Scott **Kaplan**

Department of Economics
United States Naval Academy

352 Michelson Hall
Annapolis, MD 21402
skaplan@usna.edu
www.scottkaplan.org
@skaplan92
(818) 903-8517

Employment

From 2021 **Assistant Professor of Economics**, United States Naval Academy

Education

2021 **Ph.D.**, *Agricultural and Resource Economics*, University of California, Berkeley
Dissertation committee: David Zilberman (Co-Chair), James Sallee (Co-Chair), Benjamin Handel, Sofia Villas-Boas

2017 **M.S.**, *Agricultural and Resource Economics*, University of California, Berkeley

2014 **B.S. (with honors)**, *Environmental Sciences; Environmental Economics and Policy*, University of California, Berkeley

Research

Refereed publications

2020 **Willingness to Pay vs. Willingness to Vote: Consumer and Voter Avoidance of Genetically Modified Foods**,
American Journal of Agricultural Economics, 102 (2), 505-24, 2020. (with David Zilberman and Gina Waterfield)

Many technologies face disapproval from some portion of the general public due to perceived risks or externalities. Individuals can respond to these controversial technologies as consumers by choosing favorable alternatives and as voters by supporting regulation. We examine the relationship between willingness to pay a premium for products that avoid a controversial technology and willingness to vote in favor of a ban or mandatory labeling, focusing on how this relationship is influenced by income and perceived risks. In a survey regarding genetically modified (GM) food, we find that the majority of respondents make consumer and voter choices that can be explained by a standard utility maximization framework. However, certain respondent characteristics are correlated with inconsistent choice patterns. In particular, low-income voters are overly supportive of regulation relative to their private willingness to pay. Voters who are uncertain about the safety of GM food also tend to be more in favor of regulation than their consumer choices would imply.

Hindered Growth,
Journal of Economic Dynamics and Control, 111: 103807, 2020. (with Moshe Elitzur and David Zilberman)

We develop a formalism to extract the exponential component from a growth process and describe the remainder with the optimal number of parameters. The method is demonstrated analyzing the time variation of Gross Domestic Product (GDP) and population in the US and UK, two nations with continuous data coverage going back more than 200 years. For each of the four datasets we find a successful description, with the deviation of long-term growth from a pure exponential requiring no more than a single free parameter; there is no significant gain from adding more parameters. We find persistent longterm growth patterns, consistent with Jones (1995) and showing directly from the data that population and GDP growth in different countries may follow different trajectories, illuminating their intrinsic differences.

The political economy of COVID-19,
Applied Economic Perspectives and Policy, 2020. (with David Zilberman and Jacob Lefler)
Our analysis suggests that strict shelter-in-place measures introduced in the U.S. were reasonable based on initial estimates of risk to life. Using U.S. and global data, we find that mortality risk tends to be higher in locations with older populations, higher population densities, colder winter weather, and higher travel rates. Our estimation and examination of the raw data suggest that some developing countries have lower mortality risks than developed countries. These findings lead us to question the draconian social isolation policies in India, and other developing countries and suggest that political economic considerations may rationalize these policies. We also find that there has been underinvestment in prevention and mitigation that could have reduced the cost of adaptation and suggest that there is a lesson for climate change policies.

Recycling policies, behavior and convenience: Survey evidence from the CalRecycle program,
Applied Economic Perspectives and Policy, 2020. (with Peter Berck, Gabriel Englander, Samantha Gold, Shelley He, Janet Horsager, Molly Sears, Andrew Stevens, Carly Trachtman, Rebecca Taylor, and Sofia Villas-Boas)
A deposit-refund system, called the California Redemption Value (CRV) payment, was established in 1987, as part of AB2020, to increase recycling rates on eligible beverage containers purchased in California. After paying an initial tax, the consumer may return empty containers to a state-certified recycling center for a refund. To provide for convenient recycling without having retailers handle bottles, AB2020 also establishes convenience zones and requires that there be a recycling center, co-located with a supermarket within each zone. We empirically investigate how consumers define convenience in recycling opportunities and who recycles from data collected by us from conducting two surveys. The first survey discusses purchasing behavior, convenience, and all disposal methods, for a representative sample of 1000 households in California. The second survey focuses on recycling center users, with 628 surveys conducted at 88 randomly selected recycling centers throughout California. Surveyors asked recyclers questions regarding their recycling habits, sources of containers, and convenience, and requested a copy of their receipt for accurate data on recycling volume. Using these two surveys we (i) investigate the interaction between subsidies for certain types of recycling centers, the number of centers, and recycling behavior, (ii) delineate what makes recycling convenient in the eyes of consumers, (iii) estimate simulated behavior under alternative policy changes pertaining to the level of CRV, and (iv) provide estimates of diversion from trash and curbside disposal to recycling center return. We find that recycling centers located within convenience zones are not considered to be especially convenient by recyclers, often due to limited operating hours and use of cash vouchers. Consumers prioritize recycling centers that are nearby, have flexible operating hours, and short waiting times. While the CRV is inducing people to recycle, we find that an increase in the CRV would not lead to major increases in recycling, due to the small number of containers that enter trash streams. Finally, our best estimates suggest that a majority of diversion comes from trash streams, rather than curbside recycling.

2019 **Soda Wars: The Effect of a Soda Tax Election on University Beverage Sales**,
Economic Inquiry, 57 (3), 1480-96, 2019. (with Rebecca Taylor, Sofia Villas-Boas and Kevin Jung)
We examine how soda sales changed due to the campaign attention and election outcome of a local excise tax on sugar-sweetened beverages. Using panel data of beverage sales from university retailers in Berkeley, CA, we estimate that soda purchases relative to control beverages significantly dropped immediately after the election, months before the tax was implemented in the city of Berkeley or on campus. Supplemental scanner data from off-campus retailers reveal this result is not unique to the university setting. Our findings suggest media coverage and election outcomes can have larger effects on purchasing behavior than the tax itself.

The Future of Autonomous Vehicles: Lessons from the Literature on Technology Adoption,
Applied Economic Perspectives and Policy, 41 (4), 583-97, 2019. (with Ben Gordon, Feras El-Zarwi, Joan Walker, and David Zilberman)

The introduction and adoption of autonomous vehicles (AVs) will likely reshape the transportation system and many economic activities. The economic literature on technology adoption provides lessons on the diffusion of AVs and its social and economic impacts. We rely on the threshold model of diffusion, where heterogeneous agents make decisions pursuing their self-interests. We find that private ownership of AVs may prevail after a transition period, as was the case in other technologies like computers, tractors, and conventional vehicles. With technological progress, the cost of privately owning AVs may decline. Additionally, there will be an increase in vehicle miles traveled (VMT) per capita, there may be more vehicles on the road, and perhaps the transportation user-base will expand to include those currently facing limited mobility. Congestion is likely to depend on the tradeoff between the expansion of VMT and increased efficiency of AVs to communicate and help regulate traffic. Furthermore, differentiation of vehicles will increase as driving time becomes freed for other activities. These trends may lead to increased greenhouse gas emissions and expansion of the transportation sector. Finally, the technology will evolve and may result in complementary innovations needing to be addressed, including the "last 10 feet" problem. It is evident that the future of the transportation system governed by AVs is most likely not going to be sustainable. This necessitates the importance of developing and enforcing rigorous policies at the metropolitan level and TNC levels to ensure a sustainable evolution of the future of transportation mobility.

2018 **The Political Economy of Labeling**,
Food Policy, 78, 6-13, 2018. (with Ben Gordon and David Zilberman)

Labeling arrangements are introduced to provide information and affect market outcomes. Mandatory labeling of products like genetically-modified organisms (GMOs) is subject to controversy and political debate. The exact outcome depends on the specific public decision-making process (direct vote by the public vs. voting by representatives), the political power distribution among groups, and the workings of legislative and regulatory processes. This paper presents a conceptual framework to assess the welfare implications of labeling decisions that are decided by political processes. We identify conditions under which there are gains from mandatory labeling compared to no labeling, and find that the gain from passing a mandatory labeling proposition is larger if the voluntary labeling option is not available. The conclusions suggest that when mandatory labeling is not feasible politically, promoters of labeling will introduce voluntary labeling. The paper uses the results of this conceptual framework to analyze different case studies of labeling propositions, including Proposition 37 that was voted on in California in 2012. The findings suggest that labeling decisions may evolve with new scientific knowledge, new information technologies, and changing attitudes.

2015* **The Loss from Underutilizing GM Technologies**,
Agbioforum, 18 (3), 312-19, 2015. (with Justus Wesseler and David Zilberman)

The Political Economy of Biotechnology,
German Journal of Agricultural Economics, 64 (2), 212-23, 2015. (with Gregory Graff, Gal Hochman, and David Zilberman)

2014* **Biotechnology and Food Security**,
Journal of International Affairs, 67 (2), 91-107, 2014. (with Geoffrey Barrows, Eunice Kim, Steven Sexton, and David Zilberman)

2013* **Continents Divided: Understanding Differences on GM Acceptance between Europe and North America**,
GM Crops and Food: Biotechnology in Agriculture and the Food Chain, 4 (3), 1-7, 2013. (with Gregory Graff, Gal Hochman, Eunice Kim, and David Zilberman)

Technology and the Future Bioeconomy,
Agricultural Economics, 44 (s1), 95-102, 2013. (with Eunice Kim, Sam Kirschner, Jeanne Reeves, and David Zilberman)

2012* **Biofuel and Food-Commodity Prices**,
Agriculture, 2 (3), 272-81, 2012. (with Gal Hochman, Deepak Rajagopal, and David Zilberman)

*Pre-Graduate School

Refereed publications (non-economics)

2020 **Higher Sugar-Sweetened Beverage Retail Prices After Taxation in Oakland and San Francisco**, *American Journal of Public Health*, 110 (7), 1017-23, 2020. (with Jennifer Falbe, Matthew Lee, Nadia Rojas, Alberto Ortega Hinojosa, and Kristine Madsen)

In July 2017 and January 2018, Oakland and San Francisco (SF), CA became two of the largest cities to implement SSB excise taxes (1-cent/fl oz paid by distributors). We examined the extent to which these taxes increased SSB retail prices, an important mechanism for reducing consumption. We collected pre-tax (April-May 2017) and post-tax (April-May 2018) retail prices of SSBs and non-SSBs from 155 stores across Oakland, SF, and comparison cities. Data were analyzed using difference-in-differences high-dimensional fixed effects regressions, weighted by regional beverage sales. Across all beverage sizes, the weighted average price of SSBs increased by 0.92 cents/oz (95%CI: 0.28-1.56) in Oakland and 1.00 (95%CI: 0.35-1.65) in SF, compared to that in untaxed cities. The tax did not significantly alter prices of water, 100% juice, or milk of any size examined. Diet soda only, among non-SSBs, exhibited a higher price increase for some sizes in taxed cities. Within 4-10 months of implementation, Oakland and SF's SSB excise taxes significantly increased SSB retail prices by approximately the amount of the taxes, a key mechanism for reducing consumption.

Working papers

Entertainment Utility from Skill and Thrill,

Job Market Paper, 2021.

This paper uses revealed preference methods to estimate demand for non-instrumental information in entertainment. I do this by examining the "thrill" associated with the trajectory of an event, which includes both suspense and surprise, and the "skill" of performers in an event. I apply the theory presented in Ely et al. (2015, JPE) to conduct an empirical analysis that examines the effect of thrill on consumer attention. I extend the Ely et al. (2015, JPE) framework by examining spectator preferences for characteristics of the performers themselves, which I call "skill." I use game-specific, high-temporal frequency television ratings data from the National Basketball Association (NBA) to measure spectator responses to skill and thrill. First, I find that a doubling of skill present in a game leads to an approximately 11% increase in initial viewer turnout, while the expected thrill of a game has no statistically significant impact. Next, I show that thrill during a game increases viewership by 7-30%, while a doubling of skill on the court during a specific portion of a game leads to a 1.9-2.4% increase in viewership, depending on specification. Interestingly, I find a negative interactive effect between suspense and skill, suggesting that heightened suspense leads to differentially higher viewership with lower skill on the court. The findings suggest that skill of information-conveying agents primarily impacts viewership on the extensive margin (across games), while thrill is highly time-dependent and primarily impacts viewership on the intensive margin (within games). These findings have important implications for entertainment media companies, including leagues and television broadcasters, and advertisers.

The Economic Value of Popularity: Evidence from Superstars in the National Basketball Association,

Revise and Resubmit at Economic Inquiry, 2021.

This paper estimates spectator WTP for superstars in the NBA. Using microdata from an online secondary ticket marketplace and exogenous player absence announcements, I find 4-16% ($7-$42) reductions in prices when superstars are announced to miss games. Additionally, LeBron James and Stephen Curry exhibit even larger impacts in away game absences–21% ($75/ticket) for LeBron and 18% ($55/ticket) for Curry. The results suggest popularity is a more significant determinant of WTP than ability, and in line with existing superstar literature, popularity predicts price impacts convexly. This paper provides a novel methodology to estimate superstar value, generating implications for the entertainment industry.

Estimating worldwide benefits from a genetically improved banana: The use of CRISPR-Cas9 to control Fusarium Wilt Tropical Race 4,
(with Felipe de Figueredo Silva, Freddy Magdama, Matthew D. Potts, Ramon Leonardo Espinel Martinez, and David Zilberman)

A big challenge to agricultural research is enhancing plant resistance for new plant diseases. Plant pathogens emerge sporadically and are a major source of crop production losses. In this paper, we develop a methodology to assess the economic benefits and impacts of developing and commercially introducing a genetically improved crop for an emerging plant disease. This framework incorporates both the dynamics of the spread of the disease as well as the diffusion of the solution in deriving the resulting expected net benefit, as well as its impact on farmers, producers who are affected by the disease, and producers who are not affected. We consider the time lag between the emergence of a disease and the availability of the new technology, which may be affected by regulatory and technical uncertainty. We apply our framework to the global market for bananas, which continues to be heavily impacted by Fusarium oxysporum f.sp. cubense Tropical race 4 (FocTR4). One possible solution to this problem is to use CRISPR-CAS9 gene modification technologies to develop disease-resistant varieties, yet timing of availability is uncertain due to both technological and regulatory uncertainties. We simulate welfare losses in the global market for bananas under different scenarios of disease and adoption of a solution. Our results indicate that without adoption of a solution, welfare losses range from US$ 40-83 billion, but depending on how quickly a solution is adopted, these losses can be reduced by 71-94%. The expected benefit of adopting a solution is equal to $45.37 billion dollars.

The impact of policy on the spread of COVID-19,
Revise and Resubmit at Infectious Disease Modeling, 2021 (with Moshe Elitzur, Zeljko Ivezic, and David Zilberman)

We model COVID-19 data for 89 nations and US states with a recently developed formalism that describes mathematically any pattern of growth with the minimum number of parameters. The results show that the disease has a typical duration of 18 days, with a significant increase in fatality when it lasts longer than about 4 months. Searching for correlations between "flattening of the curve" and preventive public policies, we find strong statistical evidence for the impact of the first implemented policy on decreasing the pandemic growth rate; a delay of one week in implementation nearly triples the size of the infected population, on average. Without any government action, the initial outburst still slows down after 36 days, possibly thanks to changes in public behavior in response to the pandemic toll. Stay-at-home (lockdown) was not the first policy of any sample member and we do not find statistically meaningful evidence for its added impact, similar to a recent study that employed an entirely different approach. However, lockdown was mostly imposed only shortly before the exponential rise was arrested. The possibility remains that lockdown might have shortened significantly the initial exponential rise had it been employed as first, rather than last resort.

Works in progress

The Impact of Bay Area Sugar-Sweetened Beverage Taxes on Consumption and Nutrition,
(with Justin White and Sofia Villas-Boas)

Are consumers willing to pay to avoid price uncertainty? Evidence from the vehicle leasing market,
(with Andy Hultgren and Derek Wolfson)

The impact of environmental quality on recreation: Evidence from secondary ticket marketplace microdata for outdoor professional sporting events,
(with Hal Gordon)

Research presentations

2021 United States Naval Academy

2020 Auburn University; NYU Stern Marketing Seminar; UC Berkeley Haas School of Business Marketing Seminar Series; UC Berkeley IO Seminar Series; North American Association of Sports Economics (NAASE) Annual Meeting; Reading University ROSES Seminar in Sports Economics

2019 Agricultural and Applied Economics Association (AAEA) Annual Meeting; BERCKonomics Memorial Conference

2018 UC Berkeley Environmental and Resource Economics Seminar

2017 21st Annual International Consortium on Applied Bioeconomy Research; Tufts University Future of Food and Nutrition Conference

2016 Agricultural and Applied Economics Association (AAEA) Annual Meeting

Teaching

2021 **Econometrics**, Department of Economics (SE445, United States Naval Academy)

2019 – 2021 **First Time Graduate Student Teaching Workshop**, Graduate Student Instructor Center (UC Berkeley)

2017 – 2020 **Economics "Summer Bootcamp" Lecturer**, Masters of Development Practice (UC Berkeley)

2018 **Introductory Applied Econometrics**, Environmental Economics & Policy (Env. Econ. 118, UC Berkeley)

Teaching Assistant

2018 – 2020 **Economics of Sustainable Resource Development**, Masters of Development Practice (DEVP 222, UC Berkeley)

Media

Media publications

2019 **Preferences for GMOs: Do purchasing patterns differ from voting behavior?**, *ARE Update* (with Gina Waterfield and David Zilberman)

Lessons from Berkeley's sugar-sweetened beverage election and tax, *ARE Update* (with Rebecca Taylor and Sofia Villas-Boas)

Did Zion's 'shoe explosion' actually impact Nike's value?, *Fansided: Nylon Calculus*

2014 **The cost of delaying approval of Golden Rice**, *ARE Update* (with Justus Wesseler and David Zilberman)

The political economy of biofuel, *Choices* (with Gal Hochman, Eunice Kim, and David Zilberman)

An overview of California's agricultural adaptation to climate change, *ARE Update* (with David Zilberman)

Fellowships and prizes

2020 **Graduate Remote Instruction Innovation Fellowship**, UC Berkeley ($4,000)

2019 **Sacheti Family Fellowship**, UC Berkeley ($2,500)

Sloan Sports Analytics Conference: Best Poster Winner, MIT ($500)

2016 – 2018 **National Science Foundation Data Science Fellowhip**, UC Berkeley ($52,000)

2015 **Honorable Mention, Quality of Communication Award (for "An Overview of California's Agricultural Adaptation to Climate Change")**, Agricultural and Applied Economics Association

Earlier **Sponsored Program for Undergraduate Research (SPUR) Grant**, UC Berkeley ($500)

Leadership Scholarship, UC Berkeley ($2000)

Horace Albright Memorial Scholarship, UC Berkeley ($2000)

University and professional service

UC Berkeley, Rausser College of Natural Resources Alumni Board Member (From 2017); Undergraduate Research Apprenticeship Program (URAP) Mentor (2017-20); Graduate Admissions Committee, Department of Agricultural and Resource Economics (2019); Giannini Foundation Agricultural and Resource Economics Student Conference Co-Organizer (2018)

Referee, Economic Inquiry, Agricultural Economics, Applied Economic Perspectives and Policy, Public Health Nutrition, Journal of Sustainable Forestry

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