

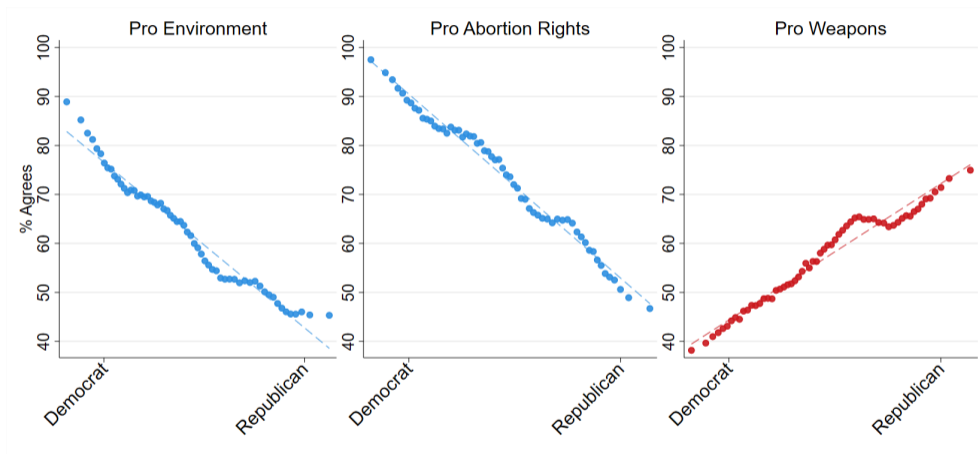
Polarized Innovation

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Democrats and Republicans Hold Different Views on a Set of Issues



Notes. \approx 550,000 US citizens from CCES (2006-2022). Regression lines control for age, sex, county FE, year FE, employment status FE, race FE, education FE, and income bracket FE.

Democrats and Republicans Hold Different Views on a Set of Issues

- ▶ Polarization by political party is increasing (Abramowitz and Saunders, 2008; Boxell et al., 2024)
- ▶ Today, party affiliation more important for social identity than race or social class (West and Iyengar, 2022)

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 - Impact on individual decisions (e.g. consumption, health) and labor market outcomes

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- ▶ What are the implications of this divide?
 - Impact on individual decisions (e.g. consumption, health) and labor market outcomes
- ▶ **This paper:** This divide is reflected in the new technologies brought to the market

This Paper: Innovation is Polarized by Political Party

- ▶ Setting: United States, years 2001–2023
- ▶ Data: Assemble a novel dataset of patents linked to political affiliation of inventors
- ▶ Finding: Inventors produce patents aligned with values of their political party

Contributions to the Literature

▶ Party affiliation matters for household decisions and labor market outcomes

- Consumption (Gerber and Huber, 2009; Ray and Kamdar, 2023; Mian et al., 2023; Conway and Boxell, 2024), financial investment (Kaustia and Torstila, 2011; Meeuwis et al., 2021; McCartney et al., 2021), health and fertility (Bursztyn et al., 2022; Wallace et al., 2022; Allcott et al., 2020; Dahl et al., 2022), productivity (Colonnelli et al., 2022; Teso et al., 2023; Engelberg et al., 2024), on-the-job decisions (Gift and Gift, 2014; Engelberg et al., 2021; Cohen and Yang, 2019; Kempf and Tsoutsoura, 2021; Dagostino et al., 2020; Jelveh et al., 2024)

⇒ **This paper:** Link values associated with political party to **content** of work

▶ Inventor demographics matter for the direction of innovation

- Gender (Koning et al., 2021; Einio et al., 2022), socio-economics status (Einio et al., 2022), race (Dossi, 2024), geographic location and family (Bell et al., 2018)

⇒ **This paper:** Values of the political party of inventors also matter

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Outline

1. Data
2. Main Result
3. Heterogeneity
4. Conclusions

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A New Dataset of Inventors Matched with Party Affiliation

- ▶ USPTO patents and inventors between 2001 and 2023
- ▶ Focus on inventors resident in the US
- ▶ Match inventors to Voter Register Data ▶ Matching Algorithm
 - In 2020, 73% of eligible voters were registered to vote
 - Registration rates higher for people with demographics similar to inventors
 - Upon registering, one can declare affiliation with a party (or remain unaffiliated)

Focus on FL, NJ, NY, & PA

- ▶ Voter Registration data for FL, NJ, NY, & PA:
 - Relevant states for total US innovation [▶ Plot](#)
 - Voters are incentivized to truthfully reveal party affiliation:
 - FL, NJ, NY, & PA have *closed* primary systems [▶ Distribution](#)
- ▶ Match 53% of patents in FL, NJ, NY, & PA since 2001 (in line with Bell et al. (2018))
- ▶ Matched and unmatched inventors are similar [▶ Balance Table](#)
- ▶ Robustness & external validity: match w/ Campaign Contributions data [Bonica (2019)]

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Linking Technologies to Values of Political Parties

- ▶ Focus on polarized topics in the political debate [▶ Topics](#)
- ▶ Select topics that can be mapped to technologies
- ▶ Dictionary approach on patents' abstract to define three dummies:
 - Green
 - Female-Health
 - Weapons
- ▶ Robustness checks with alternative measures (CPC system & Koning et al., 2021)

Empirical Specification

- ▶ C : dummy if inventor ever patented under a certain category

$$C_{i,t,c,j} = \beta_1 \text{ Democrat}_i + \beta_2 \text{ Other}_i + \underbrace{\gamma_t}_{\text{Year Dummies}} + \underbrace{\delta_c}_{\text{County FE}} + \underbrace{\zeta_j}_{\text{Section FE}} + \epsilon_{i,t,c,j}$$

- i is an inventor (restrict to male in main analysis)
 - X_i controls for gender and age
 - Other_i includes small parties (e.g., Green, Independent), but mostly unaffiliated
 - Omitted party category: Republicans
- ▶ Standard errors clustered at county level

Republicans are More Likely to Patent Weapon-related Technologies

(12) **United States Patent Kellgren**

(54) **TUBULAR MAGAZINE FIREARM WITH
SHEET METAL RECEIVER**

(75) Inventor: **George Kellgren**, Cocoa, FL (US)

(73) Assignee: **Kel-Tec CNC Industries, Inc.**, Cocoa,
FL (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 182 days.

(21) Appl. No.: **13/292,584**

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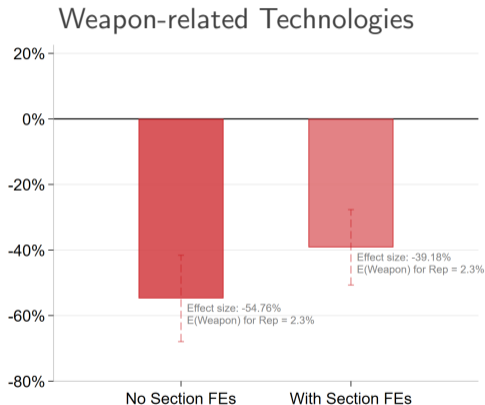
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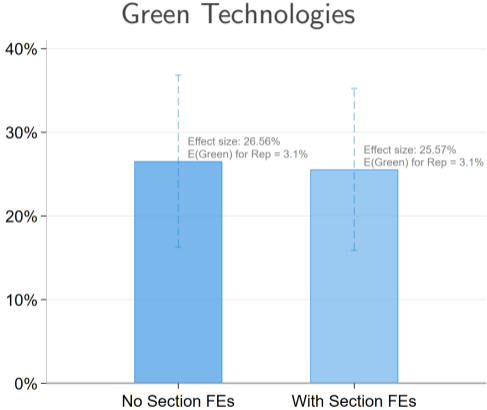
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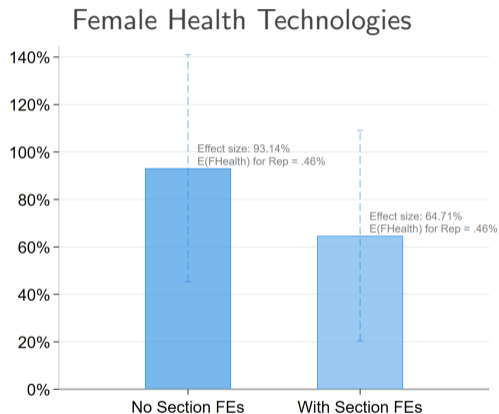
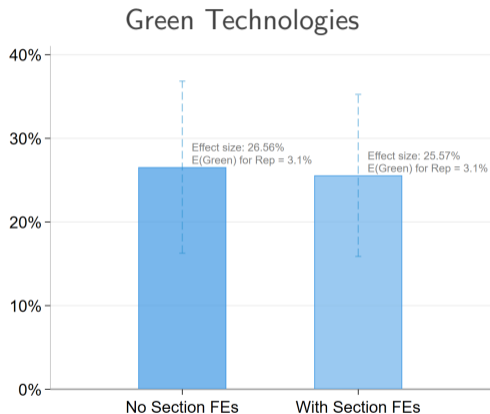
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Democrats More Likely to Patent Green and Female Health Technologies



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Main Robustness Checks

- ▶ Is this driven by inventors adopting the values of the firm?
 - Similar results for sample who **registered young** (before entering labor market)
- ▶ Is this driven by patent examiners selectively granting patents?
 - Similar results in sample of patent **applications**
- ▶ Is this limited to four US states?
 - Similar results across **all US states** using Campaign Contributions data (Bonica, 2019)
- ▶ Are results robust to different empirical **specifications**? Findings are robust to:
 - Including different fixed effects (city FE or state FE)
 - Using a Poisson count model on total n. of patents by inventor
 - Estimating a regression at the patent level (instead of inventor level)

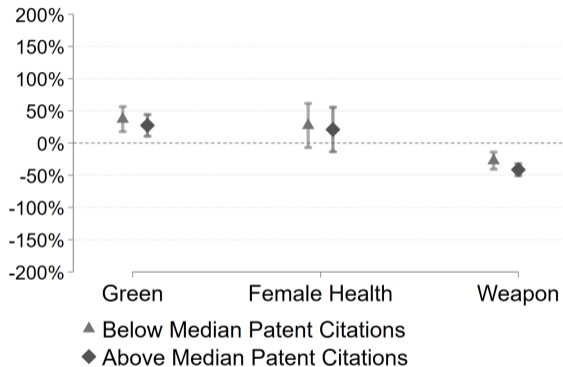
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Who Produces Polarized Innovation?

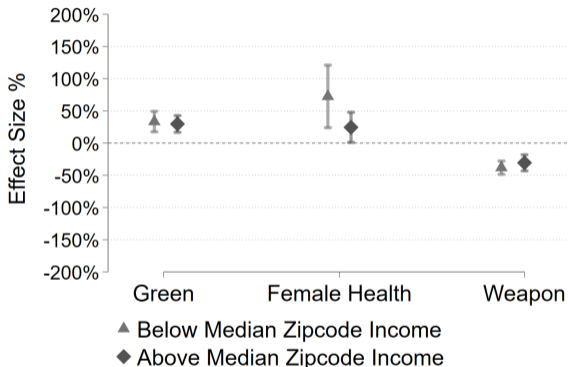
- ▶ So far: Inventors patent technologies aligned with values of their party
- ▶ We test how this match varies with other factors driving technology choice
 - Building on existing literature (e.g., Enke et al., 2023; Colonnelli et al., 2022)
 - Split sample by above- and below-median patent returns, SES, assignee size
 - Polarized innovation occurs across all subsamples

Polarized Innovation Happens Among Patents of Low and High Returns



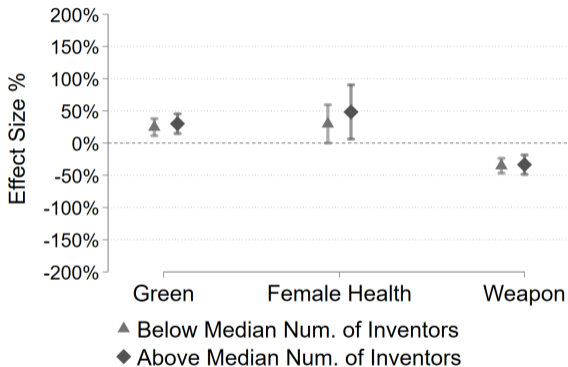
- ▶ No evidence of trade-off between polarized innovation and patent returns

Polarized Innovation Happens in Low and High SES Neighborhoods



- ▶ Polarized innovation doesn't appear to be a “luxury good” (Enke et al., 2023)

Polarized Innovation Happens in Small and Large Assignees



- ▶ Polarized innovation occurs also where social networks matter less (Colonnelli et al., 2022)

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Conclusions

▶ Main result: Production of Innovation is Politically Polarized

- New margin along which partisanship reflects in the economy (beyond political sphere)
- Match between inventor and innovation based on values

▶ Potential Implications

- Lost productivity (Colonnelli et al., 2022; Evans et al., 2024)
- Lower diffusion of technologies and fewer new ideas (Atkin et al., 2022; Posch et al., 2024)

⇒ May lead to lost output and higher inequality

- E.g., female health & the environment (Koning et al., 2021; Morello-Frosch and Obasogie, 2023)

Thank You!

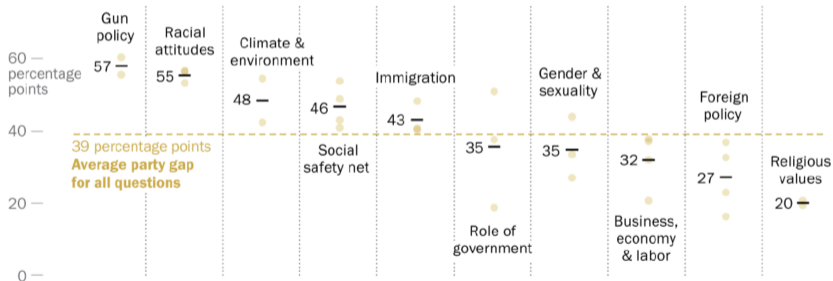
Additional Materials

Polarizing Themes [◀ Back](#)

Wide partisan gaps on political values across a number of areas, but the largest differences are on guns and race

Difference between Republicans and Democrats on 30 political values items

- Average party gap for all questions within the topic
- Party gap on one question within the given topic



Notes: Data above represents gaps on 30 different values questions grouped thematically. See appendix for full details and question wording. Partisans include leaners.

Source: Survey of U.S. adults conducted Sept. 3-15, 2019.

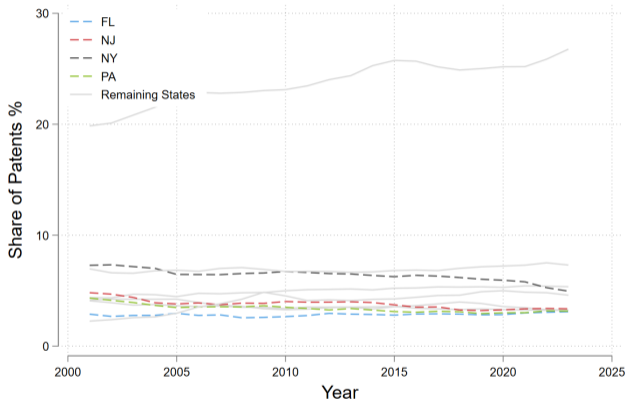
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Voters Distribution across Parties (All Registered Voters) [◀ Back](#)

	Florida 2017		Florida 2022		New York 2020	
	Freq	Percent	Freq	Percent	Freq	Percent
BLK	3,022,354	25.17	3,582,111	27.61	3,776,192	19.91
DEM	4,539,637	37.81	4,333,270	33.40	9,643,606	50.84
REP	4,193,212	34.92	4,827,394	37.21	4,488,336	23.66
OTH	251,436	2.095	230,387	1.78	1,059,162	5.59

Notes. The table shows the distribution of registered voters across parties for the two snapshots of the FL Voter Registration Data (2017, 2022) and the one for NY (2020). “BLK” denotes unaffiliated voters, “DEM” Democrats, “REP” Republicans, and “OTH” includes voters registered under small parties.

Importance of FL and NY for total US innovation [◀ Back](#)



Notes. The figure plots the evolution of the yearly share of patents (by residence of inventors) for the top 10 US states in terms of innovation.

Merge between patent and voters data [◀ Back](#)

- ▶ NY 2020 (N. 19mln) + FL 2017 & 2022 (N. 16mln) + PA 2020 (N. 13mln) + NJ 2022 (N. 9 mln) voter data
- ▶ Drop those younger than 16 and older than 100 at registration + pre-clean strings in same way
- ▶ Conservative match algorithm (by state):
 1. Exact match last name, first name, and city of residence
 2. Middle initial matches exactly or missing in one of the two
 3. Remove those younger than 22 at the first or last patenting year
 4. Remove those older than 89 at the first or last patenting year
 5. Among duplicates:
 - i. keep those with the same middle initials
 - ii. keep those with same party (as Teso et al. (2023))
 - iii. keep matches randomly
 6. Results unchanged if we keep only exact matches
- ▶ \approx 53% of NY & FL patents matched ($>$ than Bell et al. (2018))
- ▶ \approx 8% of all US patents since 2001

Balance Table Matched-Unmatched Inventors [◀ Back](#)

$H_0 =$ difference in characteristic X is larger than $10\% \times SD(X)$

	Matched		Unmatched		Matched-Unmatched	
	Mean	Standard	Mean	Standard	Standardized	P-value
		Deviation		Deviation		
(1)	(2)	(3)	(4)	(5)	(6)	
Gender	0.088	0.283	0.108	0.310	-0.067	0.000
Num Consonants First Name	3.702	1.129	3.644	1.217	0.049	0.000
Num Consonants Middle Name	0.842	1.153	0.781	1.236	0.051	0.000
Num Consonants Last Name	4.110	1.417	4.063	1.570	0.031	0.000
Length First Name	5.863	1.537	5.842	1.728	0.013	0.000
Length Middle Name	6.430	2.006	6.430	2.284	0.000	0.000
Length Last Name	1.180	1.753	1.124	1.904	0.030	0.000

Difference between Republican & Democrat Inventors

	Republicans mean (sd) (1)	Democrats mean (sd) (2)	Difference (p-value) (3)
Female	0.049(0.216)	0.122(0.328)	0.058***(0.000)
Age	51.093(11.166)	50.576(11.131)	-0.887**(0.027)
Log Zipcode Income	11.411(0.419)	11.571(0.450)	-0.005(0.584)
White	0.231(0.421)	0.113(0.316)	-0.018**(0.018)
Research	0.027(0.163)	0.080(0.271)	0.038***(0.000)
Non-Corp Assignee	0.018(0.132)	0.012(0.109)	-0.001(0.469)
Health technology	0.110(0.313)	0.163(0.369)	0.032***(0.001)

Notes. Issue year and county FEs; s.e. clustered at county level. [◀ Back](#)

References

- ABRAMOWITZ, A. I. AND K. L. SAUNDERS (2008): "Is Polarization a Myth?" *The Journal of Politics*, 70, 542–555.
- ALLCOTT, H., L. BOXELL, J. CONWAY, M. GENTZKOW, M. THALER, AND D. YANG (2020): "Polarization and public health: Partisan differences in social distancing during the coronavirus pandemic," *Journal of Public Economics*, 191, 104254.
- ATKIN, D., M. K. CHEN, AND A. POPOV (2022): "The returns to face-to-face interactions: Knowledge spillovers in Silicon Valley," Tech. rep., National Bureau of Economic Research.
- BELL, A., R. CHETTY, X. JARAVEL, N. PETKOVA, AND J. VAN REENEN (2018): "Who Becomes an Inventor in America? The Importance of Exposure to Innovation," *The Quarterly Journal of Economics*, 134, 647–713.
- BONICA, A. (2019): "Database on Ideology, Money in Politics, and Elections (DIME)," .
- BOXELL, L., M. GENTZKOW, AND J. M. SHAPIRO (2024): "Cross-Country Trends in Affective Polarization," *The Review of Economics and Statistics*, 106, 557–565.
- BURSZTYN, L., J. T. KOLSTAD, A. RAO, P. TEBALDI, AND N. YUCHTMAN (2022): "Political Adverse Selection," Working Paper 30214, National Bureau of Economic Research.
- COHEN, A. AND C. S. YANG (2019): "Judicial Politics and Sentencing Decisions," *American Economic Journal: Economic Policy*, 11, 160–91.

- COLONNELLI, E., V. PINHO NETO, AND E. TESO (2022): "Politics At Work," Working Paper 30182, National Bureau of Economic Research.
- CONWAY, J. AND L. BOXELL (2024): "Consuming values," *Available at SSRN 4855718*.
- DAGOSTINO, R., J. GAO, AND P. MA (2020): "Partisanship in Loan Pricing," *SSRN Electronic Journal*.
- DAHL, G. B., R. LU, AND W. MULLINS (2022): "Partisan fertility and presidential elections," *American Economic Review: Insights*, 4, 473–490.
- DOSSI, G. (2024): "Race and Science," Working Paper.
- EINIO, E., J. FENG, AND X. JARAVEL (2022): "Social push and the direction of innovation," *CEP Discussion Paper 1861*.
- ENGELBERG, J., R. LU, W. MULLINS, AND R. TOWNSEND (2024): "Political Sentiment and Innovation: Evidence from Patenters," Working paper.
- ENGELBERG, J. E., J. GUZMAN, R. LU, AND W. MULLINS (2021): "Partisan Entrepreneurship," SocArXiv qhs6j, Center for Open Science.
- ENKE, B., M. POLBORN, AND A. A. WU (2023): "Values as luxury goods and political behavior," Tech. rep., Working paper.
- EVANS, R. B., M. P. PRADO, A. E. RIZZO, AND R. ZAMBRANA (2024): "Identity, diversity, and team performance: Evidence from US mutual funds," *Management Science*.

- GERBER, A. S. AND G. A. HUBER (2009): "Partisanship and economic behavior: Do partisan differences in economic forecasts predict real economic behavior?" *American Political Science Review*, 103, 407–426.
- GIFT, K. AND T. GIFT (2014): "Does Politics Influence Hiring? Evidence from a Randomized Experiment," *Political Behavior*, 37.
- JELVEH, Z., B. KOGUT, AND S. NAIDU (2024): "Political Language in Economics," *The Economic Journal*, ueae026.
- KAUSTIA, M. AND S. TORSTILA (2011): "Stock market aversion? Political preferences and stock market participation," *Journal of Financial Economics*, 100, 98–112.
- KEMPF, E. AND M. TSOUTSOURA (2021): "Partisan Professionals: Evidence from Credit Rating Analysts," *The Journal of Finance*, 76, 2805–2856.
- KONING, R., S. SAMILA, AND J.-P. FERGUSON (2021): "Who do we invent for? Patents by women focus more on women's health, but few women get to invent," *Science*, 372, 1345–1348.
- MCCARTNEY, W. B., J. ORELLANA, AND C. ZHANG (2021): "'Sort Selling': Political Polarization and Residential Choice," FRB of Philadelphia Working Paper No. 21-14.
- MEEUWIS, M., J. A. PARKER, A. SCHOAR, AND D. SIMESTER (2021): "Belief Disagreement and Portfolio Choice," *Journal of Finance*, forthcoming.

- MIAN, A., A. SUFI, AND N. KHOSHKHOU (2023): "Partisan Bias, Economic Expectations, and Household Spending," *The Review of Economics and Statistics*, 1–18.
- MORELLO-FROSCH, R. AND O. K. OBASOGIE (2023): "The climate gap and the color line—racial health inequities and climate change," .
- POSCH, M., J. SCHULZ, AND J. HENRICH (2024): "Surname diversity, social ties and innovation," Working paper.
- RAY, W. AND R. KAMDAR (2023): "Polarized Expectations, Polarized Consumption," Working paper.
- TESO, E., J. SPENKUCH, AND G. XU (2023): "Ideology and Performance in Public Organizations," *Econometrica*, 91, 1171–1203.
- WALLACE, J., P. GOLDSMITH-PINKHAM, AND J. L. SCHWARTZ (2022): "Excess Death Rates for Republicans and Democrats During the COVID-19 Pandemic," Working Paper 30512, National Bureau of Economic Research.
- WEST, E. A. AND S. IYENGAR (2022): "Partisanship as a Social Identity: Implications for Polarization," *Political Behavior*, 44, 807–838.