APPENDIX I

Table II is a list of the 25 AI ethics topics discussed in this study. For more information on how ethics topics were identified or defined, refer to the Methodology section or contact the authors.

TABLE II
TAXONOMY OF AI ETHICS TOPICS

Accountability
Artificial General Intelligence (AGI) & Existential Threats
Bias & Fairness
Consent & Autonomy
Cultural Sensitivity
Deception & Manipulation
Economic Growth
Human-Human Interaction
Human-Robot Relationships
Human Control
Human Rights
Inequality
Misinformation
Misuse & Hostile Use
Privacy
Psychological Impacts
Public Participation
Safety & Reliability
Social Responsibility
(Technical) Explainability*
Transparency*
Trust
Unemployment
Vulnerable Populations
Workforce Diversity

*Transparency refers to broader ideas of openness, accessibility, and communication surrounding AI, while technical explainability refers to the inner workings of algorithms.

APPENDIX II

Table III below is a consolidated list of additional ethical concepts identified in the sample of 112 AI ethics documents. We include this larger list here to provide readers a sense of the diversity of ethical discussion, including important topics that our study may not have addressed. Topics addressed in three or more documents are noted with an asterisk.

TABLE III
ADDITIONAL ETHICS TOPICS DISCUSSED

Academic freedom
* Accuracy
Animals
* Authoritarian control and repression
Automating ethical decisions
* Autonomous weapons
Autonomy and free will
Balance of power in workplace
Beneficence
Child abuse and neglect
Child soldiers
* Civilian deaths and collateral damage
Conflict and violence
Conflicts of interest
Contestability and remediation
Cooperation
Corporate rights
Corporate value alignment
Cultural and gender diversity
* Data quality and diversity
Democracy and democratic values
Denial of services
Diversity and inclusiveness
* Diversity of opinions, stakeholders, and ethics
Empathy and altruism
* Ethics education
* Fair competition
Hate speech
Human experimentation
Human flourishing and quality of life
* Human identity and purpose
Human technological enhancement
Human treatment of AI
* Human-machine collaboration
* Immigration/migration
* Interdisciplinary cooperation
* International cooperation
Intimacy
* Justice
Labor rights and co-determination
* Legal personhood/status of AI
Machine ethics (ethics in AI)
Non-maleficence
Media diversity and independence
Media hype and misinformation
* Nationalism and protectionism
* Openness and collaboration
* Political rights: expression, due process, etc.
Population aging and birth rate
Precautionary principle
Price transparency
Non-repudiation
* Proportionality and distinction
Psychological dependence
* Public awareness and communication
Refusal to create
Reproducibility
* Research ethics
Research monoculture
Respect for law
Respect for persons
* Responsible disclosure and whistleblowing
* Responsible research and innovation
Robo-ethics (design of AI)
Saving human life
Sex trafficking and forced labor
* Social and political cohesion and order
Social and political participation
Social isolation and human contact
* Social scoring and profiling
* Sustainability
Trafficking of labor and sex
Underuse of AI
* Value alignment and human-centered values
Working environments of researchers

APPENDIX III

Table IV lists the full collection of documents analyzed in the final sample.

TABLE IV
DOCUMENT COLLECTION

Document Name	Author(s)	Date
"ARCC": An Ethical Framework for Artificial Intelligence	Tencent	2018
10 Principles for Ethical AI	UNI Global Union	2017
10 principles for public sector use of algorithmic decision making	Nesta	2018
10 Principles of Responsible AI	Women Leading in AI	2019
A 20-Year Community Roadmap for Artificial Intelligence Research in the US	American Association of Artificial Intelligence (AAAI) with Computing Community Consortium (CCC)	2019
A National Machine Intelligence Strategy for the United States	United States: Center for Strategic & International Studies (CSIS)	2018
A next-generation artificial intelligence development plan	China, State Council	2017
A practical guide to Responsible Artificial Intelligence (AI)	PricewaterhouseCoopers	2019
A Proposed Model Artificial Intelligence Governance Framework	Singapore: Personal Data Protection Commission (PDPC) Singapore	2019
AI at Google: our principles	Google	2018
AI Commons: About Us	AI Commons	2019
AI Engagement within Sony Group	Sony	2018
AI Ethics	Salesforce	2019
AI Ethics Principles & Guidelines	Smart Dubai	2019
AI Ethics: The Next Big Thing in Government	World Government Summit	2019
AI Governance: A Holistic Approach to Implement Ethics into AI	World Economic Forum	2019
AI in the UK: Ready, Willing and able?	United Kingdom: House of Lords, Select Committee on Artificial Intelligence	2018
AI Principles of Telefónica	Telefónica	2018
AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations	Floridi et al.	2018
APPG AI Findings 2017	United Kingdom: All Party Parliamentary Group on AI (APPG AI) Secretariat	2017
APPG AI Findings 2018	United Kingdom: All Party Parliamentary Group on AI (APPG AI) Secretariat	2018
Artificial Intelligence – The consequences of artificial intelligence on the (digital) single market, production, consumption, employment, and society	European Economic and Social Committee (EESC)	2017
Artificial Intelligence and Machine Learning: Policy Paper	Internet Society	2017
Artificial Intelligence at the service of citizens	Italy: Task Force on Artificial Intelligence of the Agency for Digital Italy (AGID) and Department of Public Administration	2018
Artificial Intelligence for Europe	European Commission	2018
Artificial Intelligence Framework	Vodafone	2019
Artificial Intelligence in the Governance Sector in India	The Centre for Internet & Society	2018
Artificial Intelligence Risk to Critical Infrastructure	United States: Department of Homeland Security, Office of Cyber and Infrastructure Analysis	2017
Artificial Intelligence, Automation, and the Economy	United States: Executive Office of the President	2016
Artificial Intelligence, Ethics and Enhanced Data Stewardship	The Information Accountability Foundation	2017
Artificial Intelligence: Australia's Ethics Framework (A Discussion Paper)	Australia: CSIRO 61 (funded by Australian Government Department of Industry Innovation and Science)	2019
Artificial Intelligence: Shaping a Future New Zealand: An Analysis of the Potential Impact and Opportunity of Artificial Intelligence on New Zealand's Society and Economy	New Zealand: AI Forum of New Zealand	2018
Artificial Intelligence: The Public Policy Opportunity	Intel	2017
Asilomar AI Principles	Future of Life Institute (FLI)	2017
Beijing AI Principles	Beijing Academy of Artificial Intelligence (BAAI)	2019
Blueprint: National Artificial Intelligence Strategy for Qatar	Qatar: Qatar Center for Artificial Intelligence (QCAI), Qatar Computing Research Institute (QCRI), Hamad Bin Khalifa University	2019
Business Ethics & Artificial Intelligence	Institute of Business Ethics	2018
Declaration of Cooperation on AI	European Commission, EU Member States	2018

Declaration of the International Panel on Artificial Intelligence	Canada: Innovation, Science and Economic Development Canada	2019
Declaration on Ethics and Data Protection in Artificial Intelligence	International Conference of Data Protection & Privacy Commissioners	2018
DeepMind Ethics & Society Principles	DeepMind	2017
Digital Ethics Guidelines on AI	Deutsche Telekom	2018
Draft AI R&D Guidelines for International Discussions (Japan)	Japan: The Conference toward AI Network Society, Institute for Information and Communications Policy (IICP), the Ministry of Internal Affairs and Communications (MIC)	2017
Dutch Artificial Intelligence Manifesto	IPN Special Interest Group on Artificial Intelligence	2018
Ethical Guidelines for Trustworthy AI	European Commission, High-Level Expert Group on Artificial Intelligence (AI HLEG)	2019
Ethical Principles for Artificial Intelligence and Data Analytics	Software & Information Industry Association (SIIA)	2017
Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems, First Edition	Institute of Electrical and Electronics Engineers (IEEE), Global Initiative on Ethics of Autonomous and Intelligent Systems	2019
Ethics and Legal in AI: Data Capitalism	United Kingdom: All Party Parliamentary Group on AI (APPG AI) Secretariat	2017
Ethics and Legal in AI: Decision Making and Moral Issues	United Kingdom: All Party Parliamentary Group on AI (APPG AI) Secretariat	2017
Everyday Ethics for Artificial Intelligence	IBM	2018
Finland's Age of Artificial Intelligence: Turning Finland into a leading country in the application of artificial intelligence, Objective and recommendations for measures	Finland: Ministry of Economic Affairs and Employment	2017
For a Meaningful Artificial Intelligence: Towards a French and European Strategy	France: Villani (MP) Task Force, Parliament	2018
G20 AI Principles [G20 Ministerial Statement on Trade and Digital Economy]	G20	2019
Governance, Social and Organisational Perspective for AI	United Kingdom: All Party Parliamentary Group on AI (APPG AI) Secretariat	2017
Governing Artificial Intelligence Upholding Human Rights & Dignity	Data & Society	2018
Guardians of trust: Who is responsible for trusted analytics in the digital age?	KPMG	2018
Harmonious Artificial Intelligence Principles	Chinese Academy of Sciences, Institute of Automation, Research Center for Brain-inspired Intelligence	2018
IBM's Principles for Trust and Transparency	IBM	2018
Inequality, Education, Skills, and Jobs	United Kingdom: All Party Parliamentary Group on AI (APPG AI) Secretariat	2017
International Perspectives and Examples	United Kingdom: All Party Parliamentary Group on AI (APPG AI) Secretariat	2017
Introducing Unity's Guiding Principles for Ethical AI	Unity Technologies	2018
ITI AI Policy Principles	Information Technology Industry Council (ITI)	2017
Lithuanian Artificial Intelligence Strategy: A Vision of the Future	Lithuania: Ministry of the Economy and Innovation	2019
Machine Intelligence Garage Ethics Framework	Digital Catapult: Machine Intelligence Garage Ethics Committee	2018
Machine learning: the power and promise of computers that learn by example	The Royal Society	2017
Malta: Towards An AI Strategy	Malta: Parliamentary Secretariat for Financial Services, Digital Economy and Innovation, Office of the Prime Minister	2019
Montréal Declaration for a Responsible Development of Artificial Intelligence	University of Montréal	2018
National approach for artificial intelligence	Sweden: Ministry of Enterprise and Innovation	2019
National Strategy for Artificial Intelligence	Denmark, Ministry of Finance and Ministry of Industry, Business and Financial Affairs	2019
National Strategy for Artificial Intelligence: #AIForAll	India: NITI Aayog	2018
National Strategy for Artificial Intelligence: AI Made in Germany	Germany: Federal Ministry of Education and Research, the Federal Ministry for Economic Affairs and Energy, and Federal Ministry of Labour and Social Affairs	2018
OECD Principles on Artificial Intelligence	OECD	2019
OP Financial Group's ethical guidelines for artificial intelligence	OP Financial Group	2018
OpenAI Charter	OpenAI	2018
Partnership on AI Tenets	Partnership on AI	2016
Phrasee's AI Ethics Policy	Phrasee	2018
Position on Robotics and Artificial Intelligence	The Greens/European Free Alliance	2016
Preparing for the Future of Artificial Intelligence	United States: Executive Office of the President, National Science and Technology Council (NSTC), Committee on Technology	2016
Principles for Accountable Algorithms and a Social Impact Statement for Algorithms	FAT/ML	2016
Principles for the Governance of AI	The Future Society	2017

Recommendation of the Council on Artificial Intelligence	OECD	2019
Recommendations from New Work Summit	New Work Summit	2019
Report of COMEST on Robotic Ethics	United Nations Educational, Scientific and Cultural Organization (UNESCO) World Commission on the Ethics of Scientific Knowledge and Technology (COMEST)	2017
Report on Artificial Intelligence and Human Society	Japan: Council for Science, Technology and Innovation	2017
Responsible AI: A Framework for Building Trust in Your AI Solutions	Accenture	2019
Rise of the Machines: Artificial Intelligence and its Growing Impact on U.S. Policy	United States: Subcommittee on Information Technology, Committee on Oversight and Government Reform	2018
Robotics and artificial intelligence	United Kingdom: House of Commons, Science and Technology Committee	2016
SAP's guiding principles for artificial intelligence	SAP	2018
Shaping the Future of Austria with Robotics and Artificial Intelligence	Austria: Austrian Council on Robotics and Artificial Intelligence, Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology	2018
Social Principles of Human-centric AI (Draft) (Japan)	Japan: Government of Japan, Cabinet Office	2018
Spanish RDI Strategy in Artificial Intelligence	Spain: Ministry of Science, Innovation and Universities	2019
Statement on Algorithmic Transparency and Accountability	Association for Computing Machinery US Public Policy Council (USACM)	2017
Statement on Artificial Intelligence, Robotics and 'Autonomous' Systems	European Commission, The European Group on Ethics in Science and New Technologies (EGE)	2018
Summary of the 2018 Department Of Defense Artificial Intelligence Strategy: Harnessing AI to Advance Our Security and Prosperity	United States: Department of Defense	2019
The Barcelona declaration for the proper development and usage of artificial intelligence in Europe	Biocat and l'Obra Social la Caixa	2018
The ethical matters raised by algorithms and artificial intelligence: how can humans keep the upper hand?	France: French Data Protection Authority (CNIL)	2017
The Ethics of Code: Developing AI for Business with Five Core Principles	Sage	2017
The ethics of research in machine learning	France: CERNA	2018
The Future Computed: Artificial Intelligence and its role in society	Microsoft	2018
The Futurice Principles for Ethical AI	Futurice	2018
The Japanese Society for Artificial Intelligence Ethical Guidelines	Japanese Society for Artificial Intelligence (JSAI)	2017
The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation	Future of Humanity Institute, Centre for the Study of Existential Risk, Center for a New American Security, Electronic Frontier Foundation, OpenAI	2018
The National Artificial Intelligence Research and Development Strategic Plan	United States: National Science and Technology Council (NSTC), Networking and Information Technology Research and Development Subcommittee	2016
The Responsible Machine Learning Principles: A practical framework to develop AI responsibly	The Institute for Ethical AI & Machine Learning	2018
The Toronto Declaration: Protecting the right to equality and non-discrimination in machine learning systems	Amnesty International and Access Now	2018
Tieto's AI ethics guidelines	Tieto	2018
Toward a Controlled, Useful and Demystified Artificial Intelligence	France: Parliamentary Office for the Evaluation of Scientific and Technological Choices (OPECST)	2017
Towards an AI Strategy in Mexico: Harnessing the AI Revolution	Mexico: British Embassy in Mexico, Oxford Insights, and C Minds	2018
Universal Guidelines for Artificial Intelligence	The Public Voice	2018
What is AI?	United Kingdom: All Party Parliamentary Group on AI (APPG AI) Secretariat	2017
Work in the age of artificial intelligence: four perspectives on economy, employment, skills and ethics	Finland: Ministry of Economic Affairs and Employment	2018
Workday's Commitments to Ethical AI	Workday	2019

APPENDIX IV

Fig. 7 presents results from simple bivariate regression of ethical breadth (Fig. 7 (a)) and ethical depth (Fig. 7 (b)) from three separate models. The first regresses ethical breadth/depth on organization sector. The second regresses ethical breadth/depth on participation in the document's creation. The third regresses ethical breadth/depth on engagement with law.

The coefficient plots represent the effect of a document being in a certain sector, having a certain level of participation, or having a certain level of engagement with law compared to an excluded or reference category. For example, Fig. 7 (a) indicates that private sector documents are associated with approximately 4.6 fewer ethics topics compared to the excluded category, public sector documents.

The magnitudes and order are in the direction expected. For example, a semi-open participatory process is associated with approximately 3.3 fewer ethics topics compared to an open participatory process, while a closed participatory process is associated with an ever larger magnitude difference, approximately 5 fewer ethics topics compared to an open participatory process.

More complicated models could be used to control for the joint influence of multiple variables. For example, it could be the case that the observed differences are mostly due to organization sector, or that an underlying unobserved variable is responsible for both differences in participation and engagement with law. We do not attempt to specify a more sophisticated causal model, but present these simple bivariate results to illustrate descriptive differences.

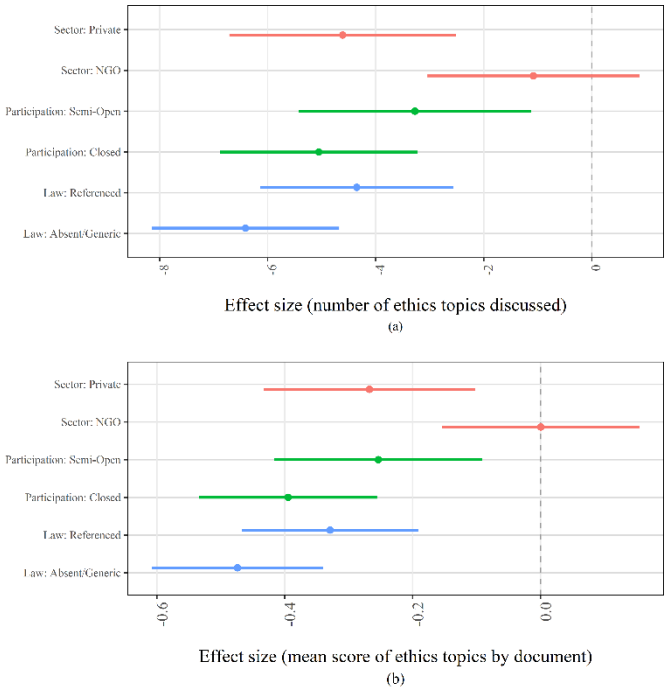

Fig. 7 (a). Coefficient plot from regression of breath of ethical discussion. Fig. 7 (b). Coefficient plot from regression of depth of ethical discussion. Figures indicate effect sizes with 95% confidence intervals from separate bivariate OLS regressions of ethical depth and breadth on organizational sector (Model 1, in red), participation (Model 2, in green), and engagement with law (Model 3, in blue). These subfigures indicate substantively large negative bivariate associations between 1) ethical breadth and depth and 2) a document being from the private sector or being marked by low levels of participation or engagement with law.