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Flipping a Coin: Evidence from University Applications

Abstract

We empirically investigate the possibility that a decision-maker prefers to avoid making a decision and instead delegates it to an external device, e.g., a coin flip. A large data set from the centralized clearinghouse for university admissions in Germany shows a choice pattern of applicants that is consistent with coin flipping and that entails substantial consequences for the matching outcome. In a series of experiments capturing the relevant features of university choice, participants often choose lotteries between allocations rather than certain allocations. This contradicts most theories of choice such as expected utility. A survey among university applicants links their choices to the experiments and confirms that the choice of random allocations is intentional.

Keywords: Preference for randomization, matching markets, individual decision making, university admissions

JEL Classification: D03; D01

1 Introduction

In situations where decision-making is hard, a possible procedural preference arises: the decision maker may wish for the decision to be taken away from her. Her cognitive or emotional cost of deciding may outweigh the benefits that arise from making the optimal choice. For example, the decision maker may prefer not to make a choice without having sufficient time and energy to think it through. Or, she may not feel entitled to make it. Or, she may anticipate a possible disappointment about her choice that can arise after a subsequent resolution of uncertainty. Waiving some or all of the decision right may thus seem desirable to her even though it typically increases the chance of a suboptimal outcome.

The difficulty of such preferences is that they are non-consequentialist and therefore excluded by most models of choice such as expected utility. In particular, flipping a coin between different choice options contradicts expected utility theory except if the decision maker is exactly indifferent between these options. Yet many decision processes resemble coin flips.[3] More general than expected utility theory, two closely related axioms of choice—stochastic dominance and betweenness—postulate that whenever the decision-maker has a strict preference for one of the options, she makes the choice herself rather than delegate it to randomness.[4]

This paper presents evidence of intentional randomization regarding an important decision in people's lives: university applications. When applying to the German clearinghouse for university admission in medicine and related subjects, the quota rules require each applicant to submit multiple rank-order lists of universities. Each of the rank-order lists can be relevant for determining the university seat. Our main empirical observation is that university applicants often contradict themselves between the multiple rank-order lists that they submit. Thereby, they effectively delegate the outcome to an uncertain process that is suboptimal under standard assumptions. If an applicant had always reported the same rank-order list instead of producing a preference reversal between her submitted lists, she would have increased the probability of ending up at a more desirable university. Our cleanest (and most conservative) calculation, which excludes rational reasons for choice reversals (see Section 3.3.2), finds that 14% of applicants exhibit such behavior. Among these, we estimate that at least 20% are assigned to a university that they prefer less than a university to which they would have been assigned in the absence of a preference reversal.

[3]Examples for deliberate randomization—which may also simply reflect risk-seeking expected-utility preferences or other standard motives—include surprise menus at restaurants, last minute holiday booking desks at airports, surprise-me features of internet services, and home delivery of boxes of produce with varying content. For a historical account of randomization in the political arena see Buchstein (2009). Sunstein (2015) discusses questions of paternalism under the assumption that decision makers have a preference for choice avoidance.

[4]Both axioms require that preference is preserved in probabilistic mixtures. In our context, their main difference lies in the domain of preference; stochastic dominance relates to sure outcomes whereas betweenness relates to lotteries. The stochastic dominance property is, in the version of Borah (2010): if $a \succ b$ and $c \succsim d$ hold for outcomes a, b, c, d, then a probabilistic mixture between the two preferred outcomes is preferred to a mixture of the two less preferred outcomes, $(\lambda a, (1-\lambda)c) \succ (\lambda b, (1-\lambda)d)$, where $\lambda \in (0, 1]$ is the common probability of receiving the first object. Betweenness requires that if $\mathcal{L} \succ \mathcal{L}'$ holds for two lotteries $\mathcal{L}, \mathcal{L}'$, then the preference value of $(\lambda \mathcal{L}, (1-\lambda)\mathcal{L}')$ lies between that of the two lotteries.

A possible alternative explanation of the preference reversals observed in university choice are irrational beliefs of the decision-makers. The allocation mechanism of the central clearinghouse is intricate and depends on the submitted preferences of thousands of applicants.[5] Allowing for the possibility of non-rational beliefs, a large set of choice patterns can be optimal. We therefore conduct a set of simple classroom experiments that capture the relevant features of university choice but leave little room for ambiguity or irrational beliefs.

The simple binary-choice format of Experiment I asks the decision-makers to choose between the same two options twice, and a random draw determines which of the two choices is payoff relevant. Just as in the university application, the experimental design thereby allows the participants to put one option ahead of another one in their first choice and vice versa in their second choice. In this experiment (Section 4.1), 28% of participants show such a preference reversal between their two choices. Experiment II (Section 4.2) shows that the tendency to opt for randomization is not induced by the repeated-choice format: if participants have an explicit option to randomize between the alternative outcomes, they choose this option even more often, namely in 53% of cases (Experiment II). Finally, Experiment III (Section 4.3) confirms that reversals can also appear in situations where people have to rank more than just two options, as in the context of university admissions. Thus, we observe that in the classroom experiments, substantial proportions of participants (between 15% and 53%) choose a random outcome and thereby violate standard theory. The frequencies of such violations are consistent with the related lab experiments by Agranov and Ortoleva (2017). In the literature review of Section 2 we discuss their experiments in detail, which differ from ours regarding the choice domain among other things.

Systematic patterns in our data lead us to reject the hypothesis that random utility shocks and bounded rationality are the main drivers of behavior.[6] In our experiments the pairs of identical decisions are taken in immediate succession, without leaving time for a substantial impact of utility swings. Moreover the agents are aware of the fact that they take the same decision multiple times, which also reduces the scope of bounded rationality as an explanation of choice variations (see Agranov and Ortoleva, 2017, for arguments along these lines). Finally, in the university applications data and in the experiments, we observe specific patterns of reversals (mainly at the first rank and between adjacent ranks) that are unlikely to result from random utility or bounded

[5]The mechanism is analyzed in Braun et al. (2010), Braun et al. (2014) and Westkamp (2013), pointing to a particular strategic feature of the mechanism that applicants fail to understand: the mechanism involves a sequence of procedures, which affects the truth-telling incentives at the early stages, because the applicants have to consider the effect of moving to the next procedure. In this paper we use these and other results from the literature on matching algorithms to rule out the possibility that rational strategic considerations may induce preference reversals that look like a preference for randomization. Pallais (2015) demonstrates another instance of questionable strategies in university admission: a variation in the number of free American College Testing score reports to colleges has a significant effect on the number of applications although the cost of an additional report is only $6.

[6]Agranov and Ortoleva (2017) provide a concise discussion of the families of these models. An important literature analyzes whether previously found biases in decision experiments may be generated by models of random utility shocks, see for example Berg et al. (2010) for a study on preference reversals or Blavatskyy (2006) on betweenness violations.

rationality. Instead, these patterns are consistent with deliberate choices.

The conclusion that the observed choice of randomized outcomes is deliberate is also supported by a survey that we ran among the university applicants. The survey responses express unambiguously that most submissions of different preference lists are conscious and intentional. Possibly, some applicants hope to thereby increase their chances of getting a desirable seat, which is reasonable only for a subset of applicants and otherwise hints at a false understanding of the mechanism or the relevant probabilities. There is also direct evidence of a role of preferences for randomization: we asked the respondents to make a hypothetical choice akin to our experiments where randomization is possible and belief distortions are implausible by design. We observe that, once again, a preference for randomization in this hypothetical choice appears frequently, and it is positively correlated with the tendency to induce a random university allocation for oneself in the actual application process.

Regarding the motives that lead people to take these choices, the psychological literature provides some relevant insights. The choice patterns are consistent with active decision avoidance (e.g., Beattie et al., 1994, and Anderson, 2003). If a random device is available and if the process of using the random device does not violate other principles, decision-makers have been shown to use it in hypothetical scenarios (Keren and Teigen, 2010). More generally, the psychological literature argues that decision-makers often prefer to avoid a decision even if this comes at the cost of a (probabilistic) material consequence.[7] In the context of university applications, the decision between different cities and programs of study can be hard. Thus, decision-avoiding behavior, by way of submitting different lists, seems plausible in the light of the psychological evidence.

Not making a decision may of course be optimal under a wider definition of (standard) economic preferences. Especially informational reasons often justify the use of one of three avoidance strategies: delay, default, or delegation. It may be important for the decision-maker to remain flexible if potential news can arrive in the future (delay). Or, there may exist an exogenous agent or decision mechanism that uses better information, making it optimal to leave the choice to them (default or delegation). Moreover, delegation can be an effective device to avoid punishment for unpopular decisions as shown by Bartling and Fischbacher (2012). But these reasons are unlikely to apply in the case of university choice. The applicants know that their rank-order lists cannot be changed after the arrival of new information, and the mechanism selecting the lists does not utilize much choice-relevant information. Our survey among applicants also indicates that avoidance of punishment by others is a minor issue for them.

The main contribution of the paper is to demonstrate that people choose to randomize deliberately in a real-world situation, namely applications to university. From a policy perspective, the

[7]As discussed for example by Zeelenberg and Pieters (2007), the tendency to employ randomization can be viewed as stemming from a particular omission bias: decision-makers associate active decisions with more regret than inactive choices such as a coin flip. See also Kahneman and Miller (1986) and Gilovich and Medvec (1995) for discussions of inaction and regret. A theoretical account of the phenomenon and its predictions is in a working-paper version of this paper, Dwenger et al. (2014).

question arises whether randomization via multiple rank-order lists should be eliminated. Market design can be used to achieve this, e.g., by using a modified deferred-acceptance mechanism with quotas that only asks for one rank-order list from each applicant, see Westkamp (2013) and Braun et al. (2014). However, since the randomization is deliberate, one may argue that the applicants' welfare is likely to be higher if they can randomize. Our own conclusions about welfare effects of randomization (Subsection 3.3.3) rely on a "standard" consequentialist approach where outcomes determine welfare and randomization is thus viewed as a mistake. More research is needed to obtain policy recommendations that are robust to non-consequentialist preferences models.

The remainder of the paper proceeds as follows. Section 2 briefly describes the relevant literature in economics. Section 3 introduces the empirical context of university choice in Germany. To identify the subset of data that is suitable for our purposes, the section discusses and applies the relevant literature on matching mechanisms. Finally, it shows the calculations that yield our main empirical result, and reports on a survey among students regarding the reasons for their choices. Section 4 describes our series of experiments together with the results. Section 5 concludes.

2 Literature review

The paper contributes to a recent literature on the relevance of non-standard behavior for market design. There is evidence that preferences are not constant over time as observed for school choice in New York City where re-applications are common even by those families who received their first choice, see Narita (2016). These findings are consistent with some families making random choices. More generally, Benjamin et al. (2014) point to a lack of correspondence between submitted rank-order lists to the National Residency Matching Program and statements of preferred jobs. Various experiments from the lab and the field document the difficulty of market participants to understand the strategy proofness of matching mechanisms, see Chen and Sönmez (2006) and Guillen and Hakimov (2018).

While the psychological literature has studied the phenomenon of choosing to randomize (see the discussion above), the economics literature pays considerably less attention to the possibility of intentional use of random devices. Diecidue et al. (2004) argue that this is due to precisely the property of stochastic dominance violations: a theory that comes with a feature that is normatively so unappealing as stochastic dominance violations is easily dismissed. Diecidue et al. provide a different interpretation of coin flipping—utility of gambling—and prove that stochastic dominance violations are a core feature of such preferences. Possible motivations for gambling that are covered in the economics literature include anticipatory feelings during the state of uncertainty, such as utility from wishful thinking (see e.g., Caplin and Leahy, 2001, Brunnermeier and Parker, 2005, or Koszegi and Rabin, 2009). These motivations could in principle contribute to the attractiveness of randomization also in our choice settings, but we regard this as implausible at least in our classroom experiments because the state of uncertainty is resolved almost immediately.

Another possible driver for a preference for randomization is a possible procedural concern that arises in the context of fairness, especially when multiple people are involved. People have preferences over different allocation mechanisms even if they themselves do not participate in the mechanism (Kahneman et al., 1986). Experimental results confirm that people may prefer ex ante fair lotteries if an ex post fair outcome is unavailable (see Bolton et al., 2005 and Krawczyk and Le Lec, 2010).[8] Such fairness concerns cannot explain random choices in our experiments, due to their single-agent setups, and only implausibly so in the university context.

Several theories can account for random choices—they may be subsumed under models with boundedly rational decision makers, random-utility models, and models of deliberate randomization, see Agranov and Ortoleva (2017) for an overview. Bounded rationality encompasses models where decision makers have a well-defined utility function but err with a certain probability when making their choice (see Ratcliff, 1978, and many others). In random-utility models (e.g. Gul and Pesendorfer, 2006), the players maximize a well-defined utility function but this utility function changes over time in a random manner. In both sets of models, there is no deliberate decision to randomize. Finally, the theoretical literature on deliberate randomization—see e.g. Machina (1985), Fudenberg et al. (2015) or Cerreira-Vioglio et al. (2016)—provides structural reasons (like the desire to minimize regret) and axiomatizations of preferences that allow for deliberate coin flips.

The contribution by Agranov and Ortoleva (2017) reports on context-free experiments that were conducted independently from ours, demonstrating that participants who face the same binary-lottery choice task several times often switch between their choices if one lottery is not clearly better than the other. This is similar to the observation made by Hey and Orme (1994), among others, that a non-trivial proportion of decision makers show inconsistent behavior in repeated-choice settings.[9] Agranov and Ortoleva (2017) provide evidence that strongly suggests a deliberate decision process by showing that a significant fraction of participants is willing to *pay* for a coin flip between the two lotteries.

Our study complements Agranov and Ortoleva's work in several ways. The significant conceptual contrast between our paper and Agranov and Ortoleva's is the difference in choice domains (ambiguity versus risk). The choice objects that Agranov and Ortoleva focus on lie in the domain of risk and for their modelling of deliberate randomization, they use Cerreira-Vioglio et al.'s (2016) Cautious Stochastic Choice defined for lotteries. Our choice objects, in contrast, do not come with exogenous probabilities: a voucher's consumption value is uncertain due to the unknown transaction cost and the unknown availability of goods; a university seat is uncertain in many dimensions

[8]To account for such evidence, Borah (2010) develops a model where a decision-maker's utility is a weighted sum of her expected utility from the lottery outcome as well as a procedural component. Sen (1997) proposes accommodating concerns for the procedure in models of menu-dependent preferences.

[9]Other related studies show that experimental participants sometimes value a lottery less than its worst possible realization (Gneezy et al. 2006, Sonsino 2008, Andreoni and Sprenger 2011). This finding has been ascribed to a distaste for uncertainty (Simonsohn 2009).

of the applicant's life. Such extensions of the choice domain are important to investigate, since it is evident that many contexts of uncertainty are inherently ambiguous. One may regard as our main contribution the demonstration that the identified preference for randomization has real-world implications, namely in university admissions. Conceptually, it is a natural extension, not least because of the similarity of models: the intuition behind several theories of stochastic choice, including Cautious Stochastic Choice, involves a pessimistic attitude towards uncertainty that is similar to the formalizations of pessimism in the theories of choice under ambiguity.

Additional pre-existing experiments have also discussed false diversification motives (see Chen and Corter, 2006, and Rubinstein, 2002) where participants choose mixtures in ways that violate expected utility. Simonson (1990) explains variety-seeking by consumers as a conscious cognitive mechanism to avoid having to make difficult trade-offs. Complementing these studies, our participants face experiments that are cognitively very straightforward.[10]

The subsequent sections will refer to additional literature that is relevant in the context of the respective empirical contexts: on matching algorithms in Section 3 and on menu and framing effects in Section 4.

3 Field evidence: Reversals in university applications

Admissions to German undergraduate university programs in the medical subjects are centrally administered by a clearinghouse. The clearinghouse assigns applicants according to the following three procedures that are implemented in a sequential order:

(1) Procedure A admits students who are top of the class to up to 20% of seats.

(2) Procedure W admits students with long waiting times to up to 20% of seats.

(3) Procedure U represents admission by universities according to their own criteria to the remaining (at least 60% of) seats.

For each of the three procedures, applicants are asked to submit a preference ranking of no more than six universities, and these lists can either be identical or different across procedures. All rank-order lists are submitted at the same moment in time. The central clearinghouse employs the three procedures in a strictly sequential order: all applicants who are matched in procedure A are firmly assigned a seat at their matched university and do not take part in procedures W and U. All remaining applicants enter procedure W and may be matched there. After procedure W, all applicants who are still unmatched enter procedure U. The fact that applicants simultaneously submit three potentially different rank-order lists of universities, each of which may be relevant, is a unique property of the German mechanism and makes it suitable for our analysis.

[10] As in the experiments in Rubinstein (2002), our participants can get at most one reward and cannot hedge, removing the possibility of a diversification value. Rubinstein finds an irrational mixture of choices and ascribes the effect to a cognitive failure of grasping the multi-stage randomness in his experiment (that is, participants wrongly apply the intuition of diversification).

Applicants who are successful in procedure W are a disjoint group with relatively poor grades and low chances of being admitted through the other two procedures. We therefore restrict our attention to procedures A and U, where admission largely follows the grade point average (GPA) in final secondary school examinations. In the following section (3.1), we briefly introduce the two procedures and the relevant matching literature.

Based on the data described in section 3.2, section 3.3 assesses the frequency of preference reversals, i.e., the submission of different preference lists by the same applicants. As we will explain in detail, not all instances of self-contradicting applications violate standard theory, due to strategic reasons. We therefore need to identify a subset of cases where these strategic reasons do not apply. Our empirical strategy is as follows. We first establish that under standard, consequentialist preferences, applicants have no incentive to distort their rank-order list for procedure U. That is, the ranking in procedure U contains an applicant's "true" preference under the hypothesis that a preference for randomization is absent. (In fact, the information brochure of the clearing house indicates to applicants that it is in their interest to reveal their preferences truthfully under procedure U. We confirm this below by providing theoretical arguments.) We then establish that we can identify a subset of applicants who have incentives to also report the same rank-order list under procedure A: these are applicants for whom a preference reversal may not only have a material consequence but who also have no strategic incentives to game the application system. Within this subgroup of applicants, we can thus detect applicants with a preference for randomization as those who nevertheless reverse their two rank-order lists between procedures A and U.

A reversal by these individuals increases their probability of ending up at a suboptimal university. Notice that by construction of our argument, this is a violation of the assumption of standard, consequentialist preferences, which is needed to establish the preference list submitted for procedure U as the true preference ordering. We therefore cannot necessarily assume that the rank-order lists of procedure U reflect the true preferences of these applicants, which makes it hard to arrive at a welfare evaluation. But calculations in section 3.3.3 show that no matter what is the true preference order, the consequences of the preference reversals are economically significant.

3.1 Matching procedures

3.1.1 Procedure U

For expositional reasons, we start by introducing procedure U even though it is administered at the end of the admission process. Procedure U corresponds to a two-sided market where not only applicants but also universities express their preferences over their possible matches. Each university ranks the applicants who list it on their preference list, using the final grade from school as the predominant but not necessarily the only criterion to discriminate between applicants. Given the preference lists of universities and applicants, the central clearinghouse applies the college-proposing Gale-Shapley algorithm. The algorithm was first described by Gale and Shapley

(1962) although similar ideas had been in use since the 1950s in the U.S. clearinghouse for the first jobs of doctors (see Roth, 2008). A description of the college-proposing Gale-Shapley mechanism is in the appendix.

As indicated above, the information brochure of the clearinghouse explicitly advises applicants to reveal their true preferences in procedure U. This advice is justifiable by two theoretical arguments. First, in the college-proposing Gale-Shapley mechanism all successful manipulations can also be accomplished by truncations, see Roth and Peranson (1999), p.762, referring to results by Roth and Vande Vate (1991). Such truncations require the least information about others' preferences among all possible manipulations that are potentially beneficial to the decision maker (Roth and Rothblum, 1999). Thus, even if applicants strategically truncate their lists submitted in procedure U,[11] the correct rank order of the remaining choices is preserved. Second, if preferences of universities are perfectly correlated, then there is only one stable matching.[12] In this case, the stable matching is achieved by both the college- and the student-proposing Gale-Shapley mechanism. Since the latter is strategy-proof (Roth, 1982), it follows that truth-telling is also a dominant strategy in the college-proposing Gale-Shapley mechanism.[13]

We thus conclude that the incentives to misrepresent one's preferences in procedure U are null for perfectly correlated preferences of universities and they are small if the preferences of universities are strongly correlated. This is the case in the German university admission system where all universities have to use the GPA as the main criterion due to legal constraints: 63% of universities base their ranking of applicants solely on the final grade. The other universities also mainly base their decisions on GPA but use completed apprenticeship in the area of interest (53%), grades from major subjects in school such as grades in maths (38%), and interviews (27%) as additional admission criteria (multiple criteria possible).[14] These additional criteria are unlikely to play a major role for the ranking of universities: Less than 4% of applicants in our data set have completed an apprenticeship, while interviews and especially grades from major subjects are likely to show a strong correlation with GPA. Thus, rankings by universities are highly correlated with grade. Even if small incentives to misrepresent preferences exist, truncations of the true preference list are optimal and far more plausible than other manipulations (especially given the advice of the

[11] In the information brochure, the central clearinghouse does not mention the possibility of such truncations or other forms of strategically misrepresenting one's true preferences in procedure U (except for a "pre-selection" stage which does not affect our analysis).

[12] In a stable matching everybody prefers their match over no match at all and there is no applicant and university who are not matched but who would both prefer to be. To see why there is only one stable matching if university preferences are perfectly correlated, note that in any stable matching the applicant ranked highest by the universities gets his preferred matching partner. Thus, there is only one stable matching partner for the applicant with the best final grade. This argument can be repeated for all other applicants.

[13] The fact that only up to six universities can be ranked might induce applicants to misrepresent their preferences by including safe options (Haeringer and Klijn 2009). However, we restrict attention to top students who do not face the risk of being unassigned to a seat at one of their six choices in procedure U.

[14] Universities with additional admission criteria administer procedure U themselves. Our data set does not include information on subject grades, interview outcomes and details on completed apprenticeships. This prevents us from providing an empirically estimated correlation coefficient of university preferences.

clearinghouse). We will therefore consider the non-empty parts of the rank-order lists submitted under procedure U as reflecting the true preferences of applicants.

3.1.2 Procedure A

Procedure A is employed to reward excellent GPAs in secondary schools. The top 20% of applicants are assigned to seats, based on the preference list that they submit for procedure A and using the so-called Boston mechanism, which admits as many applicants as possible to their first choice (k^{th} choice) and considers second choices ($(k{+}1)^{th}$ choices) only if there are still seats left at the end of the first (k^{th}) round (cf. the appendix and Abdulkadiroglu and Sönmez (2003) for details on the Boston mechanism).

The Boston mechanism implies that an applicant ranking a university in k^{th} position is admitted before applicants ranking a university in $(k{+}1)^{th}$ position are considered—independently of her high-school GPA. Hence, it may be advantageous for some applicants to manipulate their true preference ordering by skipping a university if they do not have any chance of getting a seat. We need to take this incentive into account when looking for deliberate reversals in the preference lists.

In addition to the strategic incentives due to the Boston mechanism itself, the sequential nature of the admission process creates incentives to truncate one's preference list in procedure A. Procedure A is the first to be administered and any assignment in this procedure is final, so only applicants who were not admitted in procedure A (nor in procedure W) participate in procedure U. Both procedures A and U largely follow average grades, that is, applicants with a very good GPA have a chance of being admitted in both procedures. Top applicants should therefore avoid being matched to a less preferred university in procedure A if the alternative is to wait for procedure U and be admitted to a more preferred university there. This may induce applicants to submit rank-order lists in procedure A that are shorter than their true preference order.[15]

In our analysis below, we eliminate all cases where preference reversals can be driven by the strategic motives described above. The hypothesized preference for randomization can still apply, as the applicants can seek randomness by submitting different lists in procedures A and U.

3.2 Description of the data

We use the (anonymized) information collected by the central clearinghouse covering seven waves of applications between the winter term 2005/06 and the winter term 2008/09. During our observation period the following six subjects were centrally administered and are part of our data set: biology, medicine, pharmacy, psychology, animal health, and dentistry.[16] The data set contains

[15] Braun et al. (2010) investigate such truncations and demonstrate that many applicants submit too long lists for procedure A. The objective of procedure A—to give an additional advantage to the applicants with highest GPA—therefore fails to be met.

[16] In Germany, students typically choose one subject for their studies at the university, and admission criteria and procedures differ between subjects.

all applications for these subjects and records all information provided by the applicants including data on individual characteristics such as final GPA, age, sex, and location. Most important for our purpose, the database provides information on the admission procedures that a prospective student has participated in as well as the rank-order lists he or she has submitted.

To avoid multiple counting, we only consider each individual's first application in the data set. After excluding individuals not applying for procedure U and discarding individuals whose preference list for procedure U might be incomplete due to pre-selection,[17] we are left with a total of 224,016 first-time applications.

3.3 Results: Preference reversals in university applications

3.3.1 Full data set

We first examine the full set of first-time applicants to study whether preference lists coincide in procedures A and U. Table 1 shows where the entries on the lists submitted for procedure U appear on the lists for procedure A. Row i, i=*1,...,6*, of the table contains, for the universities on rank i for procedure U, the percentage of cases in which the same applicant listed the university on rank j of the list for procedure A.

Table 1: Conditional proportions, showing where universities ranked in procedure U appear in rank-order lists for procedure A (all entries in %)

U \A	1	2	3	4	5	6	not ranked
1	75.43	4.05	1.91	1.14	0.78	0.54	16.15
2	5.34	63.40	4.83	2.37	1.64	1.10	21.33
3	2.71	5.23	58.80	4.76	2.84	1.78	23.89
4	2.35	3.45	5.77	55.88	4.94	2.64	24.96
5	1.74	2.36	3.42	5.88	55.23	4.59	26.80
6	1.66	1.89	2.36	3.52	5.45	54.92	30.20

Notes: Full data set as described in Section 3.2 (N=224,016 observations).
Source: Own calculations based on ZVS data on applicants, waves 2005/06 to 2008/09.

The diagonal elements in the table indicate identical entries. For example, in 75% of applications the top-ranked university from procedure U is also ranked first in procedure A. Similarly, 63% of universities ranked second in procedure U are ranked second in procedure A, etc. The off-diagonal elements report the discrepancies between the lists that applicants submit in the two procedures. Differences at a certain preference rank can result either from listing different universities or from listing the same universities in a different ordering. Altogether, the proportions in Table 1 show that a considerable number of applicants submit different lists.

[17]All procedures are two-stage procedures. At the first stage applicants are "pre-selected" (in the language used by the clearing house) and at the second stage the pre-selected applicants compete for admission. The pre-selection criteria applied by the universities differ, requiring for example that the university be listed as a first preference, or as a first to third preference. Some universities use a combination of average final grade and preference rank. But after pre-selection, the applicants are allowed to reshuffle the ordering of their rank-list. We only consider the final rank-order list for procedure U, since this list should be free from such strategic manipulations.

Notice that skipping the top-ranked university in procedure A moves up all universities named on rank 2 and below. In Table 1, skipping the top-ranked university is therefore recorded in multiple preference reversals that appear further down the list. To avoid such double counting, Table 2 repeats the counting exercise of Table 1 but only includes the first preference reversal within an application. Entries in rows 2...6 of Table 2 (marked with an asterisk) reflect additional cases of preference reversals, relative to previous ranks. For example, not ranking the top U-ranked university in procedure A only appears in the table's first row as "not ranked" while the effects of this reversal further down the list are not counted. Table 2 therefore counts each application with a preference reversal exactly once. It confirms that preference reversals are widespread: a total of 64% of all applicants reverse at least one preference rank between procedures U and A or do not list a university in procedure A that is listed in procedure U. Disregarding reversals from not ranking universities in procedure A but listing them in procedure U (36%) shows that approximately 29% of applicants change the ordering of their preference lists.

Table 2: Preference reversals (all entries in %)

U \A	2	3	4	5	6	not ranked	total
1	4.05	1.91	1.14	0.78	0.54	16.15	24.57
2*	-	4.58	1.92	1.16	0.78	7.67	16.11
3*	-	-	3.55	1.58	0.86	3.89	9.88
4*	-	-	-	2.87	1.12	3.02	7.01
5*	-	-	-	-	1.80	2.21	4.01
6*	-	-	-	-	-	2.86	2.86
total	4.05	6.49	6.61	6.39	5.09	35.81	64.44

Notes: See Table 1.

RESULT 1: *Overall, 64% of university applicants submit different rank-order lists in procedures A and U. 29% of applicants reverse the order of at least two universities.*

3.3.2 Conservative estimate: Ruling out strategic manipulations and irrelevance

As noted in Section 3.1.2, applicants may have incentives to strategically manipulate their preference lists for procedure A by skipping a university if they do not expect to have a chance of being admitted at that university. They may also truncate their rank-order list for procedure A in order to avoid being matched to a lower preference in procedure A and instead wait for procedure U. Besides these strategic considerations, applicants might not follow their true preferences when filling out lists in procedures that are most likely to be irrelevant for them. This may result in preference reversals that are solely due to the fact that individuals do not care: e.g., an applicant who can be sure of being matched in procedure A (because her GPA is clearly good enough for her top choice on list A) might as well report a reversed list for procedure U.

In order to identify strategic incentives and the relevance of lists, applicants need to anticipate their chances of success for procedure A and assess the probability with which each of the procedures applies to them. The clearinghouse publishes detailed information on the application characteristics of admitted candidates for every university-field combination in each year. It also advises applicants to use the historical admissions statistics when devising their list for procedure A, and it points out the potential advantage of manipulating the list. Under the auxiliary assumption that admission chances are stable from year to year (which is close to correct), the applicants have the information necessary for strategic manipulations. Individuals also know from historical admissions data which procedures are likely to be relevant to them.

To exclude all observations where strategic considerations of the applicants can be at work, we first select only those applicants who, on the considered rank, would have been admitted in procedure A to the university listed in procedure U, in the preceding year. All others have a good reason to name a different university on this rank for procedure A. Second, we restrict attention to ranks where a university is listed in both procedures to exclude strategic truncations. This restricts the analysis to 91,485 first-time applications. To rule out irrelevance of procedure U, we additionally drop individuals from the data set whose GPA is at least 0.4 grade points better than the threshold needed for admission on the considered rank of list A. Further, we focus on applicants who belong to the (top 20%) group that is selected for procedure A to make sure that the preference list for A is relevant, too. This leaves us with 8,508 applicants, who are neither prone to strategic behavior nor to carelessness when deciding about their preference lists. Note also that this group of students contains many of the smartest students finishing high school in this year. This decreases the likelihood that their choices are due to confusion about the process.

Considering these applicants, we find that the percentage of individuals stating congruent preferences in both procedures increases relative to the previous count that included all applicants. 94% of applicants top-rank the same university in procedures U and A (Table 3); the remaining 6% either do not rank their top university from procedure U at all or include it on a lower rank in procedure A.

Table 3: Conditional proportions, ruling out strategic incentives and irrelevance (all entries in %)

U \A	1	2	3	4	5	6	not ranked
1	93.67	3.39	0.89	0.38	0.27	0.15	1.26
2	1.90	74.76	3.83	1.29	0.65	0.33	17.23
3	0.82	3.35	66.14	3.42	2.05	0.90	23.27
4	0.64	1.93	3.80	61.52	3.62	1.50	26.99
5	0.23	0.46	1.67	3.96	61.13	3.08	29.48
6	0.30	0.30	0.80	1.89	2.98	59.32	34.41

Notes: We only consider applications where both preference rankings contain a nonempty cell in the considered rank, and where the applicant's entry in procedure U would have been successful in the previous year, conditional on previous ranks being unsuccessful. In addition, we discard applicants who do not belong to the top 20% group selected for procedure A or individuals whose GPA is at least 0.4 grade points better than the threshold needed for admission on the considered rank of list A, or for any university listed on a previous rank. N=8,508 observations.
Source: Own calculations based on ZVS data on applicants, waves 2005/06 to 2008/09.

In order to determine the number of individuals reversing at least one preference, we again exclude double-counting and focus on the first preference reversal within each application. The resulting Table 4 shows that 14% of all individuals in our data set submit preference lists for procedures A and U that differ in at least one rank.

Table 4: Preference reversals, ruling out strategic incentives and irrelevance (all entries in %)

U \A	2	3	4	5	6	not ranked	total
1	3.39	0.89	0.38	0.27	0.15	1.26	6.34
2*	-	2.09	0.65	0.32	0.18	0.87	4.10
3*	-	-	0.84	0.46	0.12	0.48	1.89
4*	-	-	-	0.49	0.15	0.33	0.98
5*	-	-	-	-	0.28	0.31	0.59
6*	-	-	-	-	-	0.24	0.24
total	3.39	2.99	1.86	1.54	0.88	3.48	14.13

Notes: See Table 3.

RESULT 2: *In a conservative estimate, we find that 14% of applicants submit preference lists that differ in at least one rank across procedures. These choices are consistent with a preference for randomization and cannot be rationalized by strategic motives or by irrelevance of one of the lists for the applicants.*

3.3.3 Consequences arising from preference reversals

We now report on the frequencies with which applicants who reverse their preferences between lists are matched *unnecessarily* to suboptimal universities. For this exercise, we again restrict attention to applicants who neither face strategic incentives nor have reasons to ignore one of the preference lists due to irrelevance. For these applicants we ask whether those who show preference reversals would be matched to a better university if they reported the same rank-order list for both procedures.

Since these applicants reverse their preference orders between the two procedures, it is not obvious by which preference order one should evaluate their outcome. We thus consider both reported preference lists as candidates for the "true" preference order. First, we consider the case that applicants report their true preferences under procedure U, as is optimal according to the above discussion. For the first three of the seven waves of applications, we have the necessary data available to answer the question.[18] Of the N=5,170 applications that appear in these three waves, 757 (15%) show preference reversals between the two lists, which is comparable to our previous results that use all data. Column (1) of Table 5 shows the preference rank on the list for U that was realized for these applicants, and column (2) shows the rank that they could have obtained if they had reported their ranking for U also under procedure A.

The comparison of columns (1) and (2) shows that preference reversals substantially harm the individuals who commit them. While only 66.1% of applicants in this group actually obtain their

[18] For the remaining waves, the matching outcome is not available in our data set.

Table 5: Matching outcomes (all entries in %)

	Individuals showing pref. reversals		Individuals without pref. reversals
	Rank realized	Rank possible	Rank realized
Rank	(1)	(2)	(3)
1	66.1	86.9	88.9
2	17.0	4.1	5.7
3	7.9	3.0	1.6
4	3.0	1.8	1.1
5	1.7	0.9	0.9
6	2.4	1.1	0.4
Other	1.8	2.1	1.4
Sum	100.0	100.0	100.0
	N=757		N=4,413

Notes: Matching outcomes of N=5,170 applicants in three waves. All entries in percent. (1) contains actual matches of applicants who submitted lists containing preference reversals between A and U. (2) contains hypothetical matches under the counterfactual assumption that the same set of applicants submit the list for U under both procedures. We consider individual changes of lists, that is, based on the scenario that the behavior of the other applicants is unchanged. (3) contains the actual matches of all applicants who submitted consistent lists.
Source: Own calculations based on ZVS data on applicants, waves 2005/06 to 2006/07.

most preferred university seat, 86.9% could have obtained their first choice under the counterfactual that they simply report their list for U also in A. The difference is 20.8 percentage points or a total of 158 applicants in this restricted sample.[19] Column (3) shows that the remaining set of 4,413 applicants who submit consistent lists in A and U have success rates that are very close to the counterfactual results of column (2). This indicates that the two sets of applicants on average face decision problems of comparable importance.

Separate calculations show that the inefficiency becomes even stronger if we further restrict the sample to the 190 applicants (again ruling out strategic incentives and irrelevance in the three relevant waves) who simply flip their top two choices between the lists A and U. Of them, only 53.7% actually obtained their top choice according to the list in U, whereas 82.1% could have obtained it under the counterfactual strategy of submitting the list for U to both procedures.

We now consider the case that the rank-order list submitted under procedure A reflects the "true" preference order. Under this assumption, distorting one's preference list under procedure U is even more harmful in our sample: all applicants who are eligible for procedure A have a very high chance to be matched to their top A-ranked university under procedure U. A further data restriction is, however, that the central clearinghouse itself implements procedure U only for a subset of universities and we thus only have outcome data for procedure U on this subset of universities. We can therefore construct the required counterfactual outcomes for only 3,162 individuals, whereof 414 applicants (13%) display preference reversals. For these individuals, the possible rate of being matched to their top A-ranked university under procedure U is 95.7%. The

[19] The inefficiencies are even stronger if we consider an alternative counterfactual strategy where the applicants use their preference list for procedure U but truncate it optimally. Instead of 86.9% as reported in column (2) of Table 5, a total of 93.1% of the same 757 applicants could have obtained their top choice.

applicants' actual success rate of being matched to their top A-ranked university is only 65.9%. The difference in actual versus possible outcome is therefore even larger than in Table 5. We note that the employed subsample of universities may create a selection problem for this calculation. We also note that, importantly, it is more plausible that applicants report their true preference under procedure U than under procedure A because the clearinghouse advises them to do so.

RESULT 3: *Preference reversals have allocative consequences. Considering only applicants for whom both lists are relevant and who have no strategic incentives to submit lists with preference reversals, more than 20% could have been allocated to their top-ranked university seat but received a different seat as a consequence of their reversal.*

3.3.4 Survey of applicants

What are the motives for applicants to submit different lists? To answer this question, we conducted a survey among all applicants of the year 2015 for medicine and related subjects at German universities.[20] They were invited to participate through the website of the clearinghouse. Overall, 1,824 persons completed the survey. A large majority report that they were aware of the fact that different preference lists can be submitted (83%), and a majority of them did so (68%).[21] Among those who submitted different lists, 81% report that this was a conscious decision. This confirms our presumption that the submission of different lists is purposeful.

Regarding the reasons for submitting different lists, the survey questionnaire gives the respondents eight possible answers, asking to select up to three of them as applicable. Large proportions of respondents indicate that they regarded one of the lists as irrelevant (35%) or that they submitted different lists out of strategic considerations, in order to increase the likelihood of getting a seat (79%) or to increase the likelihood of getting the best possible seat (26%). Smaller proportions of respondents indicate that they were indifferent (24%), that they had difficulties in deciding (12%), that they attempted to give a "fair chance" to conflicting goals between themselves and their family and friends (5%) or that they feared to regret their decision in the future (4%). 4.4% answered "Other" as one of the main three reasons. Taking together the answers regarding difficulties in deciding, procedural fairness concerns, and fear of regret suggests that 21% of the surveyed applicants may exhibit preferences that are non-consequentialist.

The survey then asks the applicants to give one main reason for having submitted different lists. We find that 12% of applicants neither indicate irrelevance nor one of the two strategic motives as their main reason. Among these 12% of applicants, the percentages of students who mention indifference, difficulties to decide, considering goals of family/friends, fear of regret, or "Other", are 46%, 23%, 9%, 6%, and 15%, respectively.

[20] The translated questions of the survey are in the appendix.

[21] All data are self reported, since we did not get permission to match the survey responses to the individual applications.

The participants in the survey also face a hypothetical decision problem. They are asked to consider two universities: their most preferred university, labeled "university A", and the second-most preferred university, "university B". Participants choose between four options: (i) being admitted to A with certainty, (ii) being admitted to A with a probability 0.6 and B with 0.4, (iii) being admitted to B with certainty, and (iv) being admitted to A with a probability of 0.4 and to B with 0.6. This choice problem is very close to one of our experiments, described in the next section. Of all respondents, 35% choose one of the two lotteries over A and B, violating stochastic dominance. Such a choice for randomization is significantly more common among those who report having submitted different lists in the real application procedure although the difference is small (36% versus 32%, p=0.047, one-sided). When asked whether they prefer to leave certain decisions to chance, a slightly higher proportion confirms this preference among those who submitted different lists than among others (10.3% versus 7.5%, p=0.03, one-sided).

We interpret the survey results as evidence that the vast majority of applicants submit different lists on purpose and that submission of different lists in the application procedure is correlated with the respondents' preference for randomization. Moreover, the results indicate that indifference and difficulties to decide are more important correlates of a random choice than fear of regret or the desire to acknowledge the wishes of relatives and friends through the use of different lists.

4 Experiments

This section presents our three experimental designs and results. The design of Experiment III is closest to the university application context of the previous section, whereas Experiments I and II are stripped-down versions of Experiment III but can also stand alone as tests for a possible effect of a preference for randomization. We employed classroom experiments that were conducted in introductory undergraduate lectures in microeconomics and macroeconomics at Technical University Berlin and Free University Berlin.[22] Each of the experiments lasted for 5-10 minutes and was conducted with paper and pencil. Only some of the participants were paid. This procedure saved time and money compared to laboratory experiments, thus allowing for large sample sizes. All experiments were incentivized with vouchers from Amazon and/or Starbucks, which the participants received depending on their choices.[23] A translation of the instructions of all three experiments is

[22]Parallel to the classroom version of Experiment III, we also conducted a similar newspaper experiment in combination with an online survey. This experiment was advertised in the "WZB-Mitteilungen", a quarterly journal of the social science research institute WZB. The WZB-Mitteilungen is read by researchers, policy makers, and the interested public. This experiment differs from the classroom experiments in a number of respect. It qualitatively confirms the results, albeit with smaller effect sizes in most cases. Details on the procedure and results are in the appendix.

[23]The choice of vouchers as prizes has several motivations. (i) The description and delivery of vouchers are straightforward both in the classroom experiments and in the newspaper experiment. (ii) Monetary values of vouchers are flexible. (iii) Since the values of vouchers are not directly comparable across shops, the decision problem is non-trivial.

in the appendix. Note that we re-labeled the options A to D in the instructions to a_1 to a_4 in the paper. For each of the three experiments, we called a_1 the option that is preferred most frequently.

4.1 Experiment I: Deliberate choice reversals

4.1.1 Design

In Treatment 1 of Experiment I, 69 participants face a choice between two prizes. Prize a_1 is a combined package of a 14 Euro Starbucks voucher together with a 10 Euro Amazon voucher. The other prize, a_2, is a 19 Euro Starbucks voucher. Participants have to choose *twice* between the two prizes, but only one choice task is relevant ex post: participants receive the prize that they report in the first choice task with probability 0.6 and the prize that they report in the second choice task with probability 0.4. With a sufficiently strong preference for randomization, they would induce a random outcome by reporting two different prizes in the two choice tasks. A participant with standard, consequentialist preferences would choose the same prize in both tasks unless she is indifferent between the two prizes.

In a control treatment, Treatment 2, we let a separate set of 68 participants choose only *once* between the two prizes a_1 and a_2. For comparison with the second choice task in Treatment 1, the payout rule is that participants receive their chosen prize with probability 0.4. Treatment 2 generates a comparison data set, allowing us to observe the participant population's preference between the two prizes. Under standard preferences, the same choice frequencies would arise on average for the second choice task in Treatment 1 and the choice task in Treatment 2. Note that in both decisions, the participant receives the chosen prize with a probability of 0.4. For example, a random utility model with a distribution of utility shocks that is constant across choices would generate the same choice probabilities across tasks.

Both treatments are run in parallel in the same classroom, by randomly distributing different sets of instructions to different students. We paid out a prize to every tenth participating student: at the end of the experiment, we randomly determined the participants who would receive a prize and played out the random draws for the two treatments.[24]

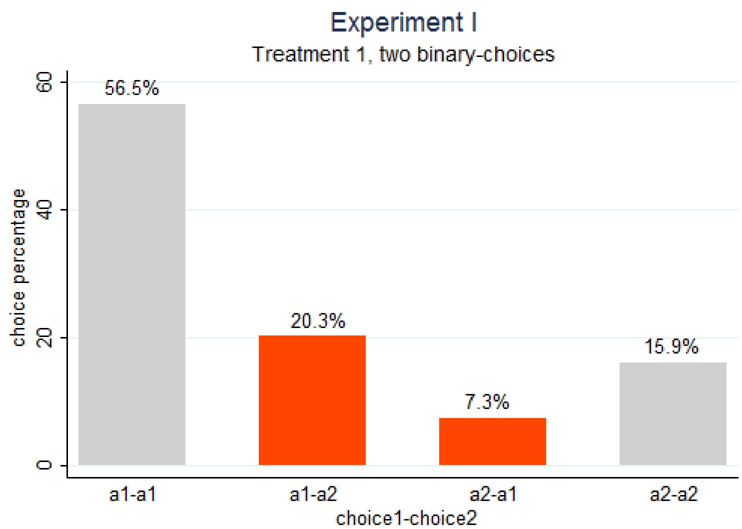
4.1.2 Results

In Treatment 2, the control treatment, 81% of participants choose a_1. More importantly, we find in Treatment 1 that a significant proportion of participants reverse their choices: 28% of participants either choose a_1 in the first task and a_2 in the second task or the reverse. Figure 1 shows the different choice combinations made by the participants in Treatment 1. While choice reversals can be trivially explained by indifference, we observe that the pattern of reversals is systematic:

[24] It may be that the random payment procedure diminishes the effect of a preference for randomization. This would make it less likely that the violations of standard preferences appear.

First, the choice of a_1 in the second choice task of Treatment 1 is significantly less frequent than in Treatment 2, $0.64 < 0.81$ ($p = 0.02$, Fisher's exact test). Second, in Treatment 1 the share of participants choosing a_1 in the first choice task is larger than in the second choice task ($p = 0.03$, one-sided test on the equality of matched pairs of observations).

Figure 1: Choice combinations made in Treatment 1



RESULT 4: *28% of participants submit two different choices in the two tasks of Treatment 1. The majority of these participants choose the option in the first choice task that is also chosen most frequently in the single-choice task of Treatment 2, i.e., the option that is more preferred by participants.*

As indicated in Section 4.1.1., a random perturbation of utilities would predict a different pattern of choices. Under this assumption, choices in the second task of Treatment 1 would be equally distributed as choices in Treatment 2, which is not observed. The presence of the first choice task significantly affects the choice probability in the second choice task. Note that this finding is a menu effect, reminiscent of prior evidence on the influence of irrelevant options in the choice set (Tversky and Simonson 1993, Sonsino 2010). The first task in Treatment 1 breaks the equivalence of the two treatments' choice sets (despite the fact that standard theory prescribes all the choices to coincide). In other words, the experiment relies on a menu effect to demonstrate a preference for randomization. The next experiment examines whether a preference for randomization also appears in a framing experiment where the set of available options is held constant.

4.2 Experiment II: Choice reversals and explicit preference for randomness

4.2.1 Design

Experiment II is conducted with 166 participants who have the choice between two prizes, where prize a_1 is a 19 Euro Amazon voucher and prize a_2 is a 19 Euro Starbucks voucher. We conduct two treatments varying the choice format. In the binary-choice format of Treatment 3, just as in Treatment 1 of Experiment I, the 74 participants choose twice between the two prizes. Only one choice task counts, as the participants receive the prize that they pick in the first choice task with probability 0.6 and the prize that they pick in the second choice task with the remaining probability of 0.4. Treatment 4 is economically equivalent to Treatment 3 but it has a four-way-choice format where 94 participants face the explicit choice between the following four options:

Option 1: You receive a_1 with probability 0.6 and a_2 with probability 0.4.
Option 2: You receive a_1 with probability 1.
Option 3: You receive a_2 with probability 0.6 and a_1 with probability 0.4.
Option 4: You receive a_2 with probability 1.

Like in Experiment I, the two treatments of Experiment II were conducted in the same classroom, and one out of ten participants is paid for real.

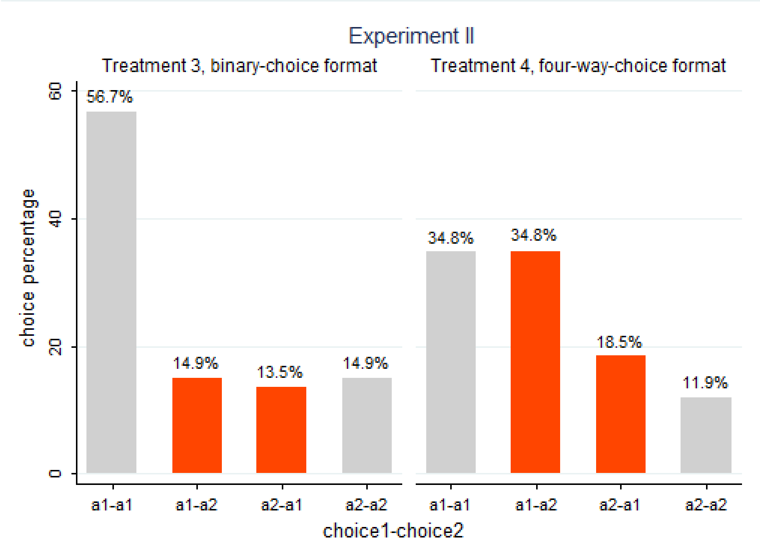
4.2.2 Results

As is shown in Figure 2, 28% of the participants randomize in Treatment 3 by choosing both a_1 and a_2 exactly once in the two tasks. This compares to 53% of the participants in Treatment 4 who choose the explicit option to randomize between the two different alternative prizes, i.e., Option 1 or Option 3. In the four-way-choice treatment the share of randomizing individuals is thus significantly larger compared to the binary-choice treatment ($p < 0.01$, one-sided Fisher's exact test). The more salient randomization opportunity in Treatment 4 evokes the participants' preference for randomization more strongly than the two-way choice frame of Treatment 3.

RESULT 5: *When given the explicit opportunity to choose a lottery between two alternatives, 53% of the participants choose it. Lotteries with different outcomes are chosen significantly more often than the corresponding indirect randomization in an economically equivalent repeated-choice format.*

As in Experiment I, random utility perturbations cannot explain the data of Experiment II. Instead, we observe a pure framing effect.

Figure 2: Choices made in Treatments 3 and 4



4.3 Experiment III: Reversals between longer preference lists

In Experiments I and II, there are only two prizes among which participants can choose. This differs from many real-life settings such as university choice where decision makers rank more than two alternatives. Experiment III examines whether reversals in the rank order can also be found in choices between longer lists. To control for beliefs about the uncertain environment, we again employ a simple experiment with vouchers as prizes. In addition, Experiment III involves an unannounced second part.

4.3.1 Design

There are four available prizes, a_1 to a_4, consisting of one or two gift vouchers:

a_1: 19 Euro Starbucks voucher
a_2: 19 Euro Amazon voucher
a_3: 14 Euro Starbucks & 10 Euro Amazon vouchers
a_4: 8 Euro Starbucks & 16 Euro Amazon vouchers.

The four options are chosen in order to make the decision problem non-trivial. Since we expect subjects to have a preference for either Amazon or Starbucks vouchers and because there may be transaction costs associated with every voucher, the combination of two different vouchers is more valuable in monetary terms than a single voucher. Participants are asked to rank the prizes on two lists, list (i) and list (ii), where each list is chosen to be payoff-relevant with a probability of 0.5. Each list, if chosen to be payoff-relevant, delivers the differently ranked prizes with given probabilities, detailed given below. This yields an incentive-compatible mechanism to report the full preference ranking: on both lists, the prize ranked first is received with the highest probability, the prize ranked second with the second highest probability, etc. As shown in Table 6, the distribution of probabilities among the different ranks slightly differs across the two lists.

Table 6: Probabilistic consequences of the two preference lists

Probability of getting prize ranked	List (i)	List (ii)
1st	.5	.4
2nd	.3	.3
3rd	.2	.2
4th	0	.1

An expected-utility maximizer with strict preferences over the available prizes a_1 to a_4 would list her most preferred prize first on both lists, the second preferred prize second etc. Any other combination of lists puts avoidable probability mass on receiving a less desirable outcome. Participants with a preference for randomization, in contrast, may decide to submit different lists.

We add to the experiment a (surprise) second part that appears immediately after the participants submit their preferred lists. In the second part, participants simply pick their most preferred prize (a_1, a_2, a_3 or a_4). The choice in the second part does not allow for randomization and we thus interpret it as the most preferred prize in the absence of the possibility of inducing randomness. We hypothesize that among the subset of participants who top-ranked two different prizes on list (i) and list (ii), a majority reports a choice in the second part that confirms the top rank of list (i), not list (ii). This would be consistent with the desire to receive, from the first choice task, the most preferred prize with the highest available probability of 0.5.

The payoffs are implemented such that 10 percent of participants receive a prize in the first part of the experiment and a different set of 10 percent of participants receive a prize in the second part.

4.3.2 Results

A total of 314 students participated. Of these participants, 126 (40%) stated different preferences on list (i) and list (ii). Almost all reversals (92%) involve adjacent ranks, indicating the systematic nature of the reversals: in most cases, a participant's list (ii) choice simply switches the ranking of two prizes that are next to each other on the same participant's list (i). Furthermore, 99 out of the 126 reversals (79%) occurred at the first rank of the lists. We also observe that of these 99 occurrences, 56 participants confirm list (i) in the experiment's second part, 30 confirmed list (ii), and 13 participants confirmed neither list (i) nor list (ii). The difference in confirmations of list (i) and list (ii) is significant ($p < 0.01$, one-sided Binomial test with N=86).[25] This asymmetry is

[25]Note that alternatives here are trichotomic: confirm list (i), confirm list (ii), confirm none of the two lists. However, a Binomial test (on confirming list (i) versus confirming list (ii)) can still be used if the third group (that does not confirm any list) is made up 50-50 by the two former groups in expectation. In that case, the number of observations relevant for the test equals the total number of reversals less the number of participants not confirming

inconsistent with unsystematic utility perturbations. We acknowledge that appropriately general utility perturbances (similar to the literature on Generalized Expected Utility, e.g. Hey and Orme, 1994) are likely able to accommodate the data patterns. We do not model utility perturbances here but merely note that for consistency with the data, their distributions would have to be asymmetric across ranks in Experiment III (so they can justify that most reversals appear at the top rank) and across tasks in Experiments I and II.

RESULT 6: *In total, 40% of participants in Experiment III submit different rank-order lists. Participants who show reversals at rank 1 between their two lists show a systematic tendency to confirm their first choice of list (i) in the second part of the experiment.*

5 Conclusion

The paper documents a revealed preference for randomization in applications to university. In a large data set on university applications in Germany, a pervasive pattern of reversals of preferences between rank-order lists appears and induces randomness that could be avoided by the decision maker. Significant economic consequences arise from these preference reversals. Moreover, a survey among university applicants indicates that the randomization is intentional. These findings relate to a recent literature in behavioral mechanism design that studies the consequences of non-standard behavior for market design. A common theme is that preferences over schools and universities are often incomplete and malleable at the outset and are only formed over time, requiring the collection and processing of information by applicants.

We conducted experiments to study the relevant features of the choice environment in a more controlled setting. Across several experiments we observe that a significant fraction of participants choose to randomize between options. Many of the observed choices to randomize appear to be deliberate, since they are taken in a row and follow patterns that are inconsistent with randomness in their (otherwise standard) utility from outcomes, with bounded rationality, and generally with most standard models of choice under uncertainty (but see the literature on stochastic choice cited in Section 2). The observed desire for randomization is robust to variations of the framing: it appears not only when the experimental participants have to make several choices and only one of them becomes relevant with a certain probability, but also when there is the possibility to choose a lottery directly.

We have identified a preference for randomization in a data set from the field, namely university applications. This complements the experimental evidence in Agranov and Ortoleva (2017). We take from the survey among university applicants that indecision or perceived indifference is the main driving force—despite the fact that the stakes are extremely high in university choice. The

any list. Since there is no reason to assume that the third group is selective, this is how we proceed. We therefore have N=99-13=86.

survey is useful to pin down the applicants' motivations when applying to universities, not necessarily the motivations of participants in the experiments. Nevertheless, the experiments add to the picture by providing evidence that preference reversals and their implied violations of standard choice theory are robust, and that different preference lists are chosen deliberately even in very simple controlled settings.

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A Appendix

A1 The Boston algorithm used in procedure A

The Boston algorithm applied in procedure A can be described as follows:

Step *1*: Only the first preferences of the applicants are considered. For each university, admit the selected applicants who have ranked it as their first choice, until there are no seats left or until all candidates ranking this university as their first choice have been admitted. If there are more candidates giving priority to a university than can be admitted, those applicants with the best grades in the Abitur are admitted. Social criteria and (subordinately) lotteries are used to break ties.

Step k: Only the k^{th} preference of the still unassigned applicants is considered. For each university with available seats, admit the selected applicants who have ranked it as their k^{th} choice, until there are no seats left or until all candidates ranking the university as their k^{th} choice have been admitted. If there are more candidates giving the rank k to a university than can be admitted, those applicants with the best average final grade from school are admitted. Social criteria and (subordinately) lotteries are used to break ties.

The algorithm stops after step $k \leq 6$ when every selected applicant is assigned or when all 6 preferences have been considered.

A2 The Gale-Shapley algorithm used in procedure U

The Gale-Shapley algorithm applied in procedure U works as follows:

Step *1*: Each university i with capacity n_i offers a seat to the n_i applicants it ranks highest. Each applicant tentatively accepts the offer from the university she ranks highest and rejects all remaining offers.

Step k: Each university that was rejected at step *k-1* by x applicants proposes to its most preferred next choices, with the number of new offers (x) being equal to the number of rejections in the previous round. Each applicant considers the university it has been holding an offer from together with her new offers and tentatively accepts the university she ranks highest and rejects all others.

The algorithm terminates when no proposal by a university is rejected. Each university and applicant is assigned according to the last tentative assignment. If for a certain seat a university is rejected by all applicants to which it has made an offer and there is no applicant left on its preference list, this seat remains unfilled.

A3 Newspaper experiment

Table 7 shows the prizes for the newspaper experiment in comparison to the classroom experiment, Experiment III.

Regarding the payoffs for participants, the newspaper experiment has an ex-ante fixed number of 10 winners for the first part and 10 different winners for part II, to be drawn randomly. Since readers of the WZB-Mitteilungen may be less likely to go to Starbucks than students, we replace the Starbucks vouchers with cash payments. The monetary prize values in the newspaper experiment are higher than in the classroom experiment in order to motivate the newspaper readers to participate. To participate, they log on to a webpage and submit their preferences. In all other respects the rules of the experiment are identical to those of Experiment III.

Table 7: Prizes to be ranked in the experiments

	Classroom - Experiment III	Newspaper
a_1	19 Euro Starbucks voucher	54 Euro Amazon voucher
a_2	19 Euro Amazon voucher	42 Euro in cash
a_3	14 Euro Starbucks & 10 Euro Amazon vouchers	34 Euro Amazon voucher & 12 Euro in cash
a_4	8 Euro Starbucks & 16 Euro Amazon vouchers	14 Euro Amazon voucher & 30 Euro in cash

Overall, 194 participants submitted a complete set of online responses.[26] Of these, 29 participants (15%) do not submit identical lists. This percentage is lower than in the classroom experiment, but the nature of reversals is similar. We observe that in 28 out of 29 reversals (97%) only adjacent ranks were involved. Of the 29 reversals, 15 occurred at the first rank (52%). We also find that choices in the experiment's second part tend to confirm the first choice on list (i). In the second part, 10 participants confirmed list (i) and only 3 confirmed list (ii). This difference is statistically significant ($p < 0.05$, one-sided Binomial test with $N = 13$). Note also that 16 out of 29 participants presenting reversals do not confirm either list in the second part, which is inconsistent with the results from Experiment III but could again be due to a desire to randomize.

A4 Experiment I: Instructions and decisions sheets

A4.1 Instructions

Welcome!

In the following part of today's lecture you will participate in a decision experiment. We will distribute decision sheets to you and we would like to ask you to please carefully read this instruction sheet first and then the decision sheet. With a bit of luck you can receive monetary prizes, depending on your entries on the decision sheet. These prizes will be described further below and they will be distributed at the end of this lecture.

Your entries will serve as data for current research projects by the TU Berlin, the HU Berlin, the WZB (Social Science Research Center Berlin), the DIW (German Institute for Economic Research) and the Max Planck Institute for Tax Law and Public Finance (Munich). Your data will remain entirely anonymous.

It is crucial for the success of this experiment that you make your entries independently of each other. From this moment on do not speak to the other participants until the end of the experiment and do not look at their decision sheets. Also, please do not make any loud noises or create other disruptions. If you do not abide by these instructions, we will exclude you from the possibility of receiving a prize. Thank you.

If you have any questions, please alert the experiment conductor via a hand signal. We will then approach you in order to answer your question silently.

Random determination of the winners

5 out of 100 experiment participants will be randomly selected and will receive their prizes according to their decision sheets. To this purpose we will randomly select code numbers with a

[26] About half of the participants were directly affiliated with the WZB and thus either social scientists or familiar with research in social sciences.

computer subsequent to the experiment, that is, during the proceeding lecture. These draws will determine who is entitled to receive a prize. Therefore, it is important that you keep the piece of paper with the code number and that you write down your code number at the top of your decision sheet. The computer will select a certain amount of numbers so as to exactly enable one out of 20 participants in each of the (started) groups to receive their payout. For instance, with 300 participants 15 code numbers will be randomly chosen. With a number of participants in between 301 and 320, 16 code numbers will be randomly chosen, etc.

Possible prizes
You can win the following vouchers – depending on your choices on the following page and the rules given there. The vouchers can be used immediately and are valid for all products that can be purchased at all Starbucks stores or at amazon.de respectively (with the exception of magazines and download products).

Alternative A: Starbucks voucher over the amount of 19 EUR
Alternative B: Starbucks voucher over the amount of 14 EUR and Amazon voucher over the amount of 10 EUR

A4.2 Decision Sheet, two lists with two-way choice (treatment 1)

Decision Sheet

We would now like to ask you to choose twice between the Alternatives A and B, in "Option (i)" and "Option (ii)".

Only one of the two choices will be relevant for the determination of the prize, though Option (i) will be more probable than Option (ii) with a ratio of 60/40. To this purpose we will later simulate a random draw with the computer, which will result in a randomly chosen number between 1 and 100, where every integer in this interval occurs with the same probability. If the random draw results in a number between 1 and 60, Option (i) is applied. Your payoff, and the payoffs of all other participants in the experiment, will only be determined by Option (i). Thus, this will occur with a probability of 60%. If, however, the random draw results in a number between 61 and 100 (which will occur with a probability of 40%) only Option (ii) will be implemented.

Please state both your selection choices below.

Option (i): Which one of the Alternatives A/B would you prefer to receive? ___

Option (ii): Which one of the Alternatives A/B would you prefer to receive? ___

Please do not forget to write down your code number at the top. As soon as all participants have filled in their choices, we will collect the decision sheets again and we will continue with part two of the experiment. Until then, please remain calm and raise your hand if you have any questions.

A4.3 Decision Sheet, one list with two-way choice (treatment 2)

We would now like to ask you to choose either alternative A or alternative B.

Your choice will only be considered with a probability of 40% and with the remaining probability of 60% you will not receive a prize. To this purpose we will later simulate a random draw with the computer, which will result in a randomly chosen number between 1 and 100, where every integer in this interval occurs with the same probability. If the random draw results in a number between 1 and 60, you will not receive a prize. If, however, the random draw results in a number between 61 and 100 (which will occur with a probability of 40%) you will receive either alternative A or B, depending on your choice.

Please state your selection choice below.

Choice: Which one of the Alternatives A/B would you prefer to receive? ___

Please do not forget to write down your code number at the top. As soon as all participants have filled in their choices, we will collect the decision sheets again and we will continue with part two of the experiment. Until then, please remain calm and raise your hand if you have any questions.

A5 Experiment II: Instructions and decisions sheets

A5.1 Instructions

Instructions

In the following part of today's lecture you will participate in a decision experiment for which we have just distributed a decision sheet. We ask you to please carefully read this instruction sheet first and then the decision sheet. With a bit of luck you can receive monetary prizes, depending on your entries on the decision sheet. These prizes will be described further below and they will be distributed at the end of this lecture.

Your entries will serve as data for current research projects by the TU Berlin, the HU Berlin, the WZB (Social Science Research Center Berlin), the DIW (German Institute for Economic Research) and the Max Planck Institute for Tax Law and Public Finance (Munich). Your data will remain entirely anonymous.

It is crucial for the success of this experiment that you make your entries independently of each other. From this moment on do not speak to the other participants until the end of the experiment and do not look at their decision sheets. Also, please do not make any loud noises or create other disruptions. If you do not abide by these instructions, we will exclude you from the possibility of receiving a prize. Thank you.

If you have any questions, please alert the experiment conductor via a hand signal. We will then approach you in order to answer your question discreetly and quietly.

Random determination of the winners

Five out of 100 experiment participants will be randomly selected and will receive their prizes according to their decision sheets. To this purpose we will randomly select code numbers with a computer subsequent to the experiment, that is, during the proceeding lecture. These draws will determine who is entitled to receive a prize. Therefore, it is important that you keep the piece of paper with the code number and that you write down your code number at the top of your decision sheet. The computer will select a certain amount of numbers so as to exactly enable one out of 20 participants in each of the (started) groups to receive their payout. For instance, with 300 participants 15 code numbers will be randomly chosen. With a number of participants between 301 and 320, 16 code numbers will be randomly chosen, and so forth.

Possible prizes

You can win the following vouchers – depending on your choices on the following page and the rules given there. The vouchers can be used immediately and are valid for all products that can be purchased at all Starbucks stores or at amazon.de respectively (with the exception of magazines and download products).

Alternative A: Starbucks voucher over the amount of 19 EUR
Alternative B: Amazon voucher over the amount of 19 EUR

A5.2 Decision sheet, binary-choice format (treatment 3)

We would now like to ask you to choose two times between the Alternatives A and B, in “Option (i)” and “Option (ii)”.

Only one of the two choices will be relevant for the determination of the prize, though Option (i) will be more probable than Option (ii) with a ratio of 60/40. To this purpose we will later simulate a random draw on the computer, which will result in a randomly chosen number between 1 and 100, where every integer in this interval occurs with the same probability. If the random draw results in a number between 1 and 60, Option (i) is applied. Your payoff, and the payoffs of all other participants in the experiment, will only be determined by Option (i). Thus, this will occur with a probability of 60%. If, however, the random draw results in a number between 61 and 100 (which will occur with a probability of 40%) only Option (ii) will be implemented. You can decide whether to choose different alternatives for both options or if you would prefer to choose the same alternative twice.

Please state both your selection choices below.

Option (i): Which one of the Alternatives A/B would you prefer to receive? ___

Option (ii): Which one of the Alternatives A/B would you prefer to receive? ___

Please do not forget to write down your code number at the top. As soon as all participants have filled in their choices, we will collect the decision sheets and we will determine the winners as well as the prizes during the proceeding lecture. At the end of the lecture we will then announce which code numbers won. Please remain silent. In case of questions questions, please raise your hand.

A5.3 Decision sheet, four-way-choice format (treatment 4)

We would now like to ask you to choose from the following 4 possible options (Option 1 to Option 4), which in some cases result in a random selection of prizes.

Option 1:
You will receive Alternative A with a probability of 60% and Alternative B with a probability of 40%.

Option 2:
You will receive Alternative A with a probability of 100%.

Option 3:
You will receive Alternative B with a probability of 60% and Alternative A with a probability of 40%.

Option 4:
You will receive Alternative B with a probability of 100%.

As you can see, the random draw which determines the prize for Options 1 and 3 follows two probabilities with a ratio of respectively 60/40. To this purpose we will later simulate a random draw with the computer, which will result in a randomly drawn number between 1 and 100, where each integer in this interval occurs with the same probability. If the random draw results in a number between 1 and 60, the primarily stated alternative will be implemented for you as well as for all other experiment participants who have chosen Option 1 or Option 3. Thus, this will occur with a probability of 60%. If, however, the random draw results in a number between 61 and 100 (which will occur with a probability of 40%) the alternative that was named in the second place will be implemented. If you choose Option 2 or Option 4, which can only result in one alternative, this random draw is irrelevant for you.

Please state your choice here:

Which one of the four Options would you like to choose? ___

Please do not forget to write down your code number at the top. As soon as all participants have filled in their choices, we will collect the decision sheets and we will determine the winners as well as the prizes during the proceeding lecture. At the end of the lecture we will then announce which code numbers won. Please remain silent. In case of questions questions, please raise your hand.

A6 Experiment III: Instructions and decisions sheets

A6.1 Instructions

Welcome!

In the following part of today's lecture you will participate in a decision experiment. We will distribute decision sheets to you in a moment and we would like to ask you to please carefully read this instruction sheet first and then the decision sheet. With a bit of luck you can receive monetary prizes, depending on your entries on the decision sheet. These prizes will be described further below and they will be distributed at the end of this lecture.

Your entries will serve as data for current research projects by the TU Berlin, the HU Berlin, the WZB (Social Science Research Center Berlin), the DIW (German Institute for Economic Research) and the Max Planck Institute for Tax Law and Public Finance (Munich). Your data will remain entirely anonymous.

It is crucial for the success of this experiment that you make your entries independently of each other. From this moment on do not speak to the other participants until the end of the experiment and do not look at their decision sheets. Also, please do not make any loud noises or create other disruptions. If you do not abide by these instructions, we will exclude you from the possibility of receiving a prize. Thank you.

If you have any questions, please alert the experiment conductor via a hand signal. We will then approach you in order to answer your question silently.

Random determination of winners

The experiment consists of two parts. In the first part, 5 out of 100 experiment participants will be randomly selected and will receive their prizes according to their decision sheets. To this purpose we will randomly select code numbers with a computer subsequent to the experiment, that is, during the proceeding lecture. These draws will determine who is entitled to receive a prize. Therefore, it is important that you keep the piece of paper with the code number and that you write down your code number at the top of your decision sheet. The computer will select a certain amount of numbers so as to exactly enable one out of 20 participants in each of the (started) groups to receive their payout. For instance, with 300 participants 15 code numbers will be randomly chosen. With a number of participants in between 301 and 320, 16 code numbers will be randomly chosen, etc.

Possible prizes
You can win the following vouchers or combination of vouchers – depending on your choices on the following page and the rules given there. The vouchers can be used immediately and are valid for all products that can be purchased at all Starbucks stores or at amazon.de respectively.

Alternative A: Starbucks voucher over the amount of 19 EUR
Alternative B: Amazon voucher over the amount of 19 EUR
Alternative C: Starbucks voucher over the amount of 14 EUR and Amazon voucher over the amount of 10 EUR
Alternative D: Starbucks voucher over the amount of 8 EUR and Amazon voucher over the amount of 16 EUR

A6.2 Decision sheet, part 1

Part 1 of the decision experiment

In this part of the experiment, we would like you to rank alternatives A to D twice, once in ranking (i) and once in ranking (ii). According to these orders, you will receive the alternatives with higher or lower probabilities

Only one of the two choices will be relevant for the determination of the prize. To this purpose we will later simulate a coin flip with the computer, which will result in either 'heads' or 'tails', both equally likely. If the coin flip results in 'heads', ranking (i) is applied. Your payoff, and the payoffs of all other participants in the experiment, will only be determined by ranking (i). If, however, the coin flip results in 'tails' only ranking (ii) will be implemented.

We will ask you with regard to both rankings, which of the alternatives you prefer over others. It is also possible to only state three or less of the four alternatives per ranking, if you do not want to receive the other alternatives. However, this does not increase the probability of winning the remaining alternatives.

Ranking (i): From this ranking, you will receive the first-listed alternative with a probability of 50%, the second-listed alternative with a probability of 30%, the third-listed alternative with a probability of 20% and the forth-listed alternative with 0% probability. Therefore, you will only receive one of the alternatives, and the higher an alternative is listed, the higher is your chance of receiving it. However, which of the alternatives from ranking (i) you will receive is determined by a random draw with the computer after the lecture. The above stated underlying distribution of probabilities is thereby respected.

Please state your ranking (i) below. But first, please read the explanation of ranking (ii).

Ranking (ii): From this ranking, you will receive the first-listed alternative with a probability of 40%, the second-listed alternative with a probability of 30%, the third-listed alternative with a probability of 20% and the forth-listed alternative with 10% probability. Similarly to ranking (i), the higher an alternative is listed, the higher is your chance of receiving it.

As explained above, only one of the two rankings will be applied, ranking (i) or ranking (ii). Please state your rankings below.

Ranking (i): 50% for alternative ___, 30% for alternative ___, 20% for alternative ___, 0% for alternative ___

Ranking (ii): 40% for alternative ___, 30% for alternative ___, 20% for alternative ___, 10% for alternative___

Please do not forget to insert your code number at the top of the page. As soon as all participants will be finished with their decisions, we will collect all decision sheets and continue with part two of the experiment. Until then, please remain silent and raise your hand if any questions arise.

A6.3 Decision sheet, part 2

Part 2 of the decision experiment

In the second and last part of the experiment, we would like you to directly choose one of the alternatives A to D. Again, the computer will select code numbers so as to ensure that exactly one out of 20 participants in each of the groups receives his or her payout. For each group of 20 participants we will draw an additional code number.

Please note that your code number cannot be chosen in both parts of the experiment. Hence, you will either receive a prize from part one of the experiment, or from part two of the experiment, or no prize. If you are selected as a winner in part two of the experiment, your prize will be your chosen alternative.

Which of the alternatives A to D do you want to receive? ___

Please remain silent and wait until we collected all decision sheets.
Thank you for your participation!

A7 Survey among university applicants

[The survey was conducted on the website of the German clearinghouse for university admissions in medicine, veterinary medicine, dental medicine, and pharmacy in the winter term 2015/2016.]

Thank you very much for taking part in this survey!

The answers provided in this survey serve to statistically evaluate the behavior of applicants in general. They have no influence on how seats are allocated.

The survey takes about two minutes to complete. In order to thank you for your participation, all participants will enter a lottery for an iPad.

1. Is this the first time you are applying to study medicine, veterinary medicine, dental medicine, or pharmacy in Germany?

   ___Yes ___No

2. In the application process, it is possible to choose universities in different locations. Applicants can submit different rank-order lists for (a) the quota for students with the best grades from high school, (b) the quota for students with long waiting times, and (c) the quota where universities select students. I have made use of this option in my application: ___Yes ___No, I have submitted identical lists in all three procedures.

   Questions which only appear if the answer was "yes":

   Do the following statements apply to you? (multiple answers are possible) ___I have specified different universities ___I have specified identical universities but in different orders

3. I knew about the possibility to submit different lists before I started my application ___Yes ___No

   Questions 4. + 5. only for those who answered "yes" in question 2:

4. The fact that I have specified different location preferences, ___just happened ___was a conscious decision

5. I have submitted different rank-order lists in the procedure for the following reasons (up to three answers):

   ___Different universities are equally suitable to me.
   ___I find it difficult to decide what is the best university for me and have therefore chosen different universities.
   ___I have no realistic chance to be admitted through the top-grade or waiting-time quota, and have therefore chosen made random choices on these lists.
   ___I would rather not take the decision myself, because I might regret my decision later on.
   ___My university preference differs from the university of choice of my family/friends. Specifying different lists allows me to give a fair chance to satisfy both my families'/friends' and my own wishes.
   ___By specifying the university preferences I have tried to maximize my chances to receive a seat at all.
   ___I have specified different lists in order to get a seat at my preferred university.

____Other reasons

I have submitted different rank-order lists of universities for the following main reason:

____Different universities are equally suitable to me.
____I find it difficult to decide what is the best university for me and have therefore chosen different universities.
____I have no realistic chance to be admitted through the top-grade or waiting-time quota, and have therefore chosen made random choices on these lists.
____I‘d rather not take the decision myself, because I might regret my decision later on.
____My university preference differs from the university of choice of my family/friends. Submitting different lists allows me to give a fair chance to satisfy both the wishes of my families and friends and my own wishes.
____When submitting the rank-order lists, I have tried to maximize my chances to receive a seat at all.
____I have submitted different lists in order to get a seat at my preferred university.
____Other reasons

From here on the questions are again posed to all applicants:

6. Now we would like to present to you the decision for the universities in a simpler, hypothetical decision scenario. Please think of your current favorite university and let's call it university A. Think of your current second favorite university and let's call it university B. Which of the following options would you prefer?

   ____I am admitted to university A with certainty.
   ____I am admitted to university A with a probability of 60% and to university B with a probability of 40%.
   ____I am admitted to university B with certainty.
   ____I am admitted to university A with a probability of 40% and to university B with a probability of 60%.

7. I rather leave some decisions to chance.
   ____Yes
   ____No

8. The following statements represent different attitudes towards life and the future in general. Please tell us to what an extent you agree on a scale from 1 to 7. Your answers will be treated anonymously.

   ____The course of my life depends on my own actions.
   ____What one achieves in life is first and foremost a question of destiny and luck.
   ____I frequently experience that others decide over my life.
   ____Success is the result of hard work.
   ____If I encounter difficulties in life, I frequently have doubts about my own abilities.
   ____My chances in life are determined by the social circumstances.
   ____More important than effort are one's capabilities.

____I have little control over the things happening in my life.

Thank you for participating in this survey!