Reciprocity Decays over Time, As Revealed by a Field Study of Charitable Giving

by Amanda Chuan, Judd B. Kessler, and Katherine Milkman

The Wharton School, University of Pennsylvania

ABSTRACT: We examine how reciprocity changes over time by studying a large quasi-experiment in the field. Specifically, we analyze administrative data from a university hospital system. The data include information about over 18,000 donation requests made by the hospital system via mail to a set of its former patients in the four months following their first hospital visit. We exploit quasi-experimental variation in the timing of solicitation mailings relative to patient hospital visits and find that an extra 30-day delay between the provision of medical care and a donation solicitation decreases the likelihood of a donation by 30%. Our findings have important implications for models of economic behavior, which currently fail to incorporate reciprocity’s sensitivity to time. The fact that reciprocal behavior decays rapidly as time passes also suggests the importance of capitalizing quickly on opportunities to benefit from a quid pro quo.

SIGNIFICANCE STATEMENT: Reciprocity motivates a wide range of cooperative behaviors (e.g., tipping, the exchange of favors, customer loyalty, etc.). It is typically assumed that once a reciprocal relationship is triggered, reciprocal motives remain stable over time. Using a large-scale field study, we demonstrate that this is not the case. Instead, we find that reciprocity decays rapidly over time. We analyze donation solicitations sent from a university hospital system to its patients and show that patients are less likely to donate when more time has elapsed since they were treated. In addition to informing our understanding of reciprocity, our results have considerable practical importance, as many charitable organizations raise funds from those they previously served (e.g., schools, hospitals, religious organizations, humane societies, etc.).
Reciprocity motivates a wide range of cooperative behaviors that are crucial to the functioning of modern society (1-7). We present the first evidence from a large-scale field study of a fundamental, and previously under-appreciated, feature of reciprocity: it decays rapidly over time. Our findings have important implications for long-term relationships between individuals as well as the relationships between individuals and organizations. In particular, if feelings of reciprocity diminish over time, interactions between parties may need to be temporally close in order to sustain strong reciprocal relationships. Our findings also provide guidance for governments and organizations interested in leveraging reciprocity to generate compliance or contributions. Policy makers and fundraisers may want to capitalize quickly on the reciprocal motives they induce in others.

Successful fundraising is critical to the survival of most not-for-profit organizations. We study reciprocity in a setting where individuals receive a service from a not-for-profit organization and then have the option to reciprocate by making a charitable gift. Specifically, we study giving to a massive hospital system which provides patients with medical care and later solicits them for charitable contributions. We examine how patients’ propensity to donate relates to the delay separating their first-ever visit to the hospital and their subsequent receipt of a charitable solicitation. Many non-profit organizations that provide services depend on charitable contributions from those they have served, just like our partner hospital system. Schools, hospitals, religious organizations, humane societies, and disaster relief providers all deliver services to individuals and later solicit donations from them. Reciprocity may play a large role in the success of these donation solicitations (8). Hospitals alone, the focus of our paper, take in over $9.6 billion in donations each year in the United States (9).

Past research in economics and psychology has shown that donation decisions are extremely sensitive to context effects. For instance, social pressure (10-13), perceptions of others’ donation decisions (14-17), perceptions of recipients’ expectations (18), the identifiability of the beneficiary (19-22), third-party evaluations of charities (23), transaction costs (18,24), the impact of the donation (25-33), the ability to target gifts (34-36), how far in the future a donation will be made (37-38), prior donation behavior (39-40), the salience of an individual’s identity as a donor (41-44), and the speed with which an individual makes a donation decision (45-52) all significantly shift a prospective donor’s likelihood of donating to a charitable organization. In addition, extensive past research suggests that time delays can significantly alter the psychology of decision-making (53,54). Nevertheless, standard theories of economic behavior, even those designed to explain the patterns of behavior described above, do not allow the delay separating a service interaction from a donation solicitation to affect generosity, holding all else constant (e.g., the arrival of new information or an income shock).

“Gather ye rosebuds while ye may, 
Old Time is still a-flying; 
And this same flower that smiles today 
Tomorrow will be dying.” –Robert Herrick 1591-1694
On the other hand, psychology research suggests that the timing of a solicitation relative to a recent interaction could indeed affect generosity. Past research on psychological reactance suggests that requesting a donation too quickly after a service interaction could be off-putting, as it might appear opportunistic and manipulative (55,56). If this were the case, a longer delay separating a service interaction from a donation solicitation would be expected to increase generosity by reducing reactance. However, there are also reasons to believe that a longer delay separating a service interaction from a donation solicitation could decrease generosity. Memories decay rapidly over time (57,58), so if more time separates a service encounter from a donation solicitation, the gratitude and reciprocity produced by that encounter should be less vividly recalled. Likewise, to the extent that reciprocity is driven by gratitude — a transient, “hot” state — longer delays between a service interaction and a solicitation would be expected to reduce generosity (59-61).

Past empirical research offers some initial support for the possibility that longer delays may decrease generosity. Using a laboratory experiment and hypothetical scenarios, Burger et al. (62) show that the likelihood of returning a small favor (e.g., the gift of a soda from a confederate, the loan of pizza money or help with class notes from a hypothetical acquaintance) decreases the longer the time delay between receiving the favor and an opportunity to reciprocate. Neo et al. (63) find that in the ultimatum game, second movers are more likely to exhibit negative reciprocity immediately after learning first movers’ actions, as opposed to after a fifteen-minute delay. And, Flynn (64) finds that in workplace surveys and a laboratory experiment, the recipients of favors report valuing them less when more time has elapsed since the favor.

To investigate how reciprocity changes over time in a field setting, we partnered with a large university hospital system comprised of a network of eight hospitals. Using data from 82,231 outpatient hospital visits as well as 18,515 donation solicitations and responses to those solicitations, we exploit quasi-experimental variation in the delay separating the hospital system’s solicitation mailings from patients’ hospital visits to study how this delay affects giving. Specifically, the hospital system solicits donations by mailing solicitations to thousands of recent patients on the same date. Because the timing of patients’ hospital visits are random with respect to the date of this mailing, we can examine how the delay separating a patient’s recent hospital visit from the receipt of a solicitation affects donations. Our key finding is that an additional 30-day delay in requesting a donation shortly after the provision of medical care decreases the likelihood of a donation to the hospital system by over 30%.

Our paper makes several key contributions to our understanding of the relationship between reciprocity and time. First, we document the decay of reciprocity over time in a consequential field setting, rather than the laboratory. Second, we are able to isolate a decay in reciprocity separately from a decay in social pressure. In our study, prospective donors receive a request to donate via a mailing that they open in the privacy of their own homes. Past studies of the sensitivity of reciprocity to time delays have always examined people’s decisions to return a favor either during a face-to-face interaction, where the request to reciprocate was made by the
individual who had already performed a favor for the subject (62), or when the potential beneficiary was in the same room (63,68,69). These past designs not only prevented researchers from separating decays in reciprocity from decays in social pressure, but they also introduced the possibility that study participants distorted their behavior, overall, as a result of their awareness that they were participating in a research study (62-64,68,69). Because the individuals we study were not aware that their behavior would be observed by researchers, our data is not subject to concerns about demand effects (70). Third, our study benefits from an extremely large participant sample — we are able to examine the behavior of a far larger population than past studies of reciprocity, which improves the precision of our estimates and allows us to detect statistically significant evidence of reciprocity where other studies were under-powered to do so (63).

To our knowledge, this is the first large-scale field study to explicitly explore the endurance of reciprocity over time. Our evidence that reciprocity decays dramatically over time informs economists’ understanding of repeated, cooperative interactions and suggests the value of capitalizing quickly on opportunities to benefit from a quid pro quo. Our guidance is important for practitioners who often choose to wait a while before soliciting donations from prospective donors after rendering them a service. This common practice of waiting to solicit could lead non-profit organizations to lose substantial fundraising revenue. Our findings indicate that the loss in fundraising revenue from waiting to solicit is quite large: a back-of-the-envelope calculation comparing our treatment effect to others in the literature suggests that avoiding an additional 30-day delay between providing a service and requesting a donation could improve donation rates by as much as offering a one-to-one matching donation (26). In addition to improving our understanding of how to promote the provision of public goods, the findings we present have important implications for leading economic models of reciprocity, which currently fail to incorporate sensitivity to time (71-73).

Methods
Data. We received donation solicitation data on adult outpatients who visited the hospital system between May 2013 and April 2015.* To explore the endurance of reciprocity over time, we focus on outpatients who were solicited for a donation by the hospital system’s Annual Giving Department in our data window and for whom we have complete information about all hospital visits. This focus leads to two data restrictions. First, we restrict our analysis to patients whose first visit was within our data window, allowing us to observe their full visit history at any of the eight hospitals in the network. Second, we restrict our analysis to patients who were

*The data the hospital system chose to share with us on charitable giving included all adult outpatients except those who: (a) had Medicaid as a form of insurance, (b) were behavioral health patients, (c) were younger than 40 years old and so were never mailed solicitations following the hospital system’s solicitation protocols, (d) were patients of certain special medical care divisions (e.g., hospices), (e) had incomplete contact information, (f) were on the Do Not Solicit list, (g) were employees of the hospital system, or (h) visited a medical location that was not immediately identifiable as a medical care location within the hospital system.
solicited in response to their first-ever visit to the hospital system,† which allows us to cleanly estimate how reciprocal giving is affected by the delay in the timing of a solicitation relative to that first visit. These sample restrictions leave us with a large pool of patients (N_{unique\_patients}=18,515; N_{outpatient\_visits}=82,231) who were each solicited for a donation by our partner hospital system. It is worth noting that our results replicate when we do not make these conservative restrictions and instead include the first observed solicitations by the hospital system to all patients in our dataset (this expands our sample to 149,817 patients, but we are forced to ignore all hospital visits before May 2013, which do not appear in our data; see Table S1 in Supplementary Information).

Table 1, column 1 provides a summary of our data. We report on the demographic characteristics of patients in our sample, the average number of visits patients made to the hospital system before receiving a donation solicitation, and the average number of hospital visits a patient made in the 132 days following her first visit,‡ as well as the percentage of patients who donate upon receiving a solicitation, and the average gift conditional on donation, which was $49.14. Columns 2 and 3 present balance regressions confirming that the time delay separating a patient’s first hospital visit from her first solicitation is (as we will assume throughout our analyses) approximately random with respect to observable patient characteristics.

Table 1: Summary Statistics and Regressions Testing Demographic Balance across Solicitation Delays

<table>
<thead>
<tr>
<th>Patient Demographics</th>
<th>Summary Statistics</th>
<th>Regressions Predicting Days Separating a Patient’s First Visit from Her First Solicitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Age</td>
<td>Avg. = 64.19</td>
<td>0.0189</td>
</tr>
<tr>
<td></td>
<td>(S.D. = 11.45)</td>
<td>(0.0123)</td>
</tr>
<tr>
<td>Single</td>
<td>18.50%</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>64.09%</td>
<td>-0.0381</td>
</tr>
<tr>
<td></td>
<td>(0.326)</td>
<td>(0.318)</td>
</tr>
<tr>
<td>Divorced</td>
<td>5.87%</td>
<td>-0.304</td>
</tr>
<tr>
<td></td>
<td>(0.575)</td>
<td>(0.560)</td>
</tr>
<tr>
<td>Separated</td>
<td>0.60%</td>
<td>-0.403</td>
</tr>
</tbody>
</table>

†The hospital system relied on somewhat ad-hoc rules (based on patients’ demographic characteristics) that varied from mailing to mailing to determine who would receive solicitations. However, we only study those who received mailings and include fixed effects for mailing date in all analyses, ensuring these selection criteria do not impact our causal estimates of the relationship between delay and reciprocity.

‡132 days is the longest period separating a first hospital visit from an initial donation solicitation in our data sample. We use the number of visits a patient made within 132 days of her first visit as a control for a patient’s sickness in some of our analyses.
<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Percentage</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widowed</td>
<td>8.21%</td>
<td>-0.0525</td>
<td>(0.543)</td>
<td>-0.0395</td>
<td>(0.530)</td>
</tr>
<tr>
<td>Marital status unknown</td>
<td>2.73%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-state resident</td>
<td>57.87%</td>
<td>-12.76</td>
<td>(12.46)</td>
<td>-10.44</td>
<td>(10.54)</td>
</tr>
<tr>
<td>Female name</td>
<td>45.71%</td>
<td>-0.525</td>
<td>(0.460)</td>
<td>-0.452</td>
<td>(0.447)</td>
</tr>
<tr>
<td>Male name</td>
<td>46.14%</td>
<td>-0.0809</td>
<td>(0.460)</td>
<td>-0.0223</td>
<td>(0.447)</td>
</tr>
<tr>
<td>Gender of name unknown</td>
<td>8.15%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Hospital Visits

<table>
<thead>
<tr>
<th># Hospital visits between 1st visit and solicitation</th>
<th>Avg. = 3.42</th>
<th>(S.D. = 3.11)</th>
</tr>
</thead>
<tbody>
<tr>
<td># Hospital visits within 132 days of 1st visit</td>
<td>Avg. = 4.44</td>
<td>(S.D. = 4.74)</td>
</tr>
</tbody>
</table>

### Donations

<table>
<thead>
<tr>
<th>Percent Donate</th>
<th>0.83%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donation</td>
<td>Donation &gt; 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patients</th>
<th>18,515</th>
<th>18,515</th>
<th>18,515</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.048</td>
<td>0.104</td>
<td></td>
</tr>
<tr>
<td>Key Controls</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>State Dummies</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td># Hospital visits between first visit and solicitation</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td># Hospital visits within 132 days of first visit</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F statistic</td>
<td>1.010</td>
<td>1.041</td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.454</td>
<td>0.391</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Column 1 presents summary statistics describing our study sample. Sample means are shown with standard deviations in parentheses. Several patients’ age data was missing from our primary age data source (solicitation administrative data); for these patients, we imputed age from the date of birth in the administrative health data (N=3,695). To protect patient privacy, imputed age was topcoded at 90 in the data. Gender was imputed from patients’ first names using the mapping in Morton, Zettelmeyer, and Silva-Risso (74). Columns 2 and 3 present ordinary least squares (OLS) regressions of the timing of a first patient visit on demographic variables with standard errors shown in parentheses. Specifically, we regress the time delay separating a patient’s first hospital visit from the date of their first solicitation on the patient’s age when solicited, marital status (single is the omitted category), imputed gender based on first names (gender of name unknown is the omitted category), and state of residence. We perform a joint F-test on these demographic characteristics and report the F-statistic and p-value in the bottom two rows. Column 2 includes the control variables included in all of our later regressions (mailing cycle, hospital, and medical department visited). Column 3 adds additional controls (dummies for number of hospital visits between the first patient visit and the solicitation mailing, dummies for number of hospital visits within 132 days of first visit). The F-tests presented here show that patient demographics do not jointly predict the time delay separating a patient’s first hospital visit from her receipt of a solicitation, suggesting that this time delay is uncorrelated with other factors that might influence donation decisions (as we assume throughout our analyses). * p<0.1, ** p<0.05, *** p<0.01.
Econometric model. Our empirical approach leverages the fact that while patients’ first hospital visits occur continuously throughout the year, donation solicitation mailings from our partner hospital system are sent in batches on fixed dates. On these fixed dates, solicitation mailings are sent simultaneously to all patients whose first visit to the hospital system occurred at any time during a predetermined, preceding two-month visit window called a mailing cycle. The timing of the these batch mailings is such that two patients whose first visits occurred up to 60 days apart, but whose first visits occurred during the same mailing cycle, would receive solicitations on the same date.

Table 2 shows the range of potential dates of a patient’s first hospital visit within each mailing cycle, and the associated month and year in which solicitations were sent to patients. The dates associated with a mailing cycle always include two consecutive calendar months (e.g., the first mailing cycle in our data includes patient visits in May and June of 2013). The solicitation mailing date for a mailing cycle is generally a few weeks after the last recorded patient visit date associated with that cycle, as this gives the development office time to organize the relevant patient information and send out mailings.$ We estimate our effects within mailing cycles. That is, we compare people whose first visit falls earlier in a specific mailing cycle to people whose first visit falls later in that same mailing cycle by including mailing cycle fixed effects in all of our regression analyses.$ We take two complementary econometric approaches to estimating the effect of time delays on reciprocity.

<table>
<thead>
<tr>
<th>Associated range of dates of patients’ first visits</th>
<th>Associated solicitation mailing date</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1 – Jun 30, 2013</td>
<td>July 2013</td>
</tr>
<tr>
<td>July 1 – Aug 31, 2013</td>
<td>September 2013</td>
</tr>
<tr>
<td>Sep 1 – Oct 31, 2013</td>
<td>December 2013</td>
</tr>
<tr>
<td>Nov 1 – Dec 31, 2013</td>
<td>January 2014</td>
</tr>
<tr>
<td>Jan 1 – Feb 28, 2014</td>
<td>March 2014</td>
</tr>
</tbody>
</table>

$There are some exceptions to this rule, but we avoid any confounds from these exceptions by estimating our effects within mailing cycles. Namely, if a particular mailing cycle is delayed, this will not bias our estimates since we will only compare patients from a delayed mailing cycle to each other when estimating the effect of a time delay on giving. For additional details, see SI Appendix: Additional Data Details.

$ Since the timing of the first patient visit relative to the end of a mailing cycle is presumably exogenous, we are able to use this variation to generate a causal estimate of the effect of the delay between service provision and solicitation on donation decisions. Patients would need to be strategically timing first visits to the hospital around unannounced and variable solicitation mailing dates for this assumption to be violated. While it is possible for unobserved factors to influence both the timing of each patient’s visit and the donation decision, this is unlikely. These factors would have to influence first visit timing relative to the date of the solicitation mailing and simultaneously influence the donation decision. This possibility appears to be ruled out by our tests of the balance of our sample across solicitation mailing delays, shown in columns 2 and 3 of Table 1.
Notes: Table 2 describes the timing of mailing cycles and solicitation mailings. The first column reports the range of hospital visit dates associated with the mailing cycle. The second column reports the month and year in which the corresponding solicitation mailing was sent. For example, all patients who visited the hospital between July 1st, 2014 and August 31st, 2014 would have their solicitations sent on one day in September, 2014. The minimum delay between hospital visit and the solicitation mailing is 24 days. The maximum is 132 days. The median is 68 days, and the mean is 67.34 days (standard deviation 20.94 days).

**Econometric approach #1—time delay between a patient’s first visit and solicitation**

Our first strategy is to examine the effect of the time delay between a patient’s first hospital visit and the mailing of a solicitation request on that patient’s donation decision by estimating the following ordinary least squares (OLS) regression:

\[
\text{Any Donation}_i = \beta_0 + \beta_1 \text{First Visit Delay}_i + \mathbf{\beta} \text{ Controls}_i + \epsilon_i \quad [1]
\]

where \(\text{Any Donation}_i\) equals 0 if individual \(i\) did not donate in our data set and 100 if individual \(i\) made a donation (so estimated coefficients can be interpreted in percentage points). \(\text{First Visit Delay}_i\) is the delay between patient \(i\)’s first hospital visit and the date on which he or she was solicited by mail to donate and \(\beta_1\) is the coefficient of interest. \(\text{Controls}_i\) is a vector of controls. In all of our regressions, this vector of controls includes dummies for mailing cycle, to restrict comparison to patients within the same mailing cycle, as well as hospital and medical department dummies, since different types of individuals may visit different hospitals and medical departments.\(^6\)

We test the robustness of all of our analyses to the addition of further control variables. One (uninteresting) way that the time delay separating a patient’s first visit from a solicitation could affect her donation decision is by changing the number of subsequent visits to the hospital she has time to make before being solicited, since additional hospital visits may alter a patient’s willingness to donate. Therefore, in some regressions, we add controls for the number of hospital visits a patient made between her first visit and the date when a donation solicitation was mailed. We include dummy variables for each possible number of visits before the solicitation to non-parametrically control for pre-solicitation hospital visits. When we add controls for the number of pre-solicitation visits, however, our analyses compare patients with the same number of visits

\(^6\)Our identification assumption is that a patient’s first visit occurs on a random date within a mailing cycle \textit{conditional on} the hospital and medical department that patient visits.
spread out over different time durations (i.e., different time lags between first visit and solicitation), making it critical to also control for the sickliness of patients, since a patient who visits the hospital three times in one month is likely sicklier than a patient who visits three times in a week. In these regressions, we thus also control non-parametrically for the number of visits patients make within 132 days of their first hospital visit. The addition of these controls, along with indicators for the medical department a patient visited (previously mentioned), proxy for a patient’s sickliness. Finally, we also add controls for all observable patient demographic characteristics deducible from data provided by the hospital system, which include gender, age (at date of solicitation), marital status, and state of residence.

As noted above, these empirical specifications rely on the assumption that the delay between a patient’s first hospital visit and her first receipt of a solicitation from the hospital system is exogenous after including our vector of controls. Given that it would be nearly impossible for patients to time their hospital visits strategically around (unknown) future solicitation dates, we are confident that this assumption is valid. Also noted above, consistent with this assumption, columns 2 and 3 of Table 1 report the results of balance regressions, which show that the date of a patient’s first visit within a mailing cycle is uncorrelated with observable patient characteristics with either set of controls in place.

Econometric approach #2—time delay between a patient’s last visit and solicitation:

The large majority of patients in our sample (77.16%) make multiple hospital visits before they receive a solicitation triggered by their first visit. It could be argued that the delay following service provision most likely to impact reciprocity would be the delay separating a patient’s last visit prior to solicitation and the receipt of a mailing. Thus, our second econometric approach to estimating the impact of a time delay on reciprocity investigates how a delay between a patient’s last visit and the date of a solicitation mailing affects giving. This exercise is complicated by the fact that the timing of a patient’s last visit is endogenous to her total number of hospital visits such that more frequent visitors are more likely to have a last visit closer to a solicitation date.

To take advantage of the fact that we expect the timing of a patient’s first visit to be exogenous with respect to total hospital visits, conditional on our controls, our second empirical strategy relies on an instrumental variables approach (75), treating the timing of the first visit as an instrument for the timing of the last visit. We estimate our two-stage least squares instrumental variables regressions as shown in equations [2] and [3]:

\[
\text{Last Visit Delay}_i = \alpha_0 + \alpha_1 \text{First Visit Delay}_i + \alpha \text{ Controls}_i + u_i \quad [2]
\]

\[
\text{Any Donation}_i = \gamma_0 + \gamma_1 \text{Last Visit Delay}_i + \gamma \text{ Controls}_i + v_i \quad [3]
\]

Note that the solicitation schedule is set in advance and does not respond to the characteristics of recent hospital patients.
As defined previously, \( Any_{Donation}_i \) equals 0 if individual \( i \) did not donate in our data set and 100 if individual \( i \) made a donation (so estimated coefficients can be interpreted in percentage points). \( Last_{Visit}_{Delay}_i \) is the delay between patient \( i \)’s last pre-solicitation hospital visit and the date of solicitation. Also as defined previously, \( First_{Visit}_{Delay}_i \) is the delay between patient \( i \)’s first hospital visit and the date of solicitation and \( Controls_i \) is a vector of controls, which includes the same sets of variables included our previously described regressions. \( Last_{Visit}_{Delay}_i \) is the predicted delay between patient \( i \)’s last pre-solicitation visit and the solicitation date, it is the exogenous component of \( Last_{Visit}_{Delay}_i \) estimated from equation [2], and \( \gamma_1 \) is the coefficient of interest.

Note that interpreting \( \gamma_1 \) as the causal effect of \( Last_{Visit}_{Delay}_i \) on \( Any_{Donation}_i \) requires both that the \( First_{Visit}_{Delay}_i \) be exogenous conditional on our vector of controls (which we justify above) and that the only effect \( First_{Visit}_{Delay}_i \) has on \( Any_{Donation}_i \) is through its influence on \( Last_{Visit}_{Delay}_i \). This means that our second specification is valid only under the assumption that donation decisions are driven primarily by the last pre-solicitation visit to the hospital, and that earlier visits play a negligible role in the decision to donate. Under this assumption, our first specification can be viewed as the reduced form of our second specification.

**Results**

Donation rates decline as the time separating a patient’s hospital visit and solicitation increases. This result holds in both of our empirical approaches described above. Figure 1 presents the raw correlation between the time delay separating a patient’s (first or last) hospital visit from her receipt of a solicitation mailing and the likelihood a patient made a donation to our partner hospital system. It shows that the percentage of patients who donate decreases considerably (from almost 1.5% to 0.4%) as the time delay separating a visit from a solicitation increases, and this is true when we look at either the date of a patient’s first or last pre-solicitation hospital visit.
**Figure 1:** Raw Relationship between the Delay Separating a Hospital Visit from a Solicitation and a Patient’s Donation Likelihood

We observe the same relationship depicted in the raw data in Figure 1 in our regression analyses, reported in Table 3. Columns 1 and 2 of Table 3 report the coefficient estimates from our first regression specification in which we estimate the effect of the delay between a patient’s first hospital visit and her first receipt of a donation solicitation on the likelihood of giving. In column 1, we only include our key controls: fixed effects for mailing cycle, hospital visited, and medical department visited. We find that increasing the delay separating a patient’s first visit and her solicitation by 30 additional days decreases the probability that the patient will donate by 0.30 percentage points (p<0.05). This effect represents a 36% decrease in the donation rate relative to the mean donation rate, across the whole sample, of 0.83 percentage points. In column 2, we add further controls to eliminate the possible impact of “extra” opportunities to visit the hospital pre-solicitation that may arise when patients’ first visits come earlier in a mailing cycle. In particular, as described previously, we add non-parametric controls for the total number of visits a patient made to the hospital before a solicitation was mailed, non-parametric controls for the number of visits within a fixed window of 132 days following a patient’s first hospital visit (a
proxy for sickness), and demographic controls. Our column 2 results remain extremely similar to those presented in column 1: increasing the lag time separating a patient’s first visit from her first receipt of a solicitation by an additional 30 days decreases the probability of donation by 0.25 percentage points (p<0.05), a 30% decrease relative to the average donation rate.

Table 3: Effect of Time Delay on Reciprocity

<table>
<thead>
<tr>
<th></th>
<th>(1) % Donate</th>
<th>(2) % Donate</th>
<th>(3) % Donate</th>
<th>(4) % Donate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay (in days) between</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>first visit and solicita</td>
<td>-0.298**</td>
<td>-0.247**</td>
<td>-0.509**</td>
<td>-0.407**</td>
</tr>
<tr>
<td>tion x 30</td>
<td>(0.122)</td>
<td>(0.125)</td>
<td>(0.208)</td>
<td>(0.204)</td>
</tr>
<tr>
<td>Delay (in days) between</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>last visit and solicita</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tion x 30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.006</td>
<td>0.019</td>
<td>0.006</td>
<td>0.019</td>
</tr>
<tr>
<td>Key Controls</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Additional Controls</td>
<td>YES</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Stage F-statistic</td>
<td>3,092</td>
<td>6,757</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Columns 1 and 2 report ordinary least squares (OLS) coefficient estimates from regressions predicting a patient’s decision to donate with the time delay separating that patient’s first hospital visit from the date when she was solicited. Columns 3 and 4 report coefficient estimates from instrumental variables analyses in which the delay between a patient’s first hospital visit and the date of a solicitation mailing is used as an instrument for the delay between a patient’s last pre-solicitation hospital visit and the date of a solicitation mailing. Columns 1 and 3 include “Key Controls”: dummies for mailing cycle, hospital visited, and medical department visited. Columns 2 and 4 add “Additional Controls”: dummies for a patient’s total number of hospital visits before the solicitation mailings were sent, dummies for a patient’s number of hospital visits within 132 days of her first hospital visit (a proxy for sickness), and controls for gender, age, marital status, and state of residence. Standard errors are in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

In columns 3 and 4 of Table 3, we present the results of our instrumental variable (IV) regressions. These regressions estimate the effect of the delay separating a patient’s last hospital visit from the mailing of a donation solicitation on donation likelihood using the delay between a patient’s first hospital visit and the date of the solicitation mailing as an instrument. As shown in Table 3, both F-statistics are above 3,000, demonstrating a strong first stage and avoiding any potential concerns about weak instruments (75,76). Column 3 of Table 3 includes the same controls as column 1 and estimates that an additional 30 days separating a patient’s last hospital visit from the date of her first donation solicitation decreases the probability of a donation by 0.51 percentage points (p<0.05), a 61% decrease from the average donation rate. Column 4 includes the same additional controls as column 2 and estimates a comparable 0.41 percentage point decrease in the probability of donation for an additional 30 days separating a patient’s last visit and the date on which the hospital system sent her a donation solicitation (p<0.05). As shown in our Supporting Information (Tables S4 and S5), these results are robust to including a wide range of different subsets of the full set of controls included in columns 2 and 4.

**We also examine the effect of a time delay on the donation amount (in logs, with log donation amount equal to 0 for non-donors) in Table S6 to determine if a time delay influences the amount donated. Consistent with our main
We conducted a series of supplemental analyses detailed in our Supporting Information to shed additional light on the psychological mechanism responsible for our findings. If forgetfulness were responsible for our results, reciprocity would be expected to decay more rapidly among patients with less severe ailments, since their hospital visits would presumably be more forgettable. To measure severity, we asked three physicians at our partner hospital system to independently rate each of the 11 medical departments that handled more than 1,000 outpatients in our data set. The physicians unanimously rated oncology, cardiology, and surgery as departments handling the most severe cases. We thus classified patients who visited the oncology, cardiology, or surgery departments as “severe” and patients who only visited other rated departments as “not severe”. We then re-ran our primary analyses (presented in Table 3) separately for “severe” patients and for “not severe” patients (presented in SI Table S3). The results demonstrate that severe patients show significantly more pronounced decays in reciprocity over time than other patients (p<0.05 in all Wald Tests), inconsistent with a forgetfulness explanation for our findings.

Discussion
Past research indicates that reciprocity is a major driver of generosity (77-79). Thus, when an individual receives a service, we can expect her to feel inclined to behave reciprocally (e.g., perhaps by donating to the provider of the service in the form of a tip). In this paper, we provide field evidence that such reciprocity wanes over time. Currently, behavioral models of reciprocal motives do not incorporate time-sensitivity; instead, they implicitly assume that the willingness to reciprocate is constant (71-73). Some psychological theories suggest that soliciting reciprocity too soon (e.g., asking a patient to donate to a hospital shortly after it provides medical care or asking a beneficiary of a charitable organization to donate soon after receiving a service) could decrease reciprocity because the request may be viewed as opportunistic or manipulative (55,56). Other theories leave open the possibility that reciprocity could decline over time due to either forgetfulness (57,58) or the fleeting nature of visceral states that may contribute to it (e.g., gratitude; 59-62,64). Our findings inform both economic and psychological theories of reciprocity by demonstrating that reciprocity declines precipitously over time.

We study decays in reciprocity by examining patient decisions about giving to a university hospital system that has provided them with medical care and show that reciprocity decreases as the delay between a visit to the hospital and a solicitation for a donation increases. An additional 30-day delay in sending a mailing requesting a donation after a patient’s first hospital visit decreases the likelihood of a donation by 30% or more, while a 30-day added delay separating a patient’s last hospital visit from a solicitation decreases donations by approximately 50%.

These results suggest that timing is an extremely important feature of reciprocity and that reciprocity falls into the category of behaviors that should be described using state-based models result that a time delay in soliciting a donation decreases the proportion who give, we find that the unconditional donation amount decreases as the solicitation delay increases.
Our results suggest that reciprocity may be a temporary, hot state that decays over time, since we find that the effect is stronger among patients visiting the hospital with more severe ailments, but more research to explore the mechanism responsible for this pattern would be of great value. Our findings suggest the need to extend current models to embed emotional and affective determinants of reciprocity (71-73) to incorporate how it changes over time.

In addition to our contributions to theory, our findings have immediate practical implications for charitable organizations. Organizations that provide a service or otherwise interact with potential donors may be able to dramatically increase donation rates and fundraising revenue by decreasing the delay between an interaction with a prospective donor and a donation request. Comparing our effect size estimates to those from past research suggests that for an organization like the one we studied that sends out solicitation requests every two months, changing to a schedule involving solicitation mailings every month could increase donation rates by as much as introducing a 1-to-1 donation match incentive.††

Finally, while our analysis focuses on charitable giving to a university hospital system, our results speak to contexts outside of charitable giving. Since reciprocity is important across a wide variety of contexts, our findings have implications for our understanding of myriad social interactions. For example, stores may increase long-term customer loyalty if they can decrease the time between a customer’s initial purchase and her next visit. Partnerships may enjoy greater longevity and success if both parties engage in frequent contact early on in relationships. And after two people first meet, they may be more prone to collaborate toward a shared goal the sooner such an opportunity presents itself. To the extent that the time delays separating interactions can be controlled, it may be valuable for individuals and organizations to consider our findings regarding the time-sensitivity of reciprocity when scheduling such interactions.

††In our setting we find that a 30-day decrease in delay increases donation rates by at least 0.3 percentage points. Estimates from previous experimental work have found a similar 0.3 percentage point increase in donation rates due to the introduction of a 1-to-1 match (see 26).
Bibliography


