

Increasing Organ Donor Registration as a Means to Increase Transplantation: An Experiment With Actual Organ Donor Registrations

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The U.S. has a severe shortage of organs for transplant. Recently — inspired by research based on hypothetical choices — jurisdictions have tried to increase organ donor registrations by changing how the registration question is asked. We evaluate these changes with a novel “field-in-the-lab” experiment, in which subjects change their real organ donor status, and with new donor registration data collected from U.S. states. A “yes/no” frame is not more effective than an “opt-in” frame, contradicting conclusions based on hypothetical choices, but other question wording can matter and asking individuals to reconsider their donor status increases registrations.

Over 100,000 people in the United States are currently on a waiting list for a life-saving organ transplant, and every year over 10,000 people die while waiting (Organ Procurement and Transplantation Network, 2022). These patients are waiting for an organ from a deceased donor, an individual whose organs are made available for transplant after their death. Estimates from a recent decade suggest that each year in the U.S. an average of 35,000–40,000 people die in a way that would allow their organs to be transplanted, representing 1.5% of all deaths and 5% of all hospital deaths each year (Organ Procurement and Transplantation Network, 2016).¹ During the same period, however, the U.S. averaged only 7,228 deceased organ donors each year (Organ Procurement and Transplantation Network, 2023).

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¹Estimates of deceased organ donor eligibility provided by UNOS. We calculate eligibility as a percentage of all deaths in the U.S. using data from National Vital Statistics Reports provided by the CDC (see <https://www.cdc.gov/nchs/products/nvsr.htm>, (accessed 8/8/2023)). We similarly calculate eligibility as a percentage of all inpatient hospital deaths using data from the National Hospital Discharge Survey (NHDS) annual summaries provided by the CDC (see <https://www.cdc.gov/nchs/nhds/nhds.publications.htm>, (accessed 8/8/2023)). When annual summaries are not available, we use data on inpatient deaths from CDC Data Highlights tables, which are also based on the NHDS. See https://www.cdc.gov/nchs/nhds/nhds_tables.htm, (accessed 8/8/2023).

Increasing the number of deceased organ donors can have a big impact. One deceased donor can provide multiple organs (kidneys, lungs, liver, heart, pancreas, and intestine) and tissues to potential recipients. To become a deceased donor, an individual must either have registered as one — typically at a state’s department of motor vehicles (DMV) — or must have their organs donated by their next of kin after death. Unsurprisingly, organ donor registration is associated with an increased likelihood of eventual donation.²

Because of the opportunity from deceased donor organs, there has been both a policy and a research focus on encouraging individuals to register as donors. Survey results suggest that only 49.9% of individuals are registered as organ donors but that 90.4% support organ donation (Health Resources and Services Administration, 2020). This large gap between registration rates and stated support for organ donation has led researchers to wonder whether *how individuals are asked to become organ donors* might impact registration rates. In particular, researchers hypothesized that individuals who support organ donation in principle might register as donors if forced to respond to a yes/no question about organ donation (i.e., where an individual is asked to give a positive or a negative response to organ donation), but if given the opportunity to opt-in (e.g., by checking a box or signing their name to indicate a desire to register as an organ donor), these same individuals might instead “skip” the organ donation question — perhaps because it is unpleasant to think about one’s own mortality — and thus not opt-in. Early work exploring the role of choice frame documented promising evidence based on hypothetical registration decisions. Johnson and Goldstein (2003; 2004) found that 42% of their experimental subjects reported a willingness to register as an organ donor when asked to opt-in to a donor registry but that the rate was a dramatically higher 79% when subjects were required to say either “yes” or “no” to organ donation, a staggering 37 percentage point treatment effect.³

Consequently, many attempts by policy makers to increase organ donation over the past two decades have focused on framing the organ donor registration question as a yes/no frame. California and New York both prominently passed legislation to switch to yes/no frames. The use of the yes/no frame for organ donation is widespread; of the 50 U.S. jurisdictions with DMV forms posted online or made available to us as part of this research, 41 (82%) asked the organ donor registration question with a yes/no frame (see Appendix Table C2).

Does the yes/no question frame actually increase organ donor registrations?

²New England Donor Services provides some data from 2010–2012: among Medically Suitable Brain-Dead potential donors, recovery rates were 33 to 44 percentage points higher when the potential donor was registered; among Medically Suitable Cardiac Death potential donors, recovery rates were 32 to 40 percentage points higher when the potential donor was registered (Fitzpatrick, 2017).

³Johnson and Goldstein (2003; 2004) also report results on an opt-out organ donation default question, both in their experiment and in data on organ donor registration rates from European countries. In an opt-out choice environment, individuals are defaulted into being registered donors and must remove themselves from a donor registry. We do not explore opt-out frames since such frames are not feasible under current U.S. gift law, which requires an affirmative statement in support of organ donation for an individual to be added to a donor registry (Glazier and Mone, 2019).

Did the state-level changes have the intended effects? In this paper, we provide empirical evidence about how choice frame affects whether individuals *actually register* as organ donors. We first describe the design and results from a controlled experiment that tests whether the choice frame affects organ donor registration. We then present results from newly collected data on registration decisions from state DMVs, leveraging state-level changes in question wording as natural experiments. Both sets of empirical work find consistent, near zero impacts of choice frame on organ donor registration, suggesting that prior estimates using hypothetical data do not accurately describe behavior under actual incentives.

Our controlled experiment gives Massachusetts residents the opportunity to change their organ donor registration status. Registration in our experiment *is* registration on the Massachusetts Donor Registry, so subjects who register to be donors in our study leave the laboratory as registered donors. The experiment is thus a “field-in-the-lab” design in that we invite subjects into the laboratory ($n = 509$) or onto an online platform we built ($n = 529$) — where we can observe choices and randomize question wording — but each subject decides about their *actual* organ donation status. Significant technical requirements were met to connect our laboratory computers to the Massachusetts Registry of Motor Vehicles online database and record each participant’s interaction.⁴ This connection allowed us to observe each subject’s previous donor status and to make any changes to a subject’s registration status in real time. Across three waves of data collection in the field-in-the-lab experiment, we find that a yes/no frame does not increase organ donor registration rates over an opt-in frame. Rates are directionally (but not significantly) lower when individuals are asked to provide a yes or no rather than just being given a chance to opt-in.

We replicate this finding using a newly constructed panel dataset on organ donor registration rates across U.S. states. We solicited data from each state on the number of individuals who were asked a donor registration question at the state’s DMV and the number of individuals who registered in response to that question from 2010–2016, inclusive. We use these data to analyze how changes in registration questions influence registration rates. We leverage changes in registration question frame in California (in 2011), New York (in 2013), and Hawaii (in 2014), and find an overall null effect of the question frame on registration rates.

Our findings thus contrast with the findings of research based on hypothetical donation decisions (e.g., Johnson and Goldstein, 2003; 2004; van Dalen and Henkens, 2014) and suggest no gain from changing whether the organ donation

⁴For the wave 1 study, we designed a Firefox extension that allowed us to manage the interface subjects saw while keeping another hidden browser open to communicate with the Massachusetts database. This design ensured that personal information used to log into the MA organ donor registry stayed on the local device used by the subject (so our software never recorded identifiable data). In waves 2 and 3, we built an application on secure Wharton servers to collect and transmit data to the MA registry and push MA registration data back to the subject. This implementation maintained high data security and was necessary to allow subjects to participate remotely (in wave 3).

question has an opt-in or yes/no frame.

However, additional findings from our field-in-the-lab study suggest other ways to increase organ donor registration. Other elements of the question wording (e.g., adding additional information about donation) may increase registration rates. In addition, we find that simply asking people to reconsider and potentially change their organ donor registration status outside of the DMV nets many new donors. We find that 27.3% of unregistered subjects choose to register as organ donors in our study while less than 1% of those who were previously registered remove themselves from the registry. As a consequence, our experiment — which included 1,038 total subjects — generated a net of 97 new donors. This latter result provides suggestive support for attempts to increase organ donor registration by asking for registrations outside of the DMV (e.g., on other government forms) and highlights the value of future work about the impact of asking people to register as organ donors more often.

I. Experiment With Actual Organ Donor Registrations

A. Design

In our field-in-the-lab experiment, 509 participants were recruited to the Computer Lab for Experimental Research (CLER) at Harvard University to participate in either wave 1 (368 participants on one of 25 dates between August 2010 and April 2012) or wave 2 (141 participants on one of 4 dates in August 2016). Recruitment information informed potential participants they needed a Massachusetts driver’s license, learner’s permit, or state identification card and the last four digits of their social security number to participate in the study, but participants were not informed in advance that the study concerned organ donation. Participants received \$15 for participating in the study. Everyone who arrived at the laboratory and had the required Massachusetts credentials was allowed to participate. In addition, 529 participants were recruited through a Qualtrics panel of Massachusetts residents (wave 3) to take an online version of our study that did not require subjects to come into the laboratory. Participants completed the study on one of 40 dates between July and August 2016 (recruitment materials, consent form, and decision screens appear in Appendix A).⁵ Table 1 provides descriptive statistics on both the in-person (wave 1 and 2) and online (wave 3) samples, based on survey data we collected towards the end of the experiment. The table also shows balance across the choice frame treatments that we randomized (i.e., opt-in and yes/no).

Since the software we built interacted with the Massachusetts registry, we were able to see each subject’s current donor status, allowing us to investigate changes in registration status in both directions (from unregistered to registered and vice

⁵We did not register a pre-analysis plan as our initial experiment began in 2010, before doing so was standard practice. In addition, our subsequent data collection and analysis closely followed the initial experimental work, which served to discipline our analysis.

Table 1—Summary Statistics, Experimental Subjects

	In-Person (Wave 1 and 2)			Online (Wave 3)		
	Opt-In (1)	Yes/No (2)	Difference (3)	Opt-In (4)	Yes/No (5)	Difference (6)
Female	0.490 [0.501]	0.489 [0.501]	-0.001 (0.044)	0.524 [0.500]	0.434 [0.496]	-0.090** (0.043)
Age	33.363 [14.665]	32.538 [14.264]	-0.825 (1.284)	41.294 [12.220]	41.115 [12.634]	-0.178 (1.081)
Non-White	0.343 [0.476]	0.398 [0.490]	0.055 (0.043)	0.172 [0.378]	0.208 [0.407]	0.036 (0.034)
Some College	0.898 [0.303]	0.920 [0.271]	0.022 (0.026)	0.872 [0.335]	0.892 [0.310]	0.020 (0.028)
Student	0.478 [0.501]	0.473 [0.500]	-0.004 (0.044)	0.060 [0.238]	0.082 [0.276]	0.022 (0.022)
Never Married	0.792 [0.407]	0.848 [0.359]	0.057* (0.034)	0.304 [0.461]	0.290 [0.455]	-0.014 (0.040)
Has Kid(s)	0.131 [0.338]	0.102 [0.304]	-0.028 (0.029)	0.480 [0.501]	0.444 [0.498]	-0.036 (0.043)
Religious	0.653 [0.477]	0.633 [0.483]	-0.020 (0.043)	0.608 [0.489]	0.620 [0.486]	0.012 (0.042)
Republican	0.392 [0.489]	0.466 [0.500]	0.074* (0.044)	0.336 [0.473]	0.376 [0.485]	0.040 (0.042)
Socially Conservative	0.143 [0.351]	0.106 [0.309]	-0.037 (0.029)	0.140 [0.348]	0.143 [0.351]	0.003 (0.030)
Registered Donor	0.433 [0.496]	0.477 [0.500]	0.045 (0.044)	0.808 [0.395]	0.814 [0.390]	0.006 (0.034)
Observations	245	264		250	279	
<i>p</i> -value (F-test):			0.492			0.320

Note: Table 1 provides summary statistics on experimental subjects disaggregated by sample and treatment group. Columns 1–3 show results for subjects in waves 1 and 2 of the field-in-the-lab experiment who completed the study in person and Columns 4–6 for subjects in wave 3 who completed the experiment online. Columns 3 (in-person) and 6 (online) report whether differences across the opt-in and yes/no treatment groups are significant within each sample. Standard deviations are in brackets, robust standard errors are in parentheses. We report the *p*-values from several joint tests for significance with the null that observables do not jointly predict treatment assignment. Column 3 shows the *p*-value from the test estimated on data from waves 1 and 2 and Column 6 on data from wave 3. The *p*-value from the test estimated on waves 1–3 jointly is 0.254. As expected, the population differs across the in-person and online samples on a number of demographic dimensions. Most prominently, the online sample is more likely to begin the study as a registered donor. The variable *Registered Donor* indicates the fraction of subjects who were registered as an organ donor at the beginning of the study. We suspect this is due to differences in the recruitment process across the platforms. The in-person subjects were not aware that the study was about organ donation until they reached the lab (and only one person who came to the lab and was eligible to participate chose not to do so, citing concerns about entering the last four digits of her social security number as part of the study), whereas the online sample learned the study was about organ donation before they had invested time or energy to participate in the study and so non-donors may have been more likely to opt out of the study at that stage. **p* < 0.10, ***p* < 0.05, ****p* < 0.01.

versa). The software also allowed for experimental manipulation of how a subject was asked about organ donor registration.

Of the 509 subjects who participated in waves 1 and 2, 232 participants (45.6%) were initially registered donors and 277 participants (54.4%) were initially unregistered at the study start. The fraction of subjects who were registered when they entered the lab was close to the fraction of MA residents who were registered in the relevant years (Donate Life America, 2011, 2012, 2013, 2017), suggesting we did not get selection into the study by organ donors in these waves.⁶ In wave 3, 429 participants (81.1%) were registered donors and 100 participants (18.9%) were unregistered when they began the study. This rate of being registered is higher than the rate of MA residents who were registered in 2016, suggesting the ability to easily opt out of participating in the online study after learning that it was about organ donation may have introduced selection into participation in wave 3.

Subjects were randomly asked about organ donor registration with an opt-in frame or a yes/no frame. In the opt-in frame, subjects were given the opportunity to change their organ donor status by checking a box and clicking “continue”. Leaving the box blank and clicking continue kept their organ donor registration status unchanged. In the yes/no frame, subjects were provided with two radio buttons, one that would add them to the organ and tissue donor registry (or leave them on the registry if they were already on it) and one that would leave them off the registry (or remove them from the registry if they were already on it). In the yes/no frame, subjects were required to check one of the buttons and click “continue” before continuing with the rest of the study. Figure 1 shows the organ donor registration question asked of those who were unregistered at the start of the study with an opt-in frame and with a yes/no frame.

As discussed below, in Wave 1 we also independently randomized the information provided to subjects on the decision screen. Some subjects were randomly provided with a list of organs that might be donated in the event of deceased donation. Images of screens with the organ lists are shown in Appendix A.

B. Results on Choice Frame

Table 2 reports on the impact of choice frame on registration decisions in our study among subjects who were initially unregistered. As discussed below, over 99% of subjects who started the experiment as registered donors remained registered. Given that nearly all initially registered donors remained on the registry, Table 2 focuses on the 377 participants who were not registered when they began our study and explores whether the way they are asked to register impacts decisions to join the registry.

⁶The share of subjects who showed up as registered donors in waves 1 and 2 was comparable to the share of Massachusetts residents who were registered in the same years (39% vs. 44% in 2010, $p = 0.22$; 49% vs. 48% in 2011, $p = 0.85$; 40% vs. 50% in 2012, $p = 0.08$; 54% vs. 59% in 2016, $p = 0.23$).

ON THIS WEBSITE YOU CAN CHOOSE TO BE AN ORGAN AND TISSUE DONOR IN THE EVENT OF YOUR DEATH.
IT IS ESTIMATED THAT ONE DONOR CAN SAVE OR ENHANCE THE LIVES OF AS MANY AS 50 PEOPLE BY DONATING ORGANS AND TISSUES.
THOSE WHO REGISTER AS ORGAN DONORS AGREE TO DONATE ALL THEIR ORGANS AND TISSUES.

IF YOU CONTINUE WITHOUT CHECKING THE BOX, YOU WILL NOT BE REGISTERED AS AN ORGAN AND
TISSUE DONOR.

☐ I WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.

CONTINUE

(a) Opt-in Frame Decision Screen

ON THIS WEBSITE YOU CAN CHOOSE TO BE AN ORGAN AND TISSUE DONOR IN THE EVENT OF YOUR DEATH.
IT IS ESTIMATED THAT ONE DONOR CAN SAVE OR ENHANCE THE LIVES OF AS MANY AS 50 PEOPLE BY DONATING ORGANS AND TISSUES.
THOSE WHO REGISTER AS ORGAN DONORS AGREE TO DONATE ALL THEIR ORGANS AND TISSUES.

PLEASE SELECT ONE OF THE FOLLOWING OPTIONS.

- ☐ I WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.
☐ I DO NOT WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.

CONTINUE

(b) Yes/No Frame Decision Screen

Figure 1. Registration Screens from the Experiment

Note: Figure 1 shows the decision screens randomly shown to subjects in all three waves of the study if they were unregistered at the start of the study. In the Opt-In Frame (panel a), subjects who did not want to be added to the registry could leave the box blank and click “continue” while those who wanted to be added could check the box and click “continue”. In the Yes/No frame (panel b), all subjects were required to select one of the two radio buttons and click continue to advance to the next page. Subjects who were registered at the start of the study saw a sentence that stated: “You are currently registered as an organ and tissue donor.” In the opt-in frame, the text shown to these subjects before the text box read: “If you continue without checking the box, you will remain registered as an organ and tissue donor.” The text next to the check box read: “I no longer want to be registered as an organ and tissue donor.” In this case, checking the box before clicking continue removed the subject from the registry. In the yes/no frame, subjects who were registered were asked to choose between “I want to remain registered as an organ and tissue donor” and “I no longer want to be registered as an organ and tissue donor”.

Columns 1–3 look at each wave of data separately, and columns 4–5 analyze the pooled data. The opt-in frame is the excluded group. In each wave separately, and in all waves jointly, the use of a yes/no frame has no impact on registration rates. Wave 1 finds a directionally negative impact of yes/no on registration rates while waves 2 and 3 find small, directionally positive impacts of the yes/no frame. Pooled together in columns 4 and 5, yes/no is associated with a registration rate that is 2–4 percentage points lower than opt-in, but this directional reduction is far from statistically significant ($p = 0.40$ in column 4 where we include dummies for wave and $p = 0.58$ in column 5 where we include both dummies for wave and dummies for the calendar day on which the subject participated).

These results are robust to different regression specifications. As shown in the Online Appendix, results look similar in Appendix Table B1 when we include

Table 2—Organ Donor Registration by Treatment (Initially Unregistered)

<i>Study Wave:</i>	Wave 1 (1)	Wave 2 (2)	Wave 3 (3)	All Waves (4)	All Waves (5)
Yes/No Frame	-0.082 (0.062)	0.015 (0.104)	0.018 (0.091)	-0.039 (0.046)	-0.027 (0.049)
Organ List	0.123** (0.062)			0.123** (0.061)	0.162** (0.067)
Constant	0.266*** (0.053)	0.207*** (0.078)	0.271*** (0.065)		
Observations	212	65	100	377	377
R-squared	0.027	0.000	0.000	0.016	0.128
Wave FE	NO	NO	NO	YES	YES
Date FE	NO	NO	NO	NO	YES

Note: Analysis includes 377 participants who were unregistered at the beginning of our study. Results are shown for each study wave separately in Columns 1–3 and across all waves jointly in Columns 4–5. *Yes/No Frame* is an indicator for whether a participant was exposed to the yes/no frame; *Organ List* is an indicator for whether a participant saw a list of organs. Analysis in Column 4 includes fixed effects for study wave. Analysis in Column 5 includes fixed effects for study wave and for the date on which a subject participated in the study. Standard errors are in parentheses. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$.

demographic controls to account for any chance imbalance in the demographics reported in Table 1 and results look similar in Appendix Table B2 when we include all subjects, including those who were initially registered at the start of the study.

We find a null effect of choice frame on organ donor registration decisions. Given our null result, one might be worried that our study was underpowered to detect a reasonably sized treatment effect. We note that our ex ante minimum detectable effect (MDE) using data across all three waves of our study was roughly 7 percentage points. We see this as reasonable compared to the prior work on how choice frame impacts organ donation. In particular, the MDE is less than 1/5 of the treatment effect observed in Johnson and Goldstein (2003; 2004). The MDE is 14 percentage points if we focus on the individuals who are initially unregistered, as we do in Table 2, but this is still less than 2/5 of the 37 percentage point effect observed in Johnson and Goldstein (2003; 2004).

The MDE in the field-in-the-lab experiment is constrained by our ability to recruit Massachusetts ID holders to participate in our experiment. Identifying subjects was more difficult than in a typical study, since subjects need to have a Massachusetts license, learner’s permit, or state ID as well as the last four digits of their social security number to participate in the study. This difficulty was part of the reason why the study was run over multiple years, which allowed the subject pool at Harvard, where waves 1 and 2 were run, to recruit more potential subjects. In part due to the relatively high MDE in the controlled experiment, in Section II, we complement this controlled experiment with state-level natural experiments that leverage much larger sample sizes. The MDE in each of our three natural experiments discussed below are on the order of 2.5 percentage

points (see Appendix Figure B1).

Nevertheless, to show how the null result from our field-in-the-lab experiment compares to the prior results based on hypothetical choice data that inspired our work, Figure 2 shows the fraction of subjects who ended our study as registered donors across the opt-in frame and the yes/no frame and compares our results to the results from Johnson and Goldstein (2003; 2004). The first two bars show results from everyone in our full sample. The next two bars show results from our in-person sample (i.e., waves 1 and 2 only). In comparing levels between Johnson and Goldstein and our studies, the in-person sample is most relevant, since these subjects showed up to participate without knowing the study was about organ donation as in Johnson and Goldstein’s experiment. The figure clearly shows that our null results are very different from the results in Johnson and Goldstein (2003; 2004) and that our 95% confidence intervals can easily rule out effect sizes similar to those in prior work.

When comparing our null results to prior work, one might wonder whether registration rates in our opt-in frame might be artificially high due to subjects in our study mindlessly checking the opt-in box (e.g., because they are in the habit of checking opt-in boxes in online interfaces without carefully reading the surrounding text). Two pieces of evidence work against this hypothesis. First, subjects who enter the study as registered donors and are in the opt-in treatment are also shown a check box, but checking the box removes the subject from the registry. Hardly anyone removes themselves from the registry, and registry removal is not more likely in the opt-in treatment (4/308) than in the yes/no treatment (2/353). The difference of 0.73 percentage points is not statistically significant ($p = 0.322$). Second, in waves 2 and 3, we added an additional question to our study to test whether subjects mindlessly check an opt-in box. Towards the end of the experiment, we asked subjects to indicate whether or not they are 100 years old (we separately asked subjects to report their age, and everyone reported being younger than 100). We randomized whether subjects were asked about being 100 years old with an opt-in frame or a yes/no frame. Rates of affirming subjects were 100 years old were not statistically different for the opt-in version (2/305) and the yes/no version (0/317). The difference of 0.66 percentage points is not statistically significant ($p = 0.149$). While the rates of removing oneself from the registry and incorrectly affirming being 100 years old are both directionally higher in the opt-in version, the small magnitudes confirm that subjects do not mindlessly check boxes at high rates when asked opt-in framed questions. Indeed, even if we were to assume that 0.66% or 0.73% of subjects in our opt-in treatment mindlessly registered as organ donors by checking the box, this would not meaningfully impact our results.

C. Additional Results

Our field-in-the-lab experiment shows that whether the question has an opt-in frame or a yes/no frame has little-to-no impact on organ donor registration rates,

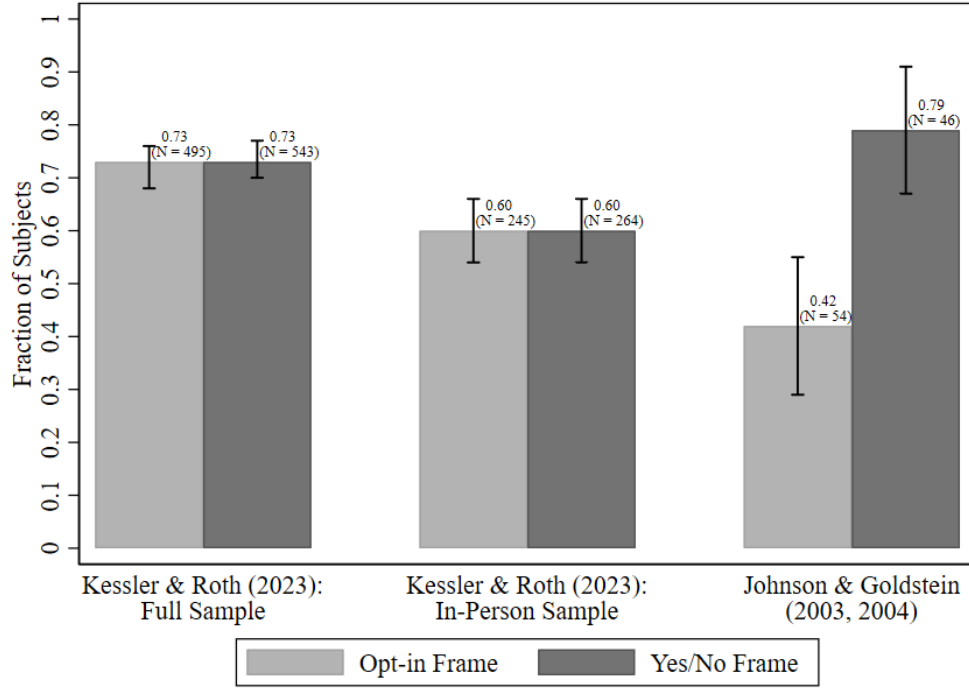


Figure 2. Comparison with Johnson and Goldstein (2003, 2004)

Note: Figure 2 shows the fraction of subjects who ended the study as organ donors in the field-in-the-lab experiment across all our data, for our in-person sample (waves 1 and 2) only, and for those who indicated they would register as organ donors in Johnson and Goldstein (2003; 2004), split by treatment group. We include 95% confidence intervals around each of our means. For Johnson and Goldstein, we calculate 95% confidence intervals based on the number of subjects in each treatment arm as provided by the authors.

but results from our study provide two additional insights into how one might successfully encourage organ donor registrations.

First, we explore the impact of simply asking individuals to change their donor status. Across all waves, we find that subjects are substantially more likely to join the registry than to remove themselves from the registry. Figure 3 shows that across all three waves, 27.1% (or 75/277 subjects who participated in person in waves 1 and 2) and 28% (or 28/100 subjects who participated online in wave 3) of those who were previously unregistered choose to join the registry, whereas fewer than 1% (2/232 in waves 1 and 2 and 4/429 in wave 3) of those who were previously registered choose to remove themselves. That is, across all three waves, participants were more than 30 times more likely to add themselves to the registry than remove themselves ($p < 0.01$ for each wave independently and all waves together). Across the three waves of the study, we observed a net increase

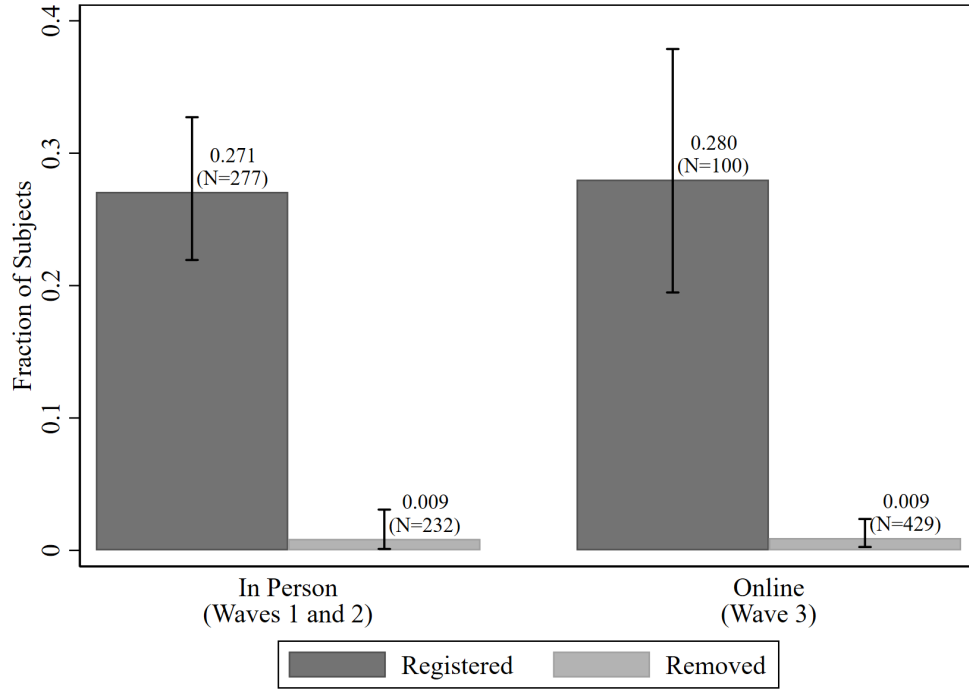


Figure 3. Changes in Registration Status by Study Wave

Note: Figure 3 shows changes in donor registration status by study wave. *Registered* is the fraction of participants who registered to be an organ donor conditional on being unregistered at the beginning of our experiment. *Removed* is the fraction of participants who were registered organ donors at the beginning of our experiment and subsequently removed themselves from the organ donor registry. We include 95% confidence intervals for each mean.

of 97 registered donors. This pattern arises even though everyone in our study has a Massachusetts license, permit, or ID, which means they were previously given the opportunity to register as organ donors, so those entering the study unregistered had previously declined.⁷

Second, in wave 1, we also independently varied whether the registration question provided other information about organ donation (see Appendix Table A1 and Appendix Figure A2). As shown in Table 2, we find that subjects are statistically significantly more likely to register as donors when shown the list of organs. The list makes subjects roughly 12 percentage points more likely to register as

⁷The Massachusetts state government website states: “You can register as an organ donor at any time through the Registry of Motor Vehicles (RMV). Many people become organ donors when they apply for or renew their Massachusetts driver’s license or ID. Registering as a donor is as simple as checking yes on your license/ID application.” See <https://www.mass.gov/how-to/register-as-an-organ-donor-at-the-rmv> (accessed 7/29/2022).

donors ($p < 0.05$). This is a promising result for policy interventions aimed to educate potential donors of the value of organ donation (see, e.g., Quinn et al., 2006; Thornton et al., 2012).⁸

These two sets of results suggest the possible value of asking about organ donor registration more often and providing more information when asking individuals to register, topics we return to in Section IV. When considering how these additional results speak to policy, however, it is worth considering the possible role of experimenter demand in our study. Namely, subjects might respond differently to our organ donor registration question as part of a study than they would in a natural field setting. While we tried to remain neutral in asking individuals to review and possibly change their organ donor registration status (e.g., we gave registered donors the chance to remove themselves from the registry and neither our instructions nor our consent form pushed aggressively for donation), subjects might reasonably believe that we would prefer they end up registered than not register given the positive externalities of organ donation.

We make three comments on the possibility of experimenter demand. First, to the extent that individuals feel experimenter demand in our study, they may also feel some pressure to register as an organ donor in other settings (e.g., at a state DMV) where someone is observing them and recording their behavior, although the extent of such demand forces could certainly differ inside and outside of the lab. Second, as shown in Figure 3, our results on asking individuals to register look nearly identical across our in-person and online waves. This comparison suggests a limited impact of being in the physical presence of an experimenter, with the caveat that wave 3 subjects may have been positively selected in attitudes about organ donation given its recruitment process. Third, related to our results in Section I.B, we do not see how experimenter demand would interact meaningfully with the choice frame or drive our null results on choice frame, and we complement our experiment on choice frame with an analysis of state-level natural experiments — where experimenter demand is not a concern — as discussed next.

II. Data from U.S. States

To complement the field-in-the-lab study, which found no increase in registration rates due to the yes/no question framing, we collected data on organ donor registration decisions from U.S. states. Each state asks some form of registration question when individuals apply for a driver’s license or other identification at that state’s DMV (and typically asks the same question when individuals renew their license or state ID card). States sometimes change the way they ask. To the

⁸Answers from a survey conducted after subjects make their registration decisions in wave 1 provide suggestive evidence for why the organ list may have increased registration. Those who see the list believe a single donor can save more lives (12.7 versus 9.6; t -test for unregistered donors, 211 observations, $p < 0.1$), potentially causing them to update on the societal value of donation. They are also more likely to report that a family member has received an organ transplant (4.7% versus 0.9%; t -test 212 observations, $p < 0.1$), suggesting the list broadens their interpretation of what constitutes an organ transplant and enhances their personal connection to donation.

extent that the specific timing of a change is plausibly exogenous to the underlying pattern of organ donor registrations in the state, the change can be treated as an experiment to evaluate how the specific wording of the organ donor question affects individuals’ willingness to register as an organ donor.

We use changes in question frame to assess the relative efficacy of a yes/no frame and an opt-in frame. Section II.A provides a description of the empirical approach and data. Section II.B presents the results. Additional details and results are shown in Appendix C.

A. Empirical Approach and Data

To further test whether a yes/no frame generates a higher rate of donor registration than an opt-in frame, we leverage changes to organ donor registration questions at state DMVs. One approach would be to compare organ donor registration rates within a state before and after a framing change, but such a comparison might conflate secular trends in registration rates with the framing change. If organ donor registration rates in other states are subject to the same secular trends, however, those states can serve as a control group in a difference-in-differences identification strategy. In addition, synthetic control approaches (Abadie and Gardeazabal, 2003; Abadie, Diamond and Hainmueller, 2010) can reweight the data from those other states to create a tailored control group for a given state.

A key remaining concern with this approach would be if the specific timing of the question re-wording responded to state-specific data trends (e.g., if a change in frame was implemented in response to an idiosyncratically low donor registration rate in prior quarters, and so we might conflate mean reversion with the change in question frame; or if a state-wide organ donor awareness campaign was timed to occur alongside the framing change). These concerns are mitigated somewhat by the legislative and administrative process underlying these wording changes, which typically take effect a few years after they are proposed and roughly a year after any relevant legislation is passed. We also find no evidence of contemporaneous state-specific organ donor awareness drives or other policy changes that we would expect to be correlated with organ donor sentiment around the changes we analyze. Nevertheless, our data suggest some possibility of pre-trends in our treatment states and we aim to account for the possibility of such failures of the parallel trends assumption.

The ideal panel dataset for this analysis includes information on each state’s organ donor registration rate (i.e., the fraction of those who are asked to register who respond positively) at a granular level (e.g., quarterly) for a sufficient period before and after a change in question framing.⁹ The ideal dataset would also include information on all changes in organ donor question wording to identify potential experiments and to ensure that we are not including a state in a control group during a period in which they also made changes to their organ donor

⁹Annual data is less helpful since changes typically take place in the middle of a calendar year.

registration question.

From 2017–2018, we aimed to construct such a dataset. We contacted each U.S. state’s DMV and asked for data on donor registration rates for years 2010–2016. We also asked for copies of relevant forms not available online and information on any changes to the forms with respect to the donor registration question, with dates any changes took effect. If states were not responsive, we submitted freedom of information act (FOIA) requests, which compel states to provide available data. Our process was to send multiple requests until we received any usable data or were confident that the data did not exist or was not going to be made available.¹⁰ Usable data were converted into organ donor registration rates at a quarterly level for as much of 2010–2016 as possible for each state. This led to a panel dataset that had at least some coverage for 42 states and Washington DC. Appendix Table C1 shows our registration rate data by state and quarter. We also constructed a dataset of changes in organ donor registration forms, shown in Appendix Table C2.¹¹ The majority of changes are minor wording changes that left the question frame unchanged. However, there were three organ donor registration question changes that involved switching from an opt-in to a yes/no frame (or vice versa) for which we had data for at least some number of quarters before and after the change.¹²

CALIFORNIA

On July 1, 2011, the California DMV changed the organ donation question on its forms, switching from an opt-in frame to a yes/no frame (see Figure 4). Starting on July 1, 2011, those who left the question blank were supposed to be asked by DMV staff to complete it. In addition to changing the choice architecture, there were also small changes in wording and punctuation between the forms.

California’s registration rates have historically been lower than the rates in other states, but according to Governor Arnold Schwarzenegger, the policy change only occurred because of lobbying by Steve Jobs to change the organ donation choice frame.¹³ The change was the result of legislation introduced in February 2010 and approved in September 2020 but not implemented until the following July.¹⁴

¹⁰Many states provided partial data or revealed that they did not collect or store the data that we required. We supplemented the data that was provided by responsive states with a pre-existing dataset that we had constructed for an earlier version of this paper including quarterly level data from Donate Life California and Organize, an organ donation non-profit that received its data from Donate Life America (and for which the authors are unpaid advisors).

¹¹Appendix Section C.C1 details our empirical data collection process.

¹²In 2014, Tennessee switched from a yes/no frame to an opt-in frame. We do not have data on registration rates in Tennessee in the six quarters before and four quarters after the policy change and are therefore unable to study its effect on the registration rate. Because Tennessee underwent this policy change, we do not include it as a control state in our analyses.

¹³See <https://www.forbes.com/sites/velocity/2010/04/20/how-steve-jobs-got-sick-got-better-and-decided-to-save-some-lives/?sh=5ca176063c46> (accessed 8/1/2022).

¹⁴For legislation and timing, see the bill at http://leginfo.ca.gov/pub/09-10/bill/sen/sb_1351-1400/sb_1395_bill_20100902_chaptered.html (accessed 7/21/2023).

7 DO YOU WISH TO REGISTER TO BE AN ORGAN AND TISSUE DONOR?		
DO YOU WISH TO REGISTER TO BE AN ORGAN AND TISSUE DONOR?	<input type="checkbox"/> YES! I want to be an organ and tissue donor.	If you mark "YES!" you will be added to the Donate Life California organ and tissue donor registry and a pink donor dot will be printed on the front of your driver license or identification card. If you are currently registered, you must check "YES!" to have the pink donor dot printed on your license or identification card. If you wish to remove your name from the donor registry, you must contact Donate Life California (see back). The Department of Motor Vehicles can only remove the pink donor dot from your license or identification card.
	<input type="checkbox"/> \$2 voluntary contribution to support and promote organ and tissue donation.	

(a) Old CA Organ Donation Question (until June 30, 2011)

7 DO YOU WISH TO REGISTER TO BE AN ORGAN AND TISSUE DONOR?		
DO YOU WISH TO REGISTER TO BE AN ORGAN AND TISSUE DONOR?	<input type="checkbox"/> YES, add my name to the donor registry	Marking 'Yes' adds your name to the Donate Life California Organ and Tissue Donor Registry and a pink 'Donor' dot will appear on your license. If you registered through the DMV previously, check 'Yes' to have the pink 'Donor' dot printed on your license or ID card. If you wish to remove your name from the registry, you must contact Donate Life California (see back); DMV can remove the pink dot from your license but cannot remove your name from the registry.
	<input type="checkbox"/> I do not wish to register at this time	
	<input type="checkbox"/> \$2 voluntary contribution to support organ and tissue donation	

(b) New CA Organ Donation Question (as of July 1, 2011)

Figure 4. CA Organ Donation Question

Note: The new CA organ donor registration question in panel (b) offers a yes/no frame with a yes and no option in place of the old opt-in frame shown in panel (a) that only offered a yes option. The legislation that proposed this change simultaneously legislated that DMV staff ask whether someone wants to be an organ donor if the question is left blank.

NEW YORK

On October 3, 2013, the New York State DMV switched from an opt-in choice frame to a yes/no choice frame (see Figure 5). Starting October 3, 2013, those who left the question blank were asked by DMV staff to complete it. As with the change in CA, the change in NY also included minor wording changes between the forms.

New York's registration rates have historically been lower than the rates in other states, including CA, but the specific policy change came about due to the passage of "Lauren's Law," signed by Governor Andrew Cuomo on October 4, 2012, a year before the policy took effect.¹⁵

HAWAII

In September 2014, the Hawaii DMV switched from a yes/no to an opt-in question frame (see Figure 6).¹⁶ As with the changes in California and New York, there was a small change in wording along with the change in frame.

¹⁵See <https://www.nysenate.gov/legislation/bills/2011/A10039> (accessed 8/1/2022).

¹⁶In an email correspondence with the Hawaii DMV in July 2017, DMV staff confirmed that the organ donor question frame was changed from a yes/no frame to an opt-in frame in 2014. Our research team further clarified that the switch happened in September 2014 during a phone call with DMV staff, although the DMV was unable to provide additional information on the precise date of the switch. However, the specific date is not required for our analysis, since we analyze all changes in the registration rates at the quarterly level.

NEW YORK STATE ORGAN AND TISSUE DONATION **SIGN BELOW** ♥ to enroll in the NYS Department of Health's Donate Life™ Registry. By signing, you are certifying that you are: 18 years of age or older; consenting to donate all of your organs and tissues for transplantation, research or both; authorizing DMV to transfer your name and identifying information to DOH for enrollment in the Registry; and authorizing DOH to allow access to this information to federally regulated organ donation organizations and NYS-licensed tissue and eye banks and hospitals, upon your death. "ORGAN DONOR" will be printed on the front of your DMV photo document. You will receive a confirmation letter from DOH, which will also provide you an opportunity to limit your donation.

♥ Donor Consent Signature: _____ Date: _____

☐ Check this box to make a \$1 voluntary contribution to the Life...Pass It On Trust Fund. The \$1 donation will be added to your total transaction fee. A contribution to the Fund is used for organ donation and transplant research and educational projects promoting organ and tissue donation.

(a) Old NY Organ Donation Question (until October 2, 2013)

NEW YORK STATE ORGAN AND TISSUE DONATION (You must fill out the following section)

To enroll in the NYS Department of Health's Donate Life™ Registry, check the "yes" box and then sign and date below. You are certifying that you are: 18 years or older; consenting to donate all of your organs and tissues for transplantation, research or both; authorizing DMV to transfer your name and identifying information to DOH for enrollment in the Registry; and authorizing DOH to allow access to this information to federally regulated organ donation organizations and NYS-licensed tissue and eye banks and hospitals, upon your death. "ORGAN DONOR" will be printed on the front of your DMV photo document. You will receive a confirmation from DOH, which will also provide you an opportunity to limit your donation.

You must answer the following question: Would you like to be added to the Donate Life Registry? ☐ Yes ☐ Skip This Question

♥ Donor Consent Signature: _____ Date: _____

☐ Check this box to make a \$1 voluntary contribution to the Life...Pass It On Trust Fund. The \$1 donation will be added to your total transaction fee. A contribution to the Fund is used for organ donation and transplant research and educational projects promoting organ and tissue donation.

(b) New NY Organ Donation Question (as of October 3, 2013)

Figure 5. NY Organ Donation Question

Note: The new NY organ donor registration question in panel (b) offers a yes/no frame with a yes and "skip this question" in place of the old opt-in frame shown in panel (a) that only offered the individual an opportunity to sign. The legislation that proposed this change simultaneously legislated that DMV staff ask whether someone wants to be an organ donor if the question is left blank.

Do you wish to be an organ donor? ☐ YES ☐ NO

(a) Old HI Organ Donation Question (until September, 2014)

Do you wish to be an organ / tissue donor? ☐ YES

(b) New HI Organ Donation Question (as of September, 2014)

Figure 6. HI Organ Donation Question

Note: The new HI organ donor registration question in panel (b) offers an opt-in choice frame with a yes option only in place of the old yes/no frame shown in panel (a) that asked for a yes or a no.

B. Results

Table 3 reports difference-in-differences estimates of the effect of switching from an opt-in to a yes/no frame and vice versa. Columns 1–4 summarize the effect of changing the organ donor question format from an opt-in to a yes/no frame in California (columns 1–2) and New York (columns 3–4). Columns 5–6 estimate the effect of switching from a yes/no to an opt-in frame in Hawaii. The dependent variable is the organ donor registration rate in a state s in year-quarter t . $Post$ is an indicator equal to 1 for observations after Quarter 2, 2011 in columns 1–2, after Quarter 3, 2013 in columns 3–4, and after Quarter 2, 2014 in columns 5–6

Table 3—Effect of Question Frame on Registration Decisions

<i>Treated State:</i>	California		New York		Hawaii		Stacked DID
	Opt-in to Yes/No	Opt-in to Yes/No	Opt-in to Yes/No	Opt-in to Yes/No	Yes/No to Opt-in	Yes/No to Opt-in	Opt-in to Yes/No
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post \times Treated	-0.053*** (0.016)	-0.019*** (0.005)	-0.016 (0.013)	0.001 (0.011)	-0.029** (0.012)	-0.016 (0.010)	-0.001 (0.012)
Post	0.046*** (0.016)		0.027** (0.013)		0.021* (0.012)		
Treated	-0.166*** (0.026)		-0.345*** (0.023)		-0.037 (0.022)		
Constant	0.438*** (0.026)		0.462*** (0.023)		0.466*** (0.022)		0.581 (0.006)
Observations	819	819	837	837	831	831	896
R-squared	0.051	0.927	0.205	0.939	0.009	0.925	0.980
States	40	40	40	40	40	40	42
State FE	NO	YES	NO	YES	NO	YES	NO
Year-Quarter FE	NO	YES	NO	YES	NO	YES	NO
State-Cohort FE	NO	NO	NO	NO	NO	NO	YES
Year-Quarter-Cohort FE	NO	NO	NO	NO	NO	NO	YES

Note: Columns 1 and 2 summarize the effect of changing the organ donor question format from an opt-in to a yes/no frame in California; Columns 3 and 4 summarize the effect of changing the organ donor question format from an opt-in to a yes/no frame in New York; and Columns 5 and 6 summarize the effect of changing the organ donor question format from a yes/no to an opt-in frame in Hawaii. Results from the stacked difference-in-differences estimation are included in Column 7 and summarize the effect of a yes/no frame in all three treated states. For the purposes of this pooled analysis, the treatment indicator in Hawaii turns on in the period prior to Quarter 3, 2014, before the switch from a yes/no to an opt-in frame. Analysis in Column 7 is based on 42 states (California, New York, Hawaii, and 39 control states). Analysis in Columns 1–6 is based on 40 states (one treated state and 39 control states). Data in Column 7 include state-quarter observations in the 6 quarters before and 4 quarters after each policy change. Standard errors clustered at the state level are in parentheses. * < 0.10, ** < 0.05, *** < 0.01.

(i.e., the quarters after the question was changed in each state). *Treated* is an indicator equal to 1 for California, New York, and Hawaii in the relevant columns, respectively.¹⁷

The interaction of *Post* \times *Treated* represents the difference-in-differences estimate of interest. The negative and statistically significant coefficient in columns 1 and 2 suggests that by switching from an opt-in frame to a yes/no frame, California's registration rate was (depending on specification) between 1.9 and 5.3 percentage points lower than it would have been otherwise. Results in column 3 suggest a directionally similar, although statistically insignificant, effect on registration rates in New York. Finally, the negative and significant coefficient on *Post* \times *Treated* in column 5 indicates that, relative to control states, the registration rate in Hawaii decreased after switching to an opt-in frame. Column 6 shows that this difference is no longer statistically significant when controlling for state and year-quarter fixed effects.

¹⁷The coefficient on *Post* ranges from 0.021–0.046 and represents the average difference in registration rates before and after the change among states in the control group for the relevant analysis. These estimates suggest a positive secular trend in registration rates in the relevant time periods of our empirical analysis. The coefficient on *Treated* is negative across all three treated states and significant in California and New York, suggesting that the registration rates in California, New York, and Hawaii were lower than the registration rates in their respective control groups in the pre-period.

We also implement a “stacked” difference-in-differences specification to estimate the effect of the yes/no frame, pooling across treated states (see Appendix Section C.C2 for additional details). These results are summarized in column 7. As before, the key coefficient of interest is on $Post \times Treated$, which is an indicator equal to 1 for year-quarters in which California, Hawaii, and New York have a yes/no frame. The coefficient is directionally negative but statistically insignificant and very close to zero. Taken together, these results suggest a very limited impact of the yes/no frame on organ donor registration rates.

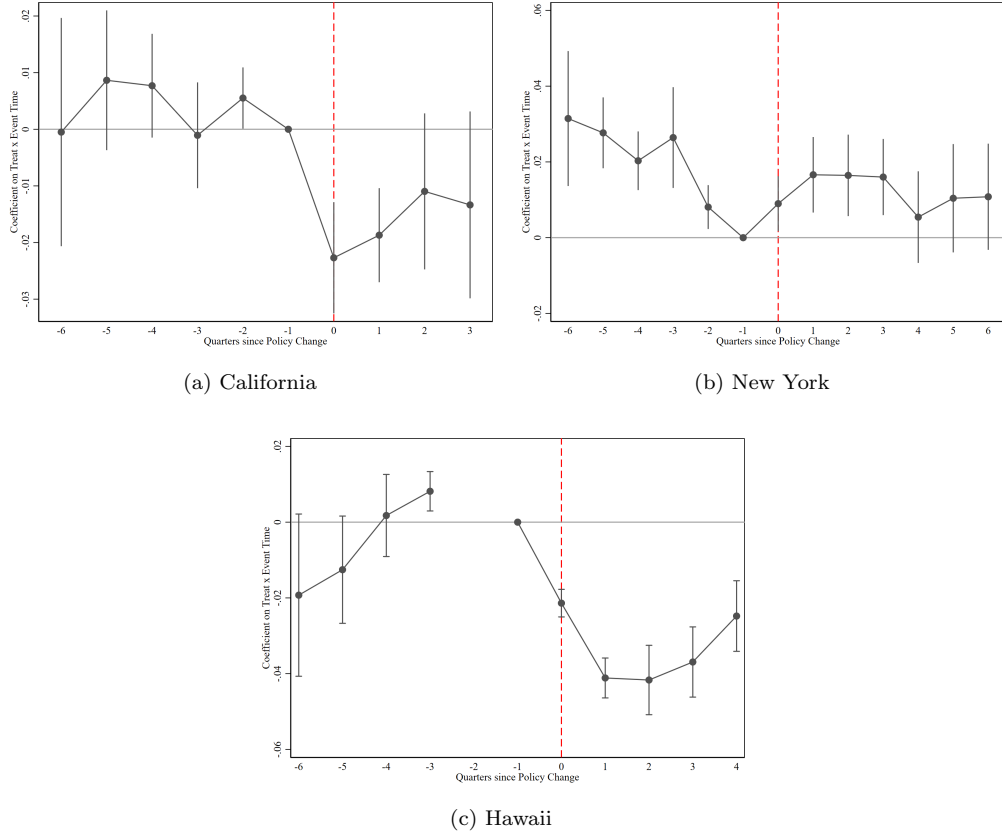


Figure 7. Quarterly Organ Donor Registration Rates

Note: Panel (a) plots estimates of the effect of switching to a yes/no frame on organ donor registration rates in California. The dashed line indicates the quarter in which California switched from an opt-in to a yes/no frame (Quarter 3, 2011). Panel (b) plots estimates of the effect of switching to a yes/no frame on organ donor registration rates in New York. The dashed line indicates the quarter in which New York switched from an opt-in to a yes/no frame (Quarter 4, 2013). Panel (c) plots estimates of the effect of switching to an opt-in frame on organ donor registration rates in Hawaii. The dashed line indicates the quarter in which Hawaii switched from a yes/no to an opt-in frame (Quarter 3, 2014). For all states, the omitted period is $t = -1$, so the coefficient in this period is mechanically set to zero. Regressions include state fixed effects. Standard errors are clustered at the state level.

Figure 7 shows event study plots summarizing the effect of the yes/no and opt-in frame in each year-quarter comparing the treated states to the control states, showing the results from Table 3 graphically and allowing for an evaluation of pre-trends.

The key assumption underpinning this difference-in-differences analysis is that the registration rate in treated and control states would have evolved similarly in the absence of the change to the organ donor question frame. While panel (a) of Figure 7 suggests that the parallel trends assumption is satisfied in California, we are underpowered to detect a difference in trends between treated and control states, even if such a difference were there. Furthermore, panels (b) and (c) indicate that there may be pre-trends in New York and Hawaii.

To partially account for this, we take two approaches (additional details can be found in Appendix C.C3). First, we implement a synthetic control method (Abadie and Gardeazabal, 2003), comparing the evolution of the donor registration rate in treated states with the evolution in a weighted combination of control states that do not change the frame of the donor question during the sample period and best resemble registration rates in the treated state of interest in the pre-period. The synthetic control results are consistent with those in Table 3. The yes/no frame has a directionally negative effect on registration rates in California and New York and the opt-in frame has a directionally negative effect on rates in Hawaii (see Appendix Figure C2 for the synthetic control results). Second, we implement a sensitivity analysis introduced by Rambachan and Roth (2023). This exercise imposes restrictions on how large the violation of parallel trends in the first post-period can be (relative to the worst violation in the pre-period across two consecutive pre-periods). It allows us to identify the largest violation for which there is still a significant effect of the question frame on organ donor registrations. We find that this “breakdown value,” borrowing language from Rambachan and Roth (2023), is roughly 1 in California, 0.1 in New York (where pre-trends are the most severe), and 1.1 in Hawaii (see Appendix Figure C3 for confidence intervals of our main difference-in-differences estimate for that state’s change for various violations of parallel trends). These results suggest that whether we find statistically significant differences due to the change in question frame depends somewhat on how parallel trends are treated and it emphasizes that results in New York are the most sensitive to these concerns.

That the results are not sensitive to the control group we construct and that the statistical significance that we do find may be sensitive to how possible pre-trends are handled underscores our point that the question frame fails to have a large impact on organ donor registration rates. If effects of choice frame on registration were substantial and robust, we would expect a different pattern in our difference-in-differences analysis than we have seen here.

III. Next of Kin Experiment

The results from the prior two sections show that the way in which the organ donor registration question is asked (i.e., with either an opt-in or yes/no frame) does not have sizable impacts on organ donor registration rates. In this section, we highlight that the way in which the organ donation question is asked might have *indirect* effects on the number of deceased donor organs recovered through a separate channel.

In the Introduction, we noted that there are two ways an individual might end up as a deceased organ donor. First, they may register as an organ donor themselves (i.e., the focus of the prior two sections). Second, their organs might be donated by their next of kin. To the extent that next of kin have a sense of how an organ donor registration question was asked of the deceased (e.g., if they are aware of how the deceased’s state asks people to register at the DMV), the question frame might also impact donation through decisions of next of kin.

In a separate experiment, we asked 803 subjects from Amazon’s Mechanical Turk (MTurk) to report what next of kin should do when deciding whether to donate the organs of a deceased relative.¹⁸ Subjects answered questions in four scenarios. In each scenario they saw one of the two decision screens in Figure 1 and were told that a hypothetical deceased had either chosen to join or not join the registry. For the opt-in frame subjects were told the deceased either: selected “I want to register as an organ and tissue donor” or did not select “I want to register as an organ and tissue donor.” For the yes/no frame, subjects were told the deceased either: selected “I want to register as an organ and tissue donor” or selected “I do not want to register as an organ and tissue donor.” In each scenario, the subject was then asked whether the next of kin should donate the organs of the deceased and how confident they were in that answer. The four scenarios were presented one-at-a-time in one of four random orders.

Nearly all subjects (94%) support next of kin donating the organs if the deceased was a registered donor and support does not depend on the frame.¹⁹ When the deceased is unregistered, however, subjects respond to the question frame. As shown in Figure 8, which shows results from the first scenario each subject sees, when the deceased is unregistered because they failed to opt in, 38.1% of subjects say the next of kin should donate the organs of the deceased; when the deceased is unregistered because they selected “no” in a yes/no frame, only 26.7% of subjects say the next of kin should donate the organs (*t*-test, 405 observations, $p = 0.014$). Results are similar when we analyze responses to all four scenarios (including within-subject variation) and when we analyze subjects’ confidence in

¹⁸This study was run in January 2013, before researchers started worrying about bots on the MTurk platform. Subjects were told the survey would take 5 to 10 minutes (on average it was completed in just over 5 minutes) and were paid \$0.50 for completing the survey. Additional experimental details are in Appendix D.

¹⁹Signing up to the registry is thought to be legally binding (Glazier et al., 2009), but doctors may defer to the next of kin if the next of kin protests to donation upon death, although this type of protest is rare.

their responses (see Appendix Table D1).

The results presented in prior sections suggest that one might want to be somewhat skeptical of hypothetical choice data in this context. Nevertheless, this experiment suggests a possible channel for question wording to have an indirect effect on organ recovery if next of kin are aware of the choice frame in which their deceased relatives were asked to register. In particular, our results suggest that if policy makers want to encourage more donations, the yes/no frame may have an additional downside of discouraging next-of-kin donations.²⁰

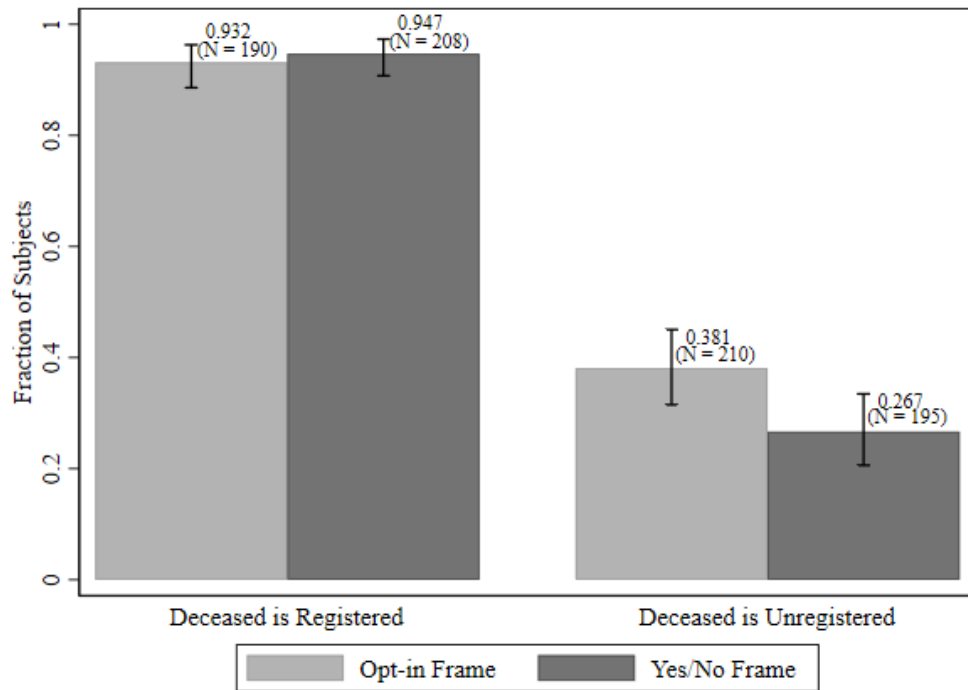


Figure 8. Share Saying Next of Kin Should Donate

Figure 8 shows the share of subjects saying the next of kin should donate the organs of the deceased by question frame and the deceased's registration status. Data is from the first scenario subjects saw. We include 95% confidence intervals for each mean.

²⁰An anonymous referee raises an interesting point and writes: “a yes/no frame increases the concordance between the wishes of the deceased person and the next of kin's decision. Someone who does not wish to join the registry may express their wish unambiguously in a yes/no frame, whereas not opting-in in an opt-in frame is open to interpretation (as the mTurk study result suggests).” Indeed, if policy makers want to give the deceased a way to more clearly indicate a desire not to donate, our results suggest they may see an added benefit of the yes/no frame in helping to ensure the deceased's wishes are satisfied.

IV. Summary and Discussion

Across our field-in-the-lab experiment and the natural experiments we analyze, a yes/no frame has a near zero effect on organ donor registrations. This finding stands in stark contrast to the prior results that relied on hypothetical choices. To make this comparison plain, Figure 9 summarizes the treatment effects associated with switching from an opt-in frame to a yes/no frame, estimated in our field-in-the-lab experiment and in each of the three natural experiments. It presents our results alongside estimates of the effect from Johnson and Goldstein (2003, 2004), which relied on hypothetical choice data. Our results involve actual donor registration decisions, which may help to explain the difference from previous work that relies on hypothetical decisions.

That our results contrast with prior studies, which found a much larger impact of choice architecture on decisions, connects our paper to a recent set of work on how nudge-style interventions operate “at scale.” DellaVigna and Linos (2022) compare the results of nudge interventions run by the two largest nudge units in the U.S. to meta analyses of nudges published in academic journals. They find that the average effect in the academic meta analyses is on the order of 8.7 percentage points while the nudge unit effects are dramatically smaller at 1.4 percentage points. We add evidence along similar lines and make a complementary point by suggesting the importance of relying on actual choice data.

In addition to finding that a yes/no decision frame does not increase registration rates above an opt-in frame, we make a number of additional contributions. First, results from wave 1 of our field-in-the-lab study suggest that giving information about the benefits of donation (in our case a list of organs) can increase registration rates, which is promising for interventions aiming to educate potential donors of the value of organ donation (see Quinn et al., 2006; Thornton et al., 2012; Reese et al., 2020). Second, results from our next-of-kin study reported in Section III highlight a possible negative indirect effect on donation from the yes/no frame. Third, our field-in-the-lab study suggest that asking for donor registration regularly in a variety of contexts (e.g., on government forms outside of the DMV) may also increase registration. Asking repeatedly for the same prosocial decision is common (e.g., charities repeatedly ask donors to give during a fundraising campaign, as do political campaigns). An added benefit of asking repeatedly is that it allows individuals to have their most recent wishes reflected on the state registry.

We also observe that registered donors are unlikely to remove themselves from the registry when given the opportunity to do so (less than 1% do so in our experiment). This lack of latent demand to remove oneself from a state registry suggests that an individual being listed on a state registry may reliably reflect their current intent to be a donor. This supports the policy established by the Anatomical Gift Act that being on a registry can be used to reflect the last wishes of a deceased donor (Glazier et al., 2009). This finding may also be helpful to policy makers in considering how to ask already registered organ donors about

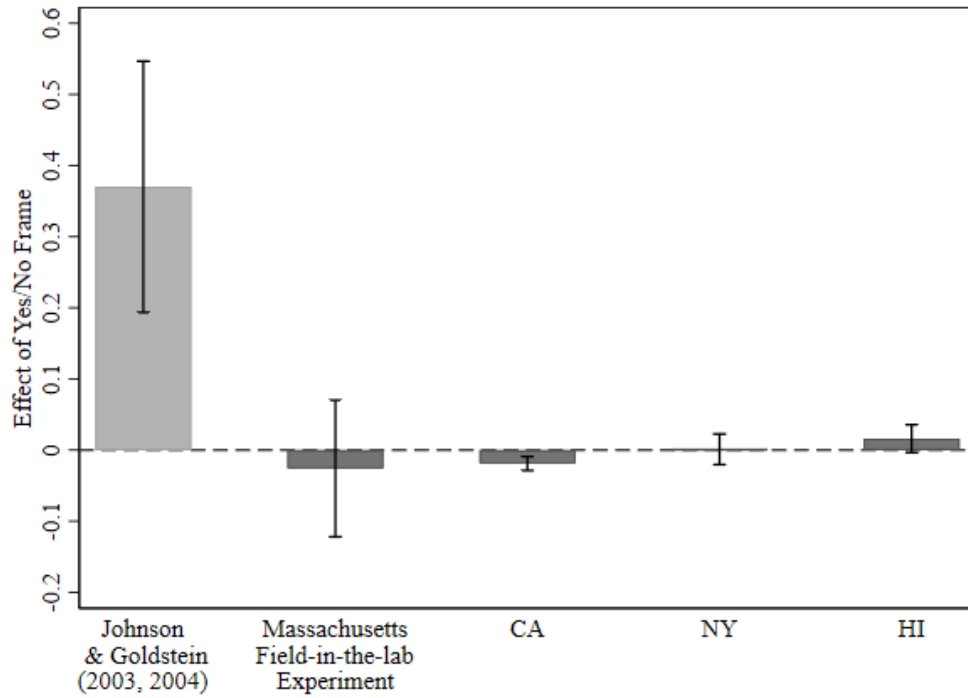


Figure 9. Effect of Yes/No Frame Across Studies

Figure 9 shows the effects of a yes/no frame on organ donor registrations across studies. The light gray bar on the left shows the effect of a yes/no frame on hypothetical organ donor registrations in Johnson and Goldstein (2003; 2004). We calculate 95% confidence intervals using the sample size in each treatment arm as provided by the authors. Massachusetts Field-in-the-lab Experiment shows the effect of the yes/no frame on organ donor registrations in our field-in-the-lab experiment (see Table 2, column 5). CA, NY, and HI show results from the difference-in-differences analysis including state and year-quarter fixed effects (see Table 3, columns 2, 4, and 6, respectively). We include 95% confidence intervals for each mean. In Table 3, we report the effect of moving from a yes/no to an opt-in frame in Hawaii. For consistency with the other estimates, here we instead report the effect of moving from an opt-in to a yes/no frame.

registration. In some states, including Massachusetts, individuals are repeatedly asked about organ donor registration and are removed from the registry unless they reaffirm their desire to register each time they are asked.²¹ Other states, such as Ohio, assume registered donors want to continue to be registered and so do not ask them to reaffirm.²² Our results suggest that there may not be that

²¹From the Massachusetts state government website: “You must reconfirm your wish to be an organ donor each time you renew your Massachusetts driver’s license or ID card, even if you were previously registered as a donor.” See: <https://www.mass.gov/how-to/register-as-an-organ-donor-at-the-rmv#:~:text=You%20can%20register%20as%20an,on%20your%20license%2FID%20application> (accessed 8/1/2022).

²²The policy in Ohio is described here: <https://www.dispatch.com/story/lifestyle/health-fitness/201>

many donors who wish to remove themselves at any point in time.²³

While we explored certain wording changes, there are other ways to change how the organ donor registration question is asked that we did not explore. One could imagine adding an additional option (e.g., of the form “I am not sure” or “Ask me later”) to the organ donation question and then following-up with individuals who select that new option (e.g., with additional information about organ donation). Whether such options would encourage or discourage eventual donations is a question for future work. In online registration questions that use a yes/no frame, one could also imagine having a pre-selected default option to the organ donor registration question (see Jachimowicz et al. (2019) for a meta analysis on the efficacy of defaults). Whether such a default would have a sizable impact in this setting is also a question for future work.

Addressing the worldwide shortage of all transplantable organs requires action on many fronts (Kessler and Roth, 2014b). Most organs for transplant can only be obtained from deceased donors.²⁴ Approaches to increase deceased donation include providing priority on organ donor waiting lists for those who registered as donors or those who have consented as next of kin (Kessler and Roth, 2012, 2014a; Stoler et al., 2016, 2017). There is also considerable effort to increase the efficiency with which deceased donor organs are recovered and used.²⁵ The present paper focuses on the decision to register as a deceased donor, which is the very beginning of the supply chain for most transplantable organs.

3/10/09/bmv-won-t-offer-to/23737814007/ (accessed 8/1/2022). Note that individuals may go online and remove themselves from the Ohio registry at any time.

²³Collecting and exploring data on how an individual’s organ donor registration status changes over time (e.g., across driver’s license renewals) would be particularly valuable to inform these types of policy questions and is an interesting direction for future work. Our understanding of most DMV data systems, however, is that they have historically stored only point-in-time registration status and so are not likely to have such longitudinal data.

²⁴The two notable exceptions are kidneys (which make up the large majority of transplanted organs) and livers which can both be donated by living as well as deceased donors. Efforts to ease the shortage of living-donor kidneys involve kidney exchange (see Ashlagi and Roth (2021) for a survey). There is a continual discussion of how to ethically and effectively offer incentives to kidney donors (see e.g. Becker and Elias (2007), although paying donors is legally banned in most of the world (Roth, 2007)).

²⁵Most deceased donor kidneys facilitate a single transplant, but see, for example, Melcher et al. (2016) for a recent proposal to coordinate deceased and living donor kidneys in kidney exchange chains that could facilitate multiple transplants.

REFERENCES

- Abadie, Alberto.** 2021. "Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects." *Journal of Economic Literature*, 59(2): 391–425.
- Abadie, Alberto, Alexis Diamond, and Jens Hainmueller.** 2010. "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program." *Journal of the American Statistical Association*, 105(490): 493–505.
- Abadie, Alberto, Alexis Diamond, and Jens Hainmueller.** 2015. "Comparative Politics and The Synthetic Control Method." *American Journal of Political Science*, 59(2): 495–510.
- Abadie, Alberto, and Javier Gardeazabal.** 2003. "The Economic Costs of Conflict: A Case Study of the Basque Country." *American Economic Review*, 93(1): 113–132.
- Arias, Elizabeth, Robert N. Anderson, Hsiang-Ching Kung, Sherry L. Murphy, and Kenneth D. Kochanek.** 2003. "Deaths: Final Data for 2001." *National Vital Statistics Reports*, 52(3): 1–116.
- Ashlagi, Itai, and Alvin E. Roth.** 2021. "Kidney Exchange: An Operations Perspective." *Management Science*, 67(9): 5455–5478.
- Baker, Andrew C., David F. Larcker, and Charles C.Y. Wang.** 2022. "How Much Should We Trust Staggered Difference-in-Differences Estimates?" *Journal of Financial Economics*, 144(2): 370–395.
- Becker, Gary S., and Julio Jorge Elias.** 2007. "Introducing Incentives in The Market for Live and Cadaveric Organ Donations." *Journal of Economic Perspectives*, 21(3): 3–24.
- Borusyak, Kirill, Xavier Jaravel, and Jann Spiess.** 2022. "Revisiting Event Study Designs: Robust and Efficient Estimation." *Working Paper*.
- Buie, Verita C., Maria F. Owings, Carol J. DeFrances, and Alexander Golosinskiy.** 2010. "National Hospital Discharge Survey: 2006 Annual Summary." *Vital and Health Statistics*, 13(168): 1–79.
- Burlig, Fiona, Louis Preonas, and Matt Woerman.** 2020. "Panel Data and Experimental Design." *Journal of Development Economics*, 144(102458): 1–15.
- de Chaisemartin, Clement, and Xavier D'Haultfoeuille.** 2020. "Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects." *American Economic Review*, 110(9): 2964–2996.

- DeFrances, Carol J., Karen A. Cullen, and Lola J. Kozak.** 2007. "National Hospital Discharge Survey: 2005 Annual Summary with Detailed Diagnosis and Procedure Data." *Vital and Health Statistics*, 13(165): 1–209.
- DellaVigna, Stefano, and Elizabeth Linos.** 2022. "RCTs to Scale: Comprehensive Evidence from Two Nudge Units." *Econometrica*, 90(1): 81–116.
- Donate Life America.** 2011. *National Donor Designation Report Card 2011*. Richmond, VA:Donate Life America.
- Donate Life America.** 2012. *National Donor Designation Report Card 2012*. Richmond, VA:Donate Life America.
- Donate Life America.** 2013. *National Donor Designation Report Card 2013*. Richmond, VA:Donate Life America.
- Donate Life America.** 2017. *2017 Annual Update*. Richmond, VA:Donate Life America.
- Fitzpatrick, Sean.** 2017. "New England Organ Bank Data." *Personal Communication*.
- Glazier, Alexandra, and Thomas Mone.** 2019. "Success of Opt-In Organ Donation Policy in the United States." *Journal of the American Medical Association*, 322(8): 719–720.
- Glazier, Alexandra K.** 2006. "Donor Rights and Registries." *Journal of Medical Ethics*, 13(1): 4.
- Glazier, Alexandra K., Alessandro Nanni Costa, J. M. Simón i Castellví, Antonio G. Spagnolo, Nunziata Cormoretto, Jean Lafitte, and Håkan Gäbel.** 2009. "A Colloquium on the Congress 'A Gift for Life. Considerations on Organ Donation.'" *Transplantation*, 88(7S): S108–S158.
- Goodman-Bacon, Andrew.** 2021. "Difference-in-Differences with Variation in Treatment Timing." *Journal of Econometrics*, 225(2): 254–277.
- Gormley, Todd A., and David A. Matsa.** 2011. "Growing Out of Trouble? Corporate Responses to Liability Risk." *Review of Financial Studies*, 24(8): 2781–2821.
- Health Resources and Services Administration.** 2020. "National Survey of Organ Donation Attitudes and Practices, 2019." <https://www.organdonor.gov/sites/default/files/organ-donor/professional/grants-research/nsodap-organ-donation-survey-2019.pdf>, accessed 07/09/2023.
- Heron, Melonie, Donna L. Hoyert, Sherry L. Murphy, Kenneth D. Kochanek, and Betzaida Tejada-Vera.** 2009. "Deaths: Final Data for 2006." *National Vital Statistics Reports*, 57(14): 1–121.

- Hoyert, Donna L., Melonie P. Heron, Sherry L. Murphy, and Hsiang-Ching Kung.** 2006. "Deaths: Final Data for 2003." *National Vital Statistics Reports*, 54(13): 1–120.
- Jachimowicz, Jon M., Shannon Duncan, Elke U. Weber, and Eric J. Johnson.** 2019. "When and Why Defaults Influence Decisions: A Meta-Analysis of Default Effects." *Behavioural Public Policy*, 3(2): 159–186.
- Johnson, Eric J., and Daniel G. Goldstein.** 2003. "Do Defaults Save Lives?" *Science*, 302(5649): 1338–1339.
- Johnson, Eric J., and Daniel G. Goldstein.** 2004. "Defaults and Donation Decisions." *Transplantation*, 78(12): 1713–1716.
- Kessler, Judd B., and Alvin E. Roth.** 2012. "Organ Allocation Policy and the Decision to Donate." *American Economic Review*, 102(5): 2018–2047.
- Kessler, Judd B., and Alvin E. Roth.** 2014a. "Loopholes Undermine Donation: An Experiment Motivated by an Organ Donation Priority Loophole in Israel." *Journal of Public Economics*, 114: 19–28.
- Kessler, Judd B., and Alvin E. Roth.** 2014b. "Getting More Organs For Transplantation." *American Economic Review: Papers and Proceedings*, 104(5): 425–430.
- Kochanek, Kenneth D., Jiaquan Xu, Sherry L. Murphy, Arialdi M. Mini no, and Hsiang-Ching Kung.** 2011. "Deaths: Final Data for 2009." *National Vital Statistics Reports*, 60(3): 1–117.
- Kochanek, Kenneth D., Sherry L. Murphy, Robert N. Anderson, and Chester Scott.** 2004. "Deaths: Final Data for 2002." *National Vital Statistics Reports*, 53(5): 1–116.
- Kozak, Lola J., Carol J. DeFrances, and Margaret J. Hall.** 2006. "National Hospital Discharge Survey: 2004 Annual Summary with Detailed Diagnosis and Procedure Data." *Vital and Health Statistics*, 13(162): 1–209.
- Kozak, Lola J., Karen A. Lees, and Carol J. DeFrances.** 2006. "National Hospital Discharge Survey: 2003 Annual Summary with Detailed Diagnosis and Procedure Data." *Vital and Health Statistics*, 13(160): 1–206.
- Kozak, Lola J., Margaret J. Hall, and Maria F. Owings.** 2002. "National Hospital Discharge Survey: 2000 Annual Summary with Detailed Diagnosis and Procedure Data." *Vital and Health Statistics*, 13(153): 1–194.
- Kozak, Lola J., Maria F. Owings, and Margaret J. Hall.** 2004. "National Hospital Discharge Survey: 2001 Annual Summary with Detailed Diagnosis and Procedure Data." *Vital and Health Statistics*, 13(156): 1–198.

- Kozak, Lola J., Maria F. Owings, and Margaret J. Hall.** 2005. "National Hospital Discharge Survey: 2002 Annual Summary with Detailed Diagnosis and Procedure Data." *Vital and Health Statistics*, 13(158): 1–199.
- Kung, Hsiang-Ching, Donna L. Hoyert, Jiaquan Xu, and Sherry L. Murphy.** 2008. "Deaths: Final Data for 2005." *National Vital Statistics Reports*, 56(10): 1–121.
- Melcher, Marc L., John P. Roberts, Alan B. Leichtman, Alvin E. Roth, and Michael A. Rees.** 2016. "Utilization of Deceased Donor Kidneys to Initiate Living Donor Chains." *American Journal of Transplantation*, 16(5): 1367–1370.
- Miniño, Arialdi M., Elizabeth Arias, Kenneth D. Kochanek, Sherry L. Murphy, and Betty L. Smith.** 2002. "Deaths: Final Data for 2000." *National Vital Statistics Reports*, 50(15): 1–120.
- Miniño, Arialdi M., Melonie P. Heron, Sherry L. Murphy, and Kenneth D. Kochanek.** 2007. "Deaths: Final Data for 2004." *National Vital Statistics Reports*, 55(19): 1–120.
- Miniño, Arialdi M., Sherry L. Murphy, Jiaquan Xu, and Kenneth D. Kochanek.** 2011. "Deaths: Final Data for 2008." *National Vital Statistics Reports*, 59(10): 1–157.
- Murphy, Sherry L., Jiaquan Xu, and Kenneth D. Kochanek.** 2013. "Deaths: Final Data for 2010." *National Vital Statistics Reports*, 61(4): 1–118.
- Organ Procurement and Transplantation Network.** 2016. "OPTN Deceased Donor Potential Study (DDPS)." https://optn.transplant.hrsa.gov/media/1161/ddps_03-2015.pdf, accessed 07/09/2023.
- Organ Procurement and Transplantation Network.** 2022. "Data." <https://optn.transplant.hrsa.gov/data/>, accessed 08/16/2022.
- Organ Procurement and Transplantation Network.** 2023. "National Data." <https://optn.transplant.hrsa.gov/data/view-data-reports/national-data/>, accessed 07/09/2023.
- Quinn, Michael T., G. Caleb Alexander, Diane Hollingsworth, Kate Grubbs O'Connor, and David Meltzer.** 2006. "Design and Evaluation of a Workplace Intervention to Promote Organ Donation." *Progress in Transplantation*, 16(3): 253–259.
- Rambachan, Ashesh, and Jonathan Roth.** 2023. "A More Credible Approach to Parallel Trends." *Review of Economic Studies*.

- Reese, Peter P., Karen Glanz, Ankur Shah, Adam Mussell, Simona Levsky, Lester Shuda, Justine Shults, and Judd B. Kessler.** 2020. "A Randomized Trial of Theory-Informed Appeals for Organ Donor Registration Using Internet Advertisements." *Kidney International Reports*, 5(12): 2238–2245.
- Roth, Alvin E.** 2007. "Repugnance as a Constraint on Markets." *Journal of Economic Perspectives*, 21(3): 37–58.
- Stoler, Avraham, Judd B. Kessler, Tamar Ashkenazi, Alvin E. Roth, and Jacob Lavee.** 2016. "Incentivizing Authorization for Deceased Organ Donation With Organ Allocation Priority: The First 5 Years." *American Journal of Transplantation*, 16(9): 2639–2645.
- Stoler, Avraham, Judd B. Kessler, Tamar Ashkenazi, Alvin E. Roth, and Jacob Lavee.** 2017. "Incentivizing Organ Donor Registrations with Organ Allocation Priority." *Health Economics*, 26(4): 500–510.
- Thornton, J. Daryl, Marilyn Alejandro-Rodriguez, Janeen B. Leon, and Jeffrey M. Albert.** 2012. "Effect of an iPod Video Intervention on Consent to Donate Organs: A Randomized Trial." *Annals of Internal Medicine*, 156(7): 483–490.
- van Dalen, Hendrik P., and Kène Henkens.** 2014. "Comparing The Effects of Defaults in Organ Donation Systems." *Social Science and Medicine*, 106: 137–142.
- Xu, Jiaquan, Kenneth D. Kochanek, Sherry L. Murphy, and Betzaida Tejada-Vera.** 2010. "Deaths: Final Data for 2007." *National Vital Statistics Reports*, 58(19): 1–135.

APPENDIX A: FIELD-IN-THE-LAB STUDY DETAILS FOR WAVE 1

Appendix A provides additional information on wave 1 of the field-in-the-lab experiment described in Section I in the main text. In wave 1, we recruited subjects via a posting on the CLER website, shown in Figure A1. Wave 2 used nearly identical recruitment materials. Wave 3 differed somewhat to accommodate on-line recruitment.

“IN ORDER TO PARTICIPATE IN THIS STUDY YOU MUST HAVE A MASSACHUSETTS DRIVER’S LICENSE, MA PERMIT, OR MA STATE ID AND WILL NEED TO PRESENT IT FOR ENTRY INTO THE STUDY. THOSE WITHOUT A MASSACHUSETTS DRIVER’S LICENSE, MA PERMIT, OR MA STATE ID WILL BE TURNED AWAY. YOU MUST ALSO KNOW THE LAST FOUR DIGITS OF YOUR SOCIAL SECURITY NUMBER.”

Study Description: You will log into a state database, make a decision and complete a survey.

Compensation: Participants who arrive on time and are eligible to participate will receive \$15 for completing the study. There is the possibility that some subjects will be turned away from the experiment. Those who are eligible and are turned away will receive a \$10 turn-away fee and will not be required to stay for the study.”

Figure A1. Study Recruitment Text on CLER Website

Participants in wave 1 were in one of four treatments in a two-by-two factorial design shown in Table A1. In waves 2 and 3, subjects were randomized to one of the cells in the top row only. See Figure 1 in the main text and Figure A2 below for the registration question screens associated with each cell.

Table A1—Study Design and Subjects (Wave 1)

<i>2x2 Design</i>		<u>Choice Frame</u>	
		Yes/No	Opt-in
Information Provided	Control	82 subjects (51 non-donors and 31 donors)	93 subjects (55 non-donors and 37 donors)
	List of Organs	99 subjects (51 non-donors and 48 donors)	95 subjects (55 non-donors and 40 donors)

Note: The number of subjects, including initial donors and non-donors, in each of the four treatments in the 2x2 design of wave 1.

After arriving at the laboratory, each subject was seated at an isolated computer terminal and signed a consent form (see Figure A3). In addition, the experimenter

ON THIS WEBSITE YOU CAN CHOOSE TO BE AN ORGAN AND TISSUE DONOR IN THE EVENT OF YOUR DEATH.
IT IS ESTIMATED THAT ONE DONOR CAN SAVE OR ENHANCE THE LIVES OF AS MANY AS 50 PEOPLE BY DONATING THE FOLLOWING ORGANS AND TISSUES:

- BONE AND CONNECTIVE TISSUE
- CORNEAS
- EYES
- HEART (FOR VALVES)
- HEART WITH CONNECTIVE TISSUE
- KIDNEYS
- LIVER OR ILLIAC VESSELS
- LUNGS
- PANCREAS
- SKIN
- SMALL INTESTINE
- VEINS

THOSE WHO REGISTER AS ORGAN DONORS AGREE TO DONATE ALL THEIR ORGANS AND TISSUES.

IF YOU CONTINUE WITHOUT CHECKING THE BOX, YOU WILL NOT BE REGISTERED AS AN ORGAN AND TISSUE DONOR.

☐ I WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.

CONTINUE

(a) Opt-in Frame Decision Screen with Organ List

ON THIS WEBSITE YOU CAN CHOOSE TO BE AN ORGAN AND TISSUE DONOR IN THE EVENT OF YOUR DEATH.
IT IS ESTIMATED THAT ONE DONOR CAN SAVE OR ENHANCE THE LIVES OF AS MANY AS 50 PEOPLE BY DONATING THE FOLLOWING ORGANS AND TISSUES:

- BONE AND CONNECTIVE TISSUE
- CORNEAS
- EYES
- HEART (FOR VALVES)
- HEART WITH CONNECTIVE TISSUE
- KIDNEYS
- LIVER OR ILLIAC VESSELS
- LUNGS
- PANCREAS
- SKIN
- SMALL INTESTINE
- VEINS

THOSE WHO REGISTER AS ORGAN DONORS AGREE TO DONATE ALL THEIR ORGANS AND TISSUES.

PLEASE SELECT ONE OF THE FOLLOWING OPTIONS.

- ☐ I WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.
☐ I DO NOT WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.

CONTINUE

(b) Yes/No Frame Decision Screen with Organ List

Figure A2. Registration Screens from the Experiment (with Organ Lists)

Note: Figure A2 shows the message shown to a random subset of wave 1 subjects that included a list of organs that might be donated should the subject become a deceased donor. In wave 1, we had intended to have a third dimension of variation that included an explicit reference to death by car crash. We hypothesized that this messaging would depress registration rates. A software bug inadvertently dropped some text from the screens of the first 43 subjects who received the car crash language without the list of organs. Given the bug and low recruitment numbers, we cut the car crash language from future sessions. In total, 121 subjects in wave 1 saw the car crash language ($n = 51$ initial donors and $n = 70$ initial non-donors). Our results are qualitatively the same if we exclude these subjects from the analysis.

read aloud a paragraph from the consent form explaining that participants would log into the Massachusetts Organ and Tissue Donor Registry and have the opportunity to change their donor registration status. Subjects initiated the study by logging into the Massachusetts Organ and Tissue Donor Registry maintained by the Department of Transportation (DOT) accessible through the website of the Registry of Motor Vehicles. Our software allowed subjects to log into and interact

with the real MA Organ and Tissue Donor Registry (see Figure A4) through a front end that could be manipulated experimentally (see Figure A5).

Please consider this information carefully before deciding whether to participate in this research.

Purpose of the research: To understand the decision to register as an organ donor.

What you will do in this research: You will (1) enter information that will be used to log you into a registry of organ and tissue donors in Massachusetts, (2) be provided with information about organ and tissue donation, (3) decide whether or not you would like to register as an organ and tissue donor, and (4) complete a survey.

Time required: Participation will take approximately 45 minutes to complete.

Risks: There are no anticipated risks associated with participating in this study.

Benefits: At the end of the study, we will provide a thorough explanation of the study and of our hypotheses. We will describe the potential implications of the results of the study both if our hypotheses are supported and if they are disconfirmed. If you wish, you can send an email message to Judd Kessler (jkessler@hbs.edu) and we will send you a copy of any manuscripts based on the research (or summaries of our results).

Compensation: You will receive \$15 for participating in this study.

Confidentiality: Your participation in this study will remain confidential, and your identity or personal information will not be stored with your data. Your responses will be assigned a code number, and we will not connecting your name or any of your personal information with this number.

Participation and withdrawal: Your participation in this study is completely voluntary, and you may withdraw at any time without penalty. You will receive payment based on the proportion of the study you completed. You may withdraw by informing the researcher that you no longer wish to participate (no questions will be asked).

<p>To Contact the Researcher: If you have questions about this research, please contact Judd Kessler, Doctoral Candidate, Baker Library 420F, 617-495-8845, jkessler@hbs.edu.</p>
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Whom to contact about your rights in this research, for questions, concerns, suggestions, or complaints that are not being addressed by the researcher, or research-related harm: Jane Calhoun, Harvard University Committee on the Use of Human Subjects in Research, 1414 Massachusetts Avenue, Room 234, Cambridge, MA 02138. Phone: 617-495-5459. E-mail: jcalhoun@fas.harvard.edu

Agreement:

The nature and purpose of this research have been sufficiently explained and I agree to participate in this study. I understand that I am free to withdraw at any time without incurring any penalty.

Signature: _____ Date: _____

Name (print): _____

Figure A3. Consent Form

Massachusetts Registry of Motor Vehicles

Home Online Services Forms & Manuals License & ID Registration Suspensions & Hearings Title & Salvage Branch Info

Organ & Tissue Donor Enrollment

To request your Organ & Tissue Donor status, you need your MA License/Permit or ID Number, your last and first name, date of birth and the last four digits of your SSN. This information must be entered exactly as it appears on your current MA License/Permit or ID. If you do not have a Social Security Number, you will need to visit a full service RMV Office in person to update your Organ & Tissue Donor status.

Please enter your information below:
All fields are required.

*License/Permit/ID:
 *Last name:
 *First name:
 *D.O.B: (MM/DD/YYYY)
 *SSN (Last 4 digits):
 *Email:
 *ReType Email:

If you require assistance, please contact the RMV Telephone Center.

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(a) Login Page

Massachusetts Registry of Motor Vehicles

Home Online Services Forms & Manuals License & ID Registration Suspensions & Hearings Title & Salvage Branch Info

Organ & Tissue Donor Enrollment Details

Transaction ID: 8419631LP 2/14/2013 10:16:29 AM

Your current Organ & Tissue Donor status is: No, I am not in the Organ & Tissue Donor Registry.

☐ Yes, I wish to be an Organ & Tissue Donor.
☒ Please do not change my current status.

If you require assistance, please contact the RMV Telephone Center.

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(b) Donor Registration Page

Figure A4. Login and Registration Page, MA Registry of Motor Vehicles

Note: Screenshot of login and registration page on the Massachusetts Registry of Motor Vehicles Webpage that subjects did not see due to the experimental interface. “Please do not change my current status.” is the default option that is automatically selected on the page. This selection is implemented when either the “Exit” or “Submit” button is pressed.

After logging into the registry, all subjects—those who were previously donors and those who were previously not donors—were asked whether they wanted to change their organ and tissue donor registration status. After subjects made their organ donor registration decision, they completed a 40-question survey.

Procedures were very similar for wave 2, which utilized a different survey interface. In wave 3, subjects were recruited from a Qualtrics panel to be representative of residents of Massachusetts and completed all parts of the study online.

PLEASE FILL IN THE FOLLOWING INFORMATION. ALL FIELDS ARE REQUIRED.

FIRST NAME:

LAST NAME:

DATE OF BIRTH(MM/DD/YYYY):

MA STATE LICENSE NUMBER:

SOCIAL SECURITY NUMBER(LAST FOUR DIGITS):

E-MAIL:

RE-TYPE E-MAIL:

SUBMIT INFORMATION

THIS INFORMATION WILL BE USED TO LOG INTO A SYSTEM THAT WILL RECORD YOUR DECISION OF WHETHER TO REGISTER AS AN ORGAN AND TISSUE DONOR. WE WILL NOT STORE ANY OF THE INFORMATION YOU PROVIDE ON THIS PAGE OR SHARE THIS INFORMATION WITH ANYONE EXCEPT THE SYSTEM WHICH WE ARE LOGGING YOU INTO NOW.

Figure A5. Screenshot of Login Page in Experiment

APPENDIX B: ADDITIONAL RESULTS

Appendix B reports additional results from the field-in-the-lab experiment. Table B1 shows that our main results (Table 2 in the main text) are not meaningfully different when controlling for observables.

Table B1—Organ Donor Registration by Treatment (Initially Unreg.), with Controls

<i>Study Wave:</i>	Wave 1 (1)	Wave 2 (2)	Wave 3 (3)	All Waves (4)	All Waves (5)
Yes/No Frame	-0.075 (0.063)	0.058 (0.106)	0.010 (0.097)	-0.036 (0.046)	-0.020 (0.050)
Organ List	0.111* (0.064)			0.107* (0.063)	0.139** (0.070)
Constant	0.198 (0.205)	0.311 (0.285)	0.100 (0.270)		
Observations	212	65	100	377	377
R-squared	0.087	0.220	0.045	0.035	0.153
Wave FE	NO	NO	NO	YES	YES
Date FE	NO	NO	NO	NO	YES

Note: Analysis includes 377 participants who were unregistered at the beginning of our study. Results are shown for each study wave separately in Columns 1–3 and across all waves jointly in Columns 4–5. *Yes/No Frame* is an indicator for whether a participant was exposed to the yes/no frame; *Organ List* is an indicator for whether a participant saw a list of organs. Analysis in Column 4 includes fixed effects for study wave. Analysis in Column 5 includes fixed effects for study wave and for the date on which a subject participated in the study. In all specifications, we include the following demographic indicators as controls: completed some college, has children, non-White, never married, female, religious, republican, socially conservative, and student. We also control for subject age. Standard errors are in parentheses. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$.

In the main text, we show our primary experimental results estimated on the sample of subjects who were not registered organ donors at the beginning of the experiment. Table B2 repeats this analysis, but leverages the full sample. As before, we estimate the effect of the yes/no frame on the decision to register as a donor in each wave separately and on the pooled data. However, we now also interact an indicator for being registered as a donor at the beginning of the experiment (*Initially Reg.*) with an indicator for being in the yes/no frame and an indicator for having seen an organ list, respectively. We find no effect of the yes/no frame on registration decisions for those who were already registered donors at the start of the experiment. This is not surprising, as very few subjects removed themselves from the registry during the course of the experiment.

Table B2—Organ Donor Registration by Treatment (Full Sample)

<i>Study Wave:</i>	Wave 1 (1)	Wave 2 (2)	Wave 3 (3)	All Waves (4) (5)	
Yes/No Frame	-0.082* (0.048)	0.015 (0.071)	0.018 (0.043)	-0.039 (0.029)	-0.044 (0.029)
Yes/No Frame \times Initially Reg.	0.082 (0.074)	-0.015 (0.097)	-0.007 (0.048)	0.046 (0.036)	0.051 (0.037)
Initially Reg.	0.719*** (0.064)	0.793*** (0.074)	0.714*** (0.034)	0.716*** (0.029)	0.707*** (0.030)
Organ List	0.123** (0.048)			0.114*** (0.035)	0.125*** (0.037)
Organ List \times Initially Reg.	-0.119 (0.074)			-0.099** (0.046)	-0.103** (0.047)
Constant	0.266*** (0.041)	0.207*** (0.053)	0.271*** (0.031)		
Observations	368	141	529	1038	1038
R-squared	0.505	0.663	0.630	0.610	0.635
Wave FE	NO	NO	NO	YES	YES
Date FE	NO	NO	NO	NO	YES

Note: Analysis includes all study participants. Results are shown for each study wave separately in Columns 1–3 and across all waves jointly in Columns 4–5. *Yes/No Frame* is an indicator for whether a participant was exposed to the yes/no frame; *Initially Reg.* is an indicator for whether a participant was registered as an organ donor at the start of the experiment; *Organ List* is an indicator for whether a participant saw a list of organs. Analysis in Column 4 includes fixed effects for study wave. Analysis in Column 5 includes fixed effects for study wave and for the date on which a subject participated in the study. Standard errors are in parentheses. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$.

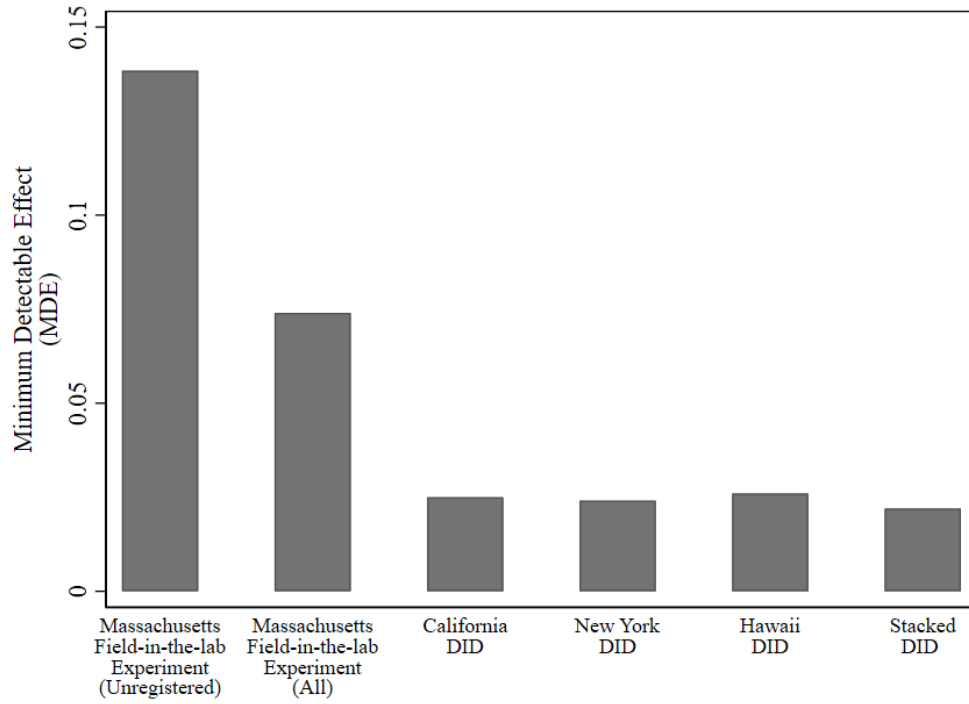


Figure B1. Minimum Detectable Effect (MDE) across Studies

Note: Figure B1 shows the Minimum Detectable Effect (MDE) for our main estimates. From left to right, we show the MDE for: the field-in-the-lab study estimated on the sample of subjects who were unregistered at the start of the experiment, the field-in-the-lab study estimated on the full sample, the difference-in-differences analysis for California, New York, and Hawaii, and the stacked difference-in-differences analysis using all three treated states. We calculate the MDE for the experimental studies using power analysis for a two-sample proportions test. For the difference-in-differences MDE calculations, we follow the simulation-based approach in Burlig, Preonas and Woerman (2020).

APPENDIX C: EMPIRICAL DETAILS

Appendix C provides additional information on the difference-in-differences analysis described in Section II in the main text. For this analysis, we solicited DMV data from each U.S. state on organ donor registration rates using the process outlined in Section C.C1. The resulting dataset is provided in Table C1.

C1. Empirical Dataset Construction

The primary outcome of interest for our empirical analysis is the fraction of individuals who registered to be organ donors, conditional on being asked to register at their state DMV. To construct this variable, we requested from state DMVs the raw number of “yes” responses to the organ donor registration question and the raw number of individuals who were faced with the organ donor registration question, at the finest level of granularity available, from 2010 to 2016 inclusive. Our data collection process was as follows:

- 1) We collected the first round of data during the summer of 2017. We contacted state DMVs directly as well as state organ donor registration agencies. We also collected copies of license application forms from each state to document changes in the organ donor registration question frame.
- 2) During the spring of 2018, we submitted Freedom of Information Act (FOIA) requests for states from which we had received incomplete or no information.
- 3) During the summer and fall of 2018, we sent a final round of FOIA requests to states that had not responded to our previous requests.

Table C1—State Registration Rates (%) from Q1 2010 to Q4 2016

State	2010				2011				2012				2013				2014				2015				2016				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Alabama	54.50	53.13	54.98	53.02	56.68	54.19	53.79	53.41	55.35	53.48	54.37	53.97	54.30	53.62	53.76	54.24	52.57	52.61	52.57	53.64	51.95	52.27	53.53	51.13	53.85	52.69	55.18	53.16	
Alaska	21.46	23.39	23.85	26.34	20.92	22.61	25.03	23.51	25.87	26.19							31.60	33.78	33.74	31.29	32.56	35.39	36.04	26.84	36.84	35.56			
Arizona	26.73	27.37	27.93	26.66	27.31	27.43	26.36	26.07	26.41	27.08							67.88	67.85	67.80	67.20	67.47	68.16	68.62	69.29	69.38	69.52	69.06		
California	63.76	65.21	66.61	66.63	66.74	67.36	67.15	66.99	65.94	66.51	67.04	66.65	66.44	67.00	67.92	67.82	67.68	67.88	67.85	67.80	67.20	67.47	68.16	68.62	69.29	69.38	69.52	69.06	
Colorado	36.73	37.09	37.90	38.39	38.05	38.53	39.51	40.24	37.91	36.46	37.60	40.91	37.91	35.19	36.81	40.58	39.91	37.15	39.83	41.26	36.59	32.32	34.90	38.20	35.18	33.56	34.16	37.84	
Connecticut	37.09	37.90	38.39	38.05	38.53	39.52	40.24	37.91	36.46	37.60	40.91	37.91	35.19	36.81	40.58	39.91	37.15	39.83	41.26	36.59	32.32	34.90	38.20	35.18	33.56	34.16	37.84		
DC	39.28	37.13	36.12	33.19	28.66	29.51	40.24	37.91	36.46	37.60	40.91	37.91	35.19	36.81	40.58	39.91	37.15	39.83	41.26	36.59	32.32	34.90	38.20	35.18	33.56	34.16	37.84		
Florida	37.53	39.28	37.13	36.12	33.19	28.66	29.51	40.24	37.91	36.46	37.60	40.91	37.91	35.19	36.81	40.58	39.91	37.15	39.83	41.26	36.59	32.32	34.90	38.20	35.18	33.56	34.16	37.84	
Georgia	40.40	43.22	44.42	45.99	47.01	47.06	47.63	47.68	46.72	47.12	45.99	45.46	44.48	44.76	45.62	44.83	44.34	42.96	42.83	42.32	41.92	42.16	41.61	41.86	41.49	42.92	43.31	42.64	
Hawaii	42.13	43.07	42.14	41.70	41.05	42.71	42.94	43.15	41.08	42.71	41.70	41.85	43.79	45.87	46.37		45.29	43.47	41.50	40.73	41.49	43.41							
Idaho	52.45	54.94	55.51	56.49	55.61	56.17	57.03	57.94	56.88	56.81	55.87	56.49	55.81	56.10	56.68	57.39	57.11	57.58	57.79	58.17	56.75	58.12	58.83	59.94	59.02	59.22	59.55	60.76	
Illinois	34.38	28.72	26.55	27.94	26.53		34.62																						
Indiana	34.17																												
Iowa	50.55	51.57	51.70	52.33	52.18	53.00	53.03	52.88	52.73	54.17	54.06	53.82	53.36	54.02	52.88	52.96	52.84	53.60	53.56	53.99	53.79	54.82	54.67	55.01	55.43	56.18	56.40	56.61	
Kansas	12.50																												
Kentucky	23.65	23.72	23.22	22.26																									
Louisiana	64.18	52.59	53.74	53.72	54.60	56.19	59.49	55.10	54.86	57.74																			
Maine																													
Maryland	59.42	61.61	59.75	61.53	62.25	62.44	58.26	58.14	48.90	49.32	48.06	49.54	48.79	49.35	48.58	49.45	47.74	47.21	45.78	48.31	47.07	47.36	47.04	48.22	48.44	47.93	47.33	47.61	
Massachusetts	41.33	43.21	44.35	44.73	45.29	45.67	46.50	45.59	46.28	45.69	46.15	46.02	45.51	45.94	46.51	46.42	45.04	45.51	46.42	45.79	45.49	45.90	46.75	47.06	47.32	48.71	49.91	48.88	
Michigan	14.18	17.16	18.17	15.63	14.91	19.23	24.61																						
Missouri	38.34	39.96	39.68	40.25	39.87	40.63	40.89	41.50	41.27	42.61	43.26	44.88	43.93	44.97	44.76	45.70	45.55	46.15	46.11	46.26	45.50	47.01	47.54	48.09	48.33	50.21	50.17	49.94	
Montana	61.52	63.39	63.52	64.29	64.06	65.78	66.83	66.74	65.23	67.02	66.25	65.75	64.74	66.12	65.93	66.13	68.53	67.58	67.08	67.52	66.79	65.78	69.68	66.12	64.84	65.99	66.81	65.00	
Nebraska	43.76	44.37	44.32	45.35	43.37	43.51	44.02	43.88	45.15	44.68	44.33	45.53	44.57	45.21	45.22	45.62	45.15	44.43	44.31	45.11	44.85	43.88	44.91	45.33	44.45	43.74	44.79	44.65	
Nevada																													
New Jersey	46.76	46.18	45.74	42.85	44.34	42.82	44.25	44.55	49.25	50.84	52.62	53.14	50.72	52.99	53.23	47.02	45.28	45.19	46.72	44.69	45.34	46.49	48.61	48.97	38.14	40.12	40.59	39.31	
New Mexico																													
New York	11.59	12.41	12.49	12.83	12.99	12.55	11.29	11.45	11.96	12.01	11.35	10.63	9.72	9.57	10.33	10.55	10.82	11.13	10.07	9.77	10.16	12.27	15.33	16.75	16.05	16.71	16.03		
North Carolina	51.19	53.10	52.60	52.90	51.90	53.20	53.40	52.84	51.36	51.88	40.92	40.43	38.65	36.65	36.96	36.46	36.80	35.94	35.94	33.93	30.08	28.55	28.46	26.11	26.16	24.86	23.83	21.51	
Ohio	54.27	55.52	55.51	55.45	55.93	57.01	57.01	57.51	56.45	57.00							56.87	57.39	57.09	58.08	58.94	59.03	58.82	58.27	58.57	58.85	58.97	58.51	
Oregon																													
Pennsylvania	44.66	44.96	45.08	45.31	45.32	45.53	45.59	45.51	45.27	45.58	45.42	45.83	45.32	46.30	46.89	46.54	45.68	46.29	46.19	46.20	46.01	47.07	47.41	47.42	48.09	48.35	48.68		
South Carolina	39.54	30.95	30.83	26.17	25.56	26.41	29.66	22.80	21.75								54.92	55.31	55.86		56.93	58.14	57.62	57.58	58.05	58.66	59.26		
South Dakota	39.02	38.71	40.08	37.93	37.13	38.91	39.42	39.55	38.52	34.28	33.85	34.00	34.20				34.69	35.68	35.91	35.35	34.68	35.53	36.03	36.39	37.14	37.42	37.50	37.45	
Tennessee	30.89	32.14	32.68	32.68	32.49	33.82	34.28	33.85	34.00	34.20	32.03	32.10	32.54	34.41	34.50	34.14	34.69	35.68	35.91	35.35	34.68	35.53	36.03	36.39	37.14	37.42	37.50	37.45	
Texas	17.95	25.22	26.90	27.69	29.47	29.60	29.54	30.11	30.91	32.03	32.03	32.10	32.54	34.41	34.50	34.14	34.69	35.68	35.91	35.35	34.68	35.53	36.03	36.39	37.14	37.42	37.50	37.45	
Utah	54.97	55.70	56.13	55.80	56.04	56.40	58.74	57.84	55.88	57.63	57.44	57.31	57.34	58.11	57.79	56.78	56.38	57.14	57.08	57.03	55.80	56.68	57.56	56.81	57.69	58.00	58.06	58.16	
Vermont																													
Virginia	32.32	32.76	34.34	26.45	36.23	34.55	35.90	34.43	37.01	34.19							58.92	59.00	60.63	60.36	60.50	60.77	59.97	59.60	60.00	59.99	60.00	60.26	
Washington	58.04	58.19	56.10	55.92	56.31	57.49	58.45	58.60	58.21	58.04	58.51	58.38	58.50	58.67	59.15	59.05	58.92	59.00	60.63	60.36	60.50	60.77	59.97	59.60	60.00	59.99	60.00	60.26	
West Virginia	7.71	7.81	7.90	8.21	7.80	7.96	7.72	7.85	7.06	7.32	7.34	8.16	8.28	8.90	9.32	9.53	8.90	8.49	8.37	8.42	7.68	7.23	7.77	8.49	9.09	9.53	9.54	9.79	
Wisconsin	56.04	57.94	58.56	57.35	57.20	57.51	56.88	56.60	58.14	59.62	60.19	59.77	59.46	59.03	59.58	59.14	56.90	56.79	57.04	56.14	55.37	56.04	55.26	55.07	55.13	55.87	55.99		
Wyoming	59.18	59.77	60.15	59.31	59.46	59.37	59.11	58.54	59.01	58.97	58.96	59.55	59.25	59.49	59.46	59.16	59.18	59.46	60.15	59.48	59.26	58.86	58.32	57.73	57.61	56.69	58.11	58.19	

Note: No data available for Arkansas, Delaware, Minnesota, Mississippi, New Hampshire, North Dakota, Oklahoma, and Rhode Island.

In addition, we constructed a dataset of changes in organ donor registration forms, summarized in Table C2. This dataset allowed us to identify treated states (i.e., states that changed their donor question frame from an opt-in to a yes/no frame or vice versa) and control states that did not change their question frame during the sample period.

Table C2—Organ Donor Registration Questions by State (2014)

<i>Panel A: Yes/No</i>		
<u>Positive Wording</u>	<u>Negative Wording</u>	<u>States</u>
"Yes"	"No"	AK, CT, GA, HI, IA, LA, MA, MS, NE, NV, NJ, NM, ND, OR, PA, RI, TX, UT, VT, WV, WY
"YES, add my name to the donor registry"	"I do not wish to register at this time"	CA
"Yes, add my name"	"No, not at this time"	MD
"Yes"	"Skip this question"	NY
"Yes"	"Not now"	MT
<u>Verbal question</u> (no fixed response)		AR, CO, DE, FL, ID, IL, IN, KS, KY, ME, MI, MO, NC, OH, OK, WA
<i>Panel B: Opt-in</i>		
<u>Positive Wording</u>		<u>States</u>
"Yes"		TN, WI, DC
"I want to be an organ and tissue donor. By checking this box, Donor Network of AZ will add me to the Donate Life AZ Registry"		AZ
"I want my license or ID card to show that I choose to be an organ and tissue donor under the Uniform Anatomical Gift Act"		MN
"Check here to consent to organ & tissue donation"		NH
"YES, I want to be an organ and tissue donor"		SC
"In the event of my death, I would like to be an organ/tissue donor"		SD
"Yes, I would like to remain or become an organ, eye and tissue donor"		VA

Note: Table C2 shows the question framing and responses for 49 states and Washington DC as of 2014, which either had DMV forms online, shared forms for our research, or answered questions about their organ donation policies when called by our research assistants (all U.S. jurisdictions excluding Alabama).

Through this process, we identified three states that changed the organ donor question frame during our data window and for which we had sufficient data. In the main text, see Figure 4 for the change in California, Figure 5 for the change in New York, and Figure 6 for the change in Hawaii. As noted in the main text, a fourth state, Tennessee, also changed the question frame during this period, but we have insufficient data to analyze how this change impacted registration rates and therefore exclude Tennessee from our analyses.

The top panel of Appendix Figure C1 plots average quarterly registration rates for California and 37 control states that did not change their question frame during the data window.²⁶ Registration rates are shown as a percentage of the Quarter 2, 2011 rate, the quarter before California switched from opt-in to yes/no. While the other states show a gradual increase in registration rates over time, California

²⁶The number of control states varies based on the data availability in the treated state of interest; i.e., we trim the data window to the available periods in the treated state, which excludes some control states where all observations for that state fall outside this data window. However, control states in each figure are pulled from the same baseline group of 39 control states that did not change the organ donor question frame during the sample period.

shows a dip in registration rates between the second and third quarters of 2011 when the question frame was modified from an opt-in to a yes/no frame.

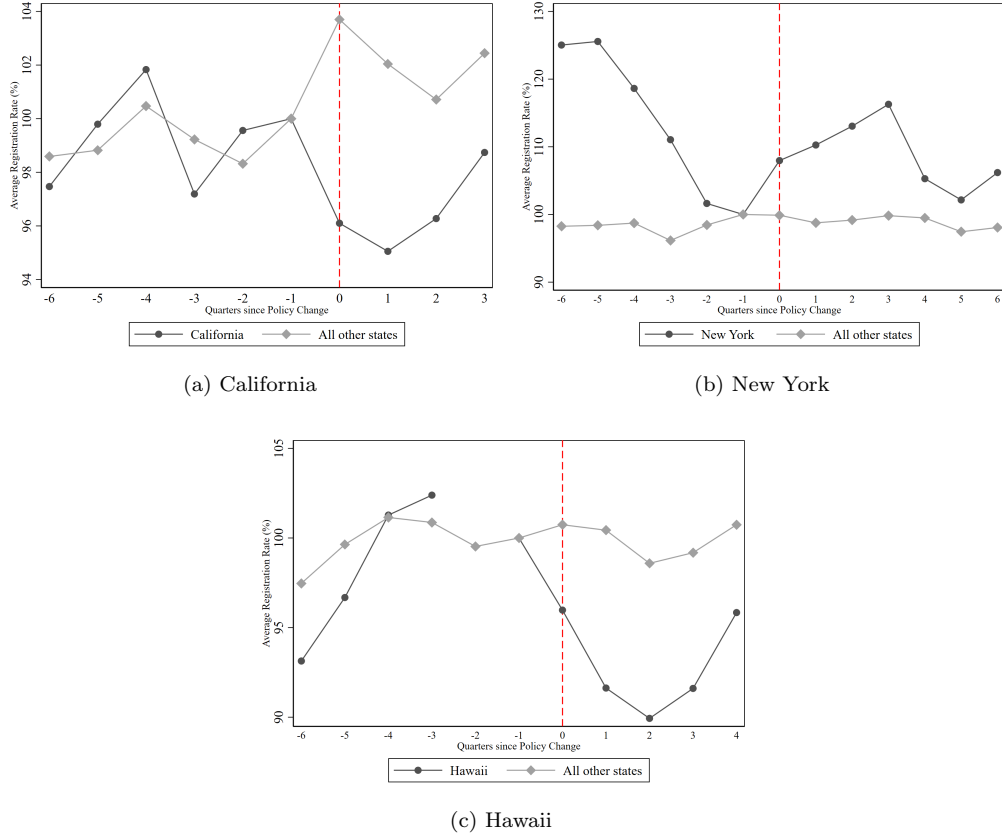


Figure C1. Quarterly Organ Donor Registration Rates (Treated States)

Note: Panel (a) shows average organ donor registration rates for California and 37 control states. Each state's registration rate is normalized to Quarter 2, 2011 (the registration rate in the quarter before the switch to the yes/no frame). The dashed line indicates the quarter in which California switched from an opt-in to a yes/no frame (Quarter 3, 2011). Panel (b) shows average organ donor registration rates for New York and 35 control states. Each state's registration rate is normalized to Quarter 3, 2013 (the registration rate in the quarter before the switch to the yes/no frame). The dashed line indicates the quarter in which New York switched from an opt-in to a yes/no frame (Quarter 4, 2013). Panel (c) shows average organ donor registration rates for Hawaii and 29 control states. Each state's registration rate is normalized to Quarter 2, 2014 (the registration rate in the quarter before the switch to the opt-in frame). The dashed line indicates the quarter in which Hawaii switched from a yes/no to an opt-in frame (Quarter 3, 2014). Data from Hawaii is missing from quarter $t = -2$. In each figure, $t = -1$ is mechanically set to 100%.

Panel B of Appendix Figure C1 similarly shows average quarterly registration rates for New York and a cohort of 35 control states, where registration rates are normalized to Quarter 3 of 2013, the quarter before New York changed the organ

donor question frame from an opt-in to a yes/no frame. Unlike in California, registration rates in New York follow an inconclusive pattern around the switch to the yes/no frame, while rates in control states are fairly constant over time.

The bottom panel of Appendix Figure C1 shows registration rates in Hawaii and 29 control states, normalized to the registration rate in Quarter 2, 2014, the quarter before Hawaii modified its question frame from a yes/no to an opt-in. Registration rates in Hawaii decrease relative to the quarter prior to the switch to opt-in, suggesting the yes/no frame in Hawaii might be associated with higher registration rates.

Table 3 in the main text summarizes difference-in-differences results based on this data. Figure 7 provides quarterly event-study estimates of the effect of the yes/no frame (or the opt-in frame in Hawaii) on registration rates.

C2. Stacked Difference-in-Differences

To fully leverage the staggered policy changes across treated states, we follow the “stacked” difference-in-differences approach in Gormley and Matsa (2011). Results from this exercise are included in Table 3 in the main text. For each year-quarter in which a treated state changed their organ donation question frame from an opt-in to a yes/no frame (or vice versa in the case of Hawaii), we construct a cohort of treated states and clean control states, restricting the sample to observations from the 6 quarters before and 4 quarters after the policy change. Clean controls in our setting are states that do not change the format of the organ donor question during the sample period. We create a cohort-specific identifier and append the event-specific datasets. Using this stacked dataset, we estimate Equation C1:

$$(C1) \quad y_{stc} = \beta_0 + \beta_1 Yes/NoFrame_{stc} + \gamma_{sc} + \delta_{tc} + \epsilon_{stc}$$

where y is the organ donor registration rate in state s and year-quarter t and $Yes/No Frame$ is an indicator equal to 1 if a state had a yes/no frame in year-quarter t . To estimate the impact of the yes/no frame net of any time-invariant differences between states, we include state-cohort fixed effects, γ_{sc} . We also account for aggregate time trends by including year-quarter-cohort fixed effects, δ_{tc} . β_1 estimates the average treatment effect. Intuitively, this approach estimates the difference-in-differences for each cohort separately and uses variance weighting to combine cohort-specific treatment effects into one pooled estimate (Baker, Larcker and Wang, 2022).²⁷

²⁷We prefer this approach because using only clean controls allows us to relax the assumption in the canonical two-way fixed effects framework that treatment effects are constant over time (Borusyak, Jaravel and Spiess, 2022; de Chaisemartin and D’Haultfoeuille, 2020; Goodman-Bacon, 2021).

C3. *Parallel Trends*

The key identifying assumption underpinning our difference-in-differences analysis is that the organ donor registration rate in treated and control states would have evolved similarly in the absence of the policy change. We take two approaches to address potential violations of the parallel trends assumption.

First, we implement the synthetic control method introduced by Abadie and Gardeazabal (2003). We compare the evolution of the organ donor registration rate in treated states with the evolution in a weighted combination of control states that do not change the frame of the organ donor question during the sample period. This synthetic control group is chosen to best approximate pre-treatment registration rates in the treated state. The treatment effect of interest is the difference between the observed registration rate in the treated state and the synthetic control cohort post treatment. More formally, let X^T and X^C be the value of the organ donor registration rate for the treated state and synthetic control group, respectively. As in Abadie and Gardeazabal (2003) and Abadie et al. (2010), we choose $W = W^*$ to minimize:

$$(C2) \quad (X^T - X^C W)^2$$

The synthetic control estimator is given by $Y^T - Y^C W^*$. See, e.g., Abadie et al. (2010; 2015; 2021) for additional details. Results from this analysis are summarized in Figure C2 below. Additionally, Table C3 summarizes the weights assigned to each control state used in this analysis. We note that the weight assigned to West Virginia in the New York analysis is very large. However, weights are assigned here solely based on pre-period organ donor registration rates, and not other characteristics that we would expect to differ across these two states.

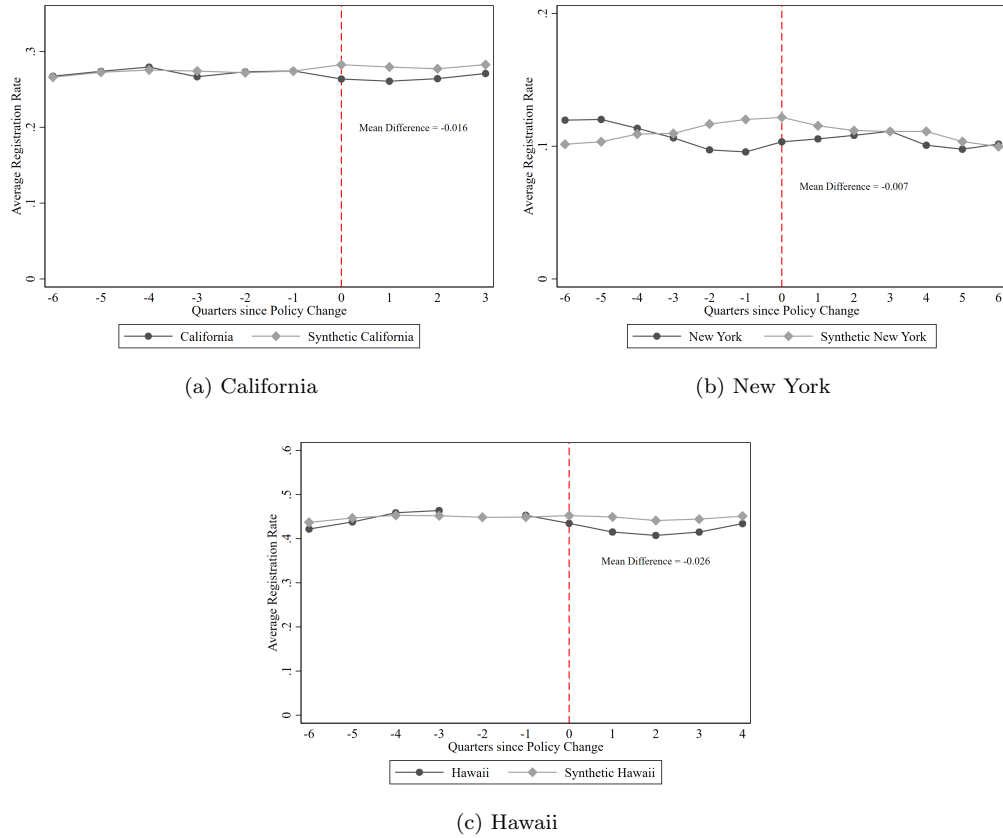


Figure C2. Quarterly Organ Donor Registration Rates (Synthetic Control)

Note: Panels (a)–(c) compare average quarterly organ donor registration rates for treated states and their synthetic control counterparts. Appendix Section C.C3 details the method used to construct the synthetic cohorts. The dashed line indicates the quarter in which the treated states switched from an opt-in to a yes/no frame or vice versa. The mean difference is calculated by subtracting the registration rate for the synthetic control group from the registration rate for the treated states in each quarter following the change to the question frame and then averaging across quarters.

Table C3—Synthetic Control Weights

<i>Treated State:</i>	California (1)	New York (2)	Hawaii (3)
Alaska	0.015	0.002	0.035
Arizona	0.056		
Colorado	0.008	0.001	0.027
Connecticut	0.031	0.005	0.042
DC	0.037	0.006	0.045
Georgia	0.024	0.004	0.041
Idaho	0.015	0.002	0.033
Iowa	0.017	0.002	0.035
Louisiana	0.014		
Maine		0.003	0.036
Maryland	0.011	0.003	0.038
Massachusetts	0.025	0.004	0.040
Missouri	0.029	0.004	0.040
Montana	0.009	0.001	0.028
Nebraska	0.025	0.004	0.040
New Jersey	0.024	0.003	0.037
North Carolina	0.017	0.005	0.046
Ohio	0.014		0.032
Oregon		0.002	0.035
Pennsylvania	0.024	0.004	0.039
South Dakota	0.031		
Texas	0.050	0.008	0.048
Utah	0.014	0.002	0.033
Vermont			0.045
Virginia	0.039		
Washington	0.013	0.002	0.032
West Virginia	0.433	0.931	0.110
Wisconsin	0.013	0.002	0.032
Wyoming	0.012	0.002	0.032

Second, we implement a sensitivity analysis introduced by Rambachan and Roth (2023) on our initial difference-in-differences results. This exercise imposes restrictions on how large the violation of parallel trends in the first post-period can be relative to the worst violation in the pre-period (across two consecutive pre-periods). In Figure C3, we report 95% robust confidence intervals for various violations of parallel trends, which allows us to identify the largest violation for which there is still a significant effect of the question frame on organ donor registrations. We find that this “breakdown value”, borrowing language from

Rambachan and Roth (2023), is roughly 1 in California, 0.1 in New York, and 1.1 in Hawaii.

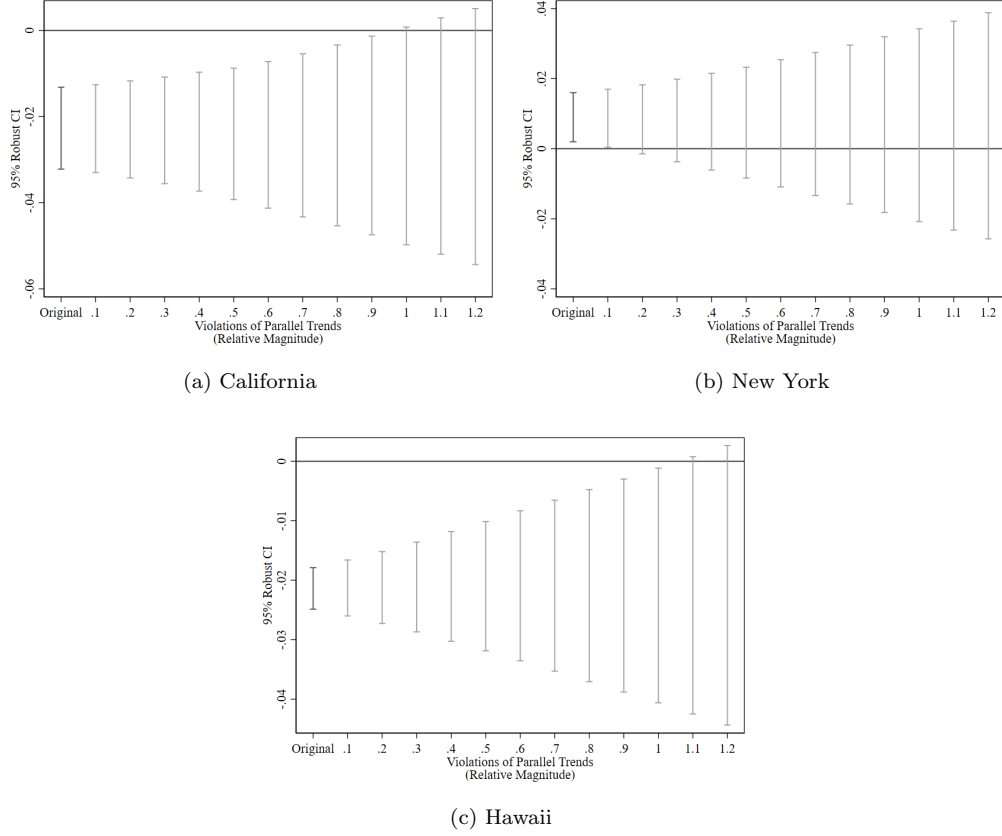


Figure C3. Event Study Sensitivity Test

Note: Figure C3 shows results from a sensitivity test proposed by Rambachan and Roth (2023). In each panel, we plot 95% robust confidence intervals under different assumptions about the relative magnitude of post-treatment violations of parallel trends. A value of 0.1 imposes that the violation of parallel trends in the first post-treatment period is no more than 0.1 times the worst pre-treatment violation between consecutive periods. A value of 1.2 imposes that the violation of parallel trends in the first post-treatment period is no more than 1.2 times the worst pre-treatment violation between consecutive periods. Panel (a) shows results for California, Panel (b) for New York, and Panel (c) for Hawaii.

APPENDIX D: NEXT OF KIN STUDY DETAILS

Appendix D provides additional information on the next of kin follow-on experiment described in Section III in the main text. Subjects on Amazon's Mechanical Turk were asked to answer a set of questions about one of the randomly selected scenarios in Figure D1.

An individual has died. The individual's next of kin has been asked whether or not they would like to donate the organs of the deceased.

The only information that the next of kin has about the wishes of the deceased is that the deceased saw this screen...

ON THIS WEBSITE YOU CAN CHOOSE TO BE AN ORGAN AND TISSUE DONOR IN THE EVENT OF YOUR DEATH. IT IS ESTIMATED THAT ONE DONOR CAN SAVE OR ENHANCE THE LIVES OF AS MANY AS 50 PEOPLE BY DONATING ORGANS AND TISSUES. THOSE WHO REGISTER AS ORGAN DONORS AGREE TO DONATE ALL THEIR ORGANS AND TISSUES.

IF YOU CONTINUE WITHOUT CHECKING THE BOX, YOU WILL NOT BE REGISTERED AS AN ORGAN AND TISSUE DONOR.

☐ I WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.

CONTINUE

...and did not select "I want to register as an organ and tissue donor."

(a) Opt-in Frame Decision Screen (Deceased Unregistered)

An individual has died. The individual's next of kin has been asked whether or not they would like to donate the organs of the deceased.

The only information that the next of kin has about the wishes of the deceased is that the deceased saw this screen...

ON THIS WEBSITE YOU CAN CHOOSE TO BE AN ORGAN AND TISSUE DONOR IN THE EVENT OF YOUR DEATH. IT IS ESTIMATED THAT ONE DONOR CAN SAVE OR ENHANCE THE LIVES OF AS MANY AS 50 PEOPLE BY DONATING ORGANS AND TISSUES. THOSE WHO REGISTER AS ORGAN DONORS AGREE TO DONATE ALL THEIR ORGANS AND TISSUES.

IF YOU CONTINUE WITHOUT CHECKING THE BOX, YOU WILL NOT BE REGISTERED AS AN ORGAN AND TISSUE DONOR.

☐ I WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.

CONTINUE

...and selected "I want to register as an organ and tissue donor."

(b) Opt-in Frame Decision Screen (Deceased Registered)

An individual has died. The individual's next of kin has been asked whether or not they would like to donate the organs of the deceased.

The only information that the next of kin has about the wishes of the deceased is that the deceased saw this screen...

ON THIS WEBSITE YOU CAN CHOOSE TO BE AN ORGAN AND TISSUE DONOR IN THE EVENT OF YOUR DEATH. IT IS ESTIMATED THAT ONE DONOR CAN SAVE OR ENHANCE THE LIVES OF AS MANY AS 50 PEOPLE BY DONATING ORGANS AND TISSUES. THOSE WHO REGISTER AS ORGAN DONORS AGREE TO DONATE ALL THEIR ORGANS AND TISSUES.

PLEASE SELECT ONE OF THE FOLLOWING OPTIONS.

☐ I WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.
☐ I DO NOT WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.

CONTINUE

...and selected "I do not want to register as an organ and tissue donor."

(c) Yes/No Frame Decision Screen (Deceased Unregistered)

An individual has died. The individual's next of kin has been asked whether or not they would like to donate the organs of the deceased.

The only information that the next of kin has about the wishes of the deceased is that the deceased saw this screen...

ON THIS WEBSITE YOU CAN CHOOSE TO BE AN ORGAN AND TISSUE DONOR IN THE EVENT OF YOUR DEATH. IT IS ESTIMATED THAT ONE DONOR CAN SAVE OR ENHANCE THE LIVES OF AS MANY AS 50 PEOPLE BY DONATING ORGANS AND TISSUES. THOSE WHO REGISTER AS ORGAN DONORS AGREE TO DONATE ALL THEIR ORGANS AND TISSUES.

PLEASE SELECT ONE OF THE FOLLOWING OPTIONS.

☐ I WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.
☐ I DO NOT WANT TO REGISTER AS AN ORGAN AND TISSUE DONOR.

CONTINUE

...and selected "I want to register as an organ and tissue donor."

(d) Yes/No Frame Decision Screen (Deceased Registered)

Figure D1. Decision Screens

What do you think the next of kin should do?

The next of kin should donate the organs of the deceased

The next of kin should not donate the organs of the deceased

(a) Hypothetical Next of Kin Decision

How confident are you in your answer to the previous question?

Very confident

Confident

Somewhat
confident

Not confident

(b) Confidence in Hypothetical Next of Kin Decision

Figure D2. Decision and Confidence Screens

Subjects were then asked whether hypothetical next of kin should donate the organs of the deceased and how confident they were in their answer (Figure D2).

Table D1 displays regression results on data from this experiment (also see Figure 8 in the main text for a graphical analysis). In these regressions, the excluded group is beliefs about what next of kin should do when the deceased chose to register in the opt-in frame. Consequently, the coefficient *Yes/No Frame* reflects the change in what subjects think the next of kin should do when the deceased registered under a yes/no frame rather than an opt-in frame. The coefficient *Deceased Unregistered* reflects the change when the deceased chose not to register rather than register under the opt-in frame. The interaction *Yes/No Frame* \times *Deceased Unregistered* is the differential effect of going from opt-in to yes/no for those who are unregistered rather than registered. The regressions show that people respond differentially to the yes/no frame when the deceased was not on the registry. In particular, they are significantly less likely to think next of kin should donate the organs of the deceased when the deceased chose not to register under the yes/no frame than when they chose not to register under the opt-in frame. Results are consistent for the confidence measure with all the same differences statistically significant ($p < 0.01$).²⁸

Interestingly, these regressions also demonstrate that subjects are somewhat more likely to think the next of kin should donate the organs of a deceased who registered under a yes/no frame than who registered under an opt-in frame—the difference is significant when considering all four scenarios in regression (2). How-

²⁸See notes in Table D1 for details on this analysis.

ever, this difference is small relative to the decrease observed when the deceased is not registered (i.e., the effect of the yes/no frame is 3% for registered donors and -14.3% for those who are not registered).

In addition, there is reason to be a bit less concerned about how next of kin respond when the deceased is registered, since due to improvements in registration technology, a deceased being registered is increasingly likely to proceed with donation. In particular, since the Uniform Anatomical Gift Act of 1968 (UAGA), joining a state registry has been a legally binding decision to be an organ donor after death, but next of kin were often consulted about donation anyway, given that the deceased may have joined the state registry years ago and so their presence on the registry might not reflect the deceased's current intent to donate (Glazier et al., 2009).²⁹ Recently, however, computer-based registries have provided a way for potential donors to easily change their organ donor status if they change their mind, which means being on the registry can be more easily interpreted as current intent to donate. Consequently, doctors can now sometimes recover organs from registered donors (but not from unregistered potential donors) without receiving explicit permission from the next of kin (Glazier, 2006).

²⁹Next of kin were historically asked since: (1) the driver's license of a potential donor was often not available at the time of death and (2) a registered donor might have changed his or her mind about donation after having been issued the driver's license and these wishes might have been communicated to the next of kin (Glazier, 2006).

Table D1—Next-of-Kin Decisions and Confidence by Condition

	Next of Kin Should Donate		Confidence	
	First Scenario Only (1)	All Four Scenarios (2)	First Scenario Only (3)	All Four Scenarios (4)
Yes/No Frame \times Deceased Unregistered	-0.130** (0.052)	-0.173*** (0.016)	-0.843*** (0.292)	-1.186*** (0.084)
Yes/No Frame	0.016 (0.024)	0.030*** (0.009)	0.064 (0.148)	0.209*** (0.047)
Deceased Unregistered	-0.551*** (0.038)	-0.564*** (0.019)	-3.200*** (0.211)	-3.345*** (0.105)
Constant	0.932*** (0.018)	0.913*** (0.015)	2.647*** (0.114)	2.518*** (0.089)
Observations	803	3212	803	3212
R-squared	0.411	0.456	0.438	0.482
Subjects (clusters)		803		803
Order FE	NO	YES	NO	YES

Note: The dependent variable in Columns 1 and 2 is an indicator for whether the subject said next of kin should donate the organs of the deceased. The dependent variable in Columns 3 and 4 is a numeric scale that indicates how confident the subject was in their decision in Columns 1 and 2. The values of the scale are as follows: the subject was Very Confident that next of kin should donate (3.5), Confident that next of kin should donate (2.5); Somewhat Confident that next of kin should donate (1.5); Not Confident that next of kin should donate (0.5); Not Confident that next of kin should not donate (-0.5); Somewhat Confident that next of kin should not donate (-1.5); Confident that next of kin should not donate (-2.5); and Very Confident that next of kin should not donate (-3.5). Columns 1 and 2 focus on the first scenario the subject saw (between-subject analysis) and Columns 2 and 4 look at all data (between- and within-subject analysis). Yes/No Frame and Deceased Unregistered are indicators for the scenario the subject was being asked about. Analysis in Columns 2 and 4 includes fixed effects for the order in which a subject saw the four scenarios. Robust standard errors are in parentheses, clustered at the subject level in Columns 2 and 4. * < 0.10 , ** < 0.05 , *** < 0.01 .