Enhancing organizations research using behavioral data science: towards a dynamic intersectional theory of female minority leadership

Online Supplementary Material

(NOT INTENDED FOR PUBLICATION)

Appendix A

Example of Excluded Political Advertisement

We exclude female leadership speech specimens, where the speech specimen contains deliberate political advertisement. These messages are much shorter than the speeches in our sample and have a particular structure, usually heavily regulated (e.g., the candidate always has to endorse the message by stating that they "approve" it). These messages are usually not very informative as their main goal is to attract attention to the candidate in order to encourage the voters to look for more information about the candidate rather than to state the candidate's point of view. These advertisements also may contain speech from other people. Please, see two examples of political advertisement for Hillary Cilnton below.

Example 1:

She Always - Sep. 20, 2016

Hillary Rodham Clinton
September 20, 2016
Print friendly
Video
Campaign status: Lost
CATEGORIES: POLITICAL ADS, TV

Hillary Rodham Clinton

CLINTON: I've always been familiar with poverty, and I've always done what I could to alleviate it and to help people. The rich are getting a whole lot richer, the middle is stagnating, and the poor are getting poorer. Now that is not good news for the American democracy. This country needs to give dignity to work, to make sure that women and men who work full-time earn a wage that lifts them out of poverty. Corporate executives have profited personally so much when the average worker in America have seen their wages and benefits basically stagnate. A new beginning that makes Wall Street shoulder its responsibility for this crisis. One that makes the most well-off among us pay our fair share. We all want an economy with more opportunity and less inequality. Where Wall Street can never wreck Main Street again. We need to make sure our economy works for everyone, not just those at the top. I'm Hillary Clinton, and I've always approved this message.

Example 2:

Hillary Rodham Clinton

First Lady Michelle Obama on Voting - Nov. 3, 2016

Hillary Rodham Clinton
November 03, 2016
🖨 Print friendly
▶ Video
Campaign status: Lost
CATEGORIES: POLITICAL ADS, WEB EXCLUSIVE

MICHELE OBAMA: Voting is how we express out values and choose the leaders we trust to shape the future for our children. And in this election, I'm casting my vote early for Hillary Clinton, and I urge you to vote early for Hillary, too.

MAN: You know that your vote counts. It's very important that we all get out and vote.

MICHELE OBAMA: I'm voting for Hillary because she shares my values, because she believes in equality, opportunity, hard work. I'm voting for Hillary because after her career as a lawyer, a law professor, First Lady of Arkansas, First Lady of the United States, a U.S. Senator, and Secretary of State, Hillary has more experience and exposure to the Presidency than anyone in our lifetime. And she is by far the most qualified candidate in this election. And I'm voting for Hillary because she has concrete, detailed policies that will actually make a difference in people's lives. Making college affordable, helping families pay their bills, improving our children's schools, and so much more. So Hillary has done her job, now it's time for us to do our job.

MAN #2: She's been a champion for us, and I want to be a champion for her.

MICHELE OBAMA: And get her elected President of the United States.

WOMAN: We're electing the first female president!

WOMAN #2: I'm so excited!

MICHELE OBAMA: That's why folks across this country, including Barack and I, are voting early. And early voting couldn't be easier. Barack voted early in person by showing up to an early vote location in our hometown of Chicago.

BARACK OBAMA: Ok, let's do this.

MICHELE OBAMA: So vote early if you can or you can join the millions of Americans who will head to the polls on Election Day, November 8. However you choose to cast your vote, just be sure that you make your voice heard and help elect Hillary as our next president. Thanks so much!

Appendix B

Table B1 List of Female Leaders

Abby Finkenauer	Barbara Jordan	Charlene Barshefsky	Donna Shalala
Abby Kelley Foster	Barbara L Boxer	Charlotte B Nelson	Doris Kearns Goodwin
Ada Deer	Barbara Lawton	Charlotte Bunch	Doris Matsui
Adelle Hazlett	Barbara Lee	Chellie M Pingree	Dorothy Denning
Alexandria Ocasio-Cortez	Barbara McClintock	Chelsea Clinton	Dorothy Height
Alexis Herman	Barbara Mikulski	Cheri Bustos	Dr. Kathleen C. Bailey
Alice M. Rivlin	Barbara O'Brien	Christina D Romer	Dr. Rita Colwell
Alice Paul	Barbara P Bush	Christine Gregoire	Eddie Bernice Johnson
Alicia Garza	Barbara S. Cochran	Christine Todd Whitman	Eileen B. Claussen
Alison Lundergan Grimes	Becky Cain	Cindy A. Cohn	Eileen Collins
Aliza Sherman	Becky S Skillman	Cindy Axne	Eilene Galloway
Allee Willis	Bella Abzug	Cindy H McCain	Elaine L Chao
Allyson Schwartz	Bernadine Healy	Claire McCaskill	Elaine Scruggs
Alma Adams	Bethany Hall-Long	Claire Wolfe	Eleanor Baum
Amata Coleman Radewagen	Betty A Ford	Clare Boothe Luce	Eleanor Holmes Norton
Amelia Earhart	Betty Friedan	Claudia Alta "Lady Bird" Johnson	Eleanor Roosevelt
Amy Kaslow	Betty McCollum	Claudia Tenney	Eleanor Smeal
Amy Klobuchar	Betty S Sutton	Cokie Roberts	Elena Kagan
Amy Kremer	Betty Shabazz	Colleen Hanabusa	Elisabeth Showalter Muhlenfeld
Amy McGrath	Beverly E Perdue	Condoleezza Rice	Elise Stefanik
Andrea Dworkin	Beverly O'Neill	Constance A. Morella	Elizabeth "Betsy" DeVos
Angelina Grimke Weld	Billie Jean King	Coretta Scott King	Elizabeth "Liz" Cheney
Anita Borg	Blanche Lambert Lincoln	Courtney Love	Elizabeth Cady Stanton
Anita Hill	Bonnie Kestner	Crystal Eastman	Elizabeth Dole
Anita Jones	Bonnie Watson Coleman	Cynthia A McKinney	Elizabeth Dowdeswell
Ann Coulter	Brenda Laurel	Cynthia M Lummis	Elizabeth Esty
Ann Kirkpatrick	Brenda Lawrence	Cynthia M. Patterson	Elizabeth Glaser
Ann M. Veneman	Brooke Astor	Daisy Bates	Elizabeth Gurley Flynn
Ann Marie Buerkle	Callie Khouri	Dale S. Brown	Elizabeth H Roberts
Ann McLane Kuster	Camille Paglia	Dana Loesch	Elizabeth McAlister
Ann Richards	Candice Miller	Darlene K Hooley	Elizabeth Warren
Ann Wagner	Candy Crowley	Deb Fischer	Ella Baker
Anna Eshoo	Carly Fiorina	Debbie A Stabenow	Ella T. Grasso
Anna Howard Shaw	Carmen Perez	Debbie Dingell	Ellen DeGeneres
Anna Kelton Wiley	Carol Bellamy	Debbie Halvorson	Ellen Greenlee
Anne C. Petersen	Carol Browner	Deborah Blum	Ellen Hancock
Anne K. Bingaman	Carol Molnau	Deborah Y. Parker	Ellen S. Hurwitz
Anne M Mulcahy	Carol Moseley Braun	Denise Levertov	Ellen Tauscher
Annie Sprinkle	Carol Shea-Porter	Diana Aviv	Elousie Cobell
Antonia Novello	Caroline Kennedy	Diana DeGette	Emily Cain
Aurelia E. Brazeal	Carolyn B Maloney	Diane Black	Emily Greene Balch
Ayanna Pressley	Carolyn McCarthy	Diane Denish	Emma Goldman
Barbara A. Goodno	Carrie Chapman Catt	Diane Nash	Emma Gonzalez
Barbara B Kennelly	Carrie P. Meek	Diane P. Wood	Erica Jong
Barbara Bush	Catherine Bertini	Diane Watson	Ernestine L. Rose
Barbara Comstock	Catherine Cortez Masto	Dianne Feinstein	Ester Dyson
Barbara Coombs Lee	Catherine Jay Didion	Dina Titus	Eva Clayton
Barbara Cubin	Cathy Cleaver	Dolores Huerta	Evelyn Sanquinetti
Barbara Dooley	Cathy McMorris Rodgers	Donna Christensen	Faith Ringgold
Barbara Ehrenreich	Cecile Richards	Donna Edwards	Fannie Lou Hamer

Table B1 continued

Faye Wattleton	Jackie Speier	Joycelyn Elders	Kirsten E Gillibrand
Florence J. Harriman	Jackie Walorski	Juanita Millender-McDonald	Kristi Noem
Florence Kelley	Jacklyn "Jacky" Rosen	Judith A. Best	Kyrsten Sinema
Fran Ulmer	Jacqueline E McGhee	Judith Crist	Laura Bush
France Anne Cordova	Jaime Herrera Beutler	Judith E. Heumann	Laura D'Andrea Tyson
Frances "Fannie" Barrier Williams	Jamie Gorelick	Judith L. Palkovitz	Laura Kelly
Frances "Sissy" Farenthold	Jamie Rappaport Clark	Judith Lichtman	Laura Richardson
Frances D. Gage	Jan Brewer	Judith Rich Harris	Laurie Marker
Frances Ellen Watkins Harper	Jan Schakowsky	Judith Rodin	Lenora B Fulani
Frances Moore Lappe	Jane Addams	Judith Wallerstein	Lillian Vernon
Frances Perkins	Jane Alexander	Judy Biggert	Linda A. Suydam
Frances Willard	Jane Butler Kahle	Judy Chu	Linda Chavez-Thompson
Frances Wright	Jane Dee Hull	Julia Brownley	Linda K Kerber
Frederica Wilson	Jane Fonda	Julia Taft	Linda Lingle
Gabrielle Giffords	Jane Harman	Julia Ward Howe	Linda McMahon
Gale Norton	Janet A Napolitano	Kamala Harris	Linda S. Fink
Geraldine A Ferraro	Janet Jagan	Karen Bass	Linda Sanchez
Gertrude B. Elion	Janet Mills	Karen Hughes	Linda Sarsour
Gina Raimondo	Janet Reno	Karen M. Torres	Linda Tarr-Whelan
Ginette Hemley	Janet Southby	Karen Pence	Lisa Blunt Rochester
Ginny Brown-Waite	Janet Yellen	Karyn Polito	Lisa Murkowski
Gloria Shatto	Janice Hahn	Kate Michelman	Lisa P Jackson
Gloria Steinem	Janice Shaw Crouse	Katha Pollitt	Lois Capps
Grace Meng	Jari Askins	Katharine T. Bartlett	Lois Frankel
Grace Napolitano	Jean A. Wright	Katherine "Kate" Brown	Lois J. Schiffer
Gretchen Driskell	Jean M Schmidt	Katherine Clark	Loretta Lynch
Gretchen Whitmer	Jeane J Kirkpatrick	Kathie Lee Gifford	Loretta Sanchez
Gwen Graham	Jeanne Diebolt	Kathleen B Blanco	Louise M Slaughter
Gwen Ifill	Jeanne Hurley Simon	Kathleen Kennedy Townsend	Lucille Roybal-Allard
Gwen Moore	Jeanne Shaheen	Kathleen Rice	Lucretia Mott
Haley Stevens	Jenean Hampton	Kathleen Sebelius	Lucy McBath
Hattie Caraway	Jennifer Carroll	Kathleen Sullivan	Lucy Stone
Hazel O'Leary	Jennifer Dunn	Kathy A Dahlkemper	Lupe Valdez
Heidi Heitkamp	Jennifer Long	Kathy Castor	Lyn Stinson
Helen Alvare	Jenniffer Gonzalez	Kathy Hochul	Lynn Jenkins
Helen Boosalis	Jenny Beth Martin	Katie Louchheim	Lynn Sherr
Helen Chenoweth	Jenny Horne	Katie McGinty	Lynn Woolsey
Helen Gahagan Douglas	Jessica Gonzalez-Rojas	Katrina Pierson	Lynne Cheney
Helen Gurley Brown	Jill Biden	Kay Bailey Hutchison	M. Jodi Rell
Helen Hamilton Gardener	Jo Ann Harris	Kay Granger	Mabel Vernon
Helen Keller	Jo Jorgensen	Kay Hagan	Madeleine Albright
Helen Prejean	Joan Brown Campbell	Kay Ivey	Madeleine Bordallo
Mrs Henry Weddington	Joan Claybrook	Keli Carender	Madeleine L'Engle
Hilda Solis	Joan Ruddock	Kelli Ward	Maggie Hassan
Hillary Rodham Clinton	Jody Williams	Kelly Ayotte	Marcia L Fudge
Ida B Wells	Joni Ernst	Kellyanne Conway	Marcia Pally
Ida H. Harper	Josephine M. D'Antonio	Kim Guadagno	Marcia S. Smith
Ilhan Omar	Joy Hakim	Kim Reynolds	Marcy C Kaptur
Isabella Beecher Hooker	Joyce Beatty	Kim Weaver	Margaret Chase Smith
Ivanka Trump	Joyce C. Lashof	Kimberle Williams Crenshaw	Margaret H Sanger

Margaret J. Geller	Michele Reagan	Phyllis Chesler	Soledad O'Brien
Margaret Spellings	Michelle Lujan Grisham	Phyllis E. Oakley	Sonia Fuentes
Margaret Warner	Michelle Nowlin	Phyllis Greenberger	Sonia Johnson
Maria Cantwell	Michelle Nunn	Phyllis Schlafly	Sonia Sotomayor
Marian Wright Edelman	Michelle Obama	Rachel Carson	Stacey Abrams
Marianne Williamson	Mimi Walters	Rachelle Chong	Stacey Plaskett
Mariannette Miller-Meeks	Molly Corbett Broad	Rebecca Kleefisch	Staci Appel
Marilyn Tucker Quayle	Molly Ivins	Rebecca L Felton	Stephanie H Sandlin
Marion C. Blakey	Monica Wehby	Rebecca Michelle "Mikie" Sherrill	Stephanie Murphy
Marjorie Dannenfelser	Morgan Carroll	Renee Chelian	Stephanie Tubbs Jones
Marsha Blackburn	Ms. Holmes	Renee Ellmers	Sue Ellspermann
Marsha Rosenbaum	Muriel Bowser	Roberta R. Katz	Sue Minter
Martha Krebs	Nadine Strossen	Ronda Hauben	Susan Allen
Martha McSally	Nan Hayworth	Rosa L. DeLauro	Susan B. Anthony
Martha Roby	Nan Keohane	Rosa Parks	Susan Brooks
Mary A. Safford	Nancy A Dunkel	Rosalyn S. Yalow	Susan C Schwab
Mary Anderson	Nancy Birdsall	Rosalynn Carter	Susan Collins
Mary Bono	Nancy Gertner	Roxanne Qualls	Susan Davis
Mary Brown Bullock	Nancy Kassebaum Baker	Ruth A Minner	Susan E Rice
Mary Burke	Nancy Lord	Ruth Bader Ginsburg	Susan Eckerly
Mary Burnett Talbert	Nancy Pelosi	Ruth Mandel	Susan Esserman
Mary Carter Smith	Nancy Reagan	Ruth Simmons	Susan Faludi
Mary Cavanaugh	Nancy Rubin	S.E. Cupp	Susan Golding
Mary Church Terrell	Nancy W. Dickey	Sally Pederson	Susan Hammer
Mary D. Nichols	Nancy Wyman	Sally Quillian Yates	Susan Molinari
Mary E Kramer	Nanette Diaz Barragan	Sally Quinn	Susan Narvaiz
Mary E Peters	Nannie Helen Burroughs	Sally Regenhard	Susan Ness
Mary Elizabeth "Tipper" Gore	Naomi Wolf	Samantha Power	Susana Martinez
Mary Fallin	Natalie Tennant	Sandy Adams	Suzan DelBene
Mary Fisher	Niki Tsongas	Sandy Thurman	Suzanne Bonamici
Mary Jane Coggeshall	Nikki Haley	Sarah Brady	Suzanne Crouch
Mary Jo Kilroy	Nita M Lowey	Sarah Palin	Suzanne M Kosmas
Mary L. Azcuenaga	Nora Callahan	Sarah Parker Remond	Tamika Mallory
Mary Landrieu	Nora Ephron	Shannon Lucid	Tammy Duckworth
Mary Taylor	Norma Torres	Shari Steele	Tammy S Baldwin
Mary-Claire King	Nydia Velazquez	Sharon Sayles Belton	Tanya Metaksa
Maryam Elahi	Olympia Jean Snowe	Sheila Jackson Lee	Tarana Burke
Marye Anne Fox	Opal Tometi	Sheila Oliver	Tempe Herndon Durham
Matilda Joslyn Gage	Oprah Winfrey	Sheila Simon	Terri Lynn Land
Maxine Waters	Pam Iorio	Sheila Widnall	Terri Sewell
Maya Angelou	Patricia A. McGuire	Shelley Berkley	Thelma Catherine "Pat" Nixon
Mazie K Hirono	Patricia Schroeder	Shelley Moore Capito	Tina Smith
Megan Barry	Patrisse Khan-Cullors	Shenna Bellows	Toni Morrison
Meghan McCain	Patsy Mink	Sherri W. Goodman	Tulsi Gabbard
Melissa Bean	Patty Judge	Shirley Chisholm	Urvashi Vaid
Meredith Monk	Patty Murray	Shirley Franklin	Valdez "Val" Demings
Mia Love	Paula Casey	Shirley M. Hufstedler	Valerie Solanas
Michaelle Jean	Paula Treckel	Shirley M. Malcom	Vicky Hartzler
Michele M Bachmann	Paulina W. Davis	Sissela Bok	Victoria C. Woodhull
Michele Norris	Pearl S. Buck	Sojourner Truth	Virginia Foxx

Table B1 continued

Wanda Wilk
Wendy Davis
Wendy Long
Wilma Mankiller
Winona LaDuke
Yvette D Clarke
Yvonne Prettner Solon
Zoe Lofgren

Appendix C

Topic Modelling Comparison and Model Selection

In our corpus, we have both individual effects and temporal effects, meaning that we need to take into account the fact that speech samples from the same leaders are correlated as well as the fact that topics may be correlated between time periods, where our time period unit is a year. Our strategy is to address the individual effects directly through the topic modelling exercise and address the temporal effects in post-topic-modelling stage. The reason for dealing with two types of effects separately is that existing topic modelling approaches do not allow to jointly address both issues. Specifically, if we consider approaches based on the latent Dirichlet allocation (LDA), on the one hand, the LDA-based Correlated Topic Model (CTM) procedure allows to directly model correlations between topics but not between specimen of text belonging to the same author (e.g., Blei and Lafferty, 2006a, 2009). On the other hand, while Dynamic LDA allows to capture the evolution of topics in a sequentially organized corpus of documents (e.g., Blei and Lafferty, 2006b), it cannot be jointly estimated with the Correlated LDA as the correlated model uses logistic normal distribution and the LDA-based Dynamic Topic Model requires the use of Gaussian models for time dynamics. Furthermore, as Blei and Lafferty (2006b) put it, "due to the nonconjugacy of the Gaussian and multinomial models, posterior inference [of the Dynamic LDA] is intractable" (Blei and Lafferty, 2006b, p. 3) and approximate inference has to be used (e.g., Snelson and Ghahramani, 2006). This option is not adequate for our study as we aim to understand the dynamic effects more precisely. In topic models based on Transformer language (Vaswani et al., 2017), it is possible to account for sequential effects (e.g., Rasmy et al., 2021) in specimens obtained from the same source or individual (which we use in our topic modelling procedure), yet, it is not the same as looking at dependencies between time periods for the whole corpus. Therefore, we first apply the topic modelling procedure accounting for individual-level dependencies and then measure individual and temporal effects using econometric methodology in post-estimation. For our study this is a valid strategy as we are interested in minority female leaders and not overall temporal allocation of topics over time.

We assume that each individual leader is associated with a multinomial distribution over topics and each topic is associated with multinomial distribution over words and apply three different topic modelling procedures: (1) an LDA-based modified Correlated Topic Model (mCTM); (2) a context-dependent Bidirectional Encoder Representations from Transformers (BERT)-based model (cdBERT) and (3) a context-dependent Robustly Optimized BERT Pre-training Approach RoBERTa-based model (cdRoBERTa). The LDA model is trained on our corpus of data, while BERT and RoBERTa represent pre-trained Transformer language models (Vaswani et al., 2017). We used $BERT_{LARGE}$ variation of BERT with 16 bidirectional self-attention heads trained on BooksCorpus of 800M words and English Wikipedia of 2,500M words (Devlin et al., 2018). RoBERTa is trained on BooksCorpus, English Wikipedia (as BERT) as well as on CC-NEWS (63 million English news articles collected between September 2016 and February 2019), OPENWEBTEXT (web content extracted from the URLs shared on Reddit with at least 3 upvotes) and STORIES (a subset of Common Crawl data filtered to match the story-like style of Winograd NLP task) datasets (Liu et al., 2019). BERT is built on two principles: language modelling (predicting masked tokens in training sample) and next sentence prediction. RoBERTa is different from BERT in a sense that it (a) is not constructed to perform the next sentence prediction; trains with larger batch sizes and uses longer sequences; as well as is able to adjust its masking patterns (unlike BERT, which uses only one static mask).

Our mCTM is identical to the generative process of LDA except that the topic proportions are drawn from a logistic normal distribution rather than a Dirichlet as per Blei and Lafferty (2006a), where topics $T_{1:K}$ are K multinomials over a fixed word vocabulary and vocabulary is constructed by the set of L leaders, where each leader l is associated with a distribution over topics ω, drawn from a logistic normal prior. The probabilistic LDA model assumes that it is possible to represent each speech s in our sample of S speeches in the form of a probabilistic mixture of T topics. These probabilities form a speech topic vector τ_s, which has a length T. The LDA then maps a matrix τ, of dimensions $S \times T$, such that $\tau = \begin{pmatrix} \tau_1 \\ \cdots \\ \tau_S \end{pmatrix} = \begin{pmatrix} p(t_1|s_1) & \cdots & p(t_T|s_1) \\ \cdots & & \cdots \\ p(t_1|s_S) & \cdots & p(t_T|s_S) \end{pmatrix}$, where $p(t_j|s_i)$ is the probability that speech i is attributed to the topic j. Each topic $t \in T$ represents a probabilistic distribution over a fixed word vocabulary. Essentially, our model represents a hybrid between the CTM by Blei and Lafferty (2006a) and the author-topic model (ATM) by Rosen-Zvi et al., (2004).[1]

Our approach in the cdBERT and cdRoBERTa models is similar to the contextualized models such as Med-BERT by Rasmy et al. (2021), which use transformer architecture to include multi-level embeddings and bidirectional transformer (see Figure C1). Specifically, we used individual leader ID to distinguish between individual leaders and speech dates (year in which a particular speech was delivered) to distinguish between speeches in the sequence. All topic models were conducted using Python 3.7.7.
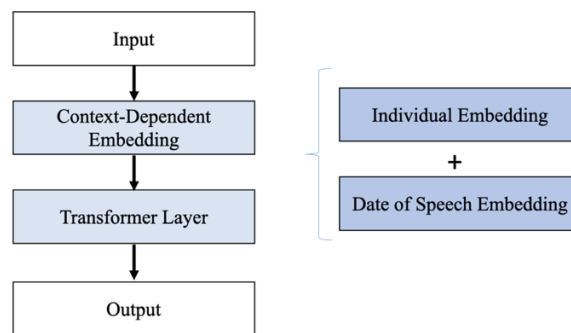
Figure C1 Architecture of Transformer Models

Models mCTM, cdBERT and cdRoBERTa return 17, 35, and 30 topics, correspondingly.[2] Table C1 provides results of the topic modelling according to all 3 procedures, presenting the overlap between the topics in the female leadership speech and the United Nations 17 global goals defined in 2015, which represent a "*blueprint to achieve a better and more sustainable future for all people and the world by 2030*".[3] Table shows that all procedures produce meaningful topics, which reflect most of the sustainable development goals. In other words, the topics, which women leaders are working on, are of global importance. The BERT-based procedure produces the most comprehensive list of topics, which appear to be more coherent and have fewer overlaps than the topics generated by the RoBERTa-based procedure.

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[1] The model by Rosen-Zvi et al. (2004) shows how LDA model can be jointly applied for understanding topics and author's interest in topics in situations, where multiple authors work on multiple text specimens, whereas our model considers multiple single-authored specimens contributing to the same vocabulary. See http://www.datalab.uci.edu/author-topic/ and https://radimrehurek.com/gensim/models/atmodel.html for more detail.

[2] The mCTM model was checked for the optimal number of topics

[3] See https://sdgs.un.org/goals for more details.

Table C1 Results of the Topic Modelling

Sustainable development goals (SDG)	mCTM		cdBERT		cdRoBERTa	
	Topic	Keywords	Topic	Keywords	Topic	Keywords
1. No poverty	Women's rights	rights, women, equal, gender	Future and nation	support, life, nation, future	Life, law, and family	life, family, justice, law
2. Zero hunger	Creativity	art, novel, critique, create	Environment, sustainability, energy, and water	environmental, energy, water, environment	Children and care	fight, family, children, care
3. Good health and well-being	Technology	technology, progress, Internet, development	Healthcare	health care, health, care, insurance	Economic development	development, human, economic, nations
4. Quality education	Service leadership	service, followers, community, responsibility	Jobs, economy, and employment	jobs, family, government, tax	Education, history, and society	life, education, history, society
5. Gender equality	Diversity and inclusion	diversity, equality, race, gender	Women's rights	vote, suffrage, government, republic	Politics	unapologetically, delighted, gratitude, politics
6. Clean water and sanitation	Resilience and perseverance	resilience, trying, attempt, success	Budget, public policy, government, and taxes	tax, government, budget, spending	Jobs, taxes, and economy	fight, jobs, tax, economy
7. Affordable and clean energy	Social security and inequality	social, security, inequality, secure	Diversity, race, gender, and childhood opportunities	life, colored, black, children	Diversity, inclusion, and voting	war, colored, law, vote
8. Decent work and economic growth	Health of women and children	heath, awareness, women, children	Domestic violence	violence, victims, domestic violence, domestic	Health insurance	health, jobs, insurance, tax
9. Industry, innovation and infrastructure	Slavery and freedom	slave, history, freedom, convention	Pregnancy, abortion, and women's right to choose	abortion, pregnancy, abortions, life	Service and debt	family, service, debt, serve
10. Reduced inequalities	Education	education, school, life, study	Life and education	life, education, history, graduation	Jobs and healthcare	jobs, healthcare, health, care
11. Sustainable cities and communities	Power and empowerment	office, running, power, congress	Cyber security, internet technology	encryption, internet, key, software	Women's rights	war, suffrage, century, conference
12. Responsible consumption and production	Economy	economy, budget, jobs, affordable	Refugees and humanitarian action	refugees, refugee, Africa, human	Energy, economy, and cities	energy, economy, city, jobs
13. Climate action	Science	science, genome, scientist, lecture	Higher education	education, community, higher education, higher	Historical events	history, celebration, century, published
14. Life below water	Discrimination	discrimination, victims, violation, right	War and nuclear weapons	war, weapons, nuclear, administration	Public mandate	award, life, family, chance
15. Life on land	War and conflict	war, conflict, military, threat	Justice	court, justice, judge, law	Disfranchisement and discrimination	colored, peace, disfranchisement, people

#	Topic	Keywords	Topic	Keywords	Topic	Keywords
16. Peace, justice, and strong institutions	Environment	environment, survival, renewable, energy	Europe, integration, European Union	European, Europe, union, European union	Air and water	standard, standards, ozone, water
17. Partnerships for the goals	Development	development, develop, peoples, nations	Defense and military	military, war, defence, training	Leadership	leader, leadership, leading, Americas
			Peace and regional conflict	Iran, Arab, peace, Gaza	Children	children, health, education, programs
			Diplomacy	girls, peace, education, diplomacy	Space and technology	NASA, internet, environmental, space
			Public education and children	education, schools, children, public	Equality	fight, equal, nation, health
			Art and music	arts, art, music, copyright	National movement	justice, nation, fight, movement, opportunity
			Cities and neighborhoods	city neighbourhoods, cities, neighbourhood	Life, children, and future	children, fight, life, future
			Art and music	arts, art, music, copyright	Law and marriage	court, law, voter, marriage
			HIV, AIDS	aids, health, HIV, HIV aids	Justice	court, judge, government, vote
			United Nations and human rights	war, liberty, nations, peace	Intelligence and regional conflict	intelligence, war, Islam, Pakistan
			Love and family	family, life, love, names	Work and family	deserve, family, worked, promise
			Disability	disabilities, mother, children, deaf	Breast cancer	breast, cancer, health, care
			Science and technology	technology, workers, science, jobs	Arts	arts, amazing, love, poetry
			Development and poverty	Development, economic, Africa, poverty	Immigration and security	legal, immigration, security, cybersecurity
			Law	law, lawyers, public life	War, weapons, and military	war, Soviet, weapons, military
			Space	space, NASA, MIR, science	Regional power	China, global, Pakistan, African
			Mental health and self-help	mental, children, health, mental health		
			Army and military service	military service, served, army		
			Rights of black community	black movement, blacks, struggle		
			Chronic debt	loans, loan, debt, indebted		
			Labor union and workers	workers, IWW, union, labor		

Comparison of the relative fit of the three models is a non-trivial exercise. There are a number of complications that need to be taken into account. First, the three procedures reveal different number of topics. Second, while mCTM is a statistically informed procedure which uses logistic distribution, the other two procedures are transformer-based. Therefore, in order to produce a measure, which would allow us to compare all three models, we compare how well the previous time period's distribution of topics predicts the next time period's distribution. In order to make sure that mCTM is not "punished" for having fewer topics than the other two procedures, we first apply the reduction procedure collapsing the number of topics in all procedures to 17.[4] After the reduction procedure, we run the linear regression model, where the subsequent year's probability for observing each topic is a dependent variable and the previous year's probability for observing each topic is an independent variable. Standard errors are clustered at the level of each topic. The relative fit of all 3 models is presented in Table C2.

Table C2 Topic Modelling Comparison

Model	Coefficient (Robust SE)	Significance P > |t|	R2	N observations	Clusters
mCTM	0.8177 (0.0928)	0.000	0.6711	2,181	17
cdBERT	0.9667 (0.0825)	0.000	0.7121	2,181	17
cdRoBERTa	0.6828 (0.0718)	0.000	0.5332	2,181	17

The fit of all models is almost the same although the BERT-based model has slightly better fit than the other two models with R^2 over 70%. We will, therefore, concentrate on the output of the BERT-based model in the rest of our analysis.

For the LDA-based analysis, we have calculated the Coherence score using our corpus for the LDA-based mCTM. Our coherence measure C_v uses a sliding window principle, taking into account a one-set segmentation of top verbal terms as well as a validation measure based on the normalized pointwise mutual information (NPMI) and the cosine similarity. Figure C1 below shows coherence scores for the number of topics 1 to 20. It demonstrates that the optimal number of topics is 17, yielding the highest coherence score of 0.421.
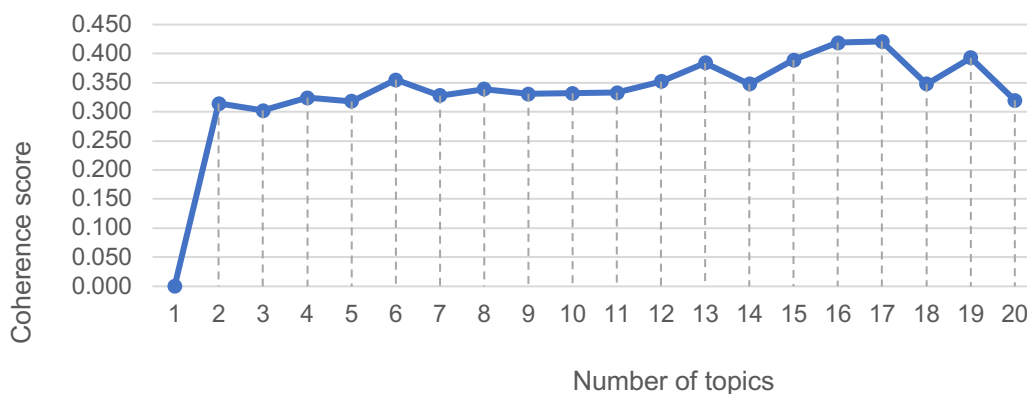
Figure C1 Coherence Score and Optimal Number of Topics

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[4] In Python, we use "reduce_topics" command for topic reduction.

Our analysis also shows that all 17 topics are distinct with only minor overlaps present between them as demonstrated on Figure C2.
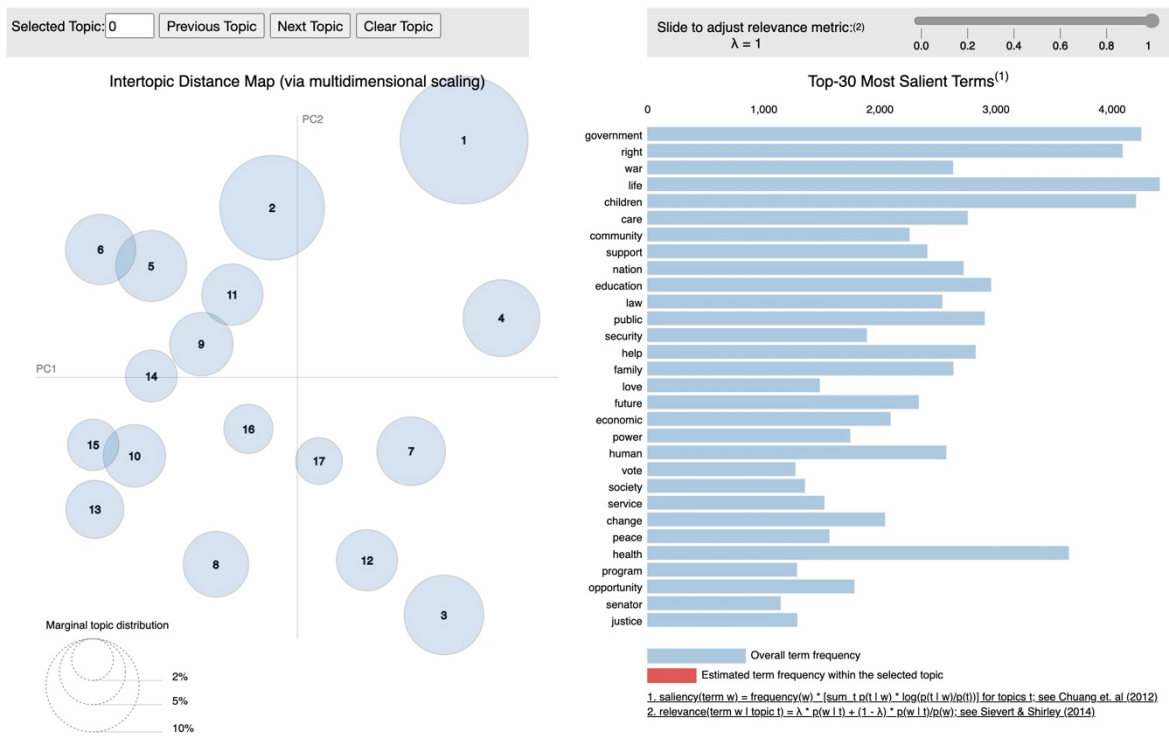
Figure C2 Inter-topic Distance Map

Appendix D

Table D1 Top Leaders by Topic

ID	Description	Top female leader representatives
1	Future and nation	Alexandria Ocasio-Cortez; Cheri Bustos; Jenean Hampton
2	Environment, sustainability, energy, and water	Carol Browner; Lois J. Schiffer; Mary D. Nichols
3	Healthcare	Judith L. Palkovitz; Kathy A Dahlkemper; Mary Jo Kilroy
4	Jobs, economy, and employment	Ann McLane Kuster; Ann Richards; Emily Cain
5	Women's rights	Ernestine L. Rose; Ida H. Harper; Isabella Beecher Hooker
6	Budget, public policy, government, and taxes	Cathy McMorris Rodgers; Jaime Herrera Beutler; Julia Brownley
7	Diversity, race, gender, and childhood opportunities	Eleanor Smeal; Paulina W. Davis; Toni Morrison
8	Domestic violence	Claire Wolfe; Emma Gonzalez; Jacquelynn Davis
9	Pregnancy, abortion, and women's right to choose	Ann Wagner; Carol Molnau; Helen Alvare
10	Life and education	Christine Gregoire; Elisabeth Showalter Muhlenfeld; Janet A Napolitano
11	Cyber security, internet technology	Cindy A. Cohn; Dorothy Denning; Nadine Strossen
12	Refugees and humanitarian action	Helen Prejean; Susan E Rice; Samantha Power
13	Higher education	Barbara Lawton; Elizabeth "Betsy" DeVos; Jill Biden
14	War and nuclear weapons	Candice Miller; Elizabeth "Liz" Cheney; Ellen Tauscher
15	Justice	Joan Ruddock; Wanda Wilk; Charlotte Bunch
16	Europe, integration, European Union	Blanche Lambert Lincoln; Elena Kagan; Linda Sanchez
17	Defense and military	Jeanne Diebolt; Judy Chu; Kathy A Dahlkemper
18	Peace and regional conflict	Jackie Walorski; Marcy C Kaptur; Martha McSally
19	Diplomacy	Condoleezza Rice; Phyllis E. Oakley; Dianne Feinstein
20	Public education and children	Beverly O'Neill; Carolyn B Maloney; Roxanne Qualls
21	Art and music	Allee Willis; Ellen S. Hurwitz; Faith Ringgold
22	Cities and neighborhoods	Betty McCollum; Lucy Stone; Mary Taylor
23	HIV, AIDS	Coretta Scott King; Elizabeth Glaser; Florence J. Harriman; Mary Fisher; Sandy Thurman
24	United Nations and human rights	Charlotte van Rappard-Boon; Deborah Y. Parker; Emma Goldman
25	Love and family	Frances Wright; Jan Brewer; Nancy Reagan
26	Disability	Chelsea Clinton; Claudia Alta "Lady Bird" Johnson; Cokie Roberts
27	Science and technology	Amelia Earhart; Amy Kaslow; Elaine L Chao
28	Development and poverty	Charlene Barshefsky; Nancy Birdsall; Samantha Power
29	Law	Barbara O'Brien; Nan Keohane; Niki Tsongas
30	Space	Eileen Collins; France Anne Cordova; Marcia S. Smith
31	Mental health and self-help	Dale S. Brown; Mary Elizabeth "Tipper" Gore; Rosalynn Carter
32	Army and military service	Barbara A. Goodno; Blanche Lambert Lincoln; Claire McCaskill
33	Rights of black community	Barbara Ehrenreich; Betty Shabazz; Jenny Horne; Kimberle Williams Crenshaw
34	Chronic debt	Claire McCaskill; Elizabeth Warren; Katie Louchheim
35	Labor union and workers	Alexis Herman; Dolores Huerta; Elizabeth Gurley Flynn

Table E1 Multilevel Regression Results

Topic 1:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0087	0.0185	-0.47	0.64	-0.0451	0.0276
B	0.0256	0.0151	1.7	0.09	-0.0040	0.0551
H	-0.0069	0.0215	-0.32	0.75	-0.0492	0.0353
W	0.0085	0.0132	0.64	0.52	-0.0174	0.0344
Constant	0.0344	0.0127	2.7	0.01	0.0094	0.0594
σ_u	0.0409					
σ_e	0.1141					
ρ	0.1136					
p	0.1129					

Topic 2:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0118176	0.0178437	-0.66	0.508	-0.0468198	0.0231847
B	-0.004678	0.014484	-0.32	0.747	-0.0330899	0.0237338
H	-0.0136192	0.0207159	-0.66	0.511	-0.0542556	0.0270171
W	0.0122197	0.0127169	0.96	0.337	-0.0127258	0.0371652
Constant	0.0194981	0.0122629	1.59	0.112	-0.0045568	0.043553
σ_u	0.0173485					
σ_e	0.10981818					
ρ	0.02434837					
p	0.0691					

Topic 3:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0174196	0.0153675	-1.13	0.257	-0.0475645	0.0127252
B	-0.0094516	0.012474	-0.76	0.449	-0.0339206	0.0150174
H	-0.0279376	0.0178411	-1.57	0.118	-0.0629347	0.0070594
W	-0.0022418	0.0109521	-0.2	0.838	-0.0237255	0.0192419
Constant	0.0320094	0.0105611	3.03	0.002	0.0112927	0.0527261
σ_u	0.02558392					
σ_e	0.09457814					
ρ	0.06818406					
p	0.2543					

Topic 4:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0152418	0.015288	1	0.319	-0.0147471	0.0452307
B	-0.0002109	0.0124095	-0.02	0.986	-0.0245533	0.0241316
H	-0.0050962	0.0177488	-0.29	0.774	-0.0399122	0.0297198
W	0.017188	0.0108955	1.58	0.115	-0.0041846	0.0385605
Constant	0.0217688	0.0105065	2.07	0.038	0.0011593	0.0423784
σ_u	0.01844077					
σ_e	0.09408895					
ρ	0.03699225					
p	0.049					

Topic 5:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0057467	0.0107466	0.53	0.593	-0.0153337	0.0268272
B	0.000486	0.0087231	0.06	0.956	-0.0166253	0.0175973
H	-0.0004875	0.0124764	-0.04	0.969	-0.0249611	0.0239862
W	0.0047462	0.0076589	0.62	0.536	-0.0102775	0.0197699
Constant	0.0290523	0.0073855	3.93	0	0.014565	0.0435396
σ_u	0.18905594					
σ_e	0.06613907					
ρ	0.89095826					
p	0.8658					

Topic 6:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0209618	0.0127969	-1.64	0.102	-0.0460641	0.0041404
B	-0.0221644	0.0103874	-2.13	0.033	-0.0425402	-0.0017885
H	-0.0332112	0.0148567	-2.24	0.026	-0.062354	-0.0040684
W	-0.0119146	0.0091201	-1.31	0.192	-0.0298045	0.0059754
Constant	0.038803	0.0087945	4.41	0	0.0215517	0.0560543
σ_u	0.01155267					
σ_e	0.07875739					
ρ	0.0210638					
p	0.0721					

Topic 7:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0041188	0.0129274	0.32	0.75	-0.0212396	0.0294772
B	0.0152631	0.0104934	1.45	0.146	-0.0053207	0.0358469
H	0.0020082	0.0150083	0.13	0.894	-0.0274319	0.0314484
W	0.0097326	0.0092132	1.06	0.291	-0.00834	0.0278051
Constant	0.0222846	0.0088842	2.51	0.012	0.0048574	0.0397119
σ_u	0.15155607					
σ_e	0.07956099					
ρ	0.78395477					
p	0.5678					

Topic 8:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0108702	0.0089213	-1.22	0.223	-0.0283703	0.0066299
B	-0.0033905	0.0072416	-0.47	0.64	-0.0175956	0.0108146
H	-0.0059708	0.0103573	-0.58	0.564	-0.0262878	0.0143461
W	-0.0075488	0.0063581	-1.19	0.235	-0.0200208	0.0049232
Constant	0.02368	0.0061311	3.86	0	0.0116532	0.0357067
σ_u	0.00741713					
σ_e	0.05490579					
ρ	0.01792177					
p	0.6132					

Topic 9:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0000031	0.0108916	0	1	-0.0213618	0.021368
B	-0.0007285	0.0088408	-0.08	0.934	-0.0180707	0.0166137
H	0.0150483	0.0126447	1.19	0.234	-0.0097556	0.0398521
W	0.0025286	0.0077622	0.33	0.745	-0.0126978	0.017755
Constant	0.0126029	0.0074851	1.68	0.092	-0.0020799	0.0272857
σ_u	0.02585957					
σ_e	0.06703146					
ρ	0.1295478					
p	0.6981					

Topic 10:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0021607	0.0094925	-0.23	0.82	-0.0207812	0.0164598
B	0.0074235	0.0077052	0.96	0.335	-0.0076911	0.022538
H	0.0005841	0.0110205	0.05	0.958	-0.0210336	0.0222018
W	0.0075998	0.0067652	1.12	0.261	-0.0056708	0.0208703
Constant	0.0138962	0.0065236	2.13	0.033	0.0010995	0.026693
σ_u	0.00900854					
σ_e	0.05842109					
ρ	0.02322542					
p	0.4977					

Topic 11:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0021359	0.0117896	0.18	0.856	-0.0209906	0.0252624
B	0.0069491	0.0095698	0.73	0.468	-0.011823	0.0257212
H	0.007286	0.0136873	0.53	0.595	-0.019563	0.034135
W	0.0120188	0.0084023	1.43	0.153	-0.0044631	0.0285006
Constant	0.006579	0.0081023	0.81	0.417	-0.0093144	0.0224724
σ_u	0.00996877					
σ_e	0.07255846					
ρ	0.01852619					
p	0.4638					

Topic 12:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0452459	0.0118724	3.81	0	0.0219571	0.0685348
B	0.0029508	0.009637	0.31	0.76	-0.0159531	0.0218546
H	0.0003623	0.0137834	0.03	0.979	-0.0266751	0.0273998
W	-0.0035233	0.0084612	-0.42	0.677	-0.0201209	0.0130742
Constant	0.0199445	0.0081592	2.44	0.015	0.0039395	0.0359495
σ_u	0.03001355					
σ_e	0.07306773					
ρ	0.14436787					
p	0.0000					

Topic 13:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0004617	0.0089025	0.05	0.959	-0.0170015	0.0179248
B	0.0061515	0.0072263	0.85	0.395	-0.0080236	0.0203266
H	-0.0009924	0.0103355	-0.1	0.924	-0.0212665	0.0192817
W	0.0084757	0.0063447	1.34	0.182	-0.00397	0.0209214
Constant	0.0121652	0.0061182	1.99	0.047	0.0001638	0.0241665
σ_u	0.00792814					
σ_e	0.05478995					
ρ	0.02050885					
p	0.4003					

Topic 14:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0061126	0.0061481	0.99	0.32	-0.0059474	0.0181727
B	-0.0001556	0.0049905	-0.03	0.975	-0.0099449	0.0096338
H	-0.0033688	0.0071377	-0.47	0.637	-0.0173701	0.0106326
W	0.0010863	0.0043816	0.25	0.804	-0.0075087	0.0096813
Constant	0.017968	0.0042252	4.25	0	0.0096798	0.0262561
σ_u	0.01123702					
σ_e	0.03783802					
ρ	0.08104732					
p	0.7141					

Topic 15:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0190764	0.0133425	1.43	0.153	-0.0070963	0.0452491
B	0.0029007	0.0108303	0.27	0.789	-0.018344	0.0241455
H	0.0038842	0.0154902	0.25	0.802	-0.0265014	0.0342697
W	0.0125653	0.009509	1.32	0.187	-0.0060875	0.0312182
Constant	0.0122206	0.0091695	1.33	0.183	-0.0057663	0.0302075
σ_u	0.03037847					
σ_e	0.08211576					
ρ	0.12038473					
p	0.2959					

Topic 16:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0016172	0.0109108	-0.15	0.882	-0.0230198	0.0197854
B	0.0020345	0.0088565	0.23	0.818	-0.0153384	0.0194073
H	0.0646801	0.0126671	5.11	0	0.0398324	0.0895278
W	0.0055443	0.007776	0.71	0.476	-0.009709	0.0207976
Constant	0.0137628	0.0074983	1.84	0.067	-0.000946	0.0284715
σ_u	0.01374357					
σ_e	0.06714993					
ρ	0.04020556					
p	0.0000					

Topic 17:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0094048	0.0095172	0.99	0.323	-0.0092641	0.0280737
B	-0.0071462	0.0077252	-0.93	0.355	-0.0223	0.0080076
H	-0.0114792	0.0110491	-1.04	0.299	-0.0331531	0.0101946
W	-0.0097353	0.0067827	-1.44	0.151	-0.0230403	0.0035697
Constant	0.0268582	0.0065406	4.11	0	0.0140283	0.0396882
σ_u	0.00800149					
σ_e	0.05857285					
ρ	0.01831971					
p	0.0699					

Topic 18:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0032789	0.0097464	0.34	0.737	-0.0158397	0.0223976
B	-0.0091749	0.0079113	-1.16	0.246	-0.0246938	0.0063439
H	-0.0109939	0.0113153	-0.97	0.331	-0.03319	0.0112021
W	-0.0083523	0.0069461	-1.2	0.229	-0.0219778	0.0052732
Constant	0.0264038	0.0066981	3.94	0	0.0132647	0.0395428
σ_u	0.03420509					
σ_e	0.05998386					
ρ	0.24538078					
p	0.4124					

Topic 19:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0309452	0.0067927	4.56	0	0.0176206	0.0442698
B	0.010586	0.0055138	1.92	0.055	-0.0002298	0.0214017
H	0.0202071	0.0078861	2.56	0.01	0.0047377	0.0356764
W	0.003718	0.0048411	0.77	0.443	-0.0057782	0.0132143
Constant	0.014119	0.0046682	3.02	0.003	0.0049618	0.0232762
σ_u	0.0137481					
σ_e	0.04180539					
ρ	0.09759401					
p	0.0000					

Topic 20:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0013649	0.0109235	0.12	0.901	-0.0200626	0.0227925
B	0.0047017	0.0088668	0.53	0.596	-0.0126913	0.0220947
H	0.0154938	0.0126818	1.22	0.222	-0.0093828	0.0403703
W	0.0115359	0.007785	1.48	0.139	-0.0037352	0.026807
Constant	0.010944	0.0075071	1.46	0.145	-0.0037818	0.0256698
σ_u	0.01091031					
σ_e	0.06722803					
ρ	0.02566157					
p	0.2854					

Topic 21:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0012727	0.0093474	0.14	0.892	-0.0170631	0.0196085
B	-0.0004741	0.0075874	-0.06	0.95	-0.0153576	0.0144093
H	-0.0044569	0.010852	-0.41	0.681	-0.0257441	0.0168303
W	0.006162	0.0066617	0.92	0.355	-0.0069056	0.0192296
Constant	0.0126828	0.0064239	1.97	0.049	0.0000818	0.0252839
σ_u	0.00968183					
σ_e	0.05752783					
ρ	0.0275441					
p	0.3741					

Topic 22:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0010987	0.0104856	0.1	0.917	-0.0194699	0.0216672
B	0.0175852	0.0085113	2.07	0.039	0.0008893	0.034281
H	0.0054026	0.0121734	0.44	0.657	-0.0184767	0.029282
W	0.0124156	0.0074729	1.66	0.097	-0.0022433	0.0270744
Constant	0.0075454	0.0072061	1.05	0.295	-0.0065901	0.0216809
σ_u	0.02279568					
σ_e	0.06453309					
ρ	0.11093618					
p	0.1517					

Topic 23:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0060235	0.0100895	-0.6	0.551	-0.025815	0.013768
B	-0.0005327	0.0081898	-0.07	0.948	-0.0165977	0.0155323
H	-0.0139343	0.0117135	-1.19	0.234	-0.0369114	0.0090429
W	-0.0070267	0.0071906	-0.98	0.329	-0.0211317	0.0070784
Constant	0.021967	0.0069339	3.17	0.002	0.0083655	0.0355685
σ_u	0.08403821					
σ_e	0.06209493					
ρ	0.64684839					
p	0.489					

Topic 24:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0063183	0.0081099	0.78	0.436	-0.00959	0.0222267
B	-0.0028008	0.0065829	-0.43	0.671	-0.0157139	0.0101123
H	-0.0030539	0.0094153	-0.32	0.746	-0.0215229	0.0154152
W	-0.0012486	0.0057798	-0.22	0.829	-0.0125862	0.0100891
Constant	0.0220874	0.0055734	3.96	0	0.0111545	0.0330203
σ_u	0.13174798					
σ_e	0.04991194					
ρ	0.87449064					
p	0.7566					

Topic 25:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0060186	0.0080432	0.75	0.454	-0.0097589	0.0217961
B	0.0067111	0.0065288	1.03	0.304	-0.0060957	0.0195179
H	0.000454	0.0093378	0.05	0.961	-0.017863	0.0187711
W	0.0060902	0.0057322	1.06	0.288	-0.0051541	0.0173345
Constant	0.0144475	0.0055276	2.61	0.009	0.0036046	0.0252904
σ_u	0.0889037					
σ_e	0.04950116					
ρ	0.76334654					
p	0.7874					

Topic 26:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0349834	0.009693	-3.61	0	-0.0539971	-0.0159697
B	-0.0267237	0.0078679	-3.4	0.001	-0.0421575	-0.01129
H	-0.0342112	0.0112532	-3.04	0.002	-0.0562854	-0.012137
W	-0.0262489	0.006908	-3.8	0	-0.0397997	-0.0126982
Constant	0.047118	0.0066614	7.07	0	0.0340511	0.060185
σ_u	0.01330718					
σ_e	0.05965473					
ρ	0.04740149					
p	0.0015					

Topic 27:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0120717	0.0094421	-1.28	0.201	-0.0305932	0.0064499
B	-0.0182831	0.0076643	-2.39	0.017	-0.0333173	-0.003249
H	-0.0255746	0.0109619	-2.33	0.02	-0.0470774	-0.0040718
W	-0.0201688	0.0067292	-3	0.003	-0.0333688	-0.0069688
Constant	0.0384037	0.0064889	5.92	0	0.0256749	0.0511324
σ_u	0.01343142					
σ_e	0.0581105					
ρ	0.05071445					
p	0.0347					

Topic 28:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.0395336	0.0113048	3.5	0	0.0173581	0.0617091
B	0.0137237	0.0091763	1.5	0.135	-0.0042765	0.0317239
H	0.0338795	0.0131245	2.58	0.01	0.0081345	0.0596244
W	0.0102678	0.0080568	1.27	0.203	-0.0055363	0.026072
Constant	0.0078167	0.0077691	1.01	0.315	-0.0074232	0.0230565
σ_u	0.0121416					
σ_e	0.06957476					
ρ	0.02955423					
p	0.001					

Topic 29:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0079871	0.0119039	-0.67	0.502	-0.0313379	0.0153636
B	0.0045065	0.0096626	0.47	0.641	-0.0144477	0.0234606
H	-0.014082	0.01382	-1.02	0.308	-0.0411913	0.0130273
W	-0.0019397	0.0084837	-0.23	0.819	-0.0185813	0.014702
Constant	0.0223062	0.0081808	2.73	0.006	0.0062587	0.0383537
σ_u	0.00911434					
σ_e	0.07326193					
ρ	0.01524135					
p	0.4993					

Topic 30:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0177227	0.010524	-1.68	0.092	-0.0383666	0.0029212
B	-0.0176349	0.0085425	-2.06	0.039	-0.0343919	-0.000878
H	-0.0194844	0.012218	-1.59	0.111	-0.0434512	0.0044824
W	-0.0153784	0.0075003	-2.05	0.041	-0.0300909	-0.0006658
Constant	0.0307093	0.0072325	4.25	0	0.016522	0.0448966
σ_u	0.00879758					
σ_e	0.06476945					
ρ	0.01811533					
p	0.2885					

Topic 31:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.000427	0.0069309	0.06	0.951	-0.0131686	0.0140226
B	0.0022947	0.0056259	0.41	0.683	-0.008741	0.0133305
H	0.0006867	0.0080465	0.09	0.932	-0.0150973	0.0164707
W	0.0062226	0.0049395	1.26	0.208	-0.0034667	0.015912
Constant	0.0111115	0.0047632	2.33	0.02	0.0017681	0.0204549
σ_u	0.01312592					
σ_e	0.04265561					
ρ	0.08649997					
p	0.3966					

Topic 32:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0228052	0.0089911	-2.54	0.011	-0.0404422	-0.0051682
B	-0.0237924	0.0072982	-3.26	0.001	-0.0381086	-0.0094762
H	-0.0279599	0.0104384	-2.68	0.007	-0.0484358	-0.007484
W	-0.0226082	0.0064078	-3.53	0	-0.0351778	-0.0100386
Constant	0.0406079	0.0061791	6.57	0	0.0284871	0.0527287
σ_u	0.00881952					
σ_e	0.05533535					
ρ	0.02477364					
p	0.0095					

Topic 33:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0012388	0.0116715	-0.11	0.915	-0.0241336	0.021656
B	0.0347934	0.0094739	3.67	0	0.0162093	0.0533774
H	0.0016757	0.0135502	0.12	0.902	-0.0249043	0.0282558
W	0.0061841	0.0083181	0.74	0.457	-0.0101327	0.0225008
Constant	0.015009	0.0080211	1.87	0.062	-0.0007253	0.0307432
σ_u	0.02609828					
σ_e	0.07183162					
ρ	0.11661213					
p	0.0000					

Topic 34:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	-0.0010396	0.0055647	-0.19	0.852	-0.0119553	0.0098762
B	0.0036688	0.004517	0.81	0.417	-0.0051916	0.0125293
H	-0.0053745	0.0064604	-0.83	0.406	-0.0180473	0.0072983
W	0.0014463	0.0039659	0.36	0.715	-0.0063332	0.0092257
Constant	0.0141323	0.0038243	3.7	0	0.0066306	0.021634
σ_u	0.0061823					
σ_e	0.03424771					
ρ	0.0315581					
p	0.5348					

Topic 35:

	Coefficient	SE	t	P>t	[95% Conf. Interval]	
A	0.000515	0.0075756	0.07	0.946	-0.0143452	0.0153752
B	0.0024042	0.0061492	0.39	0.696	-0.009658	0.0144665
H	0.0474069	0.0087949	5.39	0	0.0301548	0.0646591
W	0.0025999	0.005399	0.48	0.63	-0.0079907	0.0131905
Constant	0.0154413	0.0052062	2.97	0.003	0.0052288	0.0256538
σ_u	0.08403941					
σ_e	0.04662324					
ρ	0.76465521					
p	0.0000					

Notes: In all regression, the number of observations was 1,599. Panel effects were measured at the level of each year and each individual within a year.

Table F1 Standard Deviations in Behavioural Schemas by Group

Behavioral Schema=Topic	SD (B)	SD(W)	SD(A)	SD(H)
Future and nation	0.13215539	0.07096267	0.02641084	0.10643747
Environment, sustainability, energy, and water	0.03104003	0.10848524	0.0166035	0.00397762
Healthcare	0.06102255	0.08928849	0.00798762	0.02452031
Jobs, economy, and employment	0.0401674	0.08092493	0.06967997	0.02518888
Women's rights	0.05374145	0.07853714	0.01425212	0.0066645
Budget, public policy, government, and taxes	0.04163614	0.04071339	0.01080844	0.01203942
Diversity, race, gender, and childhood opportunities	0.11984762	0.08930144	0.0172355	0.00590514
Domestic violence	0.03039594	0.05044836	0.00410313	0.05376326
Pregnancy, abortion, and women's right to choose	0.05174054	0.0728277	0.0370223	0.09550122
Life and education	0.01369916	0.02515177	0.00457503	0.02007338
Cyber security, internet technology	0.00563853	0.10507573	0.00501471	0.00523821
Refugees and humanitarian action	0.04014463	0.06421017	0.07956091	0.01631757
Higher education	0.01237452	0.05346389	0.00408097	0.02382805
War and nuclear weapons	0.0144685	0.02491957	0.01318286	0.01081873
Justice	0.01234232	0.10074098	0.02277286	0.01760659
Defense and military	0.0084749	0.03657214	0.00633999	0.09941534
Europe, integration, European Union	0.02362982	0.04941613	0.07482441	0.02352022
Peace and regional conflict	0.01755909	0.03283828	0.01987115	0.01082456
Diplomacy	0.01774451	0.0300059	0.04285244	0.04930223
Public education and children	0.00932149	0.08372629	0.0055778	0.05471441
Art and music	0.0064378	0.05171165	0.02080816	0.00742223
Cities and neighborhoods	0.10096303	0.06958476	0.00447554	0.00695796
HIV, AIDS	0.1015179	0.07790498	0.00941975	0.01122559
United Nations and human rights	0.01080196	0.07621577	0.01383377	0.00737286
Love and family	0.01335262	0.06824225	0.03076132	0.01139371
Disability	0.01363561	0.03638535	0.005183	0.00824454
Science and technology	0.03554556	0.05296937	0.07072794	0.00753775
Development and poverty	0.10189973	0.0515706	0.06597524	0.04517742
Law	0.05264908	0.06512539	0.00887556	0.00727487
Space	0.00666454	0.08078904	0.00641349	0.00854833
Mental health and self-help	0.00649349	0.05448193	0.00470758	0.00527616
Army and military service	0.00891627	0.01614034	0.01172354	0.00861587
Rights of black community	0.11102	0.06182198	0.00847849	0.01087088
Chronic debt	0.03393534	0.01716561	0.0054642	0.00707651
Labor union and workers	0.01290924	0.02480253	0.00655474	0.19945119

Notes: B- female leaders with any Black background; W – female leaders with any White background; A- female leaders with any Asian background; H – female leaders with any Hispanic or Latino background