural record results from the relative economic equality among men.
- Polyandry is quite rare, and fairly concentrated in particular regions and economic circumstances. It often coexists with polygynous marriage.
- Modern monogamy is a peculiar set of institutions that emerged in some Greek city states (in particular in Athens and Sparta) to galvanize polity solidarity and sustain notions of equality. It was subsequently developed in Rome to increase the percentage of married citizens, and from there infused into Christianity, where it spread into Europe and eventually to much of the world.

These patterns are consistent with evolutionary approaches to human mating psychology, though they also illustrate the potency of social norms (and laws, etc.) in shaping behavioural patterns.

IV. The Consequences of Increased Polygyny

A. The Expected Effects of Polygyny

The prevalence and impact of polygyny changes dramatically as societies increase in both wealth and absolute inequality. In relatively egalitarian small-scale societies, including most foraging populations, the social implications of polygynous marriages are minor. Few men in these societies achieve sufficient

status to attract additional wives and if they do, this is typically limited to one additional wife (Marlowe 2003). In rare cases, very successful men might obtain three or at most four wives (Nielsen 2004). Among tropical African foragers, for example, the rate of polygyny ranges from 3% to 20% (Hewlett 1996). Often, because of the relatively greater dangers faced by males in hunting and violent conflict, the ratio of males to female drops below one, and polygyny partially absorbs the extra women into marriages.

However, as a society's wealth and inequality increase (exacerbated by inherited wealth and property rights), the degree of polygyny among the richest and most powerful men increases dramatically (Betzig 1982; Nielsen 2004). These increases in the degree of polygynous marriage can be expected to —*ceteris paribus*—have several consequences where, as in most modern societies, the numbers of men and women reaching marriage age are approximately equal:

- A pool of low-status men is created who will remain unmarried for all or most of their lives as all their potential marriage partners go to high status, wealthy men. Evidence outlined below suggests that such unmarried men will aggregate and engage in crime, social disruption, and personal abuses at higher rates.
- Competition for mates and access to sex created by the pool of unmarried men increases kidnapping of women (as sex slaves), rape, and prostitution. Data and proper analyses for kidnapping and prostitution are not available, but observed patterns are consistent with this prediction. Greater polygyny is strongly associated with higher rates of rape.
- Competition leads to females being married off, or promised in marriage, at younger ages. This results in increasing the age gap between wives and husbands. This reduces the equality of the marriage and leads to inexperienced and uninformed choices by young women and adolescents. Several lines of evidence converge to support this prediction.
- Because of the competition for mates, males will seek to control women (their wives, sisters, and daughters) more tightly, exacerbating female inequality, domestic violence, abuse, and possibly increased female suicides. The evidence supports several of these predictions.

Relative to monogamy, polygyny also impacts male parental investment by (1) eliminating opportunities for low-status males to establish pair-bonds (and invest in offspring), (2) diluting the per-child investment in larger and larger families, and (3) shifting investment by high status males from offspring into obtaining more long-term mates. While allowing the resources of richer men to be distributed among more children, the net effect of polygyny on male parental investment will often be to reduce the average per-child investment. This effect should be most potent in more patriarchal societies, and may result in poorer outcomes (on average) for the children of polygynous marriages compared to monogamous unions. The evidence is consistent with this prediction.

Note that it is possible to avoid creating the pool of unmarried males if population growth rates are particularly high, along with male mortality, and men marry much younger females (girls). In a rapidly growing population the size of the next generation can be double or triple the previous generation such that if young women are marrying mostly older men, most men can obtain two or more young wives

(Tertilt 2005; Tertilt 2006). Of course, these countries all have rates of population growth that are unsustainable in the long-run and high rates of girls marrying before age 18.

Below, I discuss these points in greater depth.

B. Polygyny, Crime and Social Disorder

(1) Polygyny's Creation of a Pool of Unmarried Low-Status Men

In this section I first lay out the mathematics that illustrate how polygynous marriages can increase the size of the pool of unmarried men. Then, I review the evidence that, for males, getting married (monogamously) is prophylactic against engaging in crime, social disruption, and other socially undesirable activities. Finally, at a societal level, I discuss evidence illustrating how this pool of unmarried men can impact crime rates, including murder, rape, and property crime.

This illustration reveals the underlying arithmetic that can result in a pool of low-status unmarried men. Imagine a society of 40 adults, 20 males and 20 females (actual sex ratios at birth favour males but put that aside). Suppose these 20 males vary from the unemployed high-school drop outs to CEOs, or billionaires (there are 425 billionaires in North America). Let's assume that the twelve men with the highest status marry 12 of the 20 women in monogamous marriages. Then, the top five men (25% of the population) all take a second wife, and the top two (10%) take a third wife. Finally, the top guy takes a fourth wife. This means that of all marriages, 58% are monogamous. Only men in the top 10% of status or wealth married more than two women. The most wives anyone has is four.

This degree of polygynous marriage is not extreme in cross-cultural perspective (White et al. 1988; Marlowe 2003), but it creates a pool of unmarried men equal to 40% of the male population who are incentivized to take substantial risks so they can eventually participate in the mating and marriage market. This pattern is consistent with what we would expect from an evolutionary approach to humans, and with what is known empirically about male strategies. The evidence outlined below shows that the creation of this pool will likely have a number of outcomes.

To explore the effect of this pool of unmarried men I discuss three lines of research. First, I present evidence showing the impact of marriage on males' likelihood of committing crimes or engaging in personally dangerous behaviour. The evidence indicates that unmarried men gather in groups, engage in personally risky behaviour (gambling, illegal drugs, alcohol abuse), and commit more serious crimes than married men, including rape, murder, theft, property crimes, and assault. Second, to address the issue of whether these individual effects scale-up to create societal level impacts, I examine how polygyny impacts crime rates using three different approaches.

(2) The Effect of Monogamous Marriage on Crime

There is ample research on the relationship between monogamous marriage and crime. Cross-sectional data, which is the most plentiful, show that unmarried men are more likely than married men to commit murder (Daly and Wilson 1990), robbery, and rape (Thornhill and Thornhill 1983; Daly and Wilson 1988). Moreover, unmarried men are more likely than married men to gamble, and abuse drugs/alcohol (Daly and Wilson 1988). These relationships hold controlling for socioeconomic status, age, and ethnicity.

One problem with these analyses is that they are cross-sectional. This makes it hard to argue for causality, since individuals who are less likely to commit crimes, or abuse substances, might be more marriageable or more likely to choose to get married. Recent work partially addresses this by using a variety of longitudinal datasets combined with sophisticated statistical methods that allowed the researchers to follow the same individuals over time to see how marriage impacted their behaviour relative to their own pre-marital behaviour. Sampson et. al. (2006) used detailed longitudinal data tracking boys from a Massachusetts reform school from age 17 to 70.[14] Most subjects were married multiple times, which allows the researchers to compare their likelihood of committing a crime during married vs. unmarried periods of their lives. In this case, each individual is his own control. Across all crimes, marriage reduces a person's likelihood of committing a crime by 35%. For property and violent crimes, marriage cuts the probability of committing a crime by half. When men divorce or are widowed, their crime rates go up. Supplementary analyses show that "good marriages" are even more prophylactic than average marriages, and that marrying a criminal wife has the opposite effect—of increasing a man's likelihood of committing a crime (this is consistent with prior work by Sampson and Laub (1993)).

Applying a different statistical methodology to a different dataset, Horney et. al. (1995) also demonstrate how marriage (living with a *wife*) reduces a man's likelihood of committing various crimes. They used recall data from inmates in Nebraska to examine how entering school, getting a job, moving in with a wife, moving in with a girlfriend, and using drugs (including alcohol) impact criminal activities. Controlling for all of these other factors statistically, moving in with a wife reduces the probability of a man committing a crime by roughly half. This effect is strongest for assault and weakest for property crimes, but is significant for both of these as well as drug crimes. The size of this marriage effect is similar to entering school and much stronger than being on parole or probation. Interestingly, cohabitating with a girlfriend (as opposed to a wife) either *increases* or does not impact individuals' crime rates. Having a job had mixed effects, none of which were particularly large. The positive effect on crime of living with a wife is even larger than the negative effect created by heavy drinking.

By far, taking drugs had the biggest effect on increasing individuals' crime rates, as shown by Horney et. al. (1995). This suggests that Horney et. al.'s analysis may underestimate the total impact of marriage because marriage also reduces binge drinking and marijuana use (Duncan et al. 2006). Cohabitation, as opposed to marriage, has weaker positive effects on such abuses.

In another prospective longitudinal study in London, Farrington and West (1995) found that offenders and non-offenders were equally likely to get married (i.e., the marriage effect is not a selection effect), but that getting married decreased offending compared to being single, but only if men *resided* with their wives.

There are several hypotheses about what the causal relationship is between marriage and crime. I can only sketch them here. These hypotheses are not mutually exclusive and the strength of evidence varies substantially between them.

[14] From poor backgrounds and with less than a high school education (with a mean IQ of 92); this is precisely the kind of group who won't end up marrying at all in a polygynous society.

1. Marriage changes routine activities, especially with regard to deviant peer groups. Unstructured activities with peers increase the frequency of deviant behaviours among those ages 18 to 26. The same person, when married, will spend less time with same-sex peers than when not married (or before marriage). There is supporting empirical evidence for this hypothesis in the finding that the transition to marriage is followed by a decline in time spent with friends and exposure to delinquent peer groups, controlling for age (Warr 1998). This idea is related to Waite and Gallagher's (2000: 24) argument that marriage constrains people from certain kinds of behaviour (i.e., staying up all night drinking beer) that do not pay off in the long run (in health, happiness, or income).
2. Parenting responsibilities can lead to changes in routine activities because more time is spent in family-centred activities than in unstructured time with peers.
3. A change in criminal behaviour may occur in response to the attachment or social bond that forms as a result of marriage. Social bonding: the social ties of marriage create interdependent systems of obligation, mutual support, and restraint that impose significant costs for translating criminal propensities into action (Sampson and Laub 1993).
4. For some, getting married connotes "getting serious"; in other words, becoming an adult. Marriage means having someone to care for and having someone to take care of you, and these perceived responsibilities and obligations strengthen when children enter the family. Marriage norms mean being married changes expectations of one's proper behaviour (Sampson et al. 2006).

(3) Polygyny and Crime

(a) Methods of Analysis

While the evidence that marriage reduces an individual man's chances of committing crimes is substantial, an important question is whether these individual-level effects will aggregate up to impact crime rates, and thus society in general. It might be that these effects are limited to a certain small subset of males, or that they also somehow create countervailing effects on crime that affect overall rates (e.g., perhaps monogamously married women commit *more* crimes) such that there is limited or little overall societal-level impact.

In this section I examine what we can say about the relationship between polygyny and crime at the societal level. Since monogamous marriage has spread so successfully across much of the world, and some of the polygyny included in our measure occurs despite national laws, I will employ three different approaches: one examining the relationship between the degree of polygyny across countries and crime, a second using the percentage of unmarried males as a proxy in cross-national analyses, and a third using sex ratio as a proxy to look *within* countries (which avoids the statistical issues of comparing countries). The reason for this three-pronged approach is that the seemingly straightforward statistical analysis of the linkage between polygyny and crime conceals the non-random nature of those contemporary societies that still practice polygyny to substantial levels (e.g., polygynous societies happen to all have low GDPs), and the necessarily crude measure of polygyny used. The first prong of this analytical approach addresses this problem by using a wide range of control variables (GDP, inequality, democracy, being in Africa, etc.). But, since one may still worry that something is left uncontrolled for, the second prong picks out a link in our causal argument by using the percentage of unmarried men over age 15 as a proxy. This addresses several concerns (see below). Our third prong

uses a proxy (sex ratio) to predict crime rates *within* countries. This tackles the remaining challenges of comparing countries at the aggregate level, and affords more sophisticated econometric analyses.

(b) First Prong: Greater polygyny is associated with higher rates of rape and murder

Kanazawa and Still (2000; unpublished) looked at the relationship between the degree of polygyny in countries and their rates of major felonies. Their data on crime were taken from Interpol statistics. For polygyny, they coded all of the cultures in the *Encyclopedia of World Cultures* on a four point scale (from 0 = monogamy is the rule and is widespread, to 3 = polygyny is the rule and is widespread), and then developed a country-level value by aggregating all of the cultures within a country, and multiplying each scale value for each culture by the fraction of the country's population represented by that culture.

The authors estimated a series of regression models using degree of polygyny to predict rates of murder, rape, assault, and robbery, cross-nationally. As control variables, they included Economic Development (GDP per capita), Economic Inequality (Gini coefficients), Population Density, and Democracy (degree of), as well as dummy variables for Africa (equals 1 if country is in Africa, zero otherwise) and Asia. Their analyses show that greater polygyny is associated with higher rates of murder, rape, assault, and robbery, although only the rates of rape and murder are significant at conventional levels of statistical significance. It bears emphasis that this occurs even when GDP per capita and being an African country is controlled for. The greater the degree of polygyny in a country, the higher the rates of murder and rape (on average).

(c) Second Prong: A higher percentage of unmarried men is associated with high rates of murder, rape, and robbery

Kanazawa and Still (2000; unpublished) then replace their polygyny measure with the percentage of unmarried men age 15 and up for each country. This is a good proxy for polygyny for three reasons. First, our theory above argues that polygyny causes an increase in the percentage of unmarried men, so if true, we should find a relationship *at least as strong* between crime and this proxy. Second, both polygyny and other factors influence the percentage of unmarried men, so this allows us to examine a much broader range of cross-country variation, thereby avoiding the selective nature of those countries with high rates of polygyny. Finally, using this proxy avoids the (necessarily) crudely-constructed polygyny variable (a 4 point scale) used in the preceding analyses.

The authors again estimated a series of regression models, now using the percentage of unmarried males to predict rates of murder, rape, assault, and robbery, cross-nationally. As control variables, they again included Economic Development (GDP per capita), Economic Inequality (Gini coefficients), Population Density, and Democracy (degree of), as well as dummy variables for Africa and Asia. This analysis shows that the percentage of unmarried males (15+) is positively associated with rates of murder, rape, assault, and robbery, but only statistically significantly associated with murder, rape, and robbery. The higher the percentage of unmarried men in a country, the higher the rates of murder, rape, and robbery.

(d) Third Prong: Within countries male biased sex ratio is associated with more crime

To avoid the challenges associated with cross-national comparisons, we can examine data on the linkage between a male-biased sex ratio (which implies a pool of unmarried men) and crime. Such situations have arisen in a variety of circumstances, specifically in modern India and China, where parental preferences for sons have shifted the sex ratio in favour of males (Hudson and den Boer 2004), and on frontiers, such as in the American West during the expansion of the United States. The patterns of data from such diverse cases all tell the same story (Courtwright 1996; Hudson and den Boer 2004): unmarried men form bachelor-bands that compete ferociously and engage in aggressive, violent, and anti-social activities. As I'll describe, the cases of India and China are particularly informative, since the quality of data is sufficient for detailed econometric analyses aiming at assessing causal relationships.

In China, sex ratios (males to females) rose markedly from 1.053 to 1.095 between 1988 and 2004, nearly doubling the unmarried or "surplus" men (Edlund et al. 2007). At the same time, crime rates nearly doubled—90% of which were committed by men. The increase in sex ratio was created by the gradual implementation of China's one-child policy. Each province implemented the policy at different times for idiosyncratic reasons (unrelated to crime rates or sex ratios), and this provides an excellent opportunity for statistical analyses of the impacts of the policy and the alterations in sex ratio it created. This is because the date of implementation provides an exogenous variable that can be used to established directions of causality (more on this below). Moreover, this statistically fortuitous setup is also ideal for examining how the numbers of surplus males affect crime rates for two reasons. First, limiting child number through potent family planning led to preferences for male children. It would follow that where male children are exceptionally valued, they would benefit from heavy parental investment, and one should expect, if anything, that such children would be less likely to commit crimes than the boys of previous generations. Second, limiting family size means the population began to shrink, a demographic shift that opens up opportunities in the labour market and ought to decrease people's likelihood of committing crimes. So it is significant that, despite these pressures, crime actually went up.

Focusing on property and violent crimes across different provinces in China (Edlund et al. 2007), research employing a battery of sophisticated statistical analyses using many demographic and economic control variables shows that a 0.01 increase in sex ratio is associated with a 3% increase in property and violent crimes. These analyses also indicate that the effect arises from an increase in the size of the pool of unmarried men, and not from an increase in men in general. Inequality, unemployment, and urbanization also show positive effects on crime rates, but the effect of sex ratio is independent of these effects. Since it is possible that sex ratios may be measured with an error that is (somehow?) correlated with crime rates, the authors also show that the year of implementation of the one-child policy predicts crime rates in the same manner as sex ratio. This is important evidence that increasing sex ratio *causes* crime to increase.

To challenge their own hypothesis that the effect is driven by an increase in the surplus of unmarried men, the authors also examine crimes usually committed by white-collar criminals, such as corruption. These high status men are still marriageable, and thus insulated from the hypothesized effect. These

analyses show that sex ratio does not impact corruption rates. Thus, the increase in crime driven by a surplus of unmarried men is found in property (larceny) and violent crimes.

It is also worth noting (contrary to expectations) that increases in rape do not appear to be an important component of this increase in violent crimes, although rates of rape may have been offset by a dramatic increase in prostitution (from 25,000 to between four and six million prostitutes in China) during the same period of economic growth.[15] Analyses from several studies support the linkage between higher prostitution rates and a greater excess of males. Times and places include the American frontier, urban Africa, and medieval Europe (Courtwright 1996; Edlund and Korn 2002).[16]

Murder rates in India, which have been increasing since 1970, tell a similar story. Dreze and Khera (2000) show that murder rates across districts are likely influenced by sex ratio differences across districts (319 districts in India account for 90% of the population). The authors used murder rates because they worried about under- or biased reporting of other crimes—but deaths are hard to avoid reporting. Controlling for many other factors and across diverse specifications of these statistical models, districts with more males relative to females have much higher murder rates than would be predicted purely by an increase in the number of "average males"—that is, there seems to be an effect of the imbalance of males and females on the tendency of males to commit murder. The effect is large: going from a male to female ratio (in Uttar Pradesh) of 1.12 to one (in Kerala) of 0.97 cuts the murder rate in half. The authors also broke the sex ratio down into effects created by differences in sex ratio at birth and that created by migration of males in, or out. Both had significant effects, as expected. Literacy is also an important independent predictor of murder rates across districts, though poverty and urbanization are not.

Using historical data sources, Courtwright in his book, *Violent Land*, indicates that pools of unmarried men have created similar effects (high crime, violence, drug abuse, etc.) in a variety of circumstances. Courtwright examines a range of data to argue that the violent character of the American West arose principally from the large pool of unmarried men who migrated there. Variation in crime rates, including murders, in America corresponds to the spatial distribution of sex ratios in the 19th century. And, temporally, as sex ratios move toward 1 in regions, crime rates drop. Courtwright suggests a similar case can be made for New South Wales in Australia in the late 1700s and the Argentinean Pampas in the gaucho era (Courtwright 1996). Courtwright's historical data is not suitable to the kind of econometric analyses used for India and China above, but its consistency with these analyses broadens the applicability of the case they make.

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[15] Another potential implication of widespread polygyny is an increase in sexually transmitted diseases, such as AIDS. More unmarried males—primed to take risks—means more prostitution. Tucker and colleagues (2005) argue that the surplus unmarried men will have a profound effect on the spread of HIV in China.

[16] While it is the case that in China prostitution is most abundant in areas with the *least* skewed sex ratios, and trafficking of women is more common in parts of Africa and Europe which have sex ratios closer to 1 compared to China (United Nations Office on Drugs and Crime 2006), it is clear that many factors influence prostitution rates besides sex ratio (Edlund and Korn 2002), so this tells us little. More conclusive findings await a proper statistical analysis.

Finally, I note that there is one cross-national study (Barber 2000) showing that sex ratio is *negatively* (not positively) related to crime (murder, rapes, and assaults). Overall there are two reasons not to worry about conclusions drawn by this study. First, these are cross-national analyses, which mean many different factors vary across nations (unlike the within-country analyses above) that might be causing these effects. That is, truly causal variables not included in the analyses may correlate with the few variables included in the analyses to create these effects. Normally, econometricians would include many control variables to address this (like the Gini coefficient used in the Kanazawa and Still work), but Barber's study controlled only for infant mortality. Second, the sex ratios in many of these nations are very far from 1.05 (the birth value), which means that most of the sex ratio differences are driven by migration, or death of males due to organized violence. What these findings might be telling us is that males leave unstable and violent countries with more crime to move to peaceful and stable countries with less crime. Or, societies with more crime may tend also to have more war and organized violence, which disproportionately remove males (they get killed). This could be sorted out with the analysis of longitudinal (time series) data, such as was used for China above, but this analysis has not been done.

As an interesting aside to this study, I note that the author does find that *polygyny* is associated with more assaults (and marginally more murders), independent of sex ratio.

(4) Polygyny and Crime Rates in the Anthropological Record

The findings from modern societies are broadly consistent with studies of the anthropological database. In many pre-industrialized societies, including many small-scale societies, young unmarried men formed groups of marauders and later armies that went on raids to steal wealth and wives, while raping and pillaging. Polygynous societies engage in more warfare (White and Burton 1988), and this has often been to capture and enslave women to bring home as concubines or "wives" (White et al. 1988). This creates a self-perpetuating cycle in which bands of young males perform raids to obtain women each generation. The anthropological database also suggests that small-scale polygynous societies also have more crime relative to monogamous societies (Bacon et al. 1963)

The leaders of past societies have often harnessed pools of "surplus men" by sending them out to conquer new lands, or peoples. Such low status males, with highly restricted reproductive opportunities, seem to participate enthusiastically. It is therefore not surprising that the impact of sex ratio on organized violence is an ongoing and serious concern for political scientists and policy makers thinking about China and India (Hudson and den Boer 2004).

C. Polygyny's Effects on Male Parental Investment

In laying out the evolutionary theory I explained that males should shift between parental investment in offspring and investment in obtaining more mates depending on their situation. Low-status males with limited mating options, should pair-bond if possible (ensuring their paternity) and invest heavily in offspring. High status males with access to more mates (both long-term pair-bonds and short-term) should invest in obtaining more mating opportunities, but shift toward more parental investment if or when further mating opportunities become limited or costly. Theoretically, this implies that the effect of monogamous marriage systems, relative to polygynous ones, should be to shift male investment from obtaining more mates toward investing in their offspring. This applies to both low and high status males.

Most low status males will be able to find a long-term mate in monogamous marriage systems, and this will give them a chance to invest in offspring (which they otherwise would not have). High status males will face high costs for establishing additional mating, especially long-term pair-bonds. This will cause high-status males to shift investment away from obtaining more mates and toward their offspring.

I will first present findings from 19th century census data from Mormon polygynous communities in Utah, and then consider contemporary studies of African societies. Heath and Hadley (1998) analyze and compare the family composition and child survival data from 90 households consisting of 45 headed by wealthy men (top 2% of wealth in that community) and 45 headed by poor, but still married, men (from the bottom 16%). The first thing these data show is that wealthy males had on average 3.2 wives compared to 1.4 among the poor. All but five of the wealthy men had more than one wife. One rich man had 11 wives. Overall, the wealthy men controlled 120 women while the poor men controlled 63. This means that 90 husbands had 183 wives, which implies roughly 93 missing men had no wives (ergo, the pool of unmarried men).

In terms of parental investment, while wealthy men had more total offspring and longer reproductive careers (33 years for wealthy men compared to 22 years for poor men), the children of poor men had better survival rates to age 15. For poor men, 6.9 of their offspring survived on average to age 15, while for wealthy men only 5.5 of their offspring survived to age 15. This is amazing, given that the poor men had less than 10% of the wealth of the rich men, and the rich men had significantly more total offspring (including those that did not make it to 15). These data are consistent with the prediction that in polygynous systems poor, but married, men will have no choice but to invest in their offspring while rich, high-status men will invest in getting more wives.

Perhaps even more telling is a comparison of the poor men with one or two wives with the rich men with one or two wives. Among men with one or two wives, poor men's children out survived rich men's children 6.9 to 5.7 (mean number of offspring surviving to age 15 per wife). This supports the idea that poor men with limited resources for another wife tend to invest more in their existing offspring while rich men with the same number of wives invest less in offspring because they are busy seeking additional wives.

Realize that from the male evolutionary perspective, both rich and poor men were behaving in a manner consistent with maximizing their reproductive success. Rich men produced many more total surviving offspring (past age 15) then poor men; it is merely that their survival rates were lower. Having additional wives more than compensated, reproductively speaking, for the lower survival rates. Poor men could not add wives without decreasing the survival rates of their children: adding wives for poor men decreased child survival, but for rich men this had no impact.

These historical patterns are similar to those observed in recent studies of contemporary polygynous African societies. Children from polygynous families have an increased risk of diminished nutritional status, poor health outcomes, and mortality. These effects are consistent with diminished male parental investment. Ethnographic accounts suggest, for example, that fathers in highly polygynous households may not even know all of their children's names (Zeitzen 2008). Converging with the ethnography,

quantitative studies in Tanzania and Chad found that children in polygynous households had poorer nutritional status than their counterparts in monogamous households, as indicated by the children's height and weight measurements (Begin et al. 1999; Sellen 1999; Hadley 2005). In Hadley's (2005) Tanzanian study, the women had freedom of mate choice and a general abundance of food with little seasonal food insecurity. Despite these favourable conditions, the children of polygynously married mothers were more likely to be underweight, and were relatively shorter and gained less weight and height during the duration of the study than children of monogamously married mothers. These differences are more pronounced during periods of scarcity. The study started in the dry season, when food is more abundant, and at that time no significant differences in weight were detected between children in monogamous and polygynous households. At the second measurement period, during the wet season when food is scarcer, 24% of children in polygynous households were underweight compared to 8% in monogamous households. No differences were detected in wealth scores between monogamously and polygynously married women and monogamously married mothers reported running out of food early during the wet season more often than polygynously married mothers. Wealth differentials do not appear to explain the difference in nutritional status. The analyses controlled for children's age and sex, and household wealth. In Sellen's (1999) Tanzanian study, children of polygynous mothers had lower weight for age scores (WAZ) and height for age scores (HAZ) than children of monogamous mothers. Children's growth and fatness were correlated with both mothers' marital status and household wealth, with wealth having a greater effect than marital status. There was no significant interaction between marital status and household wealth. The analyses controlled for wealth and child and maternal characteristics.

Children in polygynous families are also at an elevated risk of mortality compared to children in monogamous families (e.g.,Defo 1996; Strassmann 1997; Amey 2002; Omariba and Boyle 2007). A study using data from 22 sub-Saharan African countries found that polygyny is a significant risk factor for child mortality (Omariba and Boyle 2007). Children in polygynous families were 24.4% more likely to die compared to children in monogamous families. The degree to which polygyny elevated mortality risk varied by the GDP of the child's country, with polygyny posing a smaller risk to mortality in wealthier countries. Family characteristics (maternal education, socioeconomic status, and urban versus rural residency) also reduced the effect of polygyny on child mortality by approximately a third. Similarly, a study of six West African countries found that infants in polygynous families had a 60-70% greater risk of dying compared to children in monogamous families (Amey 2002). This study did not control for household wealth but did control for other socioeconomic variables such as maternal and paternal education and rural versus urban residency.

Finally,,among the Dogon of Mali (Strassmann 1997), children (under age 10) in polygynous households were 7-11 times more likely to die than their counterparts in monogamous households. Strassmann tested to see if resources are diluted in polygynous households (thus offsetting the benefits of being in a household with relatively high total wealth) and found that on a per capita basis, resources were comparable between polygynous and monogamous households. As in the Tanzanian studies (Sellen 1999; Hadley 2005), wealth was comparable between the polygynous and monogamous households and hence does not appear to be the reason for the elevated risk of mortality. Although the evidence

indicating an increased risk of mortality for children of polygynously married mothers is robust, the reason why polygyny elevates risk is unclear, though we speculate that it may arise from decreased paternal investment.

D. Polygyny, Age of Marriage, the Age Gap and Gender Equality

(1) Measuring Equality-Related Effects

The theory presented above proposes that the possibility of polygynous marriage ignites a competitive process for wives among men that increases males' efforts to control females (wives, sisters, and daughters) and drives down the age of first marriage for females while increasing the age gap between husbands and wives. Seeking out the only available (unmarried) females for both first and subsequent wives, men of all ages pursue younger and younger females. Competition drives men to use whatever connections, advantages, and alliances they have in order to obtain wives, including striking financial and reciprocal bargains with the fathers of daughters (this is the very common practice of brideprice). Once girls and young women become wives, older husbands (and brothers) will strive to "protect" their young wives from other males (to guarantee paternity of any offspring), and in the process dampen women's freedoms and exacerbate inequality.

The challenge of testing these ideas against evidence arises from the fact that most highly polygynous countries in the world today are in Africa, and are among the least developed nations. Several countries in the Middle East allow limited polygyny (often based on Islamic prescriptions), but only low percentages of rich men actually have more than a single wife. This uneven distribution of polygynous societies means that it is difficult to tease apart the effects of polygyny vs. the effects of all the other variables that might influence Africa's situation. Here, I will use a five-pronged attack to deal with these issues. First, I will examine macro level (country level) data, comparing highly polygynous countries with (a) less polygynous countries in Africa, and (2) monogamously marrying countries from between 20 degree south latitude and 20 degrees north latitude (i.e., tropical non-African nations). Second, I discuss an economic model of marriage that was calibrated to the data from highly polygynous societies (to which it provides a good fit), and then used to address the hypothetical question: what would happen if monogamous marriage were imposed? Third, I examine four case studies and compare the age of first marriage for women and age gap between married people in polygynous and monogamous marriages. Fourth, I use sex ratio as a proxy for the effects of polygyny on women. And finally, I return the relationship between rape and polygyny.

All these analytical efforts converge to the same conclusions: polygyny (1) drives the age of females' first marriage down into adolescence, and (2) increases the age gap between husbands and wives. The evidence is also consistent with the idea that imposing monogamy decreases fertility (offspring per woman) and causes men to shift their investment away from seeking additional wives in a manner that increases GDP per capita.

(2) Macro-level Data

Table 6 presents data compiled by Tertilt that compares (1) Highly Polygynous Countries in which more than 10% of married men have two or more wives, (2) Less Polygynous African Countries in which less

than 10% of married men have two or more wives, (3) Comparable Monogamous Countries (not in Africa) that lie between 20 degrees north and south latitudes (developing countries), and (4) North America and Western Europe (which provides only a familiar reference point). The row variables are mostly self explanatory, though I note that the Age Gap row gives the difference between the mean age of the husband or wife at their respective *first* marriages. In a polygynous society, the gap would further increase if the mean age for males included all subsequent wives (Tertilt 2005; Tertilt 2006).

Table 6. Comparison Data from Highly Polygynous, Less Polygynous and Comparable Monogamous Countries

Variables	Highly Polygynous (>10% married men)	Less Polygynous	Comp. Monogamous Countries	North America/Western Europe
# Countries	28	20	58	24
Female age at first marriage	19.9	22.7***	25.0***	29.6***
Age gap (with first wife only)	6.4	3.9***	2.8***	2.4***
Total fertility	6.78	5.97**	4.62***	1.84***
Child mortality rate, 1980	19.4%	18.3%	11.6%**	1.4%***
Infant mortality rate, 1980	12.2%	11.5%	6.9%**	1.2%***
GDP per capita, 1985	$975	$1574*	$2798***	$11,950***

Highly Polygynous countries in the world today have the lowest age of first marriage for women at 19.9 years, and the largest age gap between husbands and their first (or only) wife. The age of 19.9 years is significantly lower than in less polygynous countries in Africa (at 22.7 years) and much lower than poor monogamous countries in the tropics, where the mean age is 25. The asterisks indicate the degree of statistical significance compared to Highly Polygynous Countries.[17] In Highly Polygynous Countries, on average, 36.7% of women are married between the ages of 15 and 19. The age gap increases from 2.8 years in comparable monogamous countries to 6.4 years in the highly polygynous societies. In the most polygynous countries the average gap goes as high as 9 years.

The data on infant and child mortality are also consistent with the theoretical predictions regarding parental investment. In both highly and less polygynous societies married men are probably investing in obtaining additional wives, and not in their children. In poor, but monogamous, countries, males lack the option of adding wives, so they invest in their offspring. Infant and child mortality rates in comparable monogamous countries are nearly half of those in highly polygynous countries.

Tertilt (2005) asserts that you obtain the same pattern if you create your comparable sample of monogamous countries by matching on GDP instead of latitude. She did not do this because, as I discuss below, she argues (based on her economic model) that when males cannot invest in obtaining more

[17] * indicates $p < 0.05$, ** indicates $p < 0.01$, and *** indicates $p < 0.001$.

wives (because of imposed monogamy) they invest and save in a way that generates both reduced population growth and more rapid economic expansion (increasing GDP per capita). Thus she suggests that the nearly threefold increase in GPD per capita between Comparable Monogamous Countries and Highly Polygynous Countries is partially caused by legally imposed monogamy.

The available cross-country evidence also supports the idea that permitting polygyny increases males' drive to control women, an effect created by competition among males for access to women. Table 7 uses the same partitioning of countries used above. The UNDP's Gender Empowerment Measure aggregates a variety of measures of female empowerment into a single index (ranging from 0 to 1). It includes male-female income ratios and female representation in high status jobs. In 2009, Canada was ranked 4th in the world on this, with a score of 0.83 (Norway is currently 1st at 0.91). Highly Polygynous countries score at 0.22, while poor monogamous countries score at 0.50. The ratio of adult female to male literacy tells the same story.

Table 7: Female Equity Comparison

Variable	Highly Polygynous	Comparable Monogamous
Gender Empowerment Measure (GEM), 2003	0.22	0.50
Ratio of adult female to male literacy rates, 2005	0.66	0.95

(3) A "What If" Economic Model of Imposing Monogamy

Tertilt developed an economic decision-making model using standard modeling tools from economics to examine what gives rise to polygyny, how it affects an economy, and what impact, if any, imposed monogamy has (Tertilt 2005). Her model assumes men and women care about both having children and "consuming," but that men can continue to reproduce their entire lives while women are limited to only a portion of their lives (she also assumes that men tend to prefer younger women). She shows that her model produces polygynous mating patterns under a wide range of conditions, and that it can produce results that match real-world patterns related to age-gaps, fertility, and saving rates for polygynous countries.

She then calibrates the model to the Highly Polygynous data shown above (and other related data) and then asks the question of what happens when she imposes monogamy on everyone (in the model). The result is that the fertility rate goes down, the age gap goes down, saving rates go up, bride prices disappear, and GDP per capita goes way up. This occurs because men (in the model) can't invest in obtaining wives or selling daughters (which they do massively, otherwise), and instead they save and invest in production and consumption.

In a follow-up paper, Tertilt (2006) uses the same model to compare the effects of imposing monogamy legally, which has proven quite challenging in Africa, to the effect of increasing the power of women (the strategy adopted by the UN). To incorporate this, Tertilt alters her model to shift reproductive decision-making from men to women, but leaves polygyny legal. In this female-choice model, the number of wives per husband declines a little bit, as does fertility. GDP per capita also goes up some, and savings

rates go up substantially. Overall, however, empowering women does not have nearly the impact on GDP per capita and fertility that imposing monogamy does in this model. This underlines the point made above that giving women free choice does not necessarily yield monogamy, though it does yield less intensive polygyny.

(4) Micro-level Case Studies

(a) The Value of Intracultural Observations

The problem with the above cross-country data is that most Highly Polygynous countries are in Africa, and being highly polygynous is thus strongly correlated with a great many factors. Aspects of demography, colonial history, specific economic policies, etc. could influence both polygyny and our other variables of interest without polygyny being causal. Normally, analysts would try to address this statistically by controlling for many other variables, to assess the independent relationship of high levels of polygyny with the variables of interest. However, in this case, there is just not enough global variation in high levels of polygyny (e.g., no monogamous countries in sub-Saharan Africa). To address this problem, I zoom in on specific case studies comparing monogamously married people to polygynously married people *in the same societies*. Since the people analyzed in these all live in the same social group, any differences we observe cannot be traced to observed country-level differences (e.g., in freedom of the press).

It is important to realize that our theoretical approach is focused principally on how polygyny will create differences *among societies* in factors like the age gap between husbands and wives and the power of women in society. However, if men recognize early in their reproductive careers that they are likely to be either monogamously married (at best) or polygynous, we may be able to detect individual-level differences (as opposed to societal-level differences) based on the strategies men deploy going into marriage—just as we saw differences in the survival of children in 19th century Mormon communities. Men who are either highly polygynous or on the road to high levels of polygyny might prefer young wives, perhaps because they are easier to control. The higher status of polygynous men, or of men likely to be polygynous in the future, should permit them to more effectively get what they want. Yet, in societies in which men are more equal or upwardly mobile, strategic shifts in preferences for younger wives might not emerge early enough to create observable within society differences. Thus, it will be impressive if we find any differences in the predicted directions.

This case material suggests two findings. First, a polygamous man will marry a younger first wife than a monogamous man (although the difference in age is not always statistically significant, it is always in the predicted direction). Second, the age difference between husbands and wives is greater in polygynous marriages than in monogamous marriages. To illustrate these patterns, I provide data from four disparate societies in Africa, the Middle East, and Australia.

(b) Bedouin Arabs, Israel

A study of Bedouin Arab women living in Israel's Negev (Al-Krenawi and Graham 2006) found that the average age of first marriage for polygynous women and monogamous women was 19.2 and 19.5 respectively. These are not statistically significantly different, but do go in the predicted direction.

Polygynous men tend to be older at first marriage than their monogamous counterparts (27 vs. 23, respectively; p<0.001). This difference in men's age at marriage creates a greater age gap between husbands and wives in polygynous marriages (7.83 years) compared to monogamous marriages (3.49 years). See Table 8. All of the Bedouins are Muslim and 50% live in villages recognized by the state of Israel and the other 50% live in unrecognized villages. Culturally, they are characterized by their shared attributes of patriarchy, collectivism, and authoritarianism (Al-Krenawi and Graham 2006).

Table 8. Age at first marriage among Bedouin Arabs

	Women		Men	
Variable	Monogamous marriage	Polygynous marriage	Monogamous marriage	Polygynous marriage
Avg. age at 1st marriage	19.46	19.16	22.95	26.99*
Avg. # of years younger than husband	3.49	7.83*	--	--

* p<0.001

(c) Rural Turkey

Polygyny is illegal in Turkey. Nonetheless, polygyny is common in rural villages in south-eastern Turkey and it is estimated that 2% of all marriages in Turkey are polygynous. Senior wives are the first women to whom a man got married. A junior wife is the most recent wife joining the marriage. Senior wives are higher status than junior wives, and junior wives have no legal rights on the husband's heritage. Prior to 2004, children of junior wives were registered as belonging to senior wives but this practice changed when laws were passed to recognize the legitimacy of children born in extramarital affairs (Ozkan et al. 2006). The percentage of girls marrying under age 15 is significantly different across marriage types—see Table 9. Thirty percent of polygynous senior wives marry under age 15 versus only 10% of monogamous wives (Ozkan et al. 2006). The average age of first marriage for senior polygynous wives is 15, compared to 17 years of age for monogamously married wives. This difference is not statistically significant, though it goes in the predicted direction.

Table 9. Age at first marriage in a municipality in south eastern Turkey

	Monogamous wives	Polygynous-senior wives	Polygynous-junior wives	Statistical significance
Avg. age at 1st marriage	17	15	18	Not significantly different
% of women married under age 15	10	30	13	p=0.01

(d) Arsi Oromo of southern Ethiopia

The Arsi Oromo of southern Ethiopia are agro-pastoralists. A third of women are in polygynous marriages, and approximately 29% of men have two wives and 11% have three or more wives. It often takes many years for a man to accrue enough wealth to take an additional wife and the average number of years between marriages is 12.6. Among the Arsi Oromo, the average age of marriage for senior wives in polygynous marriages is 15.3 compared to 17.3 for wives in monogamous marriages. Average age at first marriage for junior wives is older than that of monogamous wives. The difference in age of

first marriage is statistically significant between each group of women (Gibson and Mace 2007). See Table 10.

Table 10. Age at first marriage among the Arsi Oromo of Ethiopia				
		Polygynous wives*		
	Monogamous wives*	Senior wives	Second wives	Third and higher wives
Avg. age at first marriage	17.25	15.32	18.73	20.1

*All ages are statistically significantly different from each other.

(e) Arnhem Land, Australia

The Aboriginal community in south-east Arnhem Land, Australia was traditionally polygynous foragers. In the 1950s, the community was established as a mission settlement and polygyny was prohibited. Although polygynous marriages continued over the next 30 years, the number of new polygynous marriages declined and by the late 1980s they were almost entirely eliminated. However, women who had previously been married in polygynous unions continued to live in the community. As of 1981, 65% of the women in the community were currently, or at some point in their life had been, in a polygynous marriage. Based on record reviews, census data and interviews, a reproductive history of women from the community was created (Chisholm and Burbank 1991). The findings revealed that there was a large age difference between husbands and wives in polygynous marriages; a gap that was much greater than that in monogamous marriages (see Table 11). Women in polygynous marriages were younger at the birth of their first child than monogamously married women, although this difference is not statistically significant. Reflecting the age difference between spouses, men in polygynous marriages were significantly older at the birth of their first child compared to men in monogamous marriages.

Table 11. Ages at first birth and age difference between spouses among Aboriginals in Arnhem Land, Australia			
	Monogamous marriages	Polygynous marriages	Statistical significance
Avg. age difference between husbands and wives	7	17.1	p=0.0001
Avg. mother's age at 1st birth	19.32	19.19	not statistically different
Avg. father's age at 1st birth	28.71	36.27	p=0.004

(f) Summary of Data from Case Studies

Overall, the findings from these case studies converge with the cross-country evidence reviewed above. Polygyny reduces the age of first marriage for women, and increases the age gap between husbands and wives. However, these intracultural studies on marriage age also are interesting because they *suggest* that, in addition to driving down marriage age for females across the board (that is, in both monogamous and polygamous unions), there is a further effect specific to polygynous marriages: that is, polygynously marrying seem to select younger girls as wives (even as first wives) compared to monogamists, both in absolute but especially in relative terms. One plausible explanation for this is that

selection of a younger (and especially a relatively younger) bride increases a man's ability to exert control over her.

It is particularly interesting that the average ages of these first wives of men who will later be polygynous are as low as 15 years. Work in evolutionary psychology suggests that females hit their maximum mate value (based on their expected future number of offspring) between ages 18 and 20 (Barrett et al. 2002), which explains in evolutionary terms why adult males (say, ages 20+) are typically most sexually attracted to younger women while adolescent males are most sexually attracted to older females (that is, to the 18 to 20 year olds). In light of this, the comparison of polygynously marrying to monogamously marrying males in the above studies suggests that polygynously marrying men are trading off the (excessive) youth of their wives against some other factor, while monogamously marrying males are not. This other factor may relate to the need for polygynously marrying men to have wives they can more easily control.

If we accept that a smaller disparity in age is an indicator of male-female equality (and it is quite striking how marriage-age disparity is lower in societies with greater male-female equality), and if we accept that a young girl (young in absolute and relative terms) may be more compliant than a woman closer to the husband's own age, then the data suggest that polygynous marriages will, on average, involve a degree of inequality above and beyond the background social levels even in societies that are heavily patriarchal and generally oppressive to women.

(5) Sex Ratios and Female Equality

(a) Sex Ratio as a Proxy to Determine the Effects of Polygyny on Women

While highly polygynous marriage systems are confined principally to Africa, sex ratios vary much more widely across the globe. Here we assume that sex ratios favouring males will create effects that mirror those of polygynous marriage by increasing the competition among men for access to women. If true, sex ratio ought to have the same effects on female power and well-being that polygyny has, *for the same reasons*. Men will tighten their control over wives, sisters and daughters. This may appear counterintuitive, as one might expect women to gain power given that they are the "limiting resource." However, empirical evidence indicates that this is not the case. As women become scarce they tend to be viewed as commodities and, along with the greater control exerted over them, fertility rates increase and divorce rates decline (South and Trent 1988).[18] An analysis of 117 countries found that in countries with a high ratio of males to females, females married younger (South and Trent 1988). Currently, the declining sex ratio in China has caused rich families to acquire infant girls to guarantee their sons have wives (Hudson and den Boer 2004). Similarly, in some regions of India (the world's largest democracy) more than half of females in some regions are married before age 15 (Burns 1998). As well, in the

[18] Both fertility rates and divorce rates are considered reliable proxies of women's empowerment by those who study human development (South and Trent 1988). When women have more power in the household and more education they have fewer children and divorce more frequently. Additional children are generally a greater cost for women compared to men. Each additional child costs women in terms of labour, health, and ability to attract additional mates. For divorce rates, suppose that 10% of the time only the husband wants a divorce, 10% of the time only the wife wants a divorce, and 10% of the time both want a divorce. If women have no power, the divorce rate is 20%. If women have power, it's 30%.

American frontier where females were in short supply, brides were reported as young as 12 and 13 (Courtwright 1996). This converges with our findings above, indicating that competition for scarce females drives the age of first marriage down.

To explore the relationship between female empowerment and sex ratio, South and Trent also analyzed data on numerous variables related to women's roles and status in relation to the country's sex ratio. The authors analyzed data from 117 countries around the world. The sample included countries from the full spectrum of development, but with a bias towards more developed countries (as the lesser developed countries were less likely to have the needed data available). The sex ratios for each country were based on data available for the number of males and females between the ages of 15 and 49 from any year between 1973 and 1982. Variability in the sex ratio could be due to differences in the sex ratio at birth, migration, or mortality. The authors speculate that in countries with high mortality rates, such as in East Africa, mortality accounts for most of the skewing of the sex ratio (with mortality impacting males between 15-49 more than females). Analyses controlled for the reliability of the sex ratio data for each country, and the socioeconomic development of each country (an indicator composed of variables including GDP, infant mortality, percentage of population living in urban areas, and life expectancy). In these analyses, higher sex ratios (i.e., more males than females) predict lower participation of women in the labour force, lower illegitimacy rates, and lower divorce rates (all illustrating male control).

In more developed countries, they found that the sex ratio had a *greater* effect on indicators of women's roles than in less developed countries, with the exception of participation in the labour force. In more developed countries, higher sex ratios predict for women a lower age at first marriage, higher fertility rate, and lower literacy.[19]

Some of South and Trent's analyses suggest that living in a society with a highly skewed sex ratio may contribute to diminished well-being for women, as evinced by the high female suicide rate relative to that of males in countries with a high sex ratio. However, data on female and male suicide rates were only available for 51 countries and were not considered highly reliable. These findings, while weak on their own, are consistent with suicide rates in China (World Health Organization (WHO)2003), which has the world's highest female suicide rate (14.8 per 100,000). As a point of comparison, Canada's female suicide rate is 5.1 per 100,000. China does not have a high suicide rate for males (13 per 100,000 compared to Canada's male suicide rate of 19.5 per 100,000) (WHO, 2003), indicating that the high female suicide rate is not a reflection of a generalized sense of diminished well-being in China but rather a problem specifically affecting females. The trend of increased female suicide rates in low female sex ratio countries suggests that something about being a woman in a country with a relative scarcity of

[19] These cross-national analyses could suffer problems similar to those discussed for Barber (2000) above. However, two reasons suggest these issues might be less pertinent in this case. First, South and Trent used an accepted measure of socioeconomic development as a control (instead of only infant mortality), a larger sample, and also included a control for data quality (which Barber did not). The use of the socioeconomic index of development as a control is crucial for their findings. Second, it is more difficult in this case to see how biased migration patterns could have skewed these results. Males would have to be disproportionately moving from countries in which women are more equal into countries in which they are less equal.

females creates an environment that is deleterious to the well-being of women.[20] The relevance of these particular findings for understanding the effects of polygyny depends on the assumption that the competition for females created by an imbalanced sex ratio is similar to that created by polygyny.

Overall, while it's possible that the causal pathways for some of these effects are different from, and specific only to, sex ratio, the convergence with both our macro-level comparisons of countries with differing degrees of polygyny and our micro-level case studies of monogamous and polygynous marriages in the same societies is striking. Increased competition for females, whether due to polygyny or to unbalanced sex ratios, seems to depress the age of marriage for females, increase the age gap between husbands and wives, and increase male efforts to control females. This seems to apply in developed societies as well as underdeveloped and developing societies.

(b) Polygyny, Sex Ratio, Rape and Sexual Exploitation

Evolutionary researchers have suggested that rape is likely to be a greater risk for women living in societies with a scarcity of available females. An evolutionary analysis examining why males commit rape and the conditions under which they do so suggests that males may use a rape strategy for reproduction when the chance of reproducing using other mating strategies is extremely low. It is not the case that males are consciously calculating the odds of reproduction and then rationally selecting rape in order to increase their reproductive fitness. Rather, some evolutionary theorists suggest that males have genes that provide a flexible repertoire of mating strategies and that the strategies employed can vary over an individual's life depending on the context (Thornhill and Thornhill 1983; Pedersen 1991; McKibbin et al. 2008). If a male has no options for reproducing using socially acceptable strategies, such as in a marital union, then he may try to reproduce using rape. Although the odds of impregnating a rape victim are low, it is higher than the alternative if there are no other mating opportunities available. Following this theory, and combined with the general increase in criminality (including violence) of men and the indicators of increased male control and lack of female equality in female-scarce populations, it is expected that sexual assaults will be more prevalent in polygynous societies.

At the macro-level, the available evidence is presented above in my discussion of the relationship between crime and polygyny. In cross-national analyses, greater polygyny is robustly associated with higher incidence of rape, even when controlling for economic differences and including continental control variables. This same relationship is found when the percentage of unmarried men is used instead of polygyny: more unmarried men, more rape.

At a micro-level, evidence for a positive relationship between degree of polygyny in a society and rape rates comes from the Gusii of Kenya (LeVine 1959). This polygynous society has a bride price that is paid from the groom's father to the bride's father in the form of cattle. Historically, the size of the brideprice continually escalated until the government periodically intervened and forced the price to be lowered. The lowered rates held temporarily and then the escalations began again. The size of the brideprice impacted how many males were able to get wives because many males were unable to afford the

[20] However, a country's socioeconomic development has a greater effect on the female suicide rate than the sex ratio (South and Trent 1988).

brideprice, especially if they did not have a sister who had gotten married (because the cattle the family receives for the sister can be used to pay the brideprice for her brother). Many fathers tried to arrange marriages for their daughters with older, wealthy men so with higher brideprices, more males were excluded from marriage and the degree of polygyny increased. In 1936-1937, brideprices were at their highest levels in nearly 50 years and many young men who could not afford brides turned to cattle raiding and rape. As brideprice increased rape rates also increased. In one reported incident, a group of young men captured a group of females at the market and raped them, precipitating a decrease in brideprice. The lower rates held until 1950, during which time rape rates were lower. When brideprices began to escalate again in 1950, outbreaks of rape and the existence of rape gangs again occurred.

The evidence from the Gusii suggests that men rape when they are unable to access females in socially legitimate ways and refrain from rape when women are available to them. Consequently, polygynous societies may face an increased risk of rape as access to females is denied to a subset of males in the population. As noted above, in addition to rape, the sexual needs of an increasing pool of unmarried men are met by expanding sex industries. In San Francisco's Chinatown in the mid-1800s, a time and place with a low female to male ratio, the 1850 census indicates that 71% of the area's females were prostitutes (Cheng and Bonacich 1984) and when Australia was populated by male European convicts but few European women, it is believed that prostitution was widespread (Alford 1984).

E. Interpersonal and Psycho-Social Impacts on Wives in Polygynous Marriages

Women in polygynous marriages may experience both benefits and costs associated with their marital arrangement. The identified benefits stem from the relationship with co-wives, who may provide assistance in household work, childcare, and companionship. Women in polygynous marriages may experience greater autonomy than women in monogamous marriages because the assistance from co-wives makes time available to pursue other endeavours (Anderson 2000). Moreover, as is the case in households of Bedouin-Arabs, when relationships among co-wives improve, the benefits ripple through the family to improve other relationships, including those among siblings, between wives and husbands, and between children and fathers (Al-Krenawi 1998).

Despite the potential advantages stemming from harmonious or helpful co-wife relationships, there are studies indicating detrimental consequences associated with being a woman in a polygynous marriage *in some societies* (but not all, see below). Studies among Arabs in Israel (Al-Krenawi and Graham 2006) and in Turkey (Ozkan et al. 2006) found significantly higher rates of psychological distress and disorders among polygynously married women compared to their monogamously married counterparts. Among the disorders/distress experienced at significantly elevated rates by polygynously married women in the Arabic sample are depression, obsession-compulsion, hostility, anxiety, phobia, psychoticism, and paranoid ideation (Al-Krenawi and Graham 2006). Women in polygynous marriages also reported significantly more problems in family functioning and marital relationships and less satisfaction in life than monogamously married women in their societies (Al-Krenawi and Graham 2006). In the sample from Turkey, the increased likelihood of having a psychological disorder among senior wives compared to monogamous wives was 1.6 times for conversion disorder and 2.4 times for somatization disorder. The other disorders were not significantly different in prevalence between monogamous and polygamous wives.

The rates of the aforementioned problems vary with the women's co-wife ranking (based on when they married in). However, the impact of wife-order differs cross-culturally. In some societies, senior wives experience higher rates of emotional and psychological distress, presumably because the wives perceive that they are being supplanted by younger wives, or because they believe they have failed to meet the standards of a "good wife" (Al-Krenawi and Graham 2006)--thus leading their husbands to add another wife. In other societies, the junior wives experience greater rates of emotional and psychological distress because they are subordinate to the senior wives, and/or their husbands favour the senior wife.

Contrary to the findings on emotional and psychological well-being among the Arabs and Turks, a study among East Africans did not find any difference in rates of anxiety or depression between women in polygynous versus monogamous marriages (Patil and Hadley 2008). However, the authors suggest that this may be due to the fact that the study was conducted during the dry season when food is generally abundant and workloads are low. Emotional distress may be more likely to manifest itself during 'hunger seasons.' Alternatively, the authors raise the possibility that the psychological measures were culturally inappropriate. Of course, it may also be that negative consequences associated with polygyny do not emerge in all cultural contexts (such as that in East Africa), or that there may also be benefits that offset the costs—thus, women do not experience a net decrease in emotional/psychological well-being from polygynous marriages. Since women in East Africa are economically productive, households with multiple wives could be generally wealthier than monogamous households, which could offset the downsides of polygyny. Although Patil and Hadley did not control for wealth, they did control for food insecurity in the three months preceding the study (which could be a proxy for wealth) and found this to be a consistent correlate of psychological distress. This suggests that there could be an offsetting wealth effect occurring.

V. Conclusion

The evidence presented above suggests that the institutions of monogamous marriage influence human mating and parental investment efforts in such a way to generate beneficial societal-level outcomes. By partially levelling differences in male reproductive success and reducing competition among males within a society, imposed monogamy reduces crime rates, including rates of murder, rape, and robbery, reduces substance abuse, increases male parental investment in offspring, and increases male-female equality. Economic models further indicate that these changes will aggregate to increase saving rates, decrease fertility rates, and create economic growth.

If this combination of theory and evidence is correct, legalizing all forms of polygamy will principally result in an increase in polygynous marriages by wealthy, prestigious men. Instead of costly divorces, some wealthy men will prefer to add wives, while keeping their children and their money in their own households. Nothing of what we know about our species' evolved psychology or from anthropological diversity indicates that either polyandry or forms of group marriage will spread beyond trivial frequencies. Serial monogamy (like philandering) can create some problems in societies with social norms and laws favouring monogamy, but it does not create the large pool of unmarried men because

males have to give up one woman before they can marry another. The question of polygamy is a question of polygyny.

The historically and cross-culturally unusual package of norms and institutions that constitute modern monogamous marriage systems may have spread so successfully across the globe because of its positive impact on the societies that adopt such practices. Moreover, it is worth speculating that the spread of normative or imposed monogamy, which represents sexual egalitarianism (Macdonald 1990), may have helped create the conditions for the emergence of democracy and political equality at all levels of government. Within the anthropological record there is a strong statistical linkage between democratic institutions and monogamy (Korotayev and Bondarenko 2000). These authors, and others (Herlihy 1995), suggest that monogamy may impact the emergence of democratic governance at all levels by (1) dissipating the pool of unmarried males that were previously harnessed by despots in wars of aggression, and (2) focusing males, especially high status males, on investing in their offspring and their current wife (in lieu of pursuing additional wives). Historically, we know that universal monogamous marriage preceded the emergence of democratic institutions in Europe, and the rise of notions of equality between the sexes. In Ancient Greece, we do not know which came first but we do know that Athens, for example, had both monogamous marriage and elements of democracy. In this sense, the peculiar institutions of monogamous marriage may be part of the foundations of Western civilization, and may explain why democratic ideals and notions of human rights first emerged as a Western phenomenon.

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IN THE SUPREME COURT OF BRITISH COLUMBIA

IN THE MATTER OF:

THE *CONSTITUTIONAL QUESTION ACT*, R.S.B.C. 1996, C.68

AND IN THE MATTER OF:

THE *CANADIAN CHARTER OF RIGHTS AND FREEDOMS*

AND IN THE MATTER OF:

A REFERENCE BY THE LIEUTENANT GOVERNOR IN COUNCIL SET OUT IN ORDER IN COUNCIL NO. 533 DATED OCTOBER 22, 2009 CONCERNING THE CONSTITUTIONALITY OF S. 293 OF THE CRIMINAL CODE OF CANADA, R.S.C. 1985, c. C-46

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