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Climate Choice Architecture

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Abstract: Personal choices drive global warming nearly as much as institutional decisions. Yet, policymakers overwhelmingly target large-scale industrial facilities for reductions in carbon emissions, with individual and household emissions a mere afterthought. Recent advances in behavioral economics, cognitive psychology, and related fields have produced a veritable behavior change revolution. Subtle changes to the choice environment, or nudges, have improved stakeholder decision-making in a wide range of contexts, from healthier food choices to better retirement planning. But the vast potential of choice architecture remains largely untapped for purposes of climate policy and action. This Article explores that untapped potential and makes the case for nudges to become a cornerstone of public and private climate governance, targeting both institutional and individual decision-making. Nudges are nimbler than most conventional regulations and adapt more readily to changing climate circumstances. Climate choice architects can build on a proven track record of successful behavioral interventions in water conservation, waste management, and other domains of environmental law and policy. Bipartisan approval of other prominent nudge campaigns demonstrates the potential of choice architecture to help defuse the increasingly polarized politics of climate change. Moreover, nudges not only improve the efficacy, efficiency, and equity of public policy but also amplify the impact of private governance action on climate change. As catalysts for more informed choices, climate nudges can further alleviate concerns over climate justice by transforming previously passive stakeholders into active decision-makers in the transition to a low-carbon economy. Despite their well-documented success, nudges have produced their share of discontents. But even the most outspoken critics support nudges that mitigate information asymmetries and remedy market failures, like the disastrous externalities imposed by greenhouse gas emissions.

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INTRODUCTION

Successful climate change mitigation and adaptation require behavioral change at an unprecedented scale.[1] From downsizing our vehicles and their engines,[2] to doing our laundry at night,[3] to reducing the meat content in our diets,[4] the climate crisis calls for the rethinking of deeply engrained personal habits. Fortunately, behavioral research has proven that minor tweaks to the choice environment can usher in a paradigm shift toward more climate-friendly decision-making. Subtle changes to the federally regulated window sticker of new cars, for example, can help buyers choose more fuel-efficient vehicles.[5] Orbs that glow green or red based on power consumption can help shift household electricity use away from high-demand times that require running older, more polluting power plants.[6] Carbon labels for food, meanwhile, can guide grocery shoppers toward more climate-friendly options.[7] But these

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[1] *See* Elke U. Weber, *Climate Change Demands Behavioral Change: What Are the Challenges?*, 82 SOC. RSCH. 561, 561 (2015).

[2] The transportation sector generates the largest share of U.S. greenhouse gas emissions at 27% of emissions, followed by electricity (25%) and industry (24%). *Sources of Greenhouse Gas Emissions*, ENV'T PROT. AGENCY, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions [https://perma.cc/2362-NHYS] (Aug. 5, 2022). The Corporate Average Fuel Economy (CAFE) standards offer a salient example of policy attempts to reduce the transportation sector's carbon footprint. *See* 49 C.F.R. pts. 531, 533 (2022) (providing fuel efficiency standards for light-duty vehicles); *id.* pts. 523, 534, 535, 538 (2021) (same for heavy-duty vehicles).

[3] Running washing machines, electric dryers, dishwashers, and other energy-intensive appliances at night, rather than during the day, lowers peak demand for electricity during the day. Such peak "shaving" eliminates the need to run dirtier and more carbon-intensive "peaker" plants. *See* Richard L. Revesz & Burcin Unel, *Managing the Future of the Electricity Grid*, 41 HARV. ENV'T L. REV. 43, 74, 86 (2017).

[4] For a snapshot of the literature on meat's contribution to climate change, see J. Poore & T. Nemecek, *Reducing Food's Environmental Impacts Through Producers and Consumers*, 360 SCIENCE 987, 990–91 (2018) (noting that livestock and aquaculture represent more than half of all agricultural greenhouse gas emissions while providing less than one-fifth of calories produced); Kayla Karimi, *Stopping Livestock's Contribution to Climate Change*, 36 UCLA J. ENV'T L. & POL'Y 347, 350–51 (2018) (suggesting solutions for minimizing the greenhouse gas emissions from raising livestock); Jonathan Lovvorn, *Clean Food: The Next Clean Energy Revolution*, 36 YALE L. & POL'Y REV. 283, 301–06 (2018) (suggesting that prioritizing crop yields in agriculture has led to negative impacts on the environment).

[5] *See* Richard P. Larrick & Jack B. Soll, *The MPG Illusion*, 320 SCIENCE 1593, 1593 (2008) (demonstrating how consumers systematically misunderstand the miles-per-gallon metric for vehicular fuel efficiency, and how a simple fix can offer dramatic improvements).

[6] *See* Elisha R. Frederiks, Karen Stenner & Elizabeth V. Hobman, *Household Energy Use: Applying Behavioural Economics to Understand Consumer Decision-Making and Behaviour*, 41 RENEWABLE & SUSTAINABLE ENERGY REVS. 1385, 1391 (2015) (reporting a 40% reduction in electricity use from a field experiment with orbs that changed color based on demand (citing RICHARD H. THALER & CASS R. SUNSTEIN, NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS (2008))).

[7] *See* Adrian R. Camilleri, Richard P. Larrick, Shajuti Hossain & Dalia Patino-Echeverri, *Consumers Underestimate the Emissions Associated with Food but Are Aided by Labels*, 9 NATURE CLI-

and other behavioral insights have been slow to translate into climate governance action. This Article makes the case for greater reliance on choice architectural nudges as a catalyst for more climate-friendly decision-making across a wide range of contexts.

Sixteen years ago, Michael Vandenbergh and Anne Steinemann urged policymakers not to ignore the sizeable impact of individual behavior on climate change.[8] Yet climate policy has continued to focus on curbing greenhouse gas emissions from power plants, heavy manufacturing, and other large-scale industrial sources.[9] Following the Supreme Court's 2007 landmark decision in *Massachusetts v. Environmental Protection Agency*,[10] federal regulation of carbon emissions under the Clean Air Act expressly exempted smaller sources, including individual and household emissions.[11] The Obama Administration's most ambitious climate policy, the ill-fated Clean Power Plan, sought to reduce the carbon intensity of large-scale power plants but not the amount of electricity demanded by their customers.[12] The core climate provisions of President Biden's Inflation Reduction Act, signed into law in August of 2022, reflect the

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MATE CHANGE 53, 53 (2019) (noting that consumers are not well informed about the greenhouse gas emissions associated with everyday products, and suggesting carbon labeling as a method of consumer education); *see also infra* notes 257–272 and accompanying text (discussing the study in greater detail).

[8] *See* Michael P. Vandenbergh & Anne C. Steinemann, *The Carbon-Neutral Individual*, 82 N.Y.U. L. REV. 1673, 1676 (2007) ("[I]ndividual behavior is a tremendous and overlooked source of greenhouse gases, accounting for one-third of all U.S. carbon dioxide emissions."); *see also* Shui Bin & Hadi Dowlatabadi, *Consumer Lifestyle Approach to US Energy Use and the Related CO_2 Emissions*, 33 ENERGY POL'Y 197, 197 (2005) (noting that the share of individual and household greenhouse gas emissions constitute 41% of total U.S. emissions (quoting Lee Schipper, Sarita Bartlett, Dianne Hawk & Edward Vine, *Linking Life-Styles and Energy Use: A Matter of Time?*, 14 ANN. REV. ENERGY 273, 317 (1989))).

[9] *See* Michael P. Vandenbergh, Jack Barkenbus & Jonathan Gilligan, *Individual Carbon Emissions: The Low-Hanging Fruit*, 55 UCLA L. REV. 1701, 1703 (2008) ("[M]ost federal, state, and local climate change measures focus directly on large industrial sources and will reduce individual and household emissions only indirectly.").

[10] Massachusetts v. Env't Prot. Agency, 549 U.S. 497, 532 (2007) (holding that the Clean Air Act gives the Environmental Protection Agency (EPA) the authority to regulate greenhouse gases).

[11] *See* Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31514, 31516 (June 3, 2010) (to be codified at 40 C.F.R. pts. 51, 52, 70, 71) (establishing a de minimis exemption for sources emitting fewer than 75,000 tons of regulated greenhouse gases per year); *see also* Util. Air Regul. Grp. v. Env't Prot. Agency, 573 U.S. 302, 321–28 (2014) (evaluating the legality of the Tailoring Rule).

[12] *See* Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64662 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60). The Supreme Court stayed the rule in 2016 pending challenges in the lower courts. West Virginia v. Env't Prot. Agency, 136 S. Ct. 1000, 1000 (2016). The Affordable Clean Energy Rule repealed and replaced the Clean Power Plan in 2019. Affordable Clean Energy Rule, 84 Fed. Reg. 32520, 35250 (July 8, 2019) (to be codified at 40 C.F.R. pt. 60). Most recently, the Supreme Court held that the Clean Power Plan was beyond the EPA's authority under the Clean Air Act. West Virginia v. Env't Prot. Agency, 142 S. Ct. 2587, 2615–16 (2022).

same emphasis on curbing institutional, rather than individual, emissions by targeting electric utilities and other large-scale developers of clean energy assets.[13] The time has come to place individual behavior front and center in the global response to climate change—to reap the direct benefits of reducing our personal carbon footprint and to enjoy the indirect benefits of creating new, more carbon-conscious social norms.

Recent advances in behavioral economics, cognitive psychology, and related fields have produced a veritable "behavior change revolution." Subtle changes to the decision environment, or choice architecture, have enabled stakeholders to overcome biases and other cognitive limitations, resulting in welfare-enhancing choices across a wide range of contexts, from healthier food selection[14] to greater retirement savings.[15] Made famous by Nobel Laureate Richard Thaler and Professor Cass Sunstein in their seminal book *Nudge*, choice architecture refers to the way the context in which we make decisions is organized.[16]

Remarkably, the vast potential of choice architectural nudges[17] remains largely untapped for purposes of climate policy and action.[18] Yet nudges have

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[13] *See, e.g.*, Inflation Reduction Act of 2022, Pub. L. No. 117-169, § 13101, 136 Stat. 1818 ("Extension and Modification of Credit for Electricity Produced from Certain Renewable Resources.").

[14] *See, e.g.*, L.R. Skov, S. Lourenço, G.L. Hansen, B.E. Mikkelsen & C. Schofield, *Choice Architecture as a Means to Change Eating Behaviour in Self-Service Settings: A Systematic Review*, 14 OBESITY REVS. 187, 192 (2013) (finding a relationship between the presentation of food choices and consumer decisions); David R. Just & Brian Wansink, *Smarter Lunchrooms: Using Behavioral Economics to Improve Meal Selection*, 24 CHOICES, no. 3, 2009, at 1, 2 (discussing the application of behavioral economics principles to helping students eat healthier meals in schools).

[15] *See generally* AUTOMATIC: CHANGING THE WAY AMERICA SAVES (William G. Gale, J. Mark Iwry, David C. John & Lina Walker eds., 2009) (discussing the positive impact of automatic enrollment on 401(k) retirement savings); RICHARD H. THALER, MISBEHAVING: THE MAKING OF BEHAVIORAL ECONOMICS 309–22 (2016) (discussing ways to design savings programs to incentivize workers to better prepare for retirement); Richard H. Thaler & Shlomo Benartzi, *Save More Tomorrow: Using Behavioral Economics to Increase Employee Saving*, 112 J. POL. ECON. S164, S169 (2004) (noting that retirement plans where workers were enrolled by default had higher rates of participation than plans where workers needed to opt in).

[16] *See* RICHARD H. THALER & CASS R. SUNSTEIN, NUDGE: THE FINAL EDITION 3 (Penguin Books 2021) ("A choice architect has the responsibility for organizing the context in which people make decisions.").

[17] Following the terminology developed by Thaler and Sunstein, this Article uses the terms "choice architectural intervention," "nudge," and their derivatives interchangeably. *See id.* at 8 ("A *nudge* . . . is any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not taxes, fines, subsidies, bans, or mandates."); *see also* On Amir & Orly Lobel, *Stumble, Predict, Nudge: How Behavioral Economics Informs Law and Policy*, 108 COLUM. L. REV. 2098, 2100 (2008) (distinguishing "gentle nudges" from "forceful shoves").

[18] *See, e.g.*, Barnabas Szaszi, Anna Palinkas, Bence Palfi, Aba Szollosi et al., *A Systematic Scoping Review of the Choice Architecture Movement: Toward Understanding When and Why Nudges Work*, 31 J. BEHAV. DECISION MAKING 355, 362 (2018) (noting that "health-related research dominates the [choice architecture] movement"). One noteworthy exception is the domain of energy effi-

already proven highly effective in other areas of environmental law and policy.[19] In the context of waste management, for example, the simple tweak of providing slightly smaller plates at hotel buffets resulted in twenty percent less food going to waste than when normal-sized plates were used.[20] Social norm-based campaigns appealing to the shared identity of residents in drought-threatened Queensland, Australia helped reduce daily per capita water consumption by more than twenty percent.[21]

As carbon pricing initiatives gather momentum in the United States and elsewhere, climate choice architecture offers a powerful complement to carbon taxes and cap-and-trade regimes, both before and after implementation.[22] Recent scholarship suggests that voter opposition to carbon pricing policies is largely a function of the electorate's biases and other cognitive limitations.[23] Choice architecture has been proven to help voters and other decision-makers overcome their biases, heuristics, and other cognitive challenges in a wide range of contexts.[24] Post-adoption, nudges can help mitigate many of the prototypical shortcomings that mar carbon taxes and cap-and-trade regimes, including emissions leakage, agency issues, and limitations in coverage.[25]

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ciency, which, aside from saving consumers money, helps reduce their carbon footprint. *See, e.g.*, Richard G. Newell & Juha Siikamäki, *Nudging Energy Efficiency Behavior: The Role of Information Labels*, 1 J. ASS'N ENV'T & RES. ECONOMISTS 555, 593–94 (2014) (concluding that a label informing consumers about the energy efficiency of various products "encourag[ed] choices with higher energy efficiency"); Richard P. Larrick, Jack B. Soll & Ralph L. Keeney, *Designing Better Energy Metrics for Consumers*, 1 BEHAV. SCI. & POL'Y, no. 1, 2015, at 73, 73–74 (suggesting that better informing consumers about fuel-economy metrics will lead to better consumer choices); Amanda R. Carrico, Michael P. Vandenbergh, Paul C. Stern, Gerald T. Gardner et al., *Energy and Climate Change: Key Lessons for Implementing the Behavioral Wedge*, 2 GEO. WASH. J. ENERGY & ENV'T L. 61, 61–62 (2011) (reviewing the literature of behavior economics and reducing energy consumption); Hunt Allcott & Todd Rogers, *The Short-Run and Long-Run Effects of Behavioral Interventions: Experimental Evidence from Energy Conservation*, 104 AM. ECON. REV. 3003, 3003–07 (2014) (suggesting that giving households information about their power use compared to that of their neighbors leads to reductions in energy use).

[19] *See infra* Section II.B.

[20] Steffen Kallbekken & Håkon Sælen, *'Nudging' Hotel Guests to Reduce Food Waste as a Win–Win Environmental Measure*, 119 ECON. LETTERS 325, 326 (2013).

[21] Andrea Walton & Margee Hume, *Creating Positive Habits in Water Conservation: The Case of the Queensland Water Commission and the Target 140 Campaign*, 16 INT'L J. NONPROFIT & VOLUNTARY SECTOR MKTG. 215, 219 (2011).

[22] *See infra* Section II.C. Cap-and-trade programs set a limit on carbon emissions from particular industries, while also providing for markets to buy and sell "emission allowances." Michael Hiltzik, *Column: No Longer Termed a 'Failure,' California's Cap-and-Trade Program Faces a New Critique: Is It Too Successful?*, L.A. TIMES (Jan. 12, 2018), https://www.latimes.com/business/hiltzik/la-fi-hiltzik-captrade-20180111-story.html [https://perma.cc/3SW3-AX7R].

[23] *See* Gary M. Lucas, Jr., *Voter Psychology and the Carbon Tax*, 90 TEMP. L. REV. 1, 13–37 (2017) (discussing how biases and heuristics negatively influence the electorate's perception of carbon taxation).

[24] *See infra* Part I.

[25] *See infra* notes 183–191 and accompanying text.

From a political economy perspective, nudges have the potential to create much needed common ground amidst the growing political polarization over climate change.[26] As scientific consensus around the causes and effects of global warming continues to solidify, the issue of climate policy divides Democrats and Republicans more than ever.[27] Political science posits that the American public's partisan divide over climate change is driven by divergent views on the appropriate role and size of government.[28] If the political controversy over climate policy is, in fact, yet another symptom of the age-old conflict between advocates of big government and market fundamentalists, then choice architecture may point the way toward common ground. Studies have repeatedly shown that, whatever their disagreement over regulatory interventions, both Democrats and Republicans overwhelmingly support the use of nudges on high-profile policy issues.[29]

To be clear, this Article does not advocate for climate nudges as a wholesale substitute for command-and-control mandates, market-based incentives, or other forms of regulation. There will always be domains, such as clean air policy, where important social goods like public health and safety require more heavy-handed measures than choice architecture alone, which, by definition, leaves the ultimate decision up to each stakeholder.[30] But even within, and certainly outside, these domains, nudges can complement existing regulation to enhance the efficacy, efficiency, and equity of public policy. Moreover, choice architecture holds enormous promise for more effective private governance action on global warming.[31] Recent research suggests, for example, that a single, seemingly innocuous tweak to the—privately ordered—choice architec-

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[26] *See infra* Section II.D.

[27] *See* Riley E. Dunlap, Aaron M. McCright & Jerrod H. Yarosh, *The Political Divide on Climate Change: Partisan Polarization Widens in the U.S.*, ENV'T: SCI. & POL'Y FOR SUSTAINABLE DEV., Sept./Oct. 2016, at 4, 19 ("[N]ot only has the gap between Democrats' and Republicans' climate change beliefs increased over time, but the political moderator effect appears to be holding steady and shows no signs of subsiding."); Elaine Kamarck, *The Challenging Politics of Climate Change*, BROOKINGS INST. (Sept. 23, 2019), https://www.brookings.edu/research/the-challenging-politics-of-climate-change/ [https://perma.cc/5VDD-WBGB] (discussing the strong correlation between political party affiliation and attitudes regarding climate change).

[28] *See, e.g.*, NAOMI ORESKES & ERIK M. CONWAY, MERCHANTS OF DOUBT 251–52 (2010).

[29] *See, e.g.*, Cass R. Sunstein, *Do People Like Nudges?*, 68 ADMIN. L. REV. 177, 187 tbl.1 (2016) (offering empirical evidence of strong bipartisan support for calorie labels, tobacco warnings, and default enrollment in retirement savings plans, among others).

[30] The EPA estimated that "[i]n 2020, the Clean Air Act Amendments will prevent over 230,000 early deaths." *Benefits and Costs of the Clean Air Act 1990–2020, the Second Prospective Study*, ENV'T PROT. AGENCY, https://www.epa.gov/clean-air-act-overview/benefits-and-costs-clean-air-act-1990-2020-second-prospective-study [https://perma.cc/6G75-Z28C] (Aug. 10, 2022).

[31] *See infra* Section II.F.

ture of securities trading can produce dramatic increases in low-carbon investment.[32]

Bipartisan support and well-documented successes notwithstanding, choice architectural nudges have produced their share of discontents. Opponents criticize the paternalistic nature of nudge policies and question their impact on the autonomy and welfare of decision-makers.[33] The paternalism critique does not, however, extend to nudges that merely seek to empower more informed choices, especially when the choice architectural intervention seeks to remedy externalities and other market failures.[34] With their profoundly negative impact on social welfare, environmental externalities like the greenhouse gas emissions that drive global warming represent one of the most daunting market failures of our time. Even the most fervent nudge critics would, therefore, struggle to find fault with the kind of externality-oriented, educative climate choice architecture proposed here to help stakeholders make less carbon-intensive choices.[35] By empowering previously passive stakeholders to become active decision-makers in the transition to a low-carbon economy, climate nudges further mitigate growing concerns over the disparate impacts of climate policy and action.

This Article makes three novel and distinct contributions to the literature, proceeding as follows. Part I offers a functionally derived, impact-oriented taxonomy of nudges to help policymakers and private actors identify the choice architectural tools that best serve their climate objectives.[36] Part II presents the empirically grounded argument why, and how, nudges can improve the efficacy, efficiency, and equity of public and private governance responses to the climate crisis.[37] Part III engages with critiques of the efficacy and ethics of nudges and explains the capacity of choice architecture to enhance the equity of climate policy.[38] A brief conclusion follows.

I. THE CHOICE ARCHITECT'S TOOLKIT

The term choice architecture metaphorically captures the reality that human decision-making is embedded into a structure of contextual and task fea-

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[32] *See infra* notes 240–243 and accompanying text.

[33] *See, e.g.*, Joshua D. Wright & Douglas H. Ginsburg, *Behavioral Law and Economics: Its Origins, Fatal Flaws, and Implications for Liberty*, 106 NW. U. L. REV. 1033, 1067–80 (2012); Edward L. Glaeser, Essay, *Paternalism and Psychology*, 73 U. CHI. L. REV. 133, 149–56 (2006).

[34] *See* STEPHEN BREYER, REGULATION AND ITS REFORM 15–35 (1982) (discussing the widespread consensus regarding the legitimacy of government intervention in response to market failures).

[35] *See* Brian Galle, *Tax, Command . . . or Nudge?: Evaluating the New Regulation*, 92 TEX. L. REV. 837, 878, 890 (2014) (making a more generalized case for greater reliance on "climate nudges").

[36] *See infra* notes 39–112 and accompanying text.

[37] *See infra* notes 113–272 and accompanying text.

[38] *See infra* notes 273–322 and accompanying text.

tures.[39] The choice architect's power flows from the observation that human preferences are malleable, for they are the construct of our choice environment.[40] There are many ways to present options to decision-makers and different presentations will often result in different choices. "[E]veryone, from a parent presenting bedtime options to a child to a government providing pension options to its citizens, influences choices and is a choice architect."[41] But the relative novelty and continuing evolution of choice architecture research have resulted in a heterogeneity of taxonomies that hinders the more widespread adoption of nudges.[42]

Some taxonomists focus on the underlying cognitive processes, including the mental constraints and cognitive biases, that choice architects target.[43] Others catalog the types of behavioral interventions used to modify the choice environment.[44] To help policymakers and practitioners identify what type of nudge best advances their climate objectives, this Article adopts a functionally derived taxonomy[45] that groups the tools of choice architecture into three categories. Section A addresses decision information,[46] Section B decision structure,[47] and Section C decision assistance.[48] Finally, Section D considers the government's role as a choice architect.[49] Each category not only features distinct methods and mechanisms but also raises its own set of ethics questions.[50]

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[39] *See* Adrian R. Camilleri & Rick P. Larrick, *Choice Architecture*, *in* EMERGING TRENDS IN THE SOCIAL AND BEHAVIORAL SCIENCES 1, 1 (Robert A. Scott, Stephen M. Kosslyn & Marlis Buchmann eds., 2015).

[40] *See generally* THE CONSTRUCTION OF PREFERENCE (Sarah Lichtenstein & Paul Slovic eds., 2006) (discussing the construct of decision-making and the factors that can affect it).

[41] Eric J. Johnson, Suzanne B. Shu, Benedict G.C. Delleart, Craig Fox et al., *Beyond Nudges: Tools of a Choice Architecture*, 23 MKTG. LETTERS 487, 488 (2012).

[42] *See* Peter D. Lunn, Policy Paper, *Behavioural Economics and Policymaking: Learning from the Early Adopters*, 43 ECON. & SOC. REV. 423, 440 (2012) ("It is very difficult to summarise for practical purposes an area of scientific research that is both extensive and rapidly evolving.").

[43] *See, e.g.*, Saugato Datta & Sendhil Mullainathan, *Behavioral Design: A New Approach to Development Policy*, 60 REV. INCOME & WEALTH 7, 20 (2014) ("Building solutions around psychology makes [financial literacy programs] more likely to succeed."); P. Dolan, M. Hallsworth, D. Halpern, D. King et al., *Influencing Behaviour: The Mindspace Way*, 33 J. ECON. PSYCH. 264, 273–74 (2012) (setting out a framework for choice architecture based in psychology).

[44] *See, e.g.*, Johnson et al., *supra* note 41, at 489 tbl.1 (listing various methods used in choice architecture to address a range of issues); Erez Yoeli, David V. Budescu, Amanda R. Carrico, Magali A. Delmas et al., *Behavioral Science Tools to Strengthen Energy and Environmental Policy*, 3 BEHAV. SCI. & POL'Y, no. 1, 2017, at 69, 70–76 (same).

[45] *See* Robert Münscher, Max Vetter & Thomas Scheurle, *A Review and Taxonomy of Choice Architecture Techniques*, 29 J. BEHAV. DECISION MAKING 511, 514 (2016) (conceptualizing the three categories of choice architecture processes used in this article).

[46] *See infra* notes 51–64 and accompanying text.

[47] *See infra* notes 66–80 and accompanying text.

[48] *See infra* notes 81–90 and accompanying text.

[49] *See infra* notes 91–112 and accompanying text.

[50] *See infra* Section III.B.

A. Decision Information

Behavioral research has long recognized the fundamental importance of available information and its processing for decision outcomes.[51] Well-established limits in the human capacity for processing information call on choice architects to present decision-relevant information in a format that is easy to digest and understand.[52] Choice architectural contributions in this space can assume a variety of forms, including (1) the translation of available information into more meaningful formats, rendering relevant but not readily available information visible; and (2) the provision of social reference points.[53]

Translational strategies often rely on the simplification of existing information in a given choice environment to promote better processing. Consider the gas mileage of motor vehicles, commonly denoted in miles per gallon (MPG). A car with a higher MPG rating is more fuel-efficient than one with a lower rating.[54] But equal increases in gas mileage do not necessarily translate to equal increases in gas savings.[55] The non-linear relationship between MPG ratings and gas savings has the potential to mislead car buyers into making suboptimal choices. You might think that upgrading your 20-MPG car to a hybrid vehicle rated at 50 MPG will yield greater gas savings than trading your 10-MPG truck for a newer model boasting 20 MPG.[56] But you would be mistaken.[57] Over one hundred miles, upgrading your car would save you three gallons of fuel, whereas the newer, more fuel-efficient truck would save you five gallons for every hundred miles driven.[58] These findings and the accompanying policy prescriptions inspired the U.S. Department of Transportation and the EPA to revise the mandatory fuel economy label for new motor vehicles. In its

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[51] *See generally* Herbert A. Simon, *A Behavioral Model of Rational Choice*, 69 Q.J. ECON. 99 (1955) (introducing the concept of bounded rationality for decision-making that deviates from perfectly rational choices because of cognitive limitations and cues in the choice environment).

[52] *See* George A. Miller, *The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information*, 63 PSYCH. REV. 81, 95–96 (1956) (discussing the constraints on short-term and long-term memory).

[53] A comprehensive discussion of the multitude of choice architectural interventions related to decision information is beyond the scope of this work. Readers interested in exploring more than the illustrative examples provided are encouraged to consult Münscher et al., *supra* note 45, at 514–16.

[54] Camilleri & Larrick, *supra* note 39, at 4.

[55] *Id.*

[56] *Id.*

[57] *Id.*

[58] *See* Larrick & Soll, *supra* note 5, at 1593 (offering the first systematic account of consumer misunderstandings of the MPG metric to denote vehicular fuel efficiency).

updated version, the label must include a more user-friendly metric that translates the traditional miles-per-gallon rating to gallons-per-hundred-miles.[59]

Whereas translational efforts aim to make existing information easier to process, other tools in the choice architect's kit seek to render previously unavailable but decision-relevant information more visible. Policymakers increasingly push for simpler access to relevant information that is typically unavailable to decision-makers, including better information on credit card statements regarding usage and fees.[60] Another illustrative example is the requirement for restaurants to post hygiene ratings in a salient location at the entrance, enabling potential patrons to incorporate this previously hidden but decision-relevant information into their dining choices.[61]

Lastly, social reference points acknowledge that humans make decisions "in a social and cultural environment," often looking to conform with the behavior of majorities or opinion leaders.[62] Social norms can be injunctive, establishing what the decision-maker should do, or descriptive, communicating what other individuals are doing.[63] In a classic example of choice architects' use of social norms, one study found that the rate of towel reuse in a hotel increased significantly when guests were told that other hotel guests had used their towels more than once.[64] Similarly, studies have found residential energy conservation increased after households were told how their energy consumption measured up against that of their neighbors.[65]

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[59] *See* Revisions and Additions to Motor Vehicle Fuel Economy Label, 76 Fed. Reg. 39478 (July 6, 2011) (to be codified at 40 C.F.R. pts. 85, 86, 600 and 49 C.F.R. pt. 575) (detailing the additional information provided by the updated labels).

[60] Münscher et al., *supra* note 45, at 515; *see* U.K. CABINET OFFICE BEHAVIORAL INSIGHTS TEAM, BETTER CHOICES: BETTER DEALS 14–24 (2011), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/60540/better-choices-better-deals.pdf [https://perma.cc/N2WY-S3QB] (discussing efforts to provide consumers with better information about products and services).

[61] *See* Paul A. Simon, Phillip Leslie, Grace Run, Ginger Zhe Jin et al., *Impact of Restaurant Hygiene Grade Cards on Foodborne-Disease Hospitalizations in Los Angeles County*, J. ENV'T HEALTH, Mar. 2005, at 32, 34 (reporting a 13% decrease in hospitalizations for foodborne illness following the requirement for restaurants to display their hygiene ratings).

[62] Münscher et al., *supra* note 45, at 516.

[63] Yoeli et al., *supra* note 44, at 75.

[64] Noah J. Goldstein, Robert B. Cialdini & Vladas Griskevicius, *A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels*, 35 J. CONSUMER RSCH. 472, 474 (2008).

[65] *See* Ian Ayres, Sophie Raseman & Alice Shih, *Evidence from Two Large Field Experiments That Peer Comparison Feedback Can Reduce Residential Energy Usage*, 29 J.L. ECON. & ORG. 992, 992 (2013) (finding that the decrease in energy use continued for months after receiving information about relative energy use); Hunt Allcott, *Social Norms and Energy Conservation*, 95 J. PUB. ECON. 1082, 1082–83 (2011) (finding that such energy information campaigns are a cost-effective method of lowering energy use).

B. Decision Structure

Aside from decision-relevant information, choice architects may direct their efforts at the arrangement of options or the decision-making format, also known as the decision structure. Common techniques in this space include setting defaults and rearranging the composition of options.[66]

A default is the option that is activated should the decision-maker not take the initiative to select a different option.[67] Forces like "laziness, fear, and distraction" lead many people to gravitate toward whichever option demands the least from them.[68] Defaults are generally counted among the strongest forms of choice architecture.[69] One of the classic studies illustrating the power of defaults compared organ donation rates among European countries. Despite the countries' socio-economic and cultural similarities, some featured dramatically lower registration rates for organ donors than others.[70] Closer examination of the data revealed that registration levels soared when organ donation was the default but plummeted without the default.[71] Defaults have been shown to influence real-world choices across a wide range of domains.[72] The literature traces the power of defaults back to three factors.[73] First, decision-makers often assume that the default represents an intentional recommendation.[74] Second, people may view the default as an option they already possess, making it harder to give up because of the so-called endowment effect.[75] Third, opting

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[66] Like decision information, a comprehensive discussion of decision structure is beyond the scope of this work. Readers interested in exploring more than the illustrative examples provided are encouraged to consult Münscher et al., *supra* note 45 at 516–19. *Cf. supra* note 53 (encouraging review of the source for comprehensive review of choice architectural interventions).

[67] Camilleri & Larrick, *supra* note 39, at 3.

[68] Richard H. Thaler, Cass R. Sunstein & John P. Balz, *Choice Architecture*, *in* THE BEHAVIORAL FOUNDATIONS OF PUBLIC POLICY 428, 430 (Eldar Shafir ed., 2013).

[69] *See* N. Craig Smith, Daniel G. Goldstein & Eric J. Johnson, *Choice Without Awareness: Ethical and Policy Implications of Defaults*, 32 J. PUB. POL'Y & MKTG. 159, 160 (2013).

[70] *See* Eric J. Johnson & Daniel Goldstein, *Do Defaults Save Lives?*, 302 SCIENCE 1338, 1338 & tbl. (2003) (reporting effective consent rates for organ donation at 12% for Germany and 99.8% for Austria).

[71] *Id.*

[72] *See, e.g.*, Henrik Cronqvist & Richard H. Thaler, *Design Choices in Privatized Social-Security Systems: Learning from the Swedish Experience*, 94 AM. ECON. REV. 424, 425 (2004) (investment); Thaler & Benartzi, *supra* note 15, at S169 (retirement planning); Goldstein et al., *supra* note 64, at 473 (hotel consumer behavior).

[73] *See* Smith et al., *supra* note 69, at 161 (describing the three factors of "implied endorsement, cognitive biases, and effort").

[74] *Id*.

[75] *See* Daniel Kahneman, Jack L. Knetsch & Richard H. Thaler, *Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias*, 5 J. ECON. PERSPS. 193, 194–97 (1991) (surveying the early literature on loss aversion and the endowment effect before providing additional experimental evidence of both). The endowment effect refers to "the fact that people often demand much more to give up an object than they would be willing to pay to acquire it . . . ." *Id.* at 194.

out of a default takes more effort than keeping it, even when the opt-out would require no more than the click of a button.[76]

Resources like time and money are limited for most decision-makers, requiring their careful allocation across different objectives. The resulting cognitive limitations open the door for heuristics and biases, such as the diversification bias, that lead decision-makers to allocate their attention and other mental resources evenly across all available choice categories.[77] Sure enough, research has demonstrated that employees "tend to allocate their retirement investments evenly over various categorical options such as stocks, bonds, and real estate" when these asset types are separated into categories instead of being listed together.[78] Choice architects can harness our penchant for diversification and other biases in a variety of ways, from how these architects arrange or group healthy and unhealthy food items on a restaurant menu[79] to splitting safety, fuel economy, and other practically important attributes of a vehicle into a greater number of subcategories while condensing less important attributes, such as cupholders and audio systems, into a single category.[80]

C. Decision Assistance

The third and final category of choice architectural techniques seeks to assist decision-makers by helping them turn intentions into actions. To this end, choice architects may provide reminders of the preferred choice option or promote commitment to, or "stickiness" of, beneficial actions.[81]

Amidst the constant onslaught of information in today's cluttered world, it is easy to lose sight of what matters and forget about positive decisions that have already been made. Think of a patient who is taking statins for high cholesterol but often forgets to take her pills. Drug compliance or, rather, the involuntary lack thereof, is a major problem in the health care industry, costing

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[76] Smith et al., *supra* note 69, at 161.

[77] *See* Craig R. Fox, Rebecca K. Ratner & Daniel S. Lieb, *How Subjective Grouping of Options Influences Choice and Allocation: Diversification Bias and the Phenomenon of Partition Dependence*, 134 J. EXPERIMENTAL PSYCH. 538, 540 (2005) (noting that participants asked to allocate resources across arbitrary categories "spread their allocations over the categories they were given," even though those categories were arbitrary); *see also* Thomas W. Doellman, Jennifer Itzkowitz, Jesse Itzkowitz & Sabuhi H. Sardarli, *Alphabeticity Bias in 401(k) Investing*, 54 FIN. REV. 643, 655 (2019) (reporting that investors prefer higher-listed options on the menu of their retirement savings plan).

[78] Johnson et al., *supra* note 41, at 494.

[79] *See* Fox et al., *supra* note 77, at 545–46.

[80] *See* Jolie M. Martin & Michael I. Norton, *Shaping Online Consumer Choice by Partitioning the Web*, 26 PSYCH. & MKTG. 908, 911–13 (2009) (finding that disaggregating factors led participants to weight the factors as more important than when they were presented in a group).

[81] For a more comprehensive discussion of decision assistance, see Münscher et al., *supra* note 45, at 519–20.

billions of dollars every year.[82] With subtle reminders, choice architecture has the potential to help solve this billion-dollar problem, as proven by a clever packaging trick for birth-control pills. Typically sold in packages with twenty-eight pills, in individually numbered compartments, only the pills for the first twenty-one days contain active ingredients; the pills for the last seven days are placebos, included only to serve as reminders for continued compliance.[83] Another simple, yet proven reminder technique of choice architects is the use of checklists. Requiring medical staff to work through checklists with such simple line items as "wash hands," for example, has proven an effective reminder of hygiene protocols, significantly reducing the rate of infections in hospitals.[84]

Many people suffer from—and are aware of—their "deficits in self-control such as temptation or procrastination."[85] Choice architecture can help overcome these deficits through commitment devices that promote greater follow-through. Websites like www.stickK.com that offer formalized agreements backed by a penalty for breach rely on constructs of choice architecture to strengthen the willpower of their users.[86] Other self-commitment techniques include browser applications that temporarily block internet access to minimize work distractions and money deposits as a wager to successfully quit smoking.[87] The choice architect's toolbox further features public commitment techniques that leverage external pressure and the fear of reputational damage to foster better follow-through. Studies have found such public commitments to be effective in the context of weight loss[88] as well as gains in student attendance based on formalized agreements between parents and schools.[89] The nudge movement's founding fathers Cass Sunstein and Richard Thaler recently provided another example of a public commitment device, labeling the updat-

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[82] *See* Thaler et al., *supra* note 68, at 432–33.

[83] *Id.*

[84] *See, e.g.*, Peter Pronovost, Dale Needham, Sean Berenholtz, David Sinopoli et al., *An Intervention to Decrease Catheter-Related Bloodstream Infections in the ICU*, 355 NEW ENG. J. MED. 2725, 2725–26 (2006).

[85] Münscher et al., *supra* note 45, at 519.

[86] *Id.*; *How It Works*, STICKK COMMIT, https://www.stickk.com/tour [https://perma.cc/N2RP-ZNA2].

[87] *See* Xavier Giné, Dean Karlan & Jonathan Zinman, *Put Your Money Where Your Butt Is: A Commitment Contract for Smoking Cessation*, 2 AM. ECON. J.: APPLIED ECON. 213, 217 (2010).

[88] Prashanth U. Nyer & Stephanie Dellande, *Public Commitment as a Motivator for Weight Loss*, 27 PSYCH. & MKTG. 1, 7 (2010).

[89] *See* LUCY EVANS, LOUISE HALL & SUSIE WREFORD, U.K. DEP'T FOR CHILD. SCHS. & FAMS., RSCH. REP. DCSF-RR030, EDUCATION-RELATED PARENTING CONTRACTS EVALUATION 67, 70 (2008), https://dera.ioe.ac.uk/7917/1/DCSF-RR030.pdf [https://perma.cc/2VZN-BL97] (noting that school leaders considered 80% of parent contracts related to absences to have been successful).

ed, second edition of their book, *Nudge*, as "the final edition" in an express effort to prevent themselves from producing further revisions.[90]

D. Government as Choice Architect

Governments are increasingly emerging as choice architects, as demonstrated by the behaviorally informed changes to MPG labels in the United States[91] and the social norm-based campaigns to conserve water in Queensland, Australia.[92] Indeed, more and more policymakers across the globe recognize the potential of nudges to help achieve their public policy objectives.[93]

The first to act on this recognition was the United Kingdom's Behavioural Insights Team, better known as the "Nudge Unit."[94] Created in 2010 by then-Prime Minister David Cameron, the Unit started out with just eight members working out of 10 Downing Street, the epicenter of British Government.[95] Now, with over two hundred experts on staff and intergovernmental collaborations that span the globe, the Nudge Unit has grown into the undisputed leader of behaviorally informed government initiatives.[96]

Over the past ten years, the Nudge Unit has effectively deployed choice architecture techniques related to decision information, structure, and assistance to improve public policy outcomes in a wide range of domains, including food hygiene, charitable payroll giving, consumer empowerment, and energy efficiency.[97] For example, a campaign of letters from Her Majesty's Revenue

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[90] *See* THALER & SUNSTEIN, *supra* note 16, at xvi ("Using this title is our commitment strategy to prevent us from tinkering with this book again.").

[91] *See supra* notes 58–59 and accompanying text.

[92] *See supra* note 21 and accompanying text.

[93] *See, e.g.*, Martin Lodge & Kai Wegrich, *The Rationality Paradox of Nudge: Rational Tools of Government in a World of Bounded Rationality*, 38 LAW & POL'Y 250, 250 (2016) ("One of the key megatrends in contemporary governance has been the enthusiastic embrace of *behavioral economics* . . . . [T]he nudge agenda has been enthusiastically endorsed by governments of all colors and international organizations."). *See generally* RHYS JONES, JESSICA PYKETT & MARK WHITEHEAD, CHANGING BEHAVIOURS (2013) (tracing the emerging trend of governmental nudging across a variety of jurisdictions); NUDGE THEORY IN ACTION: BEHAVIORAL DESIGN IN POLICY AND MARKETS (Sherzod Abdukadirov ed., 2016) (same).

[94] *See generally* DAVID HALPERN, INSIDE THE NUDGE UNIT: HOW SMALL CHANGES CAN MAKE A BIG DIFFERENCE (Ebury Press 2016) (offering an intriguing insight into the work and growth of the Behavioural Insights Team).

[95] *See* Holger Strassheim & Rebecca-Lea Korinek, *Cultivating 'Nudge': Behavioural Governance in the UK*, *in* KNOWING GOVERNANCE: THE EPISTEMIC CONSTRUCTION OF POLITICAL ORDER 107, 113 (Jan-Peter Voß & Richard Freeman eds., 2016).

[96] *Who We Are*, BEHAV. INSIGHTS TEAM, https://www.bi.team/about-us-2/who-we-are/ [https://perma.cc/W94B-RZ7K].

[97] *See* Strassheim & Korinek, *supra* note 95, at 113–14. *See generally* MICHAEL HALLSWORTH, MARK EGAN, JILL RUTTER & JULIAN MCCRAE, BEHAV. INSIGHTS TEAM, BEHAVIOURAL GOVERNMENT: USING BEHAVIORAL SCIENCE TO IMPROVE HOW GOVERNMENTS MAKE DECISIONS (2018), https://www.bi.team/wp-content/uploads/2018/08/BIT-Behavioural-Government-Report-2018.pdf

and Customs—the U.K.-equivalent of the U.S. Internal Revenue Service—to citizens behind on their taxes underscores the importance of decision information. Choice architectural variations in the letters' framing and tone produced dramatically different payment outcomes.[98] Consistent with other evidence supporting the power of choice architecturally designed decision structures, changing the default from opt-in to automatic enrollment in workplace pensions, requiring disinterested employees to opt out, has significantly improved participation in retirement savings programs among U.K. employees.[99] Lastly, text reminders have provided effective decision assistance to learners in adult literacy and numeracy programs, increasing attendance rates by nearly twenty percent.[100]

The Nudge Unit's well-documented success has inspired a steadily growing number of other nations to add choice architectural interventions to their policymaking toolbox.[101] In 2014, the White House Office of Science and Technology Policy created the Social and Behavioral Sciences Team (SBST), conceived as "a cross-agency group of experts . . . that translates findings and methods from the social and behavioral sciences into improvements in Federal policies and programs."[102] By fall of 2015, SBST had made significant pro-

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[https://perma.cc/W9KD-S656] (offering an overview of choice architectural government interventions with illustrative examples for their successful application across a range of contexts).

[98] *See* Michael Hallsworth, John A. List, Robert D. Metcalfe & Ivo Vlaev, *The Behavioralist as Tax Collector: Using Natural Field Experiments to Enhance Tax Compliance* 4 (Nat'l Bureau of Econ. Rsch., Working Paper No. 20007, 2014) (observing a treatment effect of almost £2.4 million in additional taxes paid within 23 days for the most successful letter variant).

[99] David Halpern, *Setting Smarter Defaults for Workplace Pensions*, BEHAV. INSIGHTS TEAM: OUR BLOG (Oct. 6, 2016), https://www.bi.team/blogs/setting-smarter-defaults-for-workplace-pensions/ [https://perma.cc/TE87-HJFC].

[100] *See* Michael Sanders, Elspeth Kirkman, Raj Chande, Michael Luca et al., Using Text Reminders to Increase Attendance and Attainment: Evidence from a Field Experiment 1 (Mar. 8, 2019) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3349116 [https://perma.cc/GX8A-7MPM].

[101] *See, e.g.*, Mohamed Buheji, *Behavioural Economics Trends in Improving Government Outcomes—Much More Than Nudges*, 8 AM. J. ECON. 163, 164 (2018) (offering examples from Australia, Canada, Denmark, France, and Singapore, among others); *see also* Cynthia Weiyi Cai, *Nudging the Financial Market? A Review of the Nudge Theory*, 60 ACCT. & FIN. 3341, 3354 (2020) (discussing behaviorally informed government initiatives at the national and sub-national levels). Some estimate that about 400 "nudge units" exist around the world today. *See* Roberta Fusaro & Julia Sperling-Magro, *Much Anew About 'Nudging*,*'* MCKINSEY & CO. (Aug. 6, 2021), https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/much-anew-about-nudging [https://perma.cc/8CRQ-V2HR].

[102] EXEC. OFF. OF THE PRESIDENT, NAT'L SCI. & TECH. COUNCIL, SOCIAL AND BEHAVIORAL SCIENCES TEAM: ANNUAL REPORT, at III (2015), https://sbst.gov/download/2015%20SBST%20Annual%20Report.pdf [https://perma.cc/D69U-B7KU]; *see also* Evan Nesterak, *Head of White House "Nudge Unit" Maya Shankar Speaks About Newly Formed Social and Behavioral Sciences Team*, BEHAV. SCIENTIST (July 13, 2014), https://behavioralscientist.org/head-of-white-house-nudge-unit-

gress toward its dual objectives: "streamlining access to programs and improving government efficiency."[103] Default opt-ins, behaviorally designed messages, and text message reminders helped increase retirement savings among federal employees, enhance college access and affordability, and improve public health outcomes.[104] Choice architectural interventions produced similar improvements for government efficiency. Following the simple tweak of providing a shorter URL, the Treasury Department's Debt Management Service saw online payments jump by forty-five percent.[105]

Emboldened by these and other successes, then-President Barack Obama issued Executive Order No. 13,707 titled "Using Behavioral Science Insights to Better Serve the American People."[106] The Order expressly encouraged all federal agencies to harness behavioral science to "deliver better results at a lower cost for the American people."[107] The attendant efficiency gains, said President Obama in the Order, would allow for the deployment of more government resources toward national priorities, such as job growth, public health, education, and the transition to a low-carbon economy.[108]

In 2016, in addition to the tasks and projects carried over from previous years, SBST launched new initiatives related to climate change and criminal justice reform, among others.[109] For example, SBST and the U.S. Department of Energy worked together to address "behavioral barriers" that stymy more widespread participation in clean energy programs.[110] A related effort sought to better understand behavioral impediments to more effective communication of climate risk.[111] Unfortunately for SBST, the election of Donald Trump as President of the United States prevented many of these insights from turning into actions as the Trump Administration quickly disbanded SBST and abandoned any behaviorally informed efforts to improve the efficacy and efficiency of government operations.[112]

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maya-shankar-speaks-about-newly-formed-us-social-and-behavioral-sciences-team/ [https://perma.cc/J46S-VHD4] (offering further background on the SBST's creation).

[103] EXEC. OFF. OF THE PRESIDENT, NAT'L SCI. & TECH. COUNCIL, *supra* note 102, at III.

[104] *Id.* at 6–14.

[105] *Id.* at 16.

[106] *See generally* Exec. Order No. 13,707, 80 Fed. Reg. 56365, 56365–67 (Sept. 15, 2015) (directing federal agencies to use behavioral science to improve results for the American people).

[107] *Id.* at 56365.

[108] *Id.*

[109] *See* EXEC. OFF. OF THE PRESIDENT, NAT'L SCI. & TECH. COUNCIL, SOCIAL AND BEHAVIORAL SCIENCES TEAM: 2016 ANNUAL REPORT, at X–XI (2016), https://sbst.gov/download/2016%20SBST%20Annual%20Report.pdf [https://perma.cc/N7CA-DH5C].

[110] *Id.* at 18.

[111] *Id.* at 19.

[112] Tellingly, the official SBST website is now marked as "historical material 'frozen in time' on January 20, 2017." *About SBST*, SBST (Jan. 20, 2017), https://sbst.gov/ [https://perma.cc/J8ZL-6Z8S]. For an example of the pushback against abandoning the U.S. government's choice architectural ef-

II. The Case for Climate Choice Architecture

The abrupt end of the Social and Behavioral Sciences Team has left us with little evidence of the potential for governmental nudges to address the climate crisis. The relatively sparse deployment of choice architecture to date in the war on carbon raises the question of what, if anything, nudges can contribute to climate policy. This Article argues that intelligent use of choice architecture could be a catalyst for greater climate action. Section A discusses how nudges, unlike other legislative or regulatory options, are nimble enough to adapt to the ever-evolving dictates of global warming and the attendant requirements for responsive climate policy.[113] Indeed, as Section B relays, choice architecture has already proven highly successful in other areas of environmental policy.[114] Moreover, as carbon pricing policies gain traction in the United States and elsewhere, Section C discusses how choice architecture can help address pervasive issues of leakage, agency, and coverage.[115] Section D explores the overwhelming bipartisan support for other high-profile nudge campaigns, which suggests that choice architecture has the potential to create direly needed common ground amidst the increasingly polarized politics of climate change.[116] Section E then explains how climate nudges can build momentum for a shift in social norms, away from widespread fossil fuel reliance and toward greater carbon consciousness.[117] Section F describes how choice architecture holds enormous opportunity, not only for public policy, but also for private governance responses to the climate crisis.[118] Finally, Section G offers empirical evidence of the effectiveness of climate nudges, as reflected in an experiment evaluating the impact of carbon food labeling on consumer choices.[119]

A. Nudges Are Nimble and Adaptive

Policymakers have no crystal ball. Yet, they are frequently required to predict the future as they adopt new, or amend existing, laws and regula-

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forts, see Rosa Li, *The Other Essential Pandemic Office Trump Eliminated*, Slate (Mar. 18, 2020), https://slate.com/technology/2020/03/coronavirus-social-behavior-trump-white-house.html [https://perma.cc/WVV4-NDRD] (highlighting the potential for behaviorally informed initiatives to help combat the COVID-19 pandemic).

[113] *See infra* notes 120–147 and accompanying text.

[114] *See infra* notes 148–164 and accompanying text.

[115] *See infra* notes 165–191 and accompanying text.

[116] *See infra* notes 192–214 and accompanying text.

[117] *See infra* notes 215–228 and accompanying text.

[118] *See infra* notes 229–256 and accompanying text.

[119] *See infra* notes 257–272 and accompanying text.

tions.[120] The stakes are high. Laws and regulations based on false assumptions about the future have, at best, no real-life impact and, at worst, a negative effect on public health, economic development, and other important goods.[121] Few domains are more wrought with uncertainty than climate law and policy, a fulcrum of evolving insights from climate science, ever-changing politics and macro-economic conditions, as well as disruptive innovation in carbon-relevant technologies.

The planet's changing climate first garnered the public's widespread attention in the 1980s.[122] Climate scientists have been on a steep learning curve ever since. Evidence of global warming, ocean acidification, and other symptoms continues to mount while analytical methods become more sophisticated and accurate. In its 2021 report, the Intergovernmental Panel on Climate Change proudly boasted that "[i]mproved knowledge of climate processes, paleoclimate evidence and the response of the climate system to increasing radiative forcing" have produced a "narrower range" of forecasts than that of any previous reports.[123] Even this new-and-improved range, however, spans global warming scenarios from 1.9 to 8.5 degrees Celsius,[124] each with dramatically different impacts on the planet's ecosystem, food supply and water resources, among other areas of impact.[125] Scientific uncertainty abounds not only across but also within scenarios because global warming, sea level rise, and other symptoms of our changing climate do not progress in linear fash-

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[120] *See, e.g.*, Daniel A. Farber, *Uncertainty*, 99 GEO. L.J. 901, 901 (2011) ("Many of the pressing policy issues facing us today require confronting the unknown and making difficult choices in the face of limited information."); Justin R. Pidot, *Governance and Uncertainty*, 37 CARDOZO L. REV. 113, 116 (2015) ("Lawmakers must act, even recognizing the limits of their knowledge, or else remain forever paralyzed.").

[121] Felix Mormann, *Beyond Algorithms: Toward a Normative Theory of Automated Regulation*, 62 B.C. L. REV. 1, 3 (2021) (laying out the complex relationship between imperfect forecasts of the future and their influence on the content, and success, of public policy and regulation).

[122] *See generally* World Climate Programme, Rep. of the International Conference on the Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variations and Associated Impacts, WMO No. 661 (1985), https://library.wmo.int/doc_num.php?explnum_id=8512 [https://perma.cc/P42C-2PT4] (recognizing the dangers of greenhouse gasses to the planet). The first congressional hearing on climate change dates back even further, to 1980. Nathaniel Rich, *Losing Earth: The Decade We Almost Stopped Climate Change*, N.Y. TIMES MAG. (Aug. 1, 2018), https://www.nytimes.com/interactive/2018/08/01/magazine/climate-change-losing-earth.html [https://perma.cc/9SWC-BM5D].

[123] Richard P. Allan, Paola A. Arias, Sophie Berger, Josep G. Canadell et al., *2021 Summary for Policy Makers*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [IPCC] 11 (2021), https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf [perma.cc/4K97-GC8E].

[124] *Id.* at 13. Converted to the more familiar Fahrenheit scale, the warming scenarios cover a range from 3.4 to 15.3 degrees.

[125] *Id.* at 15.

ion.[126] Scientists warn that climate tipping points such as thawing permafrost, ice sheet disintegration, Amazon deforestation, and changes in atmospheric circulation will have profound and largely unpredictable consequences for the planet.[127] Recent modeling suggests that some tipping points, once triggered, will accelerate and amplify climate change so dramatically that their economic impact more than doubles the social cost of carbon.[128]

If scientific uncertainty is not enough to keep policymakers on their toes, then unexpected disruptions to the economic landscape are all but certain to do the trick. The COVID-19 pandemic, for example, slashed the aviation sector's 2020 greenhouse gas emissions nearly in half, compared to the previous year.[129] Economy-wide emissions in the United States dropped by nearly thirteen percent year-over-year.[130] But it does not take a global public health crisis to render the best-researched projections of the future obsolete.

History is replete with technology innovation that ushered in profound changes to the economic landscape and its carbon footprint. Consider the near-universal failure to anticipate the transformative effect that directional drilling and hydraulic fracturing would have on the United States and global energy economies.[131] Failing to account for the oil-and-gas boom facilitated by fracking in shale plays across the country, the U.S. Energy Information Administration (EIA) had erroneously expected the United States to remain a net importer of fossil fuels for decades to come.[132] As a result, the agency's projections on natural gas imports missed the mark by nearly three hundred percent.[133] Rely-

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[126] R.B. Alley, J. Marotzke, W.D. Nordhaus, J.T. Overpeck et al., *Abrupt Climate Change*, 299 SCIENCE 2005, 2007–08 (2003).

[127] *See id.* at 2006 ("Amplifiers are abundant in the climate system and can produce large changes with minimal forcing."); Timothy M. Lenton, Hermann Held, Elmar Kriegler, Jim W. Hall et al., *Tipping Elements in the Earth's Climate System*, 105 PROC. NAT'L ACAD. SCI. 1786, 1788 tbl.1 (2008) (exploring a wide range of potential tipping point triggers).

[128] Simon Dietz, James Rising, Thomas Stoerk & Gernot Wagner, *Economic Impacts of Tipping Points in the Climate System*, PROC. NAT'L ACAD. SCI., Aug. 2021, at 1, 1.

[129] *See* Jeff Tollefson, *COVID Curbed Carbon Emissions in 2020—but Not by Much*, 589 NATURE 343, 343 (2021).

[130] *Id.*

[131] For a thoughtful introduction to the regulatory challenges and transformational effects of hydraulic fracturing, see generally John M. Golden & Hannah J. Wiseman, *The Fracking Revolution: Shale Gas as a Case Study in Innovation Policy*, 64 EMORY L.J. 955 (2015); David B. Spence, *Federalism, Regulatory Lags, and the Political Economy of Energy Production*, 161 U. PA. L. REV. 431 (2013).

[132] *See* U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK (AEO) RETROSPECTIVE REVIEW: EVALUATION OF AEO2018 AND PREVIOUS REFERENCE CASE PROJECTIONS 3 (2018), *available at* https://web.archive.org/web/20190805031115/https://www.eia.gov/outlooks/aeo/retrospective/pdf/retrospective.pdf (comparing the EIA projections with real world data).

[133] *Compare id.* (summarizing the incorrect AEO projections from the early 2000s), *with* Press Release, Linda Capuano, U.S. Energy Info. Admin., Annual Energy Outlook 2018, at 3 (Feb. 6, 2018), https://www.eia.gov/pressroom/presentations/Capuano_02052018.pdf [https://perma.cc/CY5E-

ing on EIA projections industry majors commissioned (and policymakers supported) dozens of terminals to import liquefied natural gas via supertankers from the Middle East and elsewhere—at a cost of billions of dollars—only to abandon most of these projects when hydraulic fracturing obviated the need for foreign natural gas.[134] For purposes of climate policy, fracking has produced near-term benefits by accelerating the demise of more carbon-intensive coal-fired power plants.[135] But the rush toward natural gas-fired power plants has created a new path to dependency on yet another fossil fuel that now threatens to slow the transition to low-carbon sources of energy, presenting policymakers with unexpected challenges.[136]

The proliferation of solar, wind, and other low-carbon renewables has also exceeded even the most optimistic projections, requiring policymakers to make repeated course adjustments. At the turn of the new millennium, the EIA predicted that "[l]ess than 400 megawatts of renewable generating capacity" would be built between 2012 and 2020.[137] In reality, nearly 16,000 megawatts of new wind and solar capacity were added in 2015 alone,[138] forty times the capacity additions the EIA had projected for *all* non-hydro renewables over a period of *eight* years. Rapid integration of so many weather-dependent solar- and wind-powered generators requires advance planning and careful policy

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8PQY] (providing more up to date estimates taking into account increased domestic fossil fuel production).

[134] In the mid-2000s, analysts (incorrectly) anticipated that imported liquefied natural gas (LNG) could account for more than one-fifth of U.S. consumption. CONG. RSCH. SERV., RL 32386, LIQUEFIED NATURAL GAS (LNG) IN U.S. ENERGY POLICY: INFRASTRUCTURE AND MARKET ISSUES 5 (2006). For a snapshot of the general exodus from LNG import terminals following the advent of hydraulic fracturing, see U.S. DEP'T OF ENERGY, NORTH AMERICA LNG IMPORT TERMINALS, https://www.energy.gov/sites/prod/files/2013/04/f0/LNG%20Import%20%26%20Export%20Terminal%20Maps%2012-18-2012.pdf [https://perma.cc/B5C3-KWLW] (diagraming the evolution of North American LNG import terminals).

[135] Brad Plumer, *As Coal Fades in the U.S., Natural Gas Becomes the Climate Battleground*, N.Y. TIMES (June 26, 2019), https://www.nytimes.com/2019/06/26/climate/natural-gas-renewables-fight.html [https://perma.cc/C8W5-SGM3].

[136] *Id.*; *see also* Robert W. Howarth, *A Bridge to Nowhere: Methane Emissions and the Greenhouse Gas Footprint of Natural Gas*, 2 ENERGY SCI. & ENG'G 47, 57 (2014) (warning that associated methane emissions may render the climate impact of shale gas worse than that of coal and oil).

[137] ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2000 WITH PROJECTIONS TO 2020, at 72 (1999).

[138] For background on the 7,286 megawatts of new solar capacity installed in 2015, see Press Release, Solar Energy Indus. Ass'n, U.S. Solar Market Sets New Record, Installing 7.3 GW of Solar PV in 2015 (Feb. 19, 2016), https://www.seia.org/news/us-solar-market-sets-new-record-installing-73-gw-solar-pv-2015 [https://perma.cc/WAJ9-NVRK]. For background on the 8,599 megawatts of new wind capacity installed in 2015, see *Wind Energy in the United States*, AM. WIND ENERGY ASS'N, https://a112.awea.org/wind-101/basics-of-wind-energy/wind-facts-at-a-glance [https://perma.cc/SV66-LWZT] (click the "2015" bar on the "Cumulative U.S. Wind Capacity" bar chart to view the underlying data referenced).

guidance to ensure necessary upgrades to physical infrastructure and market rules, among others.[139]

The pitfalls of regulatory inertia and status quo bias are well documented, in climate policy and beyond.[140] Most policymaking follows a legislative or regulatory process that balances static with dynamic elements. Constitutional provisions, whose reform is subject to stringent substantive and procedural requirements, represent the static end of the spectrum. Self-adjusting automated regulation, possibly powered by artificial intelligence and smart algorithms, seeks to stretch the dynamic end of this continuum but raises issues of transparency and accountability.[141] Nestled between these two extremes lies a multiverse of approaches to adaptive regulation that pre-commit policymakers to periodically revisit, and possibly modify, their regulatory work product to facilitate iterative learning and adjustment.[142]

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[139] The considerable challenge of balancing increasing amounts of variable renewable power generators with other resources has been vividly illustrated in a graphic known as the "duck chart," for its unusual shape. *See* CAL. INDEP. SYS. OPERATOR, WHAT THE DUCK CURVE TELLS US ABOUT MANAGING A GREEN GRID 1 (2016), https://www.caiso.com/documents/flexibleresourceshelp renewables_fastfacts.pdf [https://perma.cc/SQ6X-U4FU].

[140] *See* Rebecca M. Kysar, *Dynamic Legislation*, 167 U. PA. L. REV. 809, 815–18 (2019) (discussing the problem of status quo bias in federal policymaking generally). Regulatory inertia has imposed enormous social costs when climate policy fails to keep up with technology learning and cost improvements. *See, e.g.*, Nora Bonatz, Ru Guo, Wenhao Wu & Linjing Liu, *A Comparative Study of the Interlinkages Between Energy Poverty and Low Carbon Development in China and Germany by Developing an Energy Poverty Index*, 183 ENERGY & BLDGS. 817, 827 (2019) (discussing energy affordability challenges resulting from Germany's overly generous support for solar and other renewables); Euan Phimister, Esperanza Vera-Toscano & Deborah Roberts, *The Dynamics of Energy Poverty: Evidence from Spain*, 4 ECON. ENERGY & ENV'T POL'Y 153, 157 & tbl.1 (2015) (noting the growing energy poverty in Spain that accompanied the country's over-subsidized solar boom).

[141] *See, e.g.*, Jane Bambauer & Tal Zarsky, *The Algorithm Game*, 94 NOTRE DAME L. REV. 1, 4–5 (2018); Emily Berman, *A Government of Laws and Not of Machines*, 98 B.U. L. REV. 1277, 1280–84 (2018); Robert Brauneis & Ellen P. Goodman, *Algorithmic Transparency for the Smart City*, 20 YALE J.L. & TECH. 103, 107 (2018); Danielle Keats Citron, *Technological Due Process*, 85 WASH. U. L. REV. 1249, 1278–1301 (2008) (discussing the procedural safeguards that automation threatens); Danielle Keats Citron & Frank Pasquale, *The Scored Society: Due Process for Automated Predictions*, 89 WASH. L. REV. 1, 10–18 (2014); Cary Coglianese & David Lehr, *Improving the Administrative State with Machine Learning*, 42 ADMIN. & REGUL. L. NEWS 7, 8–9 (2017); Cary Coglianese & David Lehr, *Transparency and Algorithmic Governance*, 71 ADMIN. L. REV. 1, 38–50 (2019) (evaluating reason-giving for using machine learning in an administrative law context); Mariano-Florentino Cuéllar, *A Simpler World? On Pruning Risks and Harvesting Fruits in an Orchard of Whispering Algorithms*, 51 U.C. DAVIS L. REV. 27, 35–41 (2017); Deven R. Desai & Joshua A. Kroll, *Trust but Verify: A Guide to Algorithms and the Law*, 31 HARV. J.L. & TECH. 1, 6–16 (2017); Pauline T. Kim, *Big Data and Artificial Intelligence: New Challenges for Workplace Equality*, 57 U. LOUISVILLE L. REV. 313, 323–27 (2019); Joshua A. Kroll, Joanna Huey, Solon Barocas, Edward W. Felten et al., *Accountable Algorithms*, 165 U. PA. L. REV. 633, 678–82 (2017); McKenzie Raub, Note, *Bots, Bias and Big Data: Artificial Intelligence, Algorithmic Bias and Disparate Impact Liability in Hiring Practices*, 71 ARK. L. REV. 529, 534–37 (2018).

[142] For a snapshot of the literature on adaptive approaches to regulation based on repeat human intervention, across a range of substantive contexts, see generally Rosie Cooney & Andrew T.F. Lang,

Nudges fall on the dynamic side of the policymaking continuum because they are often easier to adopt and adapt than more traditional legislative and regulatory interventions. Choice architecture is at its most effective when deployed at the interface between regulator and regulated, where biases, heuristics, and cognitive limitations are most prominent.[143] This final link connecting policymaker to citizenry tends to offer considerable discretion to the implementing agency. The Treasury Department, for example, did not need changes to enabling legislation or a new rulemaking to increase use of its online payment system by shortening the link to its website.[144] Similarly, default enrollment in retirement savings (in the United States and the United Kingdom) and other choice architectural tweaks are often available under existing authority.[145] To be clear, the more sweeping a nudge policy's impact and the higher the demands placed on third parties, the greater its procedural and substantive hurdles are likely to be. For instance, the nationwide introduction of mandatory carbon labels for groceries would require Congress to amend the Food, Drug, and Cosmetic Act.[146] Similarly, behaviorally informed changes to MPG labels required a regulatory rulemaking.[147] But much of the hitherto unexplored low-

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Taking Uncertainty Seriously: Adaptive Governance and International Trade, 18 EUR. J. INT'L L. 523 (2007) (discussing the benefits of adaptive governance in the face of uncertainty by analyzing the effectiveness of the World Trade Organization's (WTO) measures to combat the spread of invasive species); Robin Kundis Craig & J.B. Ruhl, *Designing Administrative Law for Adaptive Management*, 67 VAND. L. REV. 1 (2014) (asserting that adaptive management, though not appropriate for all agency decision-making, offers significant promise for specific areas of administrative law); Holly Doremus, *Adaptive Management as an Information Problem*, 89 N.C. L. REV. 1455 (2011) (rejecting the presumption of adaptive management's benefits and calling for a more rigorous analysis to inform decisions on whether to use adaptive management); Zachary J. Gubler, *Experimental Rules*, 55 B.C. L. REV. 129 (2014) (advocating for policymakers' use of "experimental rules" to better address uncertainty and arguing for greater deference from courts toward such rules to promote their use); J.B. Ruhl, *Regulation by Adaptive Management—Is It Possible?*, 7 MINN. J.L. SCI. & TECH. 21 (2005) (examining the shortcomings of the implementation of adaptive management frameworks like the Endangered Species Act's Habitat Conservation Plan program and proposing measures for better deployment of adaptive management principles).

[143] *See* THE CONSTRUCTION OF PREFERENCE, *supra* note 40, at 37 ("To form public policy, it is necessary to know the preferences of the people. If the people do not have well-established preferences, then the elicitation methods will affect the preferences . . . . [P]olicy analysts are put in the position, whether they like it or not, of managing other people's preferences.").

[144] *See* EXEC. OFF. OF THE PRESIDENT, NAT'L SCI. & TECH. COUNCIL, *supra* note 102, at 16 (noting that individuals who received a shorter link were more likely to pay their debt online).

[145] *See* Halpern, *supra* note 99 (detailing the results of the U.K.'s switch to automatic enrollment in retirement savings plans); EXEC. OFF. OF THE PRESIDENT, NAT'L SCI. & TECH. COUNCIL, *supra* note 109, at VIII–IX (describing an automatic enrollment plan in the United States, which included a new program under existing authority).

[146] *See* 21 U.S.C. § 343 (detailing the current statutory requirements for food labeling in the United States, which do not include carbon impact labels).

[147] *See* Revisions and Additions to Motor Vehicle Fuel Economy Label, 76 Fed. Reg. 39478, 39478 (July 6, 2011) (to be codified at 40 C.F.R. pts. 85, 86, 600 and 49 C.F.R. pt. 575).

hanging fruit of climate nudges is accessible to policymakers now, without the need for concurrent legislative or regulatory validation.

B. A Proven Track Record of Nudges in Environmental Policy

Environmental policy has historically been informed by neoclassical models of economic theory, anchored in the assumption that all actors make rational choices at all times.[148] This ideal of *homo economicus,* an economically rational person, has produced policies that rely heavily on command-and-control regulations and incentive-based market programs.[149] Policymakers have only recently begun to incorporate cognitive biases, limited attention, willpower deficits, and other traits alien to *homo economicus* into the design and implementation of environmental policy.[150] The recency of this shift notwithstanding, choice architecture has already established a proven track record of successfully nudging more pro-environment behavior in a variety of domains, even if applications directly related to climate policy remain rare.

Indeed, choice architectural interventions have achieved impressive results in the promotion of waste reduction. In a field experiment at over fifty hotels, the simple tweak of providing slightly smaller plates at buffets resulted in almost twenty percent less food going to waste than when normal plates were used.[151] In one of the classic, best known behavioral interventions against littering, appeals to social norms and a shared self-understanding using the slogan "Don't Mess with Texas" led to a seventy-two percent drop in the amount of littering in Texas.[152] In a field experiment with 120 households, researchers found that individual and group feedback with the implicit appeal to social norms significantly increased residents' participation in curbside recycling.[153]

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[148] *See, e.g.*, Jason F. Shogren & Laura O. Taylor, *On Behavioral-Environmental Economics*, 2 REV. ENV'T ECON. & POL'Y 26, 28 (2008).

[149] *See* L. Venkatachalam, *Behavioral Economics for Environmental Policy*, 67 ECOLOGICAL ECON. 640, 640 (2008) (discussing the ubiquity of the rational actor model and its policy consequences).

[150] *See* Frank Beckenbach, *Innovative Behavioral Approaches to Analyze the Incentives of Environmental Instruments*, *in* NEW PERSPECTIVES FOR ENVIRONMENTAL POLICIES THROUGH BEHAVIORAL ECONOMICS 15, 17–18 (Frank Beckenbach & Walter Kahlenborn eds., 2015).

[151] *See* Kallbekken & Sælen, *supra* note 20, at 326–27 (reporting an even larger reduction effect from the use of signs inviting guests to come back to the buffet multiple times, thereby discouraging plates piled too high).

[152] Katie Nodjimbadem, *The Trashy Beginnings of "Don't Mess with Texas,"* SMITHSONIAN MAG. (Mar. 10, 2017), https://www.smithsonianmag.com/history/trashy-beginnings-dont-mess-texas-180962490/ [https://perma.cc/7T62-VHRQ].

[153] *See* P. Wesley Schultz, *Changing Behavior with Normative Feedback Interventions: A Field Experiment on Curbside Recycling*, 21 BASIC & APPLIED SOC. PSYCH. 25, 27, 34 (1999) (finding a 23% and 19% increase in recycling after individual and group feedback, respectively); *see also* Robert B. Cialdini, Raymond R. Reno & Carl A. Kallgren, *A Focus Theory of Normative Conduct: Recycling the Concept of Norms to Reduce Littering in Public Places*, 58 J. PERSONALITY & SOC. PSYCH. 1015,

Recourse to the choice architect's toolbox has also delivered impressive results in the context of water conservation. When a drought threatened local water supplies in Eastern Australia, the Queensland Water Commission successfully used a social norm-based campaign to reduce daily per capita water consumption from 180 liters to 129 liters, a drop of nearly thirty percent.[154] Remarkably, water consumption remained below the target of 140 liters even after the drought campaign had ended.[155] Similarly, a field experiment run through the Cobb County Water System outside of Atlanta, Georgia using a mix of information-based and social norm-based campaigns produced similarly encouraging savings in residential water use, especially among more affluent households.[156] Nudge campaigns have also proven effective in reducing water consumption more indirectly by harnessing the power of social norms to encourage hotel guests to reuse their towels.[157]

With regard to resource conservation more generally, choice architecture has helped Rutgers University save the equivalent of 620 trees per semester by changing the default option on the university's printers to double-sided printing.[158] Banks, too, have successfully relied on nudging strategies to encourage their customers to make the switch to paperless statements.[159]

The Federal Emergency Management Agency (FEMA) has embraced translational choice architecture in stretching the time horizon they communicate to homeowners to make the likelihood of future flooding more salient. Instead of simply telling homeowners living in a 100-year floodplain that there is a 1-in-100 chance of flooding next year, FEMA now warns homeowners that

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1015, 1024 (1990) (noting that when subjects were reminded of social norms against littering, they were less likely to litter).

[154] Walton & Hume, *supra* note 21, at 215. This was accomplished by a multi-pronged approach, including distributing information, "naming and shaming" individuals who violated water restrictions in local papers, and providing residents with shower timers. *Id.* at 215–19.

[155] *Id.* at 215.

[156] Paul J. Ferraro & Juan José Miranda, *Heterogeneous Treatment Effects and Mechanisms in Information-Based Environmental Policies: Evidence from a Large-Scale Field Experiment*, 35 RES. & ENERGY ECON. 356, 377–78 (2013).

[157] When hotel guests reuse towels, they "help conserve environmental resources by saving energy and reducing the amount of detergent-related pollutants released into the environment." *See* Goldstein et al., *supra* note 64, at 472–73; *see also* Aristeidis Theotokis & Emmanouela Manganari, *The Impact of Choice Architecture on Sustainable Consumer Behavior: The Role of Guilt*, 131 J. BUS. ETHICS 423, 426 (2015) (suggesting that people feel guilty when making choices that are bad for the environment, and that policy design can exacerbate or mitigate these feelings).

[158] OLIVIER OULLIER & SARAH SAUNERON, CENTRE D'ANALYSE STRATÉGIQUE, "GREEN NUDGES": NEW INCENTIVES FOR ECOLOGICAL BEHAVIOR 4 (2011), http://oullier.free.fr/files/2011_Oullier-Sauneron_CAS_Green-Nudges-Ecological-Behavior.pdf [https://perma.cc/JBY7-MLCQ].

[159] *See* Brenda Marlin, *E-Statements: Encouraging Conversions*, ABA BANK MKTG., June 2011, at 14, 18 (noting that a marketing campaign for electronic statements was roughly five times as effective as predicted).

there is a 1-in-4 chance of a flood occurring over the term of their thirty-year mortgage.[160]

Energy conservation and the transition to "greener" sources of energy have produced some of the biggest success stories for choice architecture in environmental policy. A number of field experiments have confirmed the power of social norm-based campaigns to nudge households to reduce their electricity consumption.[161] In one of the seminal studies on green nudges, researchers observed that ninety-nine percent of electricity meters in a small town in southern Germany, not known for its environmental politics, chose the green energy default offered by their local electric cooperative.[162] Lab experiments led by nudge icon Cass Sunstein and others have confirmed the power of defaults for sustainable energy choices.[163] A more recent field experiment with over forty thousand households in Germany offers further proof of the efficacy of defaults in nudging consumers toward cleaner energy choices, observing a tenfold increase in green energy contracts over non-default scenarios.[164] Nudges that decrease energy consumption and increase the market share of green electricity reduce greenhouse gas emissions and thereby help mitigate global climate change. Even still, few choice architectural interventions directly target carbon emissions.

C. Choice Architecture Complements Carbon Pricing

Economists have long argued for carbon pricing, by means of a tax on greenhouse gas emissions or a cap-and-trade regime with tradable emission

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[160] Yoeli et al., *supra* note 44, at 72; *see Flood Maps*, FED. EMERGENCY MGMT. AGENCY, https://www.fema.gov/flood-maps [https://perma.cc/56JM-4J6Z] (Nov. 10, 2021) ("Any place with a 1% chance or higher chance of experiencing a flood each year is considered to have a high risk. Those areas have at least a one-in-four chance of flooding during a 30-year mortgage.").

[161] *See, e.g.*, Jessica M. Nolan, P. Wesley Schultz, Robert B. Cialdini, Noah J. Goldstein et al., *Normative Social Influence Is Underdetected*, 34 PERSONALITY & SOC. PSYCH. BULL. 913, 917 (2008) ("[B]eliefs of how often their neighbors tried to conserve showed a strong correlation with respondents' own reported conservation efforts."); Allcott, *supra* note 65, at 1082 (finding that the households that used the most electricity had the largest decrease in consumption after being informed of their power usage relative to their neighbors).

[162] *See* Daniel Pichert & Konstantinos V. Katsikopoulos, *Green Defaults: Information Presentation and Pro-environmental Behaviour*, 28 J. ENV'T PSYCH. 63, 66 (2008). Remarkably, even after 8 years, the electricity meters continued to stick with the default. *Id.*

[163] *See* Cass R. Sunstein & Lucia A. Reisch, *Automatically Green: Behavioral Economics and Environmental Protection*, 38 HARV. ENV'T L. REV. 127, 136–37 (2014); Simon Hedlin & Cass R. Sunstein, *Does Active Choosing Promote Green Energy Use? Experimental Evidence*, 43 ECOLOGY L.Q. 107, 132 (2016) (showing a lower approval rating for active-choice energy policies as opposed to environmentally-friendly default policies).

[164] Felix Ebeling & Sebastian Lotz, *Domestic Uptake of Green Energy Promoted by Opt-Out Tariffs*, 5 NATURE CLIMATE CHANGE 868, 870 (2015).

allowances, as the first-best policy approach to mitigating climate change.[165] From an efficiency perspective, a carbon tax or cap-and-trade program would incur far lower opportunity costs than the current potpourri of policies seeking to combat climate change through financial and regulatory incentives for solar, wind, and other low-carbon technologies.[166] Both public funding for innovative efforts and the number of available experts are limited. Resources committed to the promotion of specific low-carbon technologies are, therefore, unavailable to foster technological advances in other fields. Whereas carbon pricing policies force emitters to internalize the social cost of their emissions and thereby correct a market failure—that is, an existing distortion in the economy—policies promoting low-carbon technologies add a new distortion to the market. Moreover, the transaction costs associated with an economy-wide carbon tax are likely to be lower than those generated by the administration of a multitude of tailored policies to support low-carbon technologies.[167]

Despite the many arguments that weigh heavily in favor of a carbon tax or cap-and-trade regime, empirical evidence from around the world suggests that a meaningful price on greenhouse gas emissions remains elusive in many jurisdictions, at least for the foreseeable future.[168] In 2010, expert commentators called the assumption "naïve" that carbon pricing was politically achievable in the United States.[169] More than a decade later, this assessment has proven sadly prophetic, as there is little hope for near-term change given the bleak policy outlook at the national level.[170] Even President Biden's ambitious climate plan

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[165] *See, e.g.*, Adam B. Jaffe, Richard G. Newell & Robert N. Stavins, *A Tale of Two Market Failures: Technology and Environmental Policy*, 54 ECOLOGICAL ECON. 164, 165–69 (2005) (arguing that cap-and-trade systems are efficient because they require companies to pay for environmental effects that are otherwise externalized to society at large); Dominique Finon, *Pros and Cons of Alternative Policies Aimed at Promoting Renewables*, 12 EIB PAPERS, no. 2, 2007, at 110, 112; Atanas Kolev & Armin Riess, *Environmental and Technology Externalities: Policy and Investment Implications*, 12 EIB PAPERS, no. 2, 2007, at 134, 140; NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE 35, 349 (2007).

[166] For a representative survey of the primary policies to promote low-carbon renewable energy technologies, see Felix Mormann, *Enhancing the Investor Appeal of Renewable Energy*, 42 ENV'T L. 681, 690–95 (2012).

[167] *See* Kolev & Riess, *supra* note 165, at 140 (referring to policies that favor renewable energy generation as a difficult to implement market distortion).

[168] John Alic, Daniel Sarewitz, Charles Weiss & William Bonvillian, Opinion, *A New Strategy for Energy Innovation*, 466 NATURE 316, 317 (2010).

[169] *Id.*

[170] *See, e.g.*, Robert N. Stavins, *The Future of US Carbon-Pricing Policy*, 1 ENV'T & ENERGY POL'Y & ECON. 8, 12–13 (2020) (noting the many political obstacles to a national carbon pricing policy in the United States); Jesse D. Jenkins, *Political Economy Constraints on Carbon Pricing Policies: What Are the Implications for Economic Efficiency, Environmental Efficacy, and Climate Policy Design?*, 69 ENERGY POL'Y 467, 472–74 (2014) (discussing the multitude of political economy factors that combine to prevent adoption of carbon pricing at the socially optimal level). Subnational carbon pricing initiatives, such as the Regional Greenhouse Gas Initiative in the northeastern United

made no express reference to a carbon tax or nationwide cap-and-trade program.[171]

Carbon pricing initiatives have fared better at the global level, with a total of sixty-four policies in operation, covering over twenty-one percent of global greenhouse gas emissions.[172] A closer look, however, reveals that many of these policies woefully underprice carbon. According to the International Monetary Fund,[173] the average price imposed on carbon emissions worldwide is only two dollars per ton—a tiny fraction of the price that experts consider necessary to keep global warming below two degrees Celsius.[174] Indeed, data from the World Bank suggests that less than four percent of global greenhouse gas emissions are priced high enough to meet the climate targets set forth in the Paris Agreement.[175]

States and California's cap-and-trade regime, have made valiant efforts to fill the federal policy void, albeit with limited coverage. *See Elements of RGGI*, REG'L GREENHOUSE GAS INITIATIVE, https://www.rggi.org/program-overview-and-design/elements [https://perma.cc/DJL5-V2MT] (providing an overview of the multistate effort by eastern states to lower carbon dioxide emissions); *Cap-and-Trade Program*, CAL. AIR RES. BD., https://www.arb.ca.gov/our-work/programs/cap-and-trade-program [https://perma.cc/XG4T-5MT4]. For an introduction to leakage, resource shuffling, and other challenges for subnational carbon pricing policies, see generally Jim Rossi & Andrew J.D. Smith, *Electric Power Resource "Shuffling" and Subnational Carbon Regulation: Looking Upstream for a Solution*, 5 SAN DIEGO J. CLIMATE & ENERGY L. 43 (2014).

[171] *See The Biden Plan for a Clean Energy Revolution and Environmental Justice*, BIDEN HARRIS DEMOCRATS, https://joebiden.com/climate-plan/ [https://perma.cc/M5DW-KAQF]; *see also* Isobel Asher Hamilton, *Elon Musk Said the Biden Administration Rejected His Idea of a Carbon Tax as "Too Politically Difficult,"* BUS. INSIDER (Feb. 15, 2021), https://www.businessinsider.com/elon-musk-carbon-tax-biden-administration-rejected-tesla-spacex-2021-2 [https://perma.cc/2BM8-WX39] (noting that the Biden campaign had never publicly expressed explicit support for a carbon tax). *But see* Ottmar Edenhofer, Opinion, *Carbon Pricing Could Be the Biden Administration's Climate Tool*, THE HILL (Jan. 20, 2021), https://thehill.com/opinion/energy-environment/534985-carbon-pricing-could-be-the-biden-administrations-climate-tool/ [https://perma.cc/45N6-8A55] (musing whether the Biden Administration would eventually embrace carbon pricing as a tool to mitigate climate change).

[172] *See* MARISSA SANTIKARN, ANGELA NANEU CHURIE KALLHAUGE, MUSTAFA OZGUR BOZCAGA, LEYLA SATTLER ET AL., WORLD BANK, STATE AND TRENDS OF CARBON PRICING 2021, at 21–22 & fig.2.1 (2021) (reporting a fairly even split between cap-and-trade and carbon tax policies).

[173] *See* Ian Parry, *Putting a Price on Pollution*, FIN. & DEV., Dec. 2019, at 16, 18 & chart.1 (illustrating the carbon reduction effects of different carbon prices).

[174] *See, e.g.*, Simon Jessop, Seham Eloraby & Valerie Volcovici, *Exclusive COP27: IMF Chief Says $75/Ton Carbon Price Needed by 2030*, REUTERS (Nov. 7, 2022), https://www.reuters.com/business/cop/exclusive-cop27-imf-chief-says-75ton-carbon-price-needed-by-2030-2022-11-07/ [perma.cc/JP58-UNYX] (noting that existing carbon pricing policies are only projected to reduce carbon dioxide emissions by 11% by 2050); CARBON PRICING LEADERSHIP COAL., REPORT OF THE HIGH-LEVEL COMMISSION ON CARBON PRICES 50 (Inge Pakulski ed., 2017) (pegging the required carbon price at $40-80/ton for 2020 and $50-100/ton for 2030).

[175] Santikarn et al., *supra* note 172, at 25. *But see* Patrick Bayer & Michaël Aklin, *The European Union Emissions Trading System Reduced CO_2 Emissions Despite Low Prices*, 117 PROC. NAT'L ACAD. SCI. 8804, 8809 (2020) (arguing that a stable carbon pricing program with long-term credibility can achieve significant emissions reductions without high prices).

From a political economy perspective, the reluctance of policymakers to adopt a carbon tax or cap-and-trade regime—at any price point—is easy to understand, given the near-term economic implications of carbon pricing. Firms forced to internalize the social cost of their greenhouse gas emissions pass attendant costs along to consumers raising the prices of energy and other carbon-intensive goods, at least until the resulting market pressures produce viable low-carbon alternatives. That is, of course, assuming firms do not pack up and relocate to a more "emissions-friendly" jurisdiction, taking jobs and tax revenue along with them.[176] Even the most climate-sensitive policymakers hesitate to implement a carbon pricing program that may jeopardize the short-term economic well-being of their constituents and, along the way, their own political future.[177] The few who muster the courage to adopt aggressive carbon policies face strong pushback from voters, such as the "yellow vest" protests against a new carbon tax in France, underscoring the distributional and behavioral complexities of carbon pricing.[178]

Recent scholarship suggests that the tepid political support for a carbon tax or cap-and-trade policies may be rooted in a number of biases and heuristics that negatively affect the electorate's perception of carbon pricing policies.[179] Choice architecture has been shown to help voters and other decision-makers overcome their biases, heuristics, and other cognitive limitations in a range of contexts.[180] Behaviorally informed campaigns can target these limitations to enhance the political viability of carbon policies. Experts agree that carbon pricing and other regulatory mandates have a key role to play in mitigating climate change, but caution that "such efforts must also come to terms with something that is potentially both a problem and an opportunity: human behaviour."[181] Choice architecture can complement a tax on carbon or cap-and-

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[176] *See* Felix Mormann, *Requirements for a Renewables Revolution*, 38 ECOLOGY L.Q. 903, 931 (2011) (discussing the risk of industrial leakage in response to carbon pricing policies).

[177] For a more encouraging account, albeit based on limited data, see Weber, *supra* note 1, at 569–72 (using the example of British Columbia's carbon tax to illustrate how public support for pioneering policymakers drops after the announcement of a profound policy change but may rise again following implementation, enabling political reformers to achieve reelection).

[178] *See* Alissa J. Rubin & Somini Sengupta, *'Yellow Vest' Protests Shake France. Here's the Lesson for Climate Change.*, N.Y. TIMES (Dec. 6, 2018), https://www.nytimes.com/2018/12/06/world/europe/france-fuel-carbon-tax.html [https://perma.cc/MU38-QHEL] (noting that the protests led the French government to reverse the tax increase).

[179] *See* Lucas, *supra* note 23, at 37 ("Compared to other climate policies, the costs of a carbon tax are more obvious and the benefits are less visible, both of which distort the intuitive cost-benefit analysis in which voters typically engage.").

[180] *See supra* Part II.

[181] Cass R. Sunstein & Lucia A. Reisch, *Greener by Default*, 21 TRINITY COLL. L. REV. 31, 32 (2018) (citing Lee Ross, Kenneth Arrow, Robert Cialdini, Nadia Diamond-Smith et al., *The Climate Change Challenge and Barriers to the Exercise of Foresight Intelligence*, 66 BIOSCIENCE 363 (2016)).

trade regime by reconciling the implementation of these carbon pricing policies with the electorate's biases, heuristics, and other quintessential traits of human behavior.[182]

Importantly, the benefits of climate choice architecture do not subside with successful implementation of carbon pricing policies. On the contrary, thoughtful nudges can help mitigate some of the typical shortcomings of carbon taxes and cap-and-trade programs, including leakage, agency problems, and limitations in coverage. The current geographic patchwork of carbon pricing policies at regional, national, and subnational levels of governance is prone to resource shuffling and emissions leakage that result in partial relocation instead of overall reduction of greenhouse gas emissions.[183] Some models suggest that nearly half of the emissions reductions achieved by carbon pricing in a given jurisdiction may simply shift to neighboring jurisdictions without a price on carbon.[184] Default enrollment of electricity customers in low-carbon plans and other choice architectural nudges—in jurisdictions with and without carbon pricing—can help reduce leakage and resource shuffling to maximize net emissions reductions.[185]

The economics argument for carbon pricing assumes that rational actors will adjust their behavior and consume less carbon, reigning in their appetite for energy and other carbon-intensive products or services, as emission pricing policies drive up the cost of consumption.[186] But this assumption fails in situations where costs are borne not by the acting agent but, rather, her principal. Examples include landlord-tenant relationships where the former pays the latter's utility bills or the typical scenario of employers financing their employees' means of production, including energy and other resources. A few pioneering companies have begun to include resource efficiency and climate sustaina-

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[182] *See* Yoeli et al., *supra* note 44, at 76 (noting that the tools of choice architecture can serve as a "useful complement" to carbon pricing policies).

[183] For a snapshot of the rich literature on emissions leakage under carbon pricing policies, see generally James Bushnell & Yihsu Chen, *Allocation and Leakage in Regional Cap-and-Trade Markets for CO_2*, 34 RES. & ENERGY ECON. 647 (2012); Harro van Asselt & Thomas Brewer, *Addressing Competitiveness and Leakage Concerns in Climate Policy: An Analysis of Border Adjustment Measures in the US and the EU*, 38 ENERGY POL'Y 42 (2010).

[184] *See* Justin Caron, Sebastian Rausch & Niven Winchester, *Leakage from Sub-national Climate Policy: The Case of California's Cap-and-Trade Program*, 36 ENERGY J. 167, 167 (2015) (reporting that 45% of emissions reductions in California increase emissions in neighboring states).

[185] For a survey of choice architecture's proven track record of nudging ratepayers toward low-carbon electricity plans, see *supra* notes 161–164 and accompanying text.

[186] *E.g.*, Joseph E. Aldy & Robert N. Stavins, *The Promise and Problems of Pricing Carbon: Theory and Experience*, 21 J. ENV'T & DEV. 152, 153 (2012) ("By internalizing the externalities associated with CO_2 emissions, carbon pricing can promote cost-effective abatement, deliver powerful innovation incentives, and ameliorate rather than exacerbate government fiscal problems.").

bility in their employees' performance evaluations and bonus payments.[187] But such arrangements are few and far between. Climate choice architecture can help overcome pervasive agency problems by nudging employees and other agents to be more resource-efficient even if they do not bear the cost of their consumption or reap the benefits of their thrift, as evidenced by the dramatic savings achieved through simple tweaks like defaulting office printers to double-sided output.[188]

Coverage is a perennial sticking point with carbon pricing policies, as special interest groups flex their political muscle to minimize the regulatory burden of their members.[189] Social norm-based campaigns, such as those successfully used to nudge waste reduction and water conservation,[190] can help promote voluntary opt-in by industries not subject to mandatory carbon pricing and thereby mitigate concessions made during the policymaking process.[191] Coverage is also problematic with large multinational companies that can shift their carbon-intensive operations to more emissions-friendly jurisdictions. An oil-and-gas major headquartered in the United States and listed on the New York Stock Exchange, for example, may focus its extractive efforts on offshore fields developed through subsidiaries in order to escape notoriety and carbon pricing in its home jurisdiction. The resulting reductions in the company's domestic carbon footprint might unduly endear its stocks to investors who lack the time and resources to study the corporate activities in sufficient detail to uncover its carbon shuffling.

D. A Bridge Over the Partisan Chasm of Climate Politics

Empirical evidence from other nudge campaigns suggests that choice architecture has the potential to reshape the political economy of climate policy and create much needed common ground in Congress as well as in state legislatures. Climate change has long graduated from a niche topic that fills the news lull during quiet (and hot) summer months to the political mainstream. Today, three in five Americans recognize global warming as a political is-

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[187] For the most famous of these arrangements, see Sarah Kent, *Shell to Link Carbon Emissions Targets to Executive Pay*, WALL ST. J. (Dec. 3, 2018), https://www.wsj.com/articles/shell-to-link-carbon-emissions-targets-to-executives-pay-1543843441 [https://perma.cc/A4LU-PZHU].

[188] For a discussion of the sizeable savings produced by Rutgers University's switch to double-sided printing as the default on the school's printers, see *supra* note 158 and accompanying text.

[189] *See, e.g.*, Hiltzik, *supra* note 22 (discussing opposition to California's cap-and-trade program by industry groups).

[190] *See supra* notes 151–157 and accompanying text.

[191] *See* Michael P. Vandenbergh & Mark A. Cohen, *Climate Change Governance: Boundaries and Leakage*, 18 N.Y.U. ENV'T L.J. 221, 222, 241–42 (2010) (discussing the potential of social norms to create incentives for firms to pursue emissions reductions in their supply chains).

sue.[192] In early 2020, a nationally representative survey among U.S. adults found that, for the first time, the percentage of Americans who viewed protecting the environment as a "top policy priority" was almost equal to the percentage who considered strengthening the economy as a "top policy priority."[193] A majority of Americans specifically named climate change as a top policy priority, an increase of more than one-third compared to three years earlier.[194] But the nation is deeply conflicted over whether and how politics should contribute to a solution.[195]

As scientific consensus around the origins and impacts of climate change continues to solidify, the American public is growing ever more divided.[196] In the words of one commentator, "climate change is currently at its most politicized."[197] Choice architecture has the potential to bring both parties closer together on this critical issue. After all, political scientists attribute the American public's increasing partisan polarization over climate change to both parties' divergent positions on the appropriate role and size of government.[198] The pre-

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[192] ANTHONY LEISEROWITZ, EDWARD MAIBACH, SETH ROSENTHAL, JOHN KOTCHER ET AL., CLIMATE CHANGE IN THE AMERICAN MIND 26, 96 (2020), https://climatecommunication.yale.edu/wp-content/uploads/2020/05/climate-change-american-mind-april-2020b.pdf [https://perma.cc/DFG3-DGT4].

[193] *See As Economic Concerns Recede, Environmental Protection Rises on the Public's Policy Agenda*, PEW RSCH. CTR. (Feb. 13, 2020), https://www.pewresearch.org/politics/2020/02/13/as-economic-concerns-recede-environmental-protection-rises-on-the-publics-policy-agenda/ [https://perma.cc/6VZE-8NYR] (noting that 64% of Americans viewed protecting the environment as a top policy priority compared to 67% of Americans who named strengthening the economy as a top policy priority).

[194] *Id.* (noting that 52% of Americans named climate change as a top policy priority). The COVID-19 crisis, breaking shortly after the survey was conducted, is likely to have refocused American priorities on economic, rather than environmental issues. *Public's Top Priority for 2022: Strengthening the Nation's Economy*, PEW RSCH. CTR. (Feb. 16, 2022), https://www.pewresearch.org/politics/2022/02/16/publics-top-priority-for-2022-strengthening-the-nations-economy/ [https://perma.cc/AD2E-2F5W] (discussing the results of a poll that found that 71% of U.S. adults cited strengthening the economy as the number one political priority for the country).

[195] *See, e.g.*, Nadja Popovich, *Climate Change Rises as a Public Priority. But It's More Partisan Than Ever.*, N.Y. TIMES (Feb. 20, 2020), https://www.nytimes.com/interactive/2020/02/20/climate/climate-change-polls.html [https://perma.cc/V58H-ZULC] (showing a fifty-point divide between Democrats and Republicans on the importance of addressing climate change); Oliver Milman, *Political Polarisation Over Climate Crisis Has Surged Under Trump*, THE GUARDIAN (Oct. 11, 2019), https://www.theguardian.com/environment/2019/oct/11/political-polarisation-climate-crisis-trump [https://perma.cc/L2X8-SYX9] (noting that congressional Democrats regularly vote for environmental protection measures, while Republicans almost always oppose such measures).

[196] *See* Dunlap et al., *supra* note 27, at 19 (highlighting the partisan divide regarding beliefs about climate change); Kamarck, *supra* note 27 (same).

[197] Jacqueline Toth, *As Wildfires Rage, Divide Widens Between Democratic, GOP Voters on Climate Change*, MORNING CONSULT (Aug. 22, 2018), https://morningconsult.com/2018/08/22/as-wildfires-rage-divide-widens-between-democratic-gop-voters-climate-change/ [https://perma.cc/S9DY-V7D9].

[198] Dunlap et al., *supra* note 27, at 15; ORESKES & CONWAY, *supra* note 28, at 251–52.

vailing anti-regulatory view of government among Republicans is thought to be the principal motivation behind the refusal to recognize the reality and importance of climate change. Deeply rooted fear of the climate crisis's regulatory implications, including carbon pricing, some argue, is a key motivator of concerted climate change denial.[199]

If the partisan divide over climate change, indeed, follows the same fault lines as the age-old conflict over big government versus market fundamentalism, then choice architectural policy interventions could help build a bridge. Studies have shown that, as a general matter, "Republicans do not like nudges more or less than Democrats do."[200] Researchers find no evidence of partisan differences in the American public's response to nudges when described without discussion of specific policy objectives.[201] Even when connected to specific policy goals and policymakers, Democrats and Republicans concurred in their overwhelming approval of recent nudge policies, including calorie labels, graphic warnings on cigarette packages, and auto-enrollment in retirement savings.[202]

This bipartisan support suggests that the use of nudges to effectuate climate policy could help sidestep the perennial partisan debate over regulatory mandates versus free markets. A caveat is in order, however; any fruitful discussion over *how* to address the climate crisis first requires consensus over *whether* it requires taking action. Today, Democrats and Republicans are further apart than ever in how they assess the reality and importance of climate change. Seventy-eight percent of Democrats viewed climate change as a top policy priority in 2020, compared to only twenty-one percent of Republicans.[203] Another survey, administered as record heat waves were sweeping through the United States in the summer of 2019, confirms the American public's deep, and wide, partisan divide over climate issues.[204] Although sixty-eight percent of Democrats indicated they were "very concerned" about climate change, a mere twenty-two percent of Republicans showed the same lev-

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[199] Dunlap et al., *supra* note 27, at 15; Aaron M. McCright & Riley E. Dunlap, *The Politicization of Climate Change and Polarization in the American Public's Views of Global Warming, 2001–2010*, 52 SOCIO. Q. 155, 178–80 (2011).

[200] Cass R. Sunstein, *People Prefer System 2 Nudges (Kind of)*, 66 DUKE L.J. 121, 142 (2016).

[201] Janice Y. Jung & Barbara A. Mellers, *American Attitudes Toward Nudges*, 11 JUDGMENT & DECISION MAKING 62, 63 (2016).

[202] *See* Sunstein, *supra* note 29, at 187 & tbl.1 (reporting approval ratings of 92% and 77% on calorie labels, and 77% and 68% on graphic warnings on tobacco products, for Democrats and Republicans, respectively).

[203] PEW RSCH. CTR., *supra* note 193.

[204] *See* THE ECONOMIST, *THE ECONOMIST*/YOUGOV POLL JULY 27–30, 2019, at 77 (2019), https://d25d2506sfb94s.cloudfront.net/cumulus_uploads/document/hash0nbry8/econTabReport.pdf [https://perma.cc/2HZY-PU7F] (showing that 92% of self-identified liberals were concerned about climate change, compared with only 39% of conservatives).

el of concern.[205] On the other hand, fifty-nine percent of Republicans thought that the threat of climate change was exaggerated, compared to just eleven percent of Democrats.[206] Similarly, seventy-two percent of Democrats, but only thirty-two percent of Republicans claimed to have personally felt the effects of climate change.[207] Perhaps most telling is the fact that a strong majority of Republicans denied that climate change is happening as the result of human activity, compared to only a small fraction of Democrats.[208] Even the occurrence of hurricanes, wildfires, and other natural disasters in unprecedented frequency and severity has had little, if any, effect on the partisan gulf on climate change.[209]

Nudge godfather Cass Sunstein has identified "strong antecedent preferences on the part of choosers" as a major impediment to the efficacy of choice architectural interventions.[210] Denial of anthropogenic climate change, as expressed by a majority of Republicans, certainly qualifies as a "strong antecedent preference."[211] But such deeply rooted skepticism does not require the wholesale dismissal of nudges as catalysts for greater climate action. Rather, data gathered via public opinion polls suggest that choice architects should use their considerable repertoire of options to first help educate U.S. voters and policymakers on the findings of climate science.[212] Not that long ago, medical doctors could be found on television advertising the alleged health benefits of cigarettes, even as scientific evidence told a dramatically different story.[213] Today, following a series of educational campaigns, there is universal consensus on the grave health risks associated with tobacco and smoking. Once similar, behaviorally informed campaigns have built bipartisan support that decisive climate action is, indeed, warranted, nudges can help create consensus over what form such action should take. Already, there is cause for cautious optimism that Republican leadership is overcoming its long-held skepticism of

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[205] *Id.*

[206] *Id.* at 79.

[207] *Id.* at 81.

[208] *Id.* at 82 (reporting that 57% of Republicans and 15% of Democrats denied the anthropogenic cause of climate change).

[209] *See* Kamarck, *supra* note 27 ("[N]atural disasters don't affect attitudes toward climate change . . . .").

[210] Cass R. Sunstein, *Nudges That Fail*, 1 BEHAV. PUB. POL'Y 4, 4, 8–11 (2017).

[211] *See id.* at 8–11 (discussing various scenarios where strong preferences were not overcome by policy nudges); THE ECONOMIST, *supra* note 204, at 79 (charting Republican skepticism toward climate change).

[212] *See supra* Section I.A (discussing choice architectural tools related to decision-relevant information).

[213] *See* ORESKES & CONWAY, *supra* note 28, at 15–21 (discussing the misinformation campaigns sponsored by the tobacco industry in an attempt to shape public opinion and evade regulation).

climate science and the reality of global warming, as evidenced by the recent formation of the Conservative Climate Caucus.[214]

E. Creating Momentum for Climate-Friendly Social Norms

Social norms have been recognized as effective catalysts of behavior change in a broad range of contexts, including gambling, fruit consumption, tax evasion, and sunscreen use, among others.[215] But not all social norms are created equal, and their observed effects on human behavior vary in both magnitude and directionality. Descriptive social norms reflect "predominant attitudes and patterns of behavior in a social group."[216] Reference to these positive descriptive norms can help strengthen already dominant behavior, as illustrated by the impressive success of norm-based campaigns for recycling in the United States and for water conservation in Australia.[217] Where prevailing attitudes and conduct run counter to the desired behavior change, however, reference to dominant but negative descriptive social norms produces adverse effects. Anti-pollution campaigns highlighting the prevalence of littering, for example, actually increased polluting behavior among the target population because the campaign's acknowledgment of littering as a socially dominant behavior encouraged others to join in.[218]

The stickiness of prevailing attitudes and conduct does not bode well for social norm-based efforts to encourage more climate-friendly behavior. After all, effective mitigation of global warming requires more than the—for most, unattainable—purchase of a shiny, new, all-electric Tesla vehicle.[219] But reduction of the meat content in our diets, less air travel, and other recommended

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[214] *See* Lisa Friedman, *A Shift on Climate for Some G.O.P. Leaders*, N.Y. TIMES: CLIMATE FORWARD, https://www.nytimes.com/2021/06/23/climate/nyt-climate-newsletter.html [https://perma.cc/P6DU-YUPT] (Aug. 13, 2021).

[215] *See* Robert B. Cialdini & Ryan P. Jacobson, *Influences of Social Norms on Climate Change-Related Behaviors*, 42 CURRENT OP. BEHAV. SCIS. 1, 1 (2021) (discussing the "influential effects of social norms" in these and other contexts).

[216] *E.g.*, Adrian Rinscheid, Silvia Pianta & Elke U. Weber, *What Shapes Public Support for Climate Change Mitigation Policies? The Role of Descriptive Social Norms and Elite Cues*, 5 BEHAV. PUB. POL'Y 503, 504 (2021); Kathryn L. Doherty & Thomas N. Webler, *Social Norms and Efficacy Beliefs Drive the Alarmed Segment's Public-Sphere Climate Actions*, 6 NATURE CLIMATE CHANGE 879, 880 (2016) (describing descriptive social norms as "perceptions of what others do in similar situations" (citing Cialdini et al., *supra* note 153)).

[217] *See supra* notes 153–155 and accompanying text.

[218] *See, e.g.*, Cialdini et al., *supra* note 153, at 1017 (reporting evidence of increased littering in situations where the descriptive social norm reflects pervasive littering by others).

[219] *See, e.g.*, Yang Ju, Lara J. Cushing & Rachel Morello-Frosch, *An Equity Analysis of Clean Vehicle Rebate Programs in California*, 162 CLIMATIC CHANGE 2087, 2102–03 (2020) (reporting evidence that California's electric vehicle incentive "disproportionately benefits higher-income neighborhoods with higher levels of educational attainment and fewer residents of color").

carbon-conscious conduct[220] are neither popular nor dominant patterns of behavior. As a result, they are poorly suited to serving as descriptive social norms. Reference to the less climate-concerned attitudes and behavior that prevail to date would likely dissuade, rather than encourage, the shift toward more climate-friendly conduct.[221]

Injunctive social norms add a normative filter of "attitudes and behavior considered appropriate [by] a group."[222] But these more judgmental norms are similarly problematic. Although decision-makers may comply with such norms "to avoid social sanctions or to signal their agreement with the group norms" injunctive social norms can elicit reactance in the form of conscious noncompliance.[223] This type of reactive rebellion is significantly more likely to occur in a "politically polarized domain like climate policy."[224]

There is hope. Recent research suggests that recourse to dynamic social norms provides a path forward to promote new, unadopted behaviors.[225] In situations where "only a minority of people engage in the desired behavior, a dynamic norm that communicates the upward trend" in the preferred conduct's practice has proven significantly more effective than reliance on "static minority norm[s]."[226] For purposes of climate action, for example, highlighting an

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[220] *See supra* notes 2–4 and accompanying text.

[221] *See* Rinscheid et al., *supra* note 216, at 521 ("For decarbonization efforts that strongly affect user practices and everyday routines, . . . the perceived prevalence of negative social norms may constitute an important barrier.").

[222] *Id.* at 505 (citing Cialdini et al., *supra* note 153).

[223] *Id.* at 505–06; *see also* Taejin Jung, Woomi Shim & Thad Mantaro, Letter to the Editor, *Psychological Reactance and Effects of Social Norms Messages Among Binge Drinking College Students*, J. ALCOHOL & DRUG EDUC., Dec. 2010, at 7, 9 (reporting evidence of psychological reactance to injunctive social-norm campaigns intended to reduce binge drinking among college students who, in fact, responded by drinking more). Reactance refers to "the motivational state that is hypothesized to occur when a freedom is eliminated or threatened with elimination." Jung et al., *supra*, at 8 (quoting SHARON S. BREHM & JACK W. BREHM, PSYCHOLOGICAL REACTANCE 37 (1981)). The pushback from politically conservative ratepayers against utility campaigns to encourage greater energy conservation through neighborhood comparisons is another example of reactance to injunctive social norms. *See infra* notes 278–279 and accompanying text (noting that Republicans in California, when informed of their energy usage compared with that of their neighbors, increased their energy use).

[224] Rinscheid et al., *supra* note 216, at 505–06.

[225] *See* Jessica M. Nolan, *Social Norm Interventions as a Tool for Pro-climate Change*, 42 CURRENT OP. PSYCH. 120, 122 (2021) (suggesting that dynamic social norms may be used to illustrate that norms are changing over time).

[226] *Id.*; *see* Chad R. Mortensen, Rebecca Neel, Robert B. Cialdini, Christine M. Jaeger et al., *Trending Norms: A Lever for Encouraging Behaviors Performed by the Minority*, 10 SOC. PSYCH. & PERSONALITY SCI. 201, 208 (2019) ("[P]ortraying a behavior as increasing in popularity can spur compliance even to minority norms. Trending norms may thus be a more effective way to encourage water conservation, environmental stewardship, and other desired behaviors."); Gregg Sparkman & Gregory M. Walton, *Dynamic Norms Promote Sustainable Behavior, Even if It Is Counternormative*, 28 PSYCH. SCI. 1663, 1673 (2017) ("Many reforms struggle because of the need to change existing norms, but often a small, dedicated group changes quickly. If this change is visible, appears willful,

upward trend in the choice of green electricity plans by a growing share of ratepayers could help amplify and accelerate the adoption of clean energy technologies. Dynamic social norms prompt people to "anticipate a changed future" to which they are willing to adjust their behavior, especially when the observed change in others' behavior reflects effort and, hence, the importance of the cause.[227]

Leading scientists have begun calling for greater exploration of strategies that "harness the persuasive effects of trending norms to mitigate climate change."[228] The choice architectural nudges proposed in this Article have the potential to create positive trends in climate-friendly behavior. These pro-climate trends, in turn, can generate the momentum necessary for campaigns that use dynamic social norms to help turn today's minority attitudes and behavior into the dominant, climate-conscious conduct of tomorrow.

F. Ample Opportunities for Private Climate Governance

So far, this Article has primarily focused on the vast potential of nudges to improve the efficacy and efficiency of public policy responses to the climate crisis. But choice architecture also holds enormous opportunity for private climate governance.[229] In the absence of more decisive climate policy action by nation-states and the international community,[230] private actors are increasing-

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reflects the importance of the issue, and is taken as a sign of what is to come, it may encourage broader change even in the face of a salient and socially entrenched current norm.").

[227] Sparkman & Walton, *supra* note 226, at 1672.

[228] Cialdini & Jacobson, *supra* note 215, at 5.

[229] The concept of private environmental governance, including climate governance, recognizes the critical role that private parties, from corporations to non-governmental organizations, play in addressing environmental concerns historically thought to be the exclusive domain of government regulation. *See, e.g.*, Sarah E. Light, *The Law of the Corporation as Environmental Law*, 71 STAN. L. REV. 137, 140 (2019) ("In light of the significant impact that firms can have on the environment . . . the law governing the corporation . . . should be understood as a fundamental part of environmental law."); Michael P. Vandenbergh, *Private Environmental Governance*, 99 CORNELL L. REV. 129, 133 (2013) ("[N]ew private environmental governance activities play the standard-setting, implementation, monitoring, enforcement, and adjudication roles traditionally played by public regulatory regimes."); Jody Freeman, *The Private Role in Public Governance*, 75 N.Y.U. L. REV. 543, 547 (2000) ("A careful inquiry into the private role in governance reveals not only its pervasiveness, but also the extent to which it operates symbiotically with public authority."). More specifically, the literature has recognized the importance of third-party ratings and other certification programs for environmental governance. *See* David E. Adelman & Graeme W. Austin, *Trademarks and Private Environmental Governance*, 93 NOTRE DAME L. REV. 709, 710–11 (2017) (explaining how private environmental governance through product certification "fills information gaps related to public goods and common pool resources"); *see also* Michael P. Vandenbergh, *Disclosure of Private Climate Transition Risks*, 63 WM. & MARY L. REV. 1695, 1757–62 (2022) (making a strong case for more consistent financial reporting of risks posed by private environmental governance initiatives).

[230] For a critical assessment of the 2021 United Nations Conference of the Parties in Glasgow, see Alice C. Hill & Madeline Babin, *What COP26 Did and Didn't Accomplish*, COUNCIL ON FOREIGN

ly taking matters into their own hands. Financial markets have emerged as a key battleground over private climate governance, as investors push reticent companies to adopt more climate-friendly business practices.[231] The divestment movement, for instance, urges climate-sensitive investors to "vote with their feet" and drop fossil fuel companies from their portfolios.[232] A phalanx of institutional investor heavyweights, including BlackRock, JPMorgan, Harvard Management Company, and some of the world's largest pension funds, seek to effect change from within, using their shareholder governance rights to vote to align corporate policies with international climate targets.[233] Whatever the method of choice, mounting investor pressure appears to be paying dividends.

From Alaska Airlines to Airbnb, corporations all over the world are now pledging to reduce their greenhouse gas emissions to "net zero" by 2050, if not sooner.[234] Even oil-and-gas titan ExxonMobil recently announced its "ambition" to reduce the company's net operational greenhouse gas emissions to zero by 2050.[235] Critics, however, question the scope, sincerity, and sophistication of these pledges, noting that they often lack the near-term commitments

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RELS. (Nov. 15, 2021), https://www.cfr.org/in-brief/cop26-climate-outcomes-successes-failures-glasgow [https://perma.cc/N9KU-7H72].

[231] *See* Madison Condon, *Externalities and the Common Owner*, 95 WASH. L. REV. 1, 6 (2020) (arguing that "institutional investors' climate activism is motivated by their desire to mitigate climate change risks and damages to their economy-mirroring portfolios").

[232] As of October 2022, some 1,552 institutional investors managing over $40 trillion in assets have committed to divestment of some, if not all, of their fossil fuel holdings. *Commitments*, GLOB. FOSSIL FUEL DIVESTMENT COMMITMENTS DATABASE, https://divestmentdatabase.org/ [https://perma.cc/AUZ2-RE7F]. Some participants limit their commitment to divestment of a subset of fossil fuel companies, such as the coal industry, continuing to invest in other fossil assets. For a critical assessment of the divestment movement's overwhelming focus on institutional investors and limited guidance for reinvestment, see Felix Mormann, *Why the Divestment Movement Is Missing the Mark*, 10 NATURE CLIMATE CHANGE 1067, 1067 (2020).

[233] *See, e.g.*, Rachel Koning Beals, *For First Time Ever, Majority of Shareholders Push Oil Giant Chevron to Align with Paris Climate Pact*, MARKETWATCH (June 24, 2020), https://www.marketwatch.com/story/for-first-time-ever-majority-of-shareholders-push-oil-giant-chevron-to-align-with-paris-climate-pact-2020-06-23 [https://perma.cc/F9KR-3FA4] (discussing measures sought by activist shareholders and responses by large oil companies). *See* Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104 (pledging the signatory nations to hold anthropogenic global warming to below two degrees Celsius). Many of climate-related shareholder proposals originate with Climate Action 100+, an initiative that unites some 700 investors managing more than $68 trillion of assets in their commitment to engage companies to curb emissions, improve governance, and strengthen climate-related disclosures. *About Climate Action 100+*, CLIMATE ACTION 100+, climateaction100.org/about/ [https://perma.cc/6HGJ-WEX3].

[234] *See* Hannah Sampson, *Travel Companies Are Vowing to Go 'Net Zero.' Here's What That Means.*, WASH. POST (Nov. 17, 2021), https://www.washingtonpost.com/travel/2021/11/17/net-zero-pledge-climate-change/ [https://perma.cc/P7XE-HH8P] (explaining that "net zero" means reducing carbon emissions associated with an entity to a balance of zero).

[235] Clifford Krauss, *Exxon Sets a 2050 Goal for Net-Zero Greenhouse Gas Emissions*, N.Y. TIMES (Jan. 18, 2022), https://www.nytimes.com/2022/01/18/business/exxon-net-zero-emissions.html [https://perma.cc/5EYR-EC4G].

required to put countries and companies on a credible path to net zero.[236] Sure enough, ExxonMobil has no plans to address the greenhouse gas emissions associated with the sale and consumption (or, rather, combustion) of its oil and gas products, which are together responsible for most of the company's giant carbon footprint.[237] Financial experts, meanwhile, warn that "capital is flowing freely in the wrong direction, emissions continue to rise, catastrophic climate-related damages proliferate, and the threat of truly cataclysmic impacts increase[s]."[238] Looking to the other side of the ledger, analysts ring the alarm that annual investment in climate change mitigation and adaptation will need to increase by nearly six hundred percent to meet international climate targets and prevent massive, irreversible damage to the global ecosystem.[239]

Recent research suggests that a relatively innocuous nudge could go a long way toward turning capital markets into a force for good in the war on carbon. Adding a "climate rating" to the performance metrics commonly considered by investors can boost investment in more climate-friendly stocks by over fifty percent.[240] Remarkably, this climate nudge proved highly effective even when other competing stocks boasted stronger performance data.[241] Just as importantly, the addition of a climate rating to existing investment-relevant information does not require regulatory imprimatur or intervention but, rather, is available in the here and now.[242] Trading platforms like E*Trade, Robin-

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[236] *See* Sarah Kaplan & Michael Birnbaum, *Despite COP26 Pledges, World Still on Track for Dire Warming*, WASH. POST (Nov. 9, 2021), https://www.washingtonpost.com/climate-environment/2021/11/09/cop26-un-emissions-gap/ [https://perma.cc/SKF2-A5EQ] (noting that, based on Paris Agreement targets set by countries, the planet will warm by 2.5 degrees Celsius by the end of the century). *See generally* HOLLY JEAN BUCK, ENDING FOSSIL FUELS: WHY NET ZERO IS NOT ENOUGH (2021) (advocating for government-led phasing out of fossil fuels).

[237] *See* Krauss, *supra* note 235; *see also* PAUL GRIFFIN, THE CARBON MAJORS DATABASE: CDP CARBON MAJORS REPORT 2017, at 14 app.I (2017) (bestowing upon ExxonMobil the dubious honor of being the highest greenhouse gas emitter of all publicly listed companies).

[238] Statement by Robert B. Litterman, Partner, Kepos Capital, for the Senate Special Comm. on the Climate Crisis, Climate Change Is a Risk Management Failure That Can and Must Be Fixed Immediately (Mar. 12, 2020), https://www.schatz.senate.gov/imo/media/doc/Litterman%20Testimony%20short%20version%20.pdf [https://perma.cc/25G3-HJVS].

[239] *See* BARBARA BUCHNER, BAYSA NARAN, PEDRO FERNANDES, RAJASHREE PADMANABHI ET AL., CLIMATE POL'Y INITIATIVE, GLOBAL LANDSCAPE OF CLIMATE FINANCE 2021, at 2, 5 & fig.3, 34 (2021) ("Finance flows are nowhere near the estimated needs, conservatively estimated at USD 4.5–5 trillion annually.").

[240] *See* Felix Mormann & Milica Mormann, *The Case for Corporate Climate Ratings: Nudging Financial Markets*, 53 ARIZ. ST. L.J. 1209, 1272 (2021) (providing empirical support for the effectiveness of corporate climate ratings through a series of survey experiments).

[241] *Id.* at 1279.

[242] The necessary information to compile such a rating is more readily available than commonly assumed. The international non-profit CDP, formerly known as Carbon Disclosure Project, for example, operates an annual reporting system that rates companies' and municipalities' progress and action on climate change as well as other environmental issues. In 2022, CDP rated over 13,000 companies and over 1,100 cities, states, and regions. *What We Do*, CDP, https://www.cdp.net/en/info/about-us/

hood, or Charles Schwab are free to structure their stock charts as they please and, hence, could easily include climate-relevant information in the data offered to their users.[243]

Employers, too, can use nudges to advance private climate governance, guiding their employees toward more climate-friendly investment choices as part of their workers' retirement planning. After all, employers get to determine the menu of investment options for the 401(k) plans and other defined contribution plans they sponsor.[244] Managing these retirement plans is a highly lucrative business for Fidelity, Vanguard, and other service providers who not only earn management fees but also increase the likelihood that employees invest their savings in the service provider's own fund offerings.[245] As gatekeepers to these lucrative appointments, employers command considerable clout with service providers eager to secure, and retain, a plan sponsor's business.[246] Climate-conscious employers can use their clout to structure the menu of investment options accordingly, featuring more sustainable funds more prominently or altogether dropping funds with a poor sustainability record.[247]

Beyond the realm of financial markets, the presentation and communication of climate-related information offer ample room for improvement by dipping into the choice architect's toolbox. Poor communication of scientific findings related to anthropogenic climate change is a major obstacle to more effective climate policy and greater public support thereof.[248] The Intergovernmen-

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what-we-do [https://perma.cc/C6Y8-JRB9]; *see also* Felix Mormann & Milica Mormann, *It's Time to Give Companies Standalone Climate Ratings*, HARV. BUS. REV. (May 24, 2022), https://hbr.org/2022/05/its-time-to-give-companies-standalone-climate-ratings [https://perma.cc/S3A7-9B62] (making the case for extricating climate ratings from the more complex, and convoluted, system of environmental, social, and governance (ESG) ratings).

[243] Recent research confirms the ability of retail investors, such as those using the Robinhood site, to affect the stock market valuation of publicly traded companies and, thereby, move the needle toward more carbon-conscious investment. *See* Philippe van der Beck & Coralie Jaunin, The Equity Market Implications of the Retail Investment Boom 1, 18 (Swiss Fin. Inst., Research Paper No. 21-12, 2021) (finding that Robinhood traders—despite accounting for 0.2% of market share—accounted for over 10% of the cross-sectional variation in stock returns during the second quarter of 2020).

[244] *See, e.g.*, Veronika K. Pool, Clemens Sialm & Irina Stefanescu, *It Pays to Set the Menu: Mutual Fund Investment Options in 401(k) Plans*, 71 J. FIN. 1779, 1782 (2016) ("401(k) menus are jointly determined by the plan sponsor (i.e., employer) and the plan's service providers.").

[245] *Id.* at 1780, 1785 (finding "significant favoritism" toward "funds affiliated with the service provider" in a data set comprising nearly 2,500 retirement plans with an average plan size of $324 million, surveyed over a ten-year period).

[246] *Id.* at 1779–80.

[247] For an illustrative example of how the menu structure affects employee choices in retirement investment, see Doellman et al., *supra* note 77, at 645 ("401(k) investors typically choose from a relatively small number of funds making it more manageable for investors to consider every option.").

[248] *See* Sander L. van der Linden, Anthony A. Leiserowitz, Geoffery D. Feinberg & Edward W. Maibach, *How to Communicate the Scientific Consensus on Climate Change: Plain Facts, Pie Charts or Metaphors?*, 126 CLIMATIC CHANGE 255, 261 (2014) ("[W]hen communicating the scientific con-

tal Panel on Climate Change (IPCC), for example, communicates its findings in a way that makes them difficult for non-specialists to understand.[249] The cryptic nature of these reports is all the more unfortunate as IPCC assessments "present an unparalleled opportunity for climate science to speak directly to power" and to facilitate policy action.[250] Failure to communicate climate science effectively is one potential reason for the general public's lagging concern for climate change.[251]

U.S. media are little better than scientific experts as they too render climate communication unnecessarily complicated. Coverage of the Paris Conference of the Parties (COP), for example, overwhelmingly referred to the two-degree Celsius target for global warming without offering American audiences a conversion to the more familiar Fahrenheit scale. A content analysis of the U.S. prestige press[252] for the month of the Paris COP agreement revealed that sixty-three percent of articles communicated global warming targets exclusively in degrees Celsius, with no conversion to Fahrenheit.[253] Eighty-seven percent of the articles that included Fahrenheit conversions did so only once throughout the entire article.[254] Despite this, a nationwide survey suggests that one third of U.S. adults are unable to convert Celsius to Fahrenheit.[255] The simple choice architectural tweak of reporting global warming data to American audiences using their native Fahr-

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sensus on human-caused climate change, presenting information in a way that is short, simple and easy to comprehend and remember seems to offer the highest probability of success for all audiences . . . .").

[249] *See* Ralf Barkemeyer, Suraje Dessai, Beatriz Monge-Sanz, Barbara Gabriella Renzi et al., *Linguistic Analysis of IPCC Summaries for Policymakers and Associated Coverage*, 6 NATURE CLIMATE CHANGE 311, 315 (2016) (criticizing the "mismatch between scientific and wider societal understandings of climate-related knowledge" prompt by the low readability and accessibility of climate reports).

[250] Richard Black, Commentary, *No More Summaries for Wonks*, 5 NATURE CLIMATE CHANGE 282, 282 (2015).

[251] Brigitte Nerlich, Nelya Koteyko & Brian Brown, *Theory and Language of Climate Change Communication*, WIRES CLIMATE CHANGE, Jan./Feb. 2010, at 97, 106.

[252] The literature counts the *New York Times*, the *Washington Post*, the *Los Angeles Times*, and the *Wall Street Journal* among the U.S. prestige press. Maxwell T. Boykoff & Jules M. Boykoff, *Balance as Bias: Global Warming and the US Prestige Press*, 14 GLOB. ENV'T CHANGE 125, 126 (2004).

[253] Milica Mormann & Felix Mormann, Celsius or Fahrenheit? The Impact of Message Framing on Perceptions of Climate Change 2 (unpublished manuscript) (on file with author).

[254] *Id.* at 3.

[255] Felix Mormann, Survey Conducted via Amazon's Mechanical Turk Platform, with Approval from Texas A&M University's Institutional Review Board under IRB 2020-0723 (2020) (unpublished manuscript) (on file with author); *see also* Gabriele Paolacci, Jesse Chandler & Panagiotis G. Ipeirotis, *Running Experiments on Amazon Mechanical Turk*, 5 JUDGMENT & DECISION MAKING 411, 412 (2010) ("Internet subject populations tend to be closer to the U.S. population as a whole than subjects recruited from traditional university subject pools.").

enheit scale could, therefore, go a long way toward improving popular understanding and support of climate science and its findings.[256]

G. Climate Nudging in Action: Carbon Labels for Food

Real-world applications of climate choice architecture remain few and far between. Recent research, however, illustrates the enormous potential of climate-oriented nudges to promote more carbon-conscious behavior. In a controlled lab experiment, researchers found that carbon labels on food packaging led consumers to opt for food items with a smaller, more climate-friendly carbon footprint.[257]

Policymakers and scholars have long focused their attention on the energy sector's contributions to global warming, exploring technological innovations in energy efficiency and renewable energy as strategies to mitigate climate change.[258] The overwhelming emphasis on energy has led other areas of the economy to go largely overlooked, even when their sizeable carbon footprint promises ample potential for mitigating global warming and climate change. The food system, for example, is estimated to account for roughly one-quarter of the world's greenhouse gas emissions.[259] Dietary changes, such as reduced consumption of meat or even replacement of high-carbon beef or lamb with less carbon-intensive chicken or pork, can produce significant reductions in global greenhouse gas emissions.[260] But how can consumers be persuaded to

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[256] *See* Eugene Y. Chan, *Climate Change Is the World's Greatest Threat—in Celsius or Fahrenheit?*, 60 J. ENV'T PSYCH. 21, 25 (2018) (suggesting that whether global warming information is presented in Celsius or Fahrenheit influences perceived concern over climate change).

[257] *See* Camilleri et al., *supra* note 7, at 57 fig.3.

[258] This bias is also reflected in the legal literature. *See, e.g.*, Shelley Welton, *Decarbonization in Democracy*, 67 UCLA L. REV. 56, 98 (2020) (discussing reform of energy governance to help decarbonize the U.S. economy); Felix Mormann, Dan Reicher & Victor Hanna, *A Tale of Three Markets: Comparing the Renewable Energy Experiences of California, Texas, and Germany*, 35 STAN. ENV'T L.J. 55, 83–97 (2016) (distilling comparative insights for policy recommendations from the diverse strategies policymakers use to promote renewable energy); William Boyd, *Public Utility and the Low-Carbon Future*, 61 UCLA L. REV. 1614, 1622 (2014) (analyzing the "distinctive challenges facing efforts to decarbonize" within the energy sector).

[259] *See* Sonja J. Vermeulen, Bruce M. Campbell & John S.I. Ingram, *Climate Change and Food Systems*, 37 ANN. REV. ENV'T & RES. 195, 198 (2012) ("[T]he food system contributes 19%–29% of total global anthropogenic GHG emissions . . . .").

[260] *See, e.g.*, M. Berners-Lee, C. Hoolohan, H. Cammack & C.N. Hewitt, *The Relative Greenhouse Gas Impacts of Realistic Dietary Choices*, 43 ENERGY POL'Y 184, 190 (2012) (comparing potential carbon emission reductions from dietary changes in the U.K. population to eliminating 50% of exhaust pipe emissions from all U.K. passenger cars); C. Hoolohan, M. Berners-Lee, J. McKinstry-West & C.N. Hewitt, *Mitigating the Greenhouse Gas Emissions Embodied in Food Through Realistic Consumer Choices*, 63 ENERGY POL'Y 1065, 1070 (2013) (reporting a potential 18% reduction in food-related greenhouse gas emissions by switching from carbon-intensive lamb and beef to less carbon-intensive chicken and pork).

reconsider their dietary preferences based on their climate impact? And how well do consumers even understand the relative carbon intensity of their food choices? A team of Australian and American researchers recently sought to answer these pivotal questions through two related experiments.[261]

The first experiment asked participants to estimate the greenhouse gas emissions associated with producing and transporting a serving of various foods to their point of purchase.[262] Participant responses suggest that consumers systematically underestimate the carbon intensity of food production and transportation—an underestimation that is likely to affect their food choices.[263] The good news is that a straightforward choice architectural tweak can overcome the observed information gap and nudge consumers toward more carbon-friendly food choices.

In their second experiment, the Australian-American research team asked participants to choose from among a set of food items. For the control group, food options were described by name, image, serving size, price, calories, and nutrient information. In the treatment condition, this information was complemented by a carbon label to illustrate the carbon intensity of each food item. For ease of processing,[264] the label translated greenhouse gas emissions into equivalent light-bulb minutes while also situating the food item's carbon intensity on a green-to-red scale relative to other products in the same category.[265] The observed results confirm the power of climate nudges, with participants in the treatment condition choosing less carbon-intensive foods more frequently than their counterparts in the control condition.[266]

Controlled lab experiments are prone to certain shortcomings and do not always replicate in the real world.[267] Still, the overall magnitude and high statistical significance of the observed effect suggest that, at a minimum, further exploration via real-world field studies is in order. In the researchers' own somber words, "our promising observations warrant replication outside a laboratory setting."[268]

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[261] *See* Camilleri et al., *supra* note 7, at 54–55 (discussing consumer awareness of products' climate impacts, and the effects of labeling on consumer behavior).

[262] *Id*.

[263] *Id.* at 54 ("The substantial underestimation of the environmental impact of the food's life cycle is likely to be reflected in consumers' food choices.").

[264] *See supra* Section I.A (emphasizing that information should be presented to its audience in an easy to understand fashion).

[265] *See* Camilleri et al., *supra* note 7, at 54–55 (discussing the design of both studies).

[266] *Id.* at 57 fig.3.

[267] *See, e.g.*, Sunstein & Reisch, *supra* note 181, at 41 ("Experimental results should be taken with many grains of salt, because they may not predict actual behaviour, but they can be informative . . . ." (footnote omitted) (citing George Loewenstein, Cass R. Sunstein & Russell Golman, *Disclosure: Psychology Changes Everything*, 6 ANN. REV. ECON. 391 (2014))).

[268] Camilleri, et al., *supra* note 7, at 55 (reporting statistical significance of p=0.007).

The idea of carbon labeling is not new.[269] A number of developed nations across the Americas, Asia, and Europe have introduced carbon labels in a variety of formats, albeit with mixed results.[270] The food sector is especially attractive for carbon labeling, not only because of its sizeable contribution to global greenhouse gas emissions, but also because studies indicate actual consumer demand for carbon labels.[271] Mixed results to date are largely a function of label design that makes information processing unduly difficult for consumers.[272] The Australian-American lab experiments remind us not to mistake flawed implementation for failure of concept. Drawing from the choice architect's rich toolkit, properly designed, easy-to-digest carbon labels can nudge consumers toward more climate-friendly dietary choices.

III. Nudge Policies and Their Discontents

For all their well-documented success and bipartisan approval, nudge policies are not without discontents. Critics question both the efficacy and the ethics of choice architectural interventions. Section A discusses the former criticism, [273] whereas Section B discusses the latter concerns.[274]

A. Efficacy Doubts

The literature has long recognized that the efficacy of choice architectural interventions is impossible to judge in the abstract. Whether, when, and how nudges work depends on the target audience, the decision in question, and a wide range of other factors. Some nudges work well toward a given objective

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[269] *See, e.g.*, Michael P. Vandenbergh, Thomas Dietz & Paul C. Stern, Commentary, *Time to Try Carbon Labelling*, 1 Nature Climate Change 4, 4 (2011).

[270] *See* Tiantian Liu, Qunwei Wang & Bin Su, *A Review of Carbon Labeling: Standards, Implementation, and Impact*, 53 Renewable & Sustainable Energy Revs. 68, 72–76 (2016) (surveying carbon labeling initiatives across 9 different countries).

[271] *See* Meike Guenther, Caroline M. Saunders & Peter R. Tait, *Carbon Labeling and Consumer Attitudes*, 3 Carbon Mgmt. 445, 452 (2012) (reporting consumer preference for carbon labels based on survey experiments in Japan and the United Kingdom); Hanna Hartikainen, Taneli Roininen, Juha-Matti Katajajuuri & Hannele Pulkkinen, *Finnish Consumer Perceptions of Carbon Footprints and Carbon Labelling of Food Products*, 73 J. Cleaner Prod. 285, 285 (2014) (same for Finnish consumers).

[272] *See* Klaus G. Grunert, Sophie Hieke & Josephine Wills, *Sustainability Labels on Food Products: Consumer Motivation, Understanding and Use*, 44 Food Pol'y 177, 187–88 (2014) (reporting limited impact of certain labels on food choices, even among consumers who expressed concern over the sustainability of food).

[273] *See infra* notes 275–296 and accompanying text.

[274] *See infra* notes 297–322 and accompanying text.

whereas others prove ineffective and, in some cases, even counterproductive.[275]

A 2015 federal mailing campaign illustrates the fine line between effective and ineffective nudges. The Obama administration had sent out various versions of behaviorally designed letters to encourage the American public to sign up for health insurance through the Federal Health Insurance Marketplace.[276] Letters using "action language, an implementation intention, and a picture" produced significantly higher enrollment, whereas the social norm-based variant of these letters, referencing the millions of Americans already enrolled, failed to increase the rate of enrollment.[277]

A California energy-conservation program similarly illustrates the potential for nudges to backfire, not only failing to achieve the desired positive impact but instead producing a countervailing negative effect, at least among part of the target audience.[278] A local utility company had sent energy reports to households informing them how their energy use compared to that of their neighbors. Democrats and environmentalists responded to these mailings by lowering their energy consumption, whereas Republicans showed the opposite reaction, increasing air conditioning use and keeping the lights on, driving their energy usage up instead of down.[279]

Even default enrollment of organ donors, often considered a poster child example for successful nudging,[280] has proven counterproductive on at least one occasion. In 2016, the Dutch legislature enacted a highly publicized law to change the procedure for enrollment in organ donation from one requiring ex-

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[275] *See* Sunstein, *supra* note 210, at 5 ("[N]o one should deny that some nudges are ineffective or counterproductive." (citing EXEC. OFF. OF THE PRESIDENT, NAT'L SCI. & TECH. COUNCIL, *supra* note 102)).

[276] For background on the Federal Health Insurance Marketplace and the Affordable Care Act, see generally Martha Minow, *Affordable Convergence: "Reasonable Interpretation" and the Affordable Care Act*, 126 HARV. L. REV. 117 (2012); Tom Baker, *Health Insurance, Risk, and Responsibility After the Patient Protection and Affordable Care Act*, 159 U. PA. L. REV. 1577 (2011).

[277] *See* EXEC. OFF. OF THE PRESIDENT, NAT'L SCI. & TECH. COUNCIL, *supra* note 102, at 38. Social norm-based letters that compared medical providers with unusually high drug prescribing rates to the national average proved similarly ineffective at reducing drug prescription rates. *Id.* at 17.

[278] *See* Ray Fisman, *Nudges Gone Wrong*, SLATE (Apr. 23, 2010), https://slate.com/business/2010/04/a-program-designed-to-reduce-energy-consumption-persuaded-some-republicans-to-consume-more.html [https://perma.cc/KK5X-4YL5].

[279] *Id.*; *see also* Dora L. Costa & Matthew E. Kahn, *Energy Conservation "Nudges" and Environmentalist Ideology: Evidence from a Randomized Residential Electricity Field Experiment*, 11 J. EUR. ECON. ASS'N 680, 681 (2013) ("We find that the effectiveness of energy conservation 'nudges' depends on an individual's ideology.").

[280] *See* Johnson & Goldstein, *supra* note 70, at 1338 (illustrating the difference in rates of consent between opt-in and opt-out jurisdictions).

press consent to one of presumed consent.[281] Under the new regime, residents were automatically considered organ donors unless they took action to opt out. Even before the bill went into effect, roughly forty times more residents registered as non-donors than had done so in previous months.[282] This unexpected backlash illustrates just how context-dependent the success of choice architectural campaigns is, prompting observers to muse whether the Dutch public "may have construed the change (or proposed change) in choice architecture as an attempt at coercion by their government."[283]

Even the world's most famous choice architects—the United Kingdom's Nudge Unit—openly acknowledge the difficulties of predicting the impact of specific nudges.[284] Since its establishment ten years ago, the Nudge Unit has pursued a trial-and-error approach with iterative learning to test whether and what choice architectural tweaks best nudge stakeholders toward the British government's public policy objectives before large-scale deployment of the most successful nudges.[285]

A recent meta-analysis of behaviorally informed interventions posits that nudges fail more frequently than is commonly known and that these failures provide valuable lessons for choice architects.[286] Already, the literature has identified a range of impediments for effective choice architecture, from strong antecedent preferences to "counter-nudges" by entities whose vested interests may be threatened by the nudge in question.[287] Others have developed a checklist of questions to help choice architects anticipate, and address, contrarian reactions from decision-makers.[288] These challenges, and the insights they

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[281] *See* Job M.T. Krijnen, David Tannenbaum & Craig R. Fox, Essay, *Choice Architecture 2.0: Behavioral Policy as an Implicit Social Interaction*, 3 BEHAV. SCI. & POL'Y, no. 2, 2017, at 1, 2 (reporting the Dutch legislature's failed attempt at nudging the local citizenry toward organ donation).

[282] *Id.* at 2 & n.A (citing the Dutch authorities' confirmation of the dramatic spike in non-donor registration); *see also Disappointing Donor Week: Majority of Dutch Say "No" to Being an Organ Donor*, NETH. TIMES (Oct. 19, 2016), https://nltimes.nl/2016/10/19/disappointing-donor-week-majority-dutch-say-organ-donor [https://perma.cc/8DKM-PG3P] (detailing how, in 2016, "[f]or the first time ever more Dutch said 'no' to being an organ during Donor week than 'yes'").

[283] Krijnen et al., *supra* note 281, at 2.

[284] *See* HALPERN, *supra* note 94, at 180–81.

[285] *See* HALLSWORTH ET AL., *supra* note 97, at 3, 12, 45 (discussing in more detail the team's rationale).

[286] *See* Magda Osman, Scott McLachlan, Norman Fenton, Martin Neil et al., Opinion, *Learning from Behavioural Changes That Fail*, 24 TRENDS COGNITIVE SCI. 969, 970 (2020) ("[T]here are several causal scenarios and conditions that can lead to different kinds of failure."); *see also* Sunstein, *supra* note 210, at 6 ("[F]ailure is instructive and on balance should be welcomed . . . .").

[287] *See* Sunstein, *supra* note 210, at 8–13 (discussing the example of banks pushing back against behaviorally informed regulation requiring changes to the process of enrollment in lucrative overdraft protection programs).

[288] *See* Krijnen et al., *supra* note 281, at 10–11 (urging choice architects to probe into the meaning of proposed nudges to decision-makers based on their preference uncertainty, distrust toward the

produce, should not be misconstrued as a wholesale failure of choice architecture. Rather, they illustrate the reality that, when it comes to nudges, one size most certainly does not fit all. Some policy objectives are best, if not exclusively, pursued by regulatory mandates and other heavy-handed interventions. Others may better lend themselves to a carrots-rather-than-sticks approach, calling for economic incentives.[289]

The Nudge Unit's trial-and-error approach is practiced by governments around the world, even if regulators may not always care to admit as much. Many statutes expressly incorporate the principle of proportionality, requiring that regulators resort to the least intrusive measure capable of achieving the statutory objectives.[290] The Toxic Substances Control Act of 1976, for example, explicitly mandated that regulators adopt the "least burdensome" measure that would "protect adequately" against the health risks in question.[291] The catalog of sample measures listed under the same provision requires that warnings, labels, and other choice-preserving informational nudges be considered first, before more restrictive command-and-control measures can be adopted.[292] Professor Sunstein reminds us that, in the context of choice architecture:

> [w]hat matters is welfare, not effectiveness . . . . A strong reason for nudges, as distinguished from more aggressive tools, is that they preserve freedom of choice and thus allow people to go their own way. In many contexts, that is indeed a virtue, and the ineffectiveness of nudges, for some or many, is nothing to lament.[293]

The preceding discussion illustrates why nudges are best viewed as complements to, not substitutes for other regulatory options, from market-based incentives to command-and-control measures. There will always be policy domains that require more forceful interventions than choice architectural tweaks

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choice architect, the importance of the decision in question, the degree of change imposed by the intervention, and the transparency of communicating the nudge in question).

[289] *See* Brian Galle, *The Tragedy of the Carrots: Economics and Politics in the Choice of Price Instruments*, 64 STAN. L. REV. 797, 809–813 (2012) (discussing the relative advantages, and disadvantages, of carrots and sticks from a policymaking perspective).

[290] For an insightful summary of the origins and scope of the principle of proportionality, see Alice Ristroph, *Proportionality as a Principle of Limited Government*, 55 DUKE L.J. 263, 292–97 (2005).

[291] Toxic Substances Control Act of 1976, Pub. L. No. 94-469, § 6(a), 90 Stat. 2003, 2020 (1976) (current version at 15 U.S.C. § 2605(a)).

[292] *See id.* § 6(a)(3); *see also* Corrosion Proof Fittings v. Env't Prot. Agency, 947 F.2d 1201, 1216 (5th Cir. 1991) (describing how the Environmental Protection Agency considered and rejected options such as labeling asbestos products before eventually adopting a wholesale ban of asbestos products).

[293] Sunstein, *supra* note 210, at 22 (citation omitted) (citing CASS R. SUNSTEIN, THE ETHICS OF INFLUENCE: GOVERNMENT IN THE AGE OF BEHAVIORAL SCIENCE (2016)).

that, by definition, leave the ultimate decision to the stakeholder in question.[294] Climate change has been aptly characterized as a "super wicked problem" that defies resolution because of the vast web of uncertainties, interdependencies, circularities, and conflicting stakeholder interests that are involved in any attempt at developing a solution.[295] The conflicting interests that divide stakeholders alone should give pause to anyone thinking the climate crisis can be resolved solely through behavioral interventions. Add to that the extreme urgency and daunting scope of the challenge at hand and it becomes obvious why climate nudges should be viewed as but one type of many policy tools to be deployed. In the words of Nobel Laureate Richard Thaler: "We can't solve climate change with nudging, but we can't solve it without nudging."[296]

B. Ethical Concerns

A burgeoning literature engages with the ethical concerns surrounding the use of nudges by policymakers.[297] Opponents condemn nudge policies as paternalistic government interventions with potentially adverse effects on the autonomy and welfare of decision-makers.[298] Proponents emphasize the overall choice-preserving nature of nudges, classifying such choice architecture as a libertarian form of paternalism,[299] albeit with limited success at persua-

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[294] *See* THALER & SUNSTEIN, *supra* note 16, at 8 ("Nudges are not . . . mandates.").

[295] *See* Richard J. Lazarus, *Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*, 94 CORNELL L. REV. 1153, 1159–60 (2009) (adding time pressure, lack of institutional framework, and other exacerbating traits of the climate crisis).

[296] Stephen J. Dubner, *All You Need Is Nudge*, FREAKONOMICS RADIO (Sept. 8, 2021), https://freakonomics.com/podcast/all-you-need-is-nudge/ [https://perma.cc/KDN3-N7PN].

[297] A comprehensive, in-depth engagement with the rich and fast-growing literature on the ethics of nudging would require its own article, if not an entire book. *See generally* RICCARDO REBONATO, TAKING LIBERTIES: A CRITICAL EXAMINATION OF LIBERTARIAN PATERNALISM (2012) (arguing against nudge policies as a form of government paternalism); SUNSTEIN, *supra* note 293 (defending nudge policies). In keeping with this Article's topical framing and focus, the following discussion is limited to a stylized account of the primary competing arguments on both sides of the debate.

[298] *See, e.g.*, Wright & Ginsburg, *supra* note 33, at 1069–75 (criticizing choice architecture as "infantiliz[ing] the public"); Jeffrey J. Rachlinski, *The Uncertain Psychological Case for Paternalism*, 97 NW. U. L. REV. 1165, 1222–23 (2003) ("Restructuring a decision to avoid erroneous heuristics comes at a price, however it is accomplished."); Claire A. Hill, *Anti-anti-anti-paternalism*, 2 N.Y.U. J.L. & LIBERTY 444, 445–48 (2007) (arguing that generally the government should not make choices for people, because it is ill-equipped to understand what people truly want); Glaeser, *supra* note 33, at 150–56 (similar).

[299] *See, e.g.*, Cass R. Sunstein & Richard H. Thaler, *Libertarian Paternalism Is Not an Oxymoron*, 70 U. CHI. L. REV. 1159, 1160–66 (2003) (arguing that nudges are "libertarian in spirit" because they allow people the freedom to make choices); Colin Camerer, Samuel Issacharoff, George Loewenstein, Ted O'Donoghue et al., *Regulation for Conservatives: Behavioral Economics and the Case for "Asymmetric Paternalism,"* 151 U. PA. L. REV. 1211, 1211–14 (2003) (similar).

sion.[300] Nudge advocate-in-chief Cass Sunstein and others stress the ubiquity and, hence, inevitability of choice architecture. This line of reasoning highlights the reality that every decision we make takes place in a choice environment that already exists, from the product shelving in supermarkets to the food listings on a menu. Moreover, constitutions, rules of contract, property, and tort all establish a form of choice architecture for social ordering.[301] Indeed, even weather has been shown to affect human decision-making, yet few would vilify nature for nudging.[302] Nudge policies do not create novel choice architecture where there previously was none; they merely seek to modify existing choice environments that already affect our decision-making. In Sunstein's words, "choice architecture is inevitable."[303]

A second, more nuanced caveat cautions against too much abstraction and lumping all types of nudge policies together for purposes of ethical evaluation. The paternalism critique does not apply with equal force to the three classes of choice architecture laid out in this Article.[304] Default rules and similar tweaks to the decision structure[305] that seek to guide a stakeholder's decision-making in a certain pre-determined direction are inherently value-laden.[306] Nudge critics understandably argue that choice architects cannot possibly know in every instance what the best choice option is for every decision-maker.[307] Default enrollment in a green electricity plan, often at the expense of higher utility rates, is unlikely to prove welfare-enhancing to a ratepayer that denies the reality of anthropogenic

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[300] *See, e.g.*, Gregory Mitchell, Essay, *Libertarian Paternalism Is an Oxymoron*, 99 NW. U. L. REV. 1245, 1246–48 (2005) ("Sunstein and Thaler's libertarian paternalism surrenders too much libertarian ground to the paternalist."); Heidi M. Hurd, *Fudging Nudging: Why 'Libertarian Paternalism' Is the Contradiction It Claims It's Not*, 14 GEO. J.L. & PUB. POL'Y 703, 704–09 (2016) (similar); MARK D. WHITE, THE MANIPULATION OF CHOICE: ETHICS AND LIBERTARIAN PATERNALISM, at xiii–xv (2013).

[301] Cass R. Sunstein, *The Ethics of Nudging*, 32 YALE J. ON REG. 413, 421 (2015).

[302] *See, e.g.*, David Hirshleifer & Tyler Shumway, *Good Day Sunshine: Stock Returns and the Weather*, 58 J. FIN. 1009, 1028 (2003) (finding a strong correlation between morning sunshine in the city of a country's leading stock exchange and that day's stock returns); Anna Bassi, Riccardo Colacito & Paolo Fulghieri, *'O Sole Mio: An Experimental Analysis of Weather and Risk Attitudes in Financial Decisions*, 26 REV. FIN. STUD. 1824, 1845 (2013) (offering experimental evidence of sunshine and good weather increasing risk tolerance among investors).

[303] Sunstein, *supra* note 301, at 421; *see also* Carrico et al., *supra* note 18, at 64 (noting that "current policies (or the lack thereof)" effectively nudge stakeholders).

[304] *See supra* Part I (adopting a functionally derived, tripartite taxonomy of choice architectural interventions).

[305] *See supra* Section I.B.

[306] *See* Amir & Lobel, *supra* note 17, at 2120–24 (discussing the inherently value-based nature of certain nudges).

[307] *See* JOHN STUART MILL, ON LIBERTY 74 (Elizabeth Rapaport ed., Hackett Publ'g Co. 1978) (1859) ("The interference of society to overrule [a person's] judgment and purposes in what only regards [they themselves] must be grounded on general presumptions which may be altogether wrong and, even if right, are as likely as not to be misapplied to individual cases . . . .").

climate change.[308] Similarly, default registration as an organ donor will reduce, not enhance the welfare of a citizen whose religious beliefs prohibit any medical procedures on her body, dead or alive.[309] It is hard to dispute, therefore, the critique that default rules and similar directionally weighted nudges constitute a form of paternalism that, by definition, will not be universally welfare-enhancing. Then again, pareto optimality in the sense of making everyone better off and no one worse off is beyond the reach of virtually all law and policy.[310]

The same paternalism critique cannot, however, be extended to all types of choice architecture. Behaviorally informed tweaks employed at the decision-information stage, for example, provide stakeholders with more decision-relevant information packaged in an intuitive format, without tipping the scales in favor of one outcome over another.[311] Such open-ended choice architecture arguably increases both the autonomy and welfare of stakeholders who become empowered to make more informed choices. News reports that present U.S. citizens with global warming information denoted in degrees Fahrenheit, rather than Celsius, do not decide for their readers what, if any, climate action they should take.[312] Such reporting merely makes it easier for readers to make up their own minds thanks to readily digestible information. Similarly, fuel-economy labels that help car buyers better understand the potential savings a new vehicle offers at the gas pump have no adverse impact on the buyers' autonomy.[313] If anything, easier access to decision-relevant information increases stakeholder autonomy and, with it, the ability to make welfare-enhancing choices.

Choice architectural interventions at the decision-assistance stage register along the paternalism spectrum somewhere between default rules and informational nudges.[314] Unlike default rules, such commitment tools do not nudge stakeholders toward a preferred outcome but, rather, come into play after a decision has been made, presumably free from any outcome-oriented nudges. At the same time, choice architectural decision assistance goes beyond mere decision information as the attendant nudges seek to increase the stickiness of a stakeholder's previous commitment. The resulting obstacles to changing one's

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[308] *See supra* notes 162–164 and accompanying text.

[309] *See* Johnson & Goldstein, *supra* note 70, at 1338 (finding that around 80% of people consent to organ donation when it is the default option, compared with around 40% consent when people must affirmatively choose to donate).

[310] *See, e.g.*, Guido Calabresi, *The Pointlessness of Pareto: Carrying Coase Further*, 100 YALE L.J. 1211, 1212 (1991) (noting that all policy choices "disadvantag[e] at least someone").

[311] *See supra* Section I.A.

[312] *See supra* notes 249–256 and accompanying text.

[313] *See supra* notes 58–59 and accompanying text.

[314] *See supra* Section I.C.

mind and reversing course could be viewed as a restriction of the stakeholder's autonomy, albeit a restriction the stakeholder chose.

The ethics case for informational choice architecture is especially strong when such measures seek to remedy externalities and other market failures. This follows *a fortiori* from the general approval of more draconian regulatory measures to correct market failures.[315] With their profoundly negative impact on social welfare, the greenhouse gas emissions that drive global warming represent not only one of the most daunting challenges of our time. They are also a poster child example of market failure by externality. Accordingly, even the most fervent nudge critics would struggle to find fault with the type of externality-oriented, educative climate choice architecture proposed in this Article.[316]

Informational climate nudges not only avoid much of the criticism traditionally leveled against behavioral interventions. They further have the capacity to mitigate burgeoning concerns over the equity and justice impacts of climate policy and action. Critics have long lamented that policymakers should not be in the business of picking winners and losers among competing carbon-relevant technologies.[317] More recent scholarship has expanded this narrative beyond the realm of technology to capture the disparate distributional effects of climate and clean energy policies on a wide set of stakeholders, identifying winners and losers among taxpayers, ratepayers, and other constituents.[318] The literature overwhelmingly blames "byzantine process[es]" and other democratic deficits for the substantive inequities created, or exacerbated, by climate policy.[319] Reform proposals seek to promote more widespread participation of the public in the deliberations and decisions about how to address global warming and climate change best.[320] In tune with these proposals and the gen-

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[315] *See* BREYER, *supra* note 34, at 15 ("The *justification* for [regulatory] intervention arises out of an alleged inability of the marketplace to deal with particular structural problems.").

[316] *See* Galle, *supra* note 35, at 872, 890–92 (making a persuasive case for greater reliance on "climate nudges," broadly construed).

[317] *See* Zachary Liscow & Quentin Karpilow, *Innovation Snowballing and Climate Law*, 95 WASH. U. L. REV. 387, 429, 435–36 (2017) (describing the well-established narrative of public policy support for low-carbon technologies picking winners and losers).

[318] *See* Felix Mormann, *Clean Energy Equity*, 2019 UTAH L. REV. 335, 338 ("Today's crop of clean energy policies creates winners and losers not only across competing technologies but also among ratepayers, taxpayers, and other stakeholders." (footnote omitted) (citing Liscow & Karpilow, *supra* note 317)).

[319] Shelley Welton & Joel Eisen, *Clean Energy Justice: Charting an Emerging Agenda*, 43 HARV. ENV'T L. REV. 307, 322 (2019); *see also* Uma Outka, *Fairness in the Low-Carbon Shift: Learning from Environmental Justice*, 82 BROOK. L. REV. 789, 789–92 (2017) (exploring the linkage between climate change and environmental and energy justice); Sharon B. Jacobs, *Agency Genesis and the Energy Transition*, 121 COLUM. L. REV. 835, 889 (2021) (noting that "[b]arriers to stakeholder participation" are especially problematic in the transition to a low-carbon energy economy).

[320] *See, e.g.*, Welton, *supra* note 258, at 59 (urging "more granular thinking around how to involve people in the project of decarbonization"); Mormann, *supra* note 318, at 376 (proposing a more

eral zeitgeist they reflect, the Federal Energy Regulatory Commission recently created a new Office of Public Participation to foster better access to and participation in its proceedings, including on the nation's transition to a low-carbon energy economy.[321] Climate nudges can help support and advance such top-down institutional change by empowering more informed bottom-up decision-making from a broad range of stakeholders, whose collective carbon footprint covers nearly half of U.S. greenhouse gas emissions.[322]

CONCLUSION

As droughts, floods, hurricanes, and other extreme weather events ravage the planet with ever greater frequency and severity, global warming forces us to change how and, in some cases, even where we live. In addition to these unplanned, often hasty and improvised adjustments, successful management of the climate crisis requires strategic and proactive behavioral change at unprecedented scale. From what we eat to when we do laundry, the dictates of climate change urge us to rethink and revise deeply engrained habits.

This Article offers a functionally derived, impact-oriented taxonomy of choice architecture to help policymakers and private actors identify the behavioral tools that best serve their climate objectives. The case for climate choice architecture is strong across multiple dimensions. Behaviorally informed policies have proven highly effective at nudging decision-makers toward welfare-enhancing choices in a wide range of contexts. Along the way, nudge campaigns have created rare common ground amidst polarized partisan politics, earning the approval of Democrats and Republicans alike. Even still, choice architecture should not, and cannot, altogether replace other, more traditional regulatory responses to the climate crisis. Properly integrated into a broader suite of policies, however, climate choice architecture improves the efficacy, efficiency, and equity of public policy and delivers more impactful private governance action on climate change.

The ethics of nudges have been the subject of heated debate as opponents decry nudging as a paternalistic wolf in sheep's clothing. But the paternalism argument holds little water with the climate choice architecture envisioned in this Article. Even the most outspoken critics struggle to find fault with the use of nudges to remedy market failures, such as the disastrous social and envi-

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polycentric approach to climate governance as a catalyst for greater procedural and substantive climate justice).

[321] News Release, FERC Establishes Office of Public Participation, Fed. Energy Regul. Comm'n (June 24, 2021), https://www.ferc.gov/news-events/news/ferc-establishes-office-public-participation [https://perma.cc/AT2X-XFDR].

[322] *See* Bin & Dowlatabadi, *supra* note 8, at 197 (noting that individuals are responsible for around 41% of U.S. carbon dioxide emissions).

ronmental externalities imposed by greenhouse gas emissions. Moreover, climate choice architecture can mitigate growing concern over the equity and justice of climate policy by turning previously passive stakeholders into active decision-makers along the path to a low-carbon economy.

The time has come to harness the power of nudges at both the institutional and individual level, in public and private governance responses to the climate crisis. It is time to deploy the vast potential of climate choice architecture as a force for good in the war on carbon.