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How Much Priority Bonus Should be Given to Registered Organ Donors? An Experimental Analysis*

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November 2016

Abstract

Recent laboratory experiments have demonstrated that prioritizing registered donors on the waiting list impressively increases the willingness to register as an organ donor. In these experiments, registered organ recipients are prioritized regardless of how long they have been on the waiting list. In the field, however, the willingness to register is only one factor affecting the waiting list.

In this paper, we provide a comparative-statics analysis of the priority treatment by varying the number of bonus periods a registered person can skip on the waiting list. We want to assess how much of a priority bonus registered persons should obtain in order for registration rates to improve.

Our results indicate that a higher number of bonus periods significantly improves registration rates whereas a small bonus of only one period is of minor significance. A bonus of three periods of waiting time has the same effect as absolutely prioritizing registered recipients.

JEL Classification: C90, I10, I18

Keywords: organ donation; laboratory experiment; priority rule; waiting list

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1 Introduction

When it comes to improving registration rates for organ donation, innovative rules that give priority to registered over non-registered citizens on the waiting list for organ recipients are a frequently—if controversially—discussed policy measure. Such priority rules have been implemented in Israel, Singapore, and Chile (Quigley et al., 2012; Zuniga-Fajuria, 2015). They have also been proposed by the United Kingdom's National Health Service Blood and Transplant (NHSBT) authority who recently published a new detailed strategy to improve organ donation (NHSBT, 2013). Authorities in other countries, including Germany, disfavor priority systems or do not even mention them as a potential policy.[1]

Recent laboratory experiments have demonstrated that priority rules can indeed substantially increase participants' willingness to register for organ donation. Kessler and Roth (2012) were the first to analyze in a laboratory experiment the impact a priority rule has on the willingness to donate organs. Participants could decide whether to register as potential organ donors and (fictitiously) donate their organs in the case of brain death in several experimental rounds. Receiving an organ (a kidney, say) from a deceased donor enables participants to continue playing during that round if their organs fail, but the commitment to donate at death comes at a monetary cost which represents the psychological cost of donation decisions in the field. Kessler and Roth (2012) find that giving priority on the waiting list to those who were themselves registered as donors significantly increases donor registrations. Building on Kessler and Roth (2012), a number of experimental papers have shown the robustness of this result and have extended it in various dimensions.[2]

A gap between the design of the rules in the lab and in the field, however, somewhat limits the applicability of the experimental data. In the laboratory, registered subjects

[1]While German health economists argue in favor of a priority rule (DGGÖ, 2011), the German national ethics committee discussed the priority rule extremely briefly and did not consider it to be an option (Nationaler Ethikrat, 2007).

[2]Kessler and Roth (2014a) nicely summarize this literature. Li et al.'s (2013) experiments show that an opt-out scheme with priority leads to the highest registration rates, and increased registration rates are achievable using either a priority rule or an opt-out program separately. They also compare a decontextualized to a contextualized frame. Kessler and Roth (2014b) experimentally investigate Israel's priority regulation where individuals can register and obtain priority but then avoid ever being in a situation to actually donate after death. Kessler and Roth (2014c) exploit a natural field experiment in California where registration was changed from an opt-in frame to an active choice frame. Our own previous research (Herr and Normann, 2016) demonstrates that laboratory participants vote in favor of a priority system after having experienced a phase both with and without a priority rule.

were fully prioritized over non-registered subjects in need whereas, in the field, one's willingness to register is only one of several factors affecting the waiting list. Put differently, in the experiments, registered persons obtain what we henceforth call *absolute priority*, namely, they are always prioritized, no matter how long a non-registered subject has been waiting for an organ. The waiting time only matters for allocation within these groups. In the field, organ-donation systems prioritize with respect to several criteria (waiting time, medical criteria, age, distance, etc.). Registered persons then obtain a bonus in their waiting time, or are preferred only, given otherwise identical conditions. Depending on the exact conditions, the quantitative effect due to registering as a donor may be small compared to other criteria.

Consider Israel where a priority law was implemented in 2010 and became effective in 2012. Patients in need of a kidney, for example, receive two bonus points when registered as a donor, compared to a maximum of 18 points and an average of 9.2 points for all criteria relevant for organ allocation (Lavee et al., 2010). Patients may receive more points depending on their first-degree relatives' behavior.[3] First empirical evidence from Israel (Stoler et al., 2016) shows that registration rates indeed increased due to the priority system,[4] but the question remains whether registration rates can be further improved with a bigger priority bonus or whether a smaller bonus would have achieved the same outcome. In any event, the priority system implemented in Israel differs from those in the experimental literature.

In this paper, we provide a comparative-statics analysis of the priority treatment of persons registered as a donor in lab experiments. We ask: how much priority bonus should registered donors get for registration rates to improve? Is it necessary to give them absolute priority on the waiting list? Or, by contrast, would a moderate waiting list bonus of a more symbolic nature be sufficient? Put differently, our research question is to quantitatively assess how different priority bonuses affect the registration rates. Experiments have the advantage of being able to test a comprehensive set of alternative settings. In the field, experiments with different scenarios may not be desirable or may not match the requirements of the political decision process.

[3]Patients receive points if the candidate's first-degree relative holds a donor card (1 point in the case of kidneys) or donated an organ after death (3 points) or was a non-designated donor while alive (5 points) (Lavee et al., 2010). Points for registration are allocated differently for lungs, heart, and liver which follow different allocation schemes (National Transplant Center, 2016).

[4]The increase was higher after public awareness campaigns about the priority law started in 2010. Stoler et al. (2016) find that registration rates further improved in the two months leading up to a program deadline, after which priority would only be granted with a three-year delay, and that the ease of registration is important.

Our experimental design varies, accordingly, the number of bonus periods registered donors receive. The existing literature has focused on the polar cases we will label No-Priority and Absolute-Priority. We add to these baseline treatments variants where registered donors obtain a one, two or three-period waiting time bonus. For comparison, a priority bonus of six periods has the same effect as absolute priority. In total we thus have five treatments for our comparative-statics analysis, called No-Priority, Priority-1, Priority-2, Priority-3, and Absolute-Priority.

Our results are as follows. We find that behavior is monotonic almost throughout in that giving more priority to registered donors leads to a strong improvement in registration rates. A system giving just one period of priority on the waiting list improves registration rates only very little. Granting three periods of waiting time has almost the same effect as absolute priority. The latter finding confirms that the results in Kessler and Roth (2012) and the literature following them is robust: absolute priority is not a necessary requirement for improved registration rates.

2 Experimental design

Our design largely builds on Kessler and Roth (2012). We use their z–Tree (Fischbacher, 2007) code almost throughout. We adopt minor modifications (see below).

Participants play Kessler and Roth's (2012) organ-donation game over several rounds. All rounds start with subjects having an active A organ (brain) and two active B organs (kidneys). At the beginning of a round, subjects have to decide whether to register as an organ donor in that round, at a cost. The experimental rounds were partitioned into several periods. In each of these periods, the subject's A organ had a 10% probability of failing and the B organs had a 20% chance of failing (if so, both B organs failed together). The round ended for the subject when his or her A organ failed (representing brain death) or when the B organs failed and the subject did not receive a B registration rate from a donor during the five periods after the B failure (representing death after a phase of dialysis). A new round starts when all participants in the group are dead. As in our previous paper and in Li et al. (2013), we employ a contextualized frame (using terms like "organ" rather than "unit").

Donor registration and organ transplants were conducted as follows. Subjects are asked whether they wish to become a donor at the beginning of each round. The cost of registering for donation is €0.6, which corresponds to the mean cost of Kessler and Roth

(2012) where half of the subjects bore costs of $0.40 and the other half $0.80.[5] Some donor's two B organs would be donated in the period of failure if and only if the player committed to donating in the case of death in that round by registering. Subjects could receive a B organ from a deceased player in a given period if that player's A organ failed while his or her two B organs were still active. A received B organ could not be donated again.

The allocation procedure for organs assigned different levels of priority for registered donors. In the treatment labeled No-Priority, the participants with the longest waiting time would receive a B organ (if an organ from a deceased donor was available). In the priority treatments, subjects who had registered as donors would receive a bonus in terms of periods on the waiting list. In treatment Priority-t, registered donors would be counted as having t more periods on the waiting list compared to a non-registered participant with the same actual waiting time. Since subjects die after five periods without a B organ, a bonus of six periods is sufficient to mimic Absolute-Priority. Any organs available would then be given to the participants with the longest waiting time, taking into account the priority bonus. Whenever two or more subjects had the same waiting time, a random computer move would decide on the organ allocation.

Subjects play the organ-donation game in two parts. Each part lasts eight rounds.[6] The two parts differ with respect to the degree of priority that registered donors receive, see Table 1. The first part (phase 1) starts with No-Priority or Priority-1. In phase 2, we then increase the priority bonus for registered donors. We determined the number of sessions such that we have three sessions in phase 2 each for Priority-1, Priority-2, and Priority-3. As for phase 1, we have five and four sessions for No-Priority and Priority-1, respectively. Note that the treatment in the top row is part of our companion paper. Those sessions were conducted under the same protocol and by the same experimenter as the treatments in this paper.[7]

Our within-subjects design may give rise to two different order effects. First, treatment Priority-1 may lead to different results depending on whether it is run in phase 1 or

[5] Li et al. (2013) modify this setup and introduce a cost when subjects register as an organ donor ($0.50) and a separate cost when the actual donation takes place ($2.50). Hawley et al. (2016) further vary these cost levels and analyze the effect of the cost differences in the presence of income inequality ("high" and "low earners" with different endowments and earnings per round) .

[6] In Kessler and Roth (2012), subjects played 15 rounds in either phase which we shortened to eight without negatively affecting convergence.

[7] In Herr and Normann (2016), we had a voting stage which may suggest that treatments are not directly comparable. The vote, however, occurred (and was mentioned to the participants) only after phase 1 and phase 2 were completed.

Phase 1	Phase 2	# Sessions	# Subjects	# Observations
No-Priority	Absolute-Priority	7	168	1,344[a]
No-Priority	Priority-1	3	72	552[b]
No-Priority	Priority-2	1	24	192
Priority-1	Priority-2	2	48	384
No-Priority	Priority-3	1	24	192
Priority-1	Priority-3	2	48	312[c]

Table 1: Session overview

Notes: (a) sessions were part of the experiments reported in Herr and Normann (2016); (b) , (c) due to technical problems, we had to terminate two of the sessions in phase 2 after seven (b) and five (c) out of eight rounds, respectively.

phase 2. Second, the performance of Priority-2 and Priority-3 may depend on whether the phase 1 treatment was No-Priority or Priority-1. Our empirical analysis will take these possibilities into account. Generally, we decided not to explore reverse order effects in detail because the previous literature had dealt with them already. Both, Kessler and Roth (2012) and Herr and Normann (2016) find that the increase in registration rates due to the priority rule is even more pronounced when subjects first play Absolute-Priority followed by No-Priority.

Payoffs in each round were calculated as follows. Each participant started a round with a €2 endowment. Once they died (all subjects died eventually), the subjects lost €1, regardless of their willingness to donate their organs. For subjects who registered as donors, the cost of registration (€0.6) was subtracted. As long as the A organ and at least one B organ were active, subjects earned €1 in each period. If the B organ(s) failed, the subjects survived a maximum of five periods on the waiting list without earning any money. If they received an organ, they again earned €1 in each following period.[8]

The total number of participants in the data of this paper is 384 and they were allocated to groups and sessions as follows. Subjects played repeatedly in groups of 12 participants. We always had two groups of 12 in one experimental session, as did Kessler and Roth (2012). In total, we conducted 16 sessions with 24 participants. Among these, seven sessions (168 subjects) were already part of the data in our previous paper (Herr and Normann, 2016) and nine sessions (with 216 subjects) were newly conducted for

[8]Each B organ could be donated only once but a subject could receive multiple B organs within the same round.

this research. Table 2 provides some descriptive statistics about our subjects.

Table 2: Descriptive statistics on subject pool

Variable	**mean**	**sd**
Male	0.46	0.50
Age	25.59	6.48
Aged 28 or older	0.23	0.42
Supporting priority in the field	0.63	0.48
Student	0.95	0.21
Medical student	0.10	0.31
Econ/business student	0.31	0.46

Descriptive statistics based on 384 subjects.

After they had played the donation game, we asked participants non-incentivized whether they would "support the implementation of a priority rule" in the field, as in our previous research. We did not specify which particular rule was supposed to be implemented and, of course, by then participants had been exposed to different rules.

Payments were made immediately and in cash at the end of the experiment. We randomly selected two rounds for payment, one round from each part.[9] Subjects were told about the rules for payment in the instructions (see the Appendix). Average earnings were €16.33 (approximately $18.34), including an €8 participation fee. The earnings ranged from €8.80 to €38.40. Sessions lasted around 90 minutes.[10]

3 Simulations

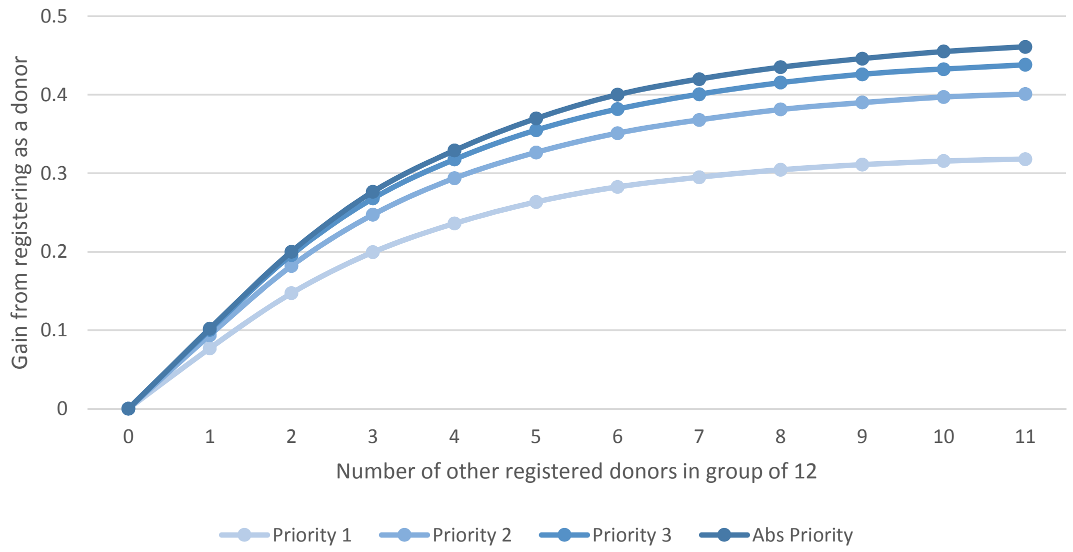
In this section, we provide some quantitative assessments of how a higher priority bonus affects payoffs. Because of the stochastic nature of the game, formal solutions are complicated and subjects also could not calculate gains and losses of registering during the

[9]Our procedure is similar to the "PORpas" payoff mechanism analyzed in Cox et al. (2015). They show that this procedure is incentive-compatible given the reduction and independence axioms of expected utility theory.

[10]In Herr and Normann (2016), which comprised three phases, sessions lasted around 120 minutes and the average payment was €20.40 (approximately $22.91).

experiment.[11] Like Kessler and Roth (2012, section III), we employ simulations. Our simulations vary the priority bonus and the number of registered donors. We report simulation results where the priority bonus corresponds to our treatments Priority-1, Priority-2, Priority-3, and Absolute-Priority.

Figure 1: The gain from registering as a donor



Note: Expected gain from registering as a donor, conditional on there being 0–11 other registered donors in a group of 12. The gain from registering shown in the figure is smaller than the cost (0.6) throughout.

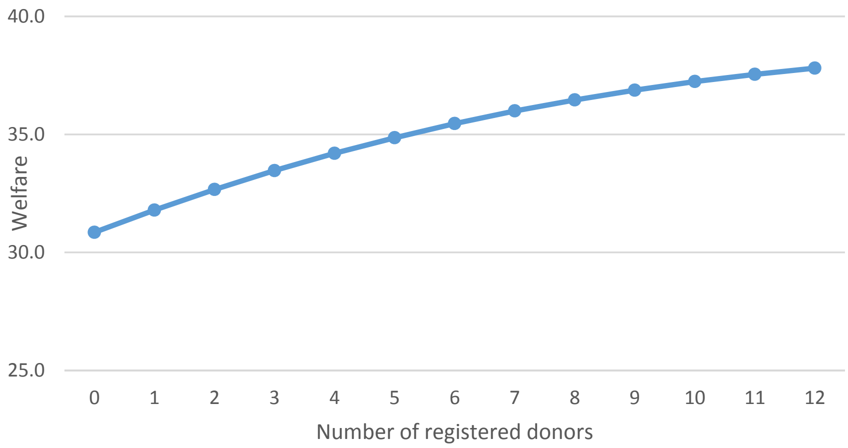
We calculate the *expected gain from registering* for donation as follows. For each priority bonus level and any integer number $n \in [0, 11]$ of *other* registered subjects in a group of 12, we work out the expected payoff (that is, a player's expected number of periods to live) when a player registers as a donor and when he or she does not. The expected gain of registering as a donor is his or her payoff as a prioritized donor minus his or her payoff as a non-donor. This gain of registering as a donor is always weakly positive as a player cannot suffer from getting priority. The gain is exactly zero when there are no other registered donors ($n = 0$) because a single donor can never receive his or her own organ. To calculate the net payoff from registering, the registration cost of 0.6 needs to be subtracted.

Figure 1 shows the results of the simulations. Most pertinent to our research questions is that a higher priority bonus monotonically increases the gain of registering as a donor.

[11] As Li (2016) shows in a different setup, an informational message about the additional dollar amount a potential recipient could earn after receiving an organ in the experiment had a positive impact on the registrations of those who were not registered as donors before the experiment.

Furthermore, a higher number of registered donors monotonically increases the gain of registering as a donor. Conspicuously, a bonus of three periods on the waiting list hardly seems to differ from receiving absolute priority as the difference between the two lines is rather small. The gain in Priority-1 is substantially reduced compared to Absolute-Priority, however. For six or more other registered donors in the group, the relative gap between the lines is virtually constant. Starting with Absolute-Priority, Priority-3 reduces the gain from registering by about 5%, Priority-2 reduces it by about 12%, and Priority-1 by about 30%. We therefore expect a decline in registration rates in Priority-1 and possibly also in Priority-2 compared to Absolute-Priority.

Figure 2: The welfare effects of registering as an organ donor



Note: Expected (net) welfare from registration as an organ donor for a group of 12, including a cost of registration of 0.6 for each registered donor. Welfare is the same in all treatments.

In all treatments, the gain of registering as a donor is smaller than the cost of 0.6, so registering as a donor cannot be an equilibrium, which makes everyone not registering the equilibrium. This is also the result in Kessler and Roth (2012), corresponding to the Absolute-Priority variant, so it is a fortiori true for our treatments Priority-1, Priority-2, and Priority-3.

Figure 2 shows how welfare (the sum of payoffs in a group of 12 minus the total cost of the registrations) behaves in the number of registered subjects. Although total costs are highest, all 12 players registering is the welfare-maximizing outcome. Welfare is concave in the number of registrations, so the welfare increase due to an additional registered donor declines. Everyone registering constitutes the welfare optimum in all treatments because the priority rules only change the allocation of organs and not overall group welfare.

4 Results

4.1 Decisions to register as a donor

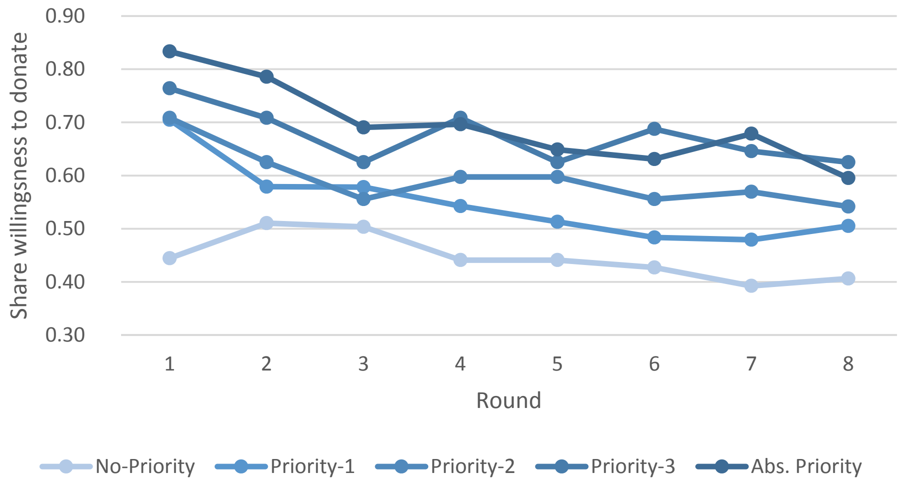
Table 3 provides a comprehensive overview of the share of subjects willing to register as a donor. The table reports the average registration rate for each priority treatment. We observe that the number of priority periods monotonically affects the willingness to donate. The effects are economically substantial: starting off with an average of 45% in No-Priority, every single additional bonus period on the waiting list increases registration rates. Whereas one or two periods added to the waiting list lead to registration rates of 48 and 59%, respectively, already with Priority-3, there is an increase of more than half compared to No-Priority. Priority-3 and Absolute-Priority lead to registration rates of almost 70%, far exceeding the overall average of 55%.

Table 3: Willingness to register as a donor

Treatment	**mean**	**N**
No-Priority	0.45	2,304
Priority-1	0.53	1,320
Priority-2	0.59	576
Priority-3	0.68	504
Absolute-Priority	0.69	1,344
Average	0.55	6,048

Figure 3 shows the registration rates conditional on the priority treatment over time. We observe that the monotonicity result shown in Table 3 also holds over time: with few minor exceptions, a bigger priority bonus results in a higher willingness to donate in virtually all rounds. The quantitative effects are strong already in round 1: subjects register with a likelihood of only 70% in Priority-1 and -2 as opposed to 83% with Absolute-Priority. The difference to No-Priority (where 44% register in the first round) is even bigger. The effects are somewhat less strong in the following rounds but remain substantial over time. The monotonic effect of priority comes to an end, however, for the borderline treatments. A conspicuous observation in Figure 3 is that the difference between Priority-3 and Absolute-Priority is small, as suggested by our simulations.

Figure 3: Willingness to register as a donor by treatment



Note: Average registration rates (across subjects) per round and treatment.

The willingness to donate declines over time in all treatments. This has been observed in other experiments and is consistent with not registering being the equilibrium. It seems remarkable that the priority treatments increase the registration rate despite this downward trend.

4.2 Order effects

We have two potential sources for order effects. First, recall that we ran the Priority-1 treatment in both phase 1 and phase 2. Second, Priority-2 and -3 were conducted in phase 2 either following the No-Priority or the Priority-1 treatment. Table 4 shows the effects of these variations on registration rates.

Whether Priority-1 was run in phase 1 or phase 2 turns out to actually matter. In phase 1, registration rates are 11 percentage points higher. This effect is statistically significant, see below. In phase 2, Priority-1 registration rates (48%) are rather close to the rates in No-Priority (45%). Our interpretation is as follows. Subjects are inexperienced in phase 1, so Priority-1 can have a positive impact. Participants appreciate the bonus and are

Table 4: Order effects

Treatment		mean	N
Priority-1 in phase 1		0.57	768
Priority-1 in phase 2		0.48	552
Priority-2	(phase 1 = No-Priority)	0.53	192
Priority-2	(phase 1 = Priority-1)	0.63	384
Priority-3	(phase 1 = No-Priority)	0.67	192
Priority-3	(phase 1 = Priority-1)	0.68	312

more inclined to register. When Priority-1 is played in phase 2, subjects have learned from experience that organs are scarce. There is also a particularly pronounced decline in registration rates (from 69% to 47%) from round 1 to round 2. It appears that subjects quickly figure out that one additional period on the waiting list will not be of much use and they are less inclined to register. Since the status quo in the field is almost always No-Priority, our treatment Priority-1 (phase 2) seems more relevant. We thus conclude that Priority-1 does not lead to improved registration rates.

For Priority-2, we also find an order effect. When run after No-Priority, registration rates are about 10 percentage points lower than when run after Priority-1. This effect is significant in our regression analysis below. One way of interpreting these data is that Priority-2 gives a similar *increase* in registration rates in both cases, $+8$ percentage points when conducted after No-Priority and $+6$ percentage points after Priority-1. But since Priority-1 (in phase 1) registration rates are above those from No-Priority, this leads to an altogether improved registration behavior when Priority-2 is run after Priority-1 compared to No-Priority.

The same effect occurs in Priority-3 although at a marginal magnitude only (one percentage point more registration after Priority-1 than after No-Priority). Here, registration rates are already rather high (as high as with Absolute-Priority) when run after No-Priority, so the difference when Priority-1 is the phase 1 treatment hardly matters.

4.3 Regression analysis

To analyze the impact of the different priority rules on the willingness to donate, we estimate several multivariate models using probit regressions (see Table 5). The model specifications build on Kessler and Roth (2012) and Li et al. (2013). Our preferred model is shown in Table 5 in column (4). We explain the probability of registering as a donor with experiences within the experiment, the order of treatments, as well as with socio-demographic characteristics and personal attitudes. In all models, standard errors are clustered at the group level and the unit of observation is the subject-round level. As noted above, we observe a restart effect when we introduce new priority rules. For this reason we coded the rounds in the second phase as 1 to 8 and treated them as being independent of the former rounds.

The estimation results (Table 5) confirm that the probability to register as an organ donor increases in the number of waiting periods assigned for registration. Columns (1) and (3) present the results of the pooled regression where it is not distinguished between phases 1 and 2, where (3) adds the control variables. Compared to the No-Priority treatment, priority significantly raises the probability to register significantly by between 6 and 22 percentage points where this number increases in the priority bonus. The preferred model in columns (2) and (4) shows that the order makes a difference for the Priority-1 and the Priority-2 treatments. One additional period in waiting time does not lead to a significantly higher willingness to donate when faced after the No-Priority treatment. However, if the subjects start with Priority-1, the comparison across subjects shows a 10 percentage-point higher baseline willingness to donate compared to the No-Priority treatment (Priority-1 in phase 1). The Priority-2 treatment is not significantly different from No-Priority when played after No-Priority (within subjects). When played after Priority-1, Priority-2 leads to 16 percentage points more registration than No-Priority (across subjects) given a ten percentage-point higher absolute starting value in Priority-1 in phase 1. For the two treatments with a higher bonus (Priority-3 and Absolute-Priority), the likelihood of registration increases by 20 and 22 percentage points compared to No-Priority where it does not matter for Priority-3 which treatment has been played in phase 1. We conclude that Priority-3 has a similar effect on registration rates as absolute priority. As shown in Figure 3, the willingness decreases slightly by 2 percentage points per round played in the lab.

The control variables show that higher previous round's earnings per se are not significantly correlated with registration. However, an increase in survival by one period (and correspondingly higher earnings) after having received a B organ (*Earnings after got organ last round*) significantly increases the willingness to donate in the next round by 2.5 percentage points.

Gender does not play a significant role. Participants who are more than 27 years old

Table 5: Probit regression: Probability to register as organ donor

P(register=1)	**(1)**	**(2)**	**(3)**	**(4)**
Priority-1 (d)	0.062		0.066	
	(0.033)		(0.032)*	
Priority-1 (in phase 1) (d)		0.106		0.105
		(0.040)**		(0.042)*
Priority-1 (in phase 2) (d)		-0.001		0.010
		(0.030)		(0.026)
Priority-2 (d)	0.128		0.129	
	(0.041)**		(0.042)**	
Priority-2 after No-Priority (d)		0.065		0.075
		(0.071)		(0.078)
Priority-2 after Priority-1 (d)		0.159		0.155
		(0.040)***		(0.042)***
Priority-3 (d)	0.202		0.209	
	(0.035)***		(0.031)***	
Priority-3 after No-Priority (d)		0.199		0.220
		(0.057)***		(0.049)***
Priority-3 after Priority-1 (d)		0.201		0.200
		(0.035)***		(0.034)***
Absolute-Priority (d)	0.225	0.225	0.216	0.216
	(0.024)***	(0.024)***	(0.024)***	(0.024)***
Round within treatment	-0.019	-0.019	-0.019	-0.019
	(0.004)***	(0.004)***	(0.004)***	(0.004)***
Earnings last round			-0.003	-0.003
			(0.002)	(0.002)
Got organ last round (d)			-0.004	-0.007
			(0.027)	(0.026)
Earnings after got organ last round			0.025	0.025
			(0.005)***	(0.005)***
Male (d)			0.015	0.014
			(0.036)	(0.035)
Age 28 or older (d)			0.069	0.064
			(0.041)	(0.042)
Supporting priority in the field (d)			0.103	0.102
			(0.028)***	(0.028)***
Medical student (d)			0.144	0.144
			(0.054)**	(0.054)**
Econ /Business student (d)			-0.037	-0.040
			(0.035)	(0.034)
Observations	5,280	5,280	5,280	5,280

Marginal effects; Standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

(d) for discrete change of dummy variable from 0 to 1. Base group: No-Priority in phase 1.

register 7 to 8 percentage points more often. Medical students show a higher willingness to donate per se (14.4 percentage points) than subjects from other fields (law, sciences, history, psychology, philosophy, languages,...). Students from economics or business register less often than others (-4 percentage points) but the difference is not statistically significant from zero. Finally, subjects who indicate that they would “support a priority rule” in the field exhibit a 10 percentage-point higher inclination to register.[12] This is consistent with Li (2016) who finds that subjects who are actually registered donors in real life are more likely to register in the experiment.

Since we are not only interested in comparisons to the No-Priority treatment, Table 6 provides the results of pairwise t-tests on the differences in the coefficients of model (4) across all priority treatments. The first row replicates the results of regression (2). The other rows show that there are clear and significant differences between coefficients in that Priority-3 and Absolute-Priority lead to higher increases in registration rates than Priority-1 and Priority-2 (an exception occurring for the comparison of Priority-2 [after No-Priority] and Priority-3 [after Priority-1]). Priority-3 and Absolute-Priority do not differ, as already seen.

4.4 Earnings

Table 7 presents the earnings in phase 2 by treatment and the willingness to donate. The experimental findings are consistent with the simulations: as expected, individual earnings are larger if the subject does not register. Earnings increase for all subjects in the priority bonus since a higher priority bonus increases registration rates and thus the number of potential life-enhancing donors, also for non-donors. In all treatments, earnings decline from the beginning (rounds 9–12) to the end (rounds 13–16) of phase 2 since registration rates decrease.[13]

5 Conclusion

A series of laboratory experiments (Kessler and Roth 2012, 2014b; Li et al. 2013; Herr and Normann, 2016) has shown that prioritizing registered donors on the waiting list

[12] On average, almost two-thirds of the participants supported priority in the field.

[13] Priority-3 is an exception since one of the two sessions had to be terminated prematurely for technical reasons and thus earnings reflect a less severe decrease in registrations over time. The stochastic nature of the game leads to earnings that increase from the first to the second part of phase 2 for those willing to register, even exceeding the earnings of those who do not register, on average.

Table 6: Differences in coefficients, Table 5, model (4)

	No-P	**Priority-1 (phase 1)**	**Priority-1 (phase 2)**	**Priority-2 (after No-P)**	**Priority-2 (after P-1)**	**Priority-3 (after No-P)**	**Priority-3 (after P-1)**	**Abs-Priority**
No Priority	–	**	n.s.	n.s.	n.s.	***	***	***
Priority-1 (in phase 1)		–	**	n.s.	n.s.	*	**	**
Priority-1 (in phase 2)			–	n.s.	***	***	***	***
Priority-2 (after No-Priority)				–	n.s.	*	n.s.	*
Priority-2 (after Priority-1)					–	n.s.	n.s.	n.s.
Priority-3 (after No-Priority)						–	n.s.	n.s.
Priority-3 (after Priority-1)							-	n.s.
Absolute-Priority								–

Pairwise t-tests on differences in coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Earnings per round in phase 2 by treatment and willingness to donate

Treatment	**N**	**mean**	**sd**	**N**	**mean**	**sd**
Rounds 9–12		Willing			Non-willing	
Priority-1	157	3.55	3.70	131	3.79	2.93
Priority-2	179	3.74	3.33	109	3.81	2.82
Priority-3	202	3.79	3.60	86	3.92	3.49
Absolute-Priority	505	3.80	3.21	167	4.17	3.32
Total	1043	3.75	3.38	493	3.95	3.14
Rounds 13–16		Willing			Non-willing	
Priority-1[a]	108	3.16	3.54	156	4.49	3.67
Priority-2	163	3.76	3.44	125	4.10	3.19
Priority-3[b]	139	4.74	4.54	77	4.22	3.39
Absolute-Priority	429	3.92	3.40	243	3.98	3.28
Total	839	3.93	3.66	601	4.17	3.38
Rounds 9-16		Willing			Non-willing	
Priority-1[a]	265	3.39	3.63	287	4.17	3.37
Priority-2	342	3.75	3.38	234	3.97	3.02
Priority-3[b]	341	4.17	4.03	163	4.06	3.43
Absolute-Priority	934	3.86	3.30	410	4.05	3.29
Total	1,882	3.83	3.51	1094	4.07	3.27

Notes: 384 subjects, (*a*) , (*b*): due to technical problems, we had to terminate two of the sessions in phase 2 after seven (*a*) and five (*b*) out of eight rounds, respectively.

can substantially increase the willingness to register for organ donation.[14] In these experiments, registered donors obtain absolute priority over non-registered recipients. In priority schemes in the field, however, organ-donation systems prioritize with respect to several criteria (waiting time, medical criteria, age, etc.) and registered donors then obtain a bonus which competes with the other criteria.

In this paper, we try to assess how much priority registered donors should obtain such that registration rates increase. With waiting time being the only criteria available in the lab, our experimental design varies the number of bonus periods registered subjects receive. The existing literature has focused on the cases "no priority" and "absolute priority," and we add to these cases variants where registered donors obtain a one, two or three-period waiting time bonus. (For comparison, absolute priority corresponds to a bonus of six years.)

We find that behavior is by and large monotonic: a higher number of bonus periods improves registration rates more significantly. But monotonicity holds up to a certain level in that a bonus of three periods of waiting time (in our setup) has nearly the same effect as absolute priority. At the bottom end, a small bonus of just one bonus period (when succeeding a phase of no priority) is insufficient to boost registration and leads to the same outcome as having no priority scheme at all.

We also identify two subject-pool effects. We find that the medical school students in our sample behaved differently to the participants from other fields of study. They register more frequently as donors in the experiment. Along the same lines, participants aged 27 or older have a substantially higher probability of registering than the younger, less mature participants.

We draw two conclusions for policy from our data. First, the results in Kessler and Roth (2012) are robust in that participants in the lab do not need to obtain absolute priority. Instead, a more moderate bonus of three periods suffices. Second, our results imply that a mere ceteris-paribus rule[15] prioritizing registered donors only if other criteria (or the points summarizing them) are equal is not sufficient. The variant where we give one bonus period to registered donors is, in fact, stronger than a ceteris-paribus rule but it does not significantly increase registrations. The overall conclusion is that newly

[14]Other incentives to increase the willingness to donate organs include, for example, opt-out rules or monetary incentives. Recent experiments show that non-donors are more inclined to actually register in Germany when offered a € 10 incentive (Eyting et al., 2016) or after receiving information about the potential gains of receiving an organ in the experiment in the US (Li, 2016).

[15]In Israel, a ceteris-paribus rule applies when two patients in need have exceeded a specific number of points. In that case, a registered donor will be prioritized (Lavee et al., 2010).

introduced priority systems should substantially prioritize registered donors but not absolutely so.

We acknowledge that the success of any priority scheme in the field will depend on several factors other than the bonus given to registered persons (advertising campaigns, bonus given to relatives, etc.). We trust, nevertheless, that our comparative-statics exercise can contribute to the debate about priority systems by illustrating the quantitative incentives such systems bring along.

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Appendix

Instructions (not intended for publication)

The following instructions are taken from one session where the subjects played Priority-1 in phase 1 and Priority-3 in phase 2. For the instructions of the sessions with No-Priority followed by Absolute-Priority compare the online Appendix of Herr and Normann (2016).

Instructions for the first part

Welcome

If you have a question after reading these instructions, please raise your hand at any time during the experiment. An experimenter will answer your question in your cubicle.

Instructions 1 of 5

This experiment is a study of decision making and behavior. In today's experiment you will decide on hypothetical organ donations. You will play a game in a group of 12 people. You will play this game a number of times in the same group. The rules of the game will change during your course of play, and you will be informed if they do.

The experiment consists of two parts. To determine your earnings, one round will be randomly drawn from each of the two parts. You have no possibilities to influence which rounds will be selected. You will be paid the sum of your earnings in the two randomly selected rounds of the experiment plus a participation fee of 8 euro. Money earned will be paid to you in cash at the end of this experiment.

Instructions 2 of 5

The Game:

At the start of each play of the game, you will have € 2 and a virtual life will be allocated to you. A virtual life consists of one A organ and two B organs. Each round of the game has a limited number of periods in which you can earn money. In each period of one round in which you have one active A organ and at least one active B organ you earn € 1.

Instructions 3 of 5

The Game:

In each period of each round, there is a 10% chance that your A organ will fail. If your A organ fails, you cannot earn any more money in that round of the game.

In each period of each round, there is a 20% chance that your B organs will fail (your B organs operate or fail together). If your A organ is still active, you can operate for up to five periods without an active B organ. In these periods you will not earn any money. If in one of these periods you receive a B organ from someone else, you can start earning money again. If you do not receive a B organ in those five periods, your A organ will fail and you cannot earn any more money in that round of the experiment.

Instructions 4 of 5

The Game:

When your A organ fails, you lose €1 and you cannot earn any more money in that round. When none of the 12 people in your group can earn more money, that round of the game ends.

Instructions 5 of 5

The Game:

Before the play of the game begins you must decide whether, if your A organ fails, you would like to donate your B organs to other players in your group. Up to two waiting players may receive your organs. A player with an active A organ and failed B organs can receive one B organ. If you decide to donate your B organs, this will cost you €0.60. This will, however, give you priority with respect to subjects who are not willing to donate by adding one waiting period in the allocation of B organs if you need one. The maximum waiting time of five periods is unaffected by this additional waiting period.

If your A organ fails and if you are willing to donate, each of your active B organs will go to a person with failed B organs if such a person is operating in that period and has had five or fewer periods without an active B organ. Each donated B organ will go to the person who has been waiting for a B organ the longest without receiving one. Persons who also registered as donors get one additional waiting period credited (priority).

Once a B organ has been donated, it cannot be donated again.

Summary

The important things to remember are:

1. At the beginning of each round, you get €2 and a virtual life with an active A organ and two active B organs.
2. If you have one active A organ and at least one active B organ, you earn €1 in each period.
3. At the start of play, you can register as a donor of your B organs to people who might need them in the event that you have an A organ failure.
4. Registering as a donor of your B organs costs €0.60 and gives you priority in terms of adding one waiting period for the allocation of B organs if you need one.
5. Each donated B organ will go to the person who has been waiting for a B organ the longest (maximal 5 periods). Persons who also registered as donors get one additional waiting period credited (priority).
6. You will be paid the sum of your earnings in two randomly selected plays of the whole experiment plus the participation fee.
7. Earnings and decisions are all private information and will not be published.

Decision for this play of the game

You currently have €2. If you decide to donate your B organs, it will cost you €0.60. If your A organ fails, each of your active B organs will go to the person who has been waiting for a B organ the longest.

Persons who also registered get one additional waiting period credited.

Agreeing to donate your B organs puts you higher up on the priority list to receive an active B organ by one period in the event of a B organs failure.

By agreeing to donate your B organs in case of an A organ failure, you are helping people who are in need, just as you may be helped by people who agree to donate their B organs.

In addition, you are particularly helping people who are also willing to help those in need.

Please decide whether you - in case of an A organ failure - would like to donate your two B organs at a cost of €0.60 or not (zero costs).

- Yes, I would like to donate my B organs.
- No, I do not like to donate my B organs.

Instructions for the second part

Any changes to the game are described in the following.

As before:

Before the play of the game begins, you must decide whether, if your A organ fails, you would like to donate your B organs to other players in your group. A player with an active A organ and with failed B organs can receive one B organ. If you decide to donate your B organs, this will cost you €0.60. Once a B organ has been donated, it cannot be donated again.

Now with three periods additional waiting time (priority) on the waiting list:

Persons who registered will now receive three periods additional waiting time (priority).

Agreeing to donate your B organs puts you higher up on the priority list to receive an active B organ in the event of a B organ failure and thus gives you a priority of three waiting periods compared to a person who is not willing to donate.

The maximal waiting time of five periods is unaffected.

Summary

The important things to remember are:

1. At the beginning of each round, you get €2 and a virtual life with an active A organ and two active B organs.
2. If you have one active A organ and at least one active B organ, you earn €1 in each period.
3. At the start of each round, you can register as a donor of your B organs to people who might need them, in the event that you have an A organ failure.
4. Donating - if applicable - your B organs costs €0.60 and gives you priority for receiving a B organ by adding three waiting periods in the event that you need one.
5. Each donated B organ will go to the person who has been waiting for a B organ the longest (maximal five periods). Persons who also registered as donors get three additional waiting periods credited on the waiting list (priority). The maximal waiting time of five periods is unaffected.

6. You will be paid the sum of your earnings in two randomly selected plays of the game across the whole experiment plus the participation fees.

7. Earnings and decisions are all private information and will not be published.

Decision for this play of the game

You currently have €2. If you decide to donate your B organs, this will cost you €0.60. If your A organ fails, each of your active B organs will go to the person who has been waiting for a B organ the longest. Persons who registered get three additional waiting periods credited.

Agreeing to donate your B organs puts you higher up on the priority list to receive an active B organ by three periods in the event of a B organs failure. By agreeing to donate your B organs in the event of an A organ failure, you are helping people who are in need, just as you may be helped by people who agree to donate their B organs. In addition, you are particularly helping people who are also willing to help those in need.

Please decide whether you –in case of an A organ failure– would like to donate your two B organs at a cost of €0.60 or not (zero costs).

- Yes, I would like to donate my B organs.
- No, I do not like to donate my B organs.

Questionnaire

Please fill in the following questionnaire.

1. Please indicate your age:
2. Please indicate your gender: Male, Female
3. Please, indicate whether you are a student: Yes, No
4. Please state your field of studies / your profession (if both apply choose the main activity):
5. Imagine that in Germany a priority rule for those willing to donate organs comes under debate. Would you vote for a priority rule for the allocation of organs in Germany? Yes, No
6. Further remarks:

Thank you.

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