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Inter-charity competition under spatial differentiation: Sorting, crowding, and spillovers

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ABSTRACT

We study spatially differentiated competition between charities in a framed field experiment. We introduce spatial differentiation by varying the observability of charities' location such that each donor faces a socially close 'home' and a socially distant 'away' charity. In our field setting, we observe spatially differentiated competition between charities offering the same good to be characterized by sorting, crowding-in, and an absence of spill-overs: Donors sort themselves by distance; fundraising (through matching) for one charity raises checkbook giving to that charity, irrespective of spatial distance; but checkbook giving to the unmatched charity is not affected.

1. Introduction

The 'science of philanthropy' (see surveys by Bekkers and Wiepking, 2011; Andreoni and Payne, 2013) has substantially enlarged the evidence base on different stakeholders in the charitable sector, which in the U.S. alone received approximately $450 billion in donations in 2019 (Giving USA, 2020). Just like participants in other sectors, charities operate under the market structure of the charitable sector as well as actively shape it. Unlike in other sectors, however, these market structures – and their effects on the insights of the science of philanthropy – have received greater attention only recently (see survey by Gee and Meer, 2020).

The present paper adds to the literature on market structure in the charitable sector by examining in a framed field experiment how spatial differentiation between competing charities affects donation outcomes. In Germany, the country of our study, more than 900 local foodbanks are organized under the joint umbrella organization of the 'Tafel Deutschland e.V' (Tafel Deutschland, 2019). According to current estimates, more than 13 million people in Germany are affected by poverty or are directly threatened by it and around 2 million of them are visiting foodbanks (Tafel Deutschland, 2023). All cities with a population of more than 100.000 have at

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least one foodbank, 3 % have more than one. For the average foodbank, there is at least one other foodbank within a distance of less than 13 km. For 41 %, the closest competitor is within 10 km. This may explain important phenomena in the charitable sector such as its strong franchise network structure. About 60 % of the foodbanks are projects within existing charitable organizations (e.g., Diakonie, Caritas, DRK, AWO), around 40 % are registered associations (e.V.). All of the 947 foodbanks carry their location in their name. These foodbanks provide near complete substitute services. This makes the foodbank sector a promising environment for studying what happens when charities deploy modern fundraising techniques in a spatially differentiated market.

In particular, we investigate donation streams to two foodbanks, each operating in a different city within the same metropolitan area.[1] In our study, these foodbanks compete for donations by directing a funding appeal at around 350 potential donors, who have participated, for a fixed reward, in an online household survey on an unrelated topic. In this appeal, they are asked to donate all or part of their 15 Euro compensation to either or both of the charities. We first examine, through the random assignment of donors to different treatment conditions, the effect of introducing spatial differentiation in the charities' competition for donations. In this spatially differentiated structure, we then investigate the effect of fundraising activities undertaken by one foodbank on donations received by both the fundraising and the passive foodbank. In our setting, 'differentiation' is spatial in the sense that randomly selected potential donors, who reside in either of the two cities within the same metropolitan area, learn the city in which each foodbank operates via a subtle manipulation of the appeal text. 'Fundraising' will mean a charity actively employing the classic one-to-one (1:1) match to donations received to attract higher donations.

As a result, the paper can speak to three issues of interest in spatial differentiation in the charitable sector. The first issue is spatial *sorting*, that is whether potential donors favor the 'home' foodbank over the 'away' foodbank, even though they ostensibly offer the same service to a similar target population. A second issue, at the intra-charity level, is *crowding*, that is whether checkbook giving by donors to the fundraising charity, exclusive of the match, is higher (crowding in) or lower (crowding out) in the presence of the match than in its absence; and whether the direction and magnitude of crowding are different for 'home' and 'away' charities. The third issue, focusing on the market structure, is whether competition at the inter-charity level results in *spillovers*. That is, do the fundraising activities of one charity affect donations received by the other passive charity, possibly differentiated for 'home' and 'away' charities; and by extension do they affect total checkbook[2] giving by all potential donors to both charities.

Four key results emerge from the experiment. First, at the sectoral level, spatial differentiation among charities leaves total checkbook giving unchanged, but induces near-perfect spatial *sorting* among donors: While average donors split their donation equally between the two charities when their location relative to the donor was not explicit, donors instead direct the same level of donations almost exclusively to their 'home' charity when it could be identified as such. Second, at the intra-charity level, fundraising in a spatially differentiated market leads to *crowding-in* for both 'home' and 'away' charities: Average checkbook giving was higher to the charity employing the match, with a slightly larger effect when the match was offered by the 'away' charity. Third, at the inter-charity level, there is no evidence of negative *spillovers* of active fundraising by one charity on donations to the other: A match applied to donations by one charity, 'home' or 'away', did not decrease giving to the 'passive' charity. It follows, and this is our fourth finding, that even in a spatially differentiated charitable sector populated by organizations offering almost perfect substitutes, fundraising by one charity increases total giving to the sector as a whole.

These results contribute in several ways to the literature on spatial differentiation in the charitable sector in particular and that of competition in the charitable sector more generally. Even though spatial differentiation constitutes a commonly encountered market structure in the non-profit sector, for example for foodbanks,[3] animal shelters, safe houses, and many other charitable goods (Bilodeau and Slivinski, 1997), its implication for fundraising, donor behavior, and charity revenues have received little systematic treatment. As a result of this new focus, we document the presence and considerable strength of spatial sorting of donors, driven by their 'home bias'.[4] Among papers studying the effect of charity location and social distance to donors on giving (Meer and Rigby, 2013; Kessler and Milkman, 2018; Brown et al., 2017; Adena et al., 2022), our paper sides with those that find evidence that social distance matters. More specifically, our design is not only able to causally identify the effect of social distance. It also draws out its implications for fundraising in a competitive environment by providing strong evidence for donor sorting. Another implication of our findings is that key results on the effect of matching donations on checkbook giving (e.g., Karlan and List, 2007; Meier, 2007; Huck and Rasul, 2011; Gneezy et al., 2014; Huck et al., 2015; Kesternich et al., 2016, Eckel and Grossman, 2017) carry over from non-competitive settings to richer market structures such as spatial differentiation. In other words, results from the literature on crowding appear largely robust to complications arising from the spatially differentiated donor-charity relationship.

[1] The two cities in which the experiment is set are in close proximity of 20km of each other. They share some regional governance structures and institutions, with inhabitants of both cities frequently commuting between both places. The level of rivalry and localism in areas such as sports or educational institutions is fairly limited compared to other cities with a similar structure. For example, there are no competing sports teams in the national soccer league.

[2] On a point of terminology, 'checkbook giving' is the amount of money that is transferred to the charity on behalf of the donor, without the matched amount included. We refer to 'total' checkbook giving as the sum of donations received by both charities from all donors. By 'aggregate' checkbook giving, we usually refer to a specific aggregation of donations either by charity or by donor location.

[3] Taking the foodbank sector as a typical example, there are often multiple foodbanks – independent operators or branches within a network – competing for donations, both in kind and in money. Most do so with names that explicitly reference their area of operation. In Germany, for instance, a popular group of foodbanks is operating within the same umbrella organization (Tafel e.V.), often within close spatial distance and the location of their operation clearly displayed.

[4] Another point on terminology. We are well aware that giving that favors local charities may simply reflect the donor's preference structure. 'Bias', therefore, is not meant to imply irrational behavior by donors, but simply an empirical regularity of spatial sorting.

At the more general level of the rich theoretical literature on inter-charity competition (Rose-Ackerman, 1982; Aldashev and Verdier, 2010; Aldashev et al., 2014; Scharf, 2014; Krasteva and Yildirim, 2016; Gayle et al., 2017; Lange et al., 2017; Krasteva and Saboury, 2021), our finding that spillovers are absent adds more nuance to an already mixed empirical[5] and experimental[6] picture. Differences in market structure have emerged as one candidate explanation for absence (Bekkers, 2015; Meer, 2017; Filiz-Ozbay and Uler, 2019) or presence of negative spillovers (van Diepen et al., 2009; Adena and Hager, 2020; Schmitz, 2021; Karol, 2023). Given that our setting of spatial differentiation among charities offering near-perfect substitutes is particularly conducive to generating negative spillovers (Adena and Huck, 2017), the absence of spillovers has particular force. As a result, our evidence sides with that of Schmitz (2021), who finds that the joint fundraising effect of (intra-charity) crowding and (inter-charity) spillovers on total giving to the charitable sector as a whole is positive, particularly when the 'home' charity campaigns. These observations hold lessons not only for an academic literature on designing the perfect ask, but also for professional fundraisers and lead donors. We draw out these implications in our conclusion.

2. Experimental design, participants, and procedures

Our experimental design features five treatment conditions motivated by the arguments discussed in the introduction and implemented in the form of a donation opportunity to two foodbanks. The two foodbanks in our study, simultaneously ask for donations from the same donor.[7] We selected them due to several desirable criteria that jointly facilitate identifying the presence and scope of a possible 'home bias': They operate in the same metropolitan region, offer highly substitutable services, and belong to the same umbrella organization, yet are run by different charitable providers. The potential donors targeted in the fundraising appeals live in the same region the charities operate in. This metropolitan region consists of two large German cities, Heidelberg and Mannheim (A and B, from now on) that are located within 25 km of each other. One of the charities operates in A and the other in B. Their exact location within the region does not appear in their officially registered names[8] but is highly visible in their public displays (*Tafel Heidelberg e.V.* and *Tafel Mannheim e.V.*).

Before the actual experiment, participants received a fixed reward of 15 Euro for completing a household survey that was thematically unrelated to the experiment. Survey participants were recruited via E-mail from an existing pool of volunteer participants in the Mannheim-Heidelberg metropolitan region that had previously registered their interest in taking part in scientific studies with the ZEW Mannheim. Subjects in this pool had participated in at least one prior study and have verified addresses in the region in which the foodbanks operate.[9] Participants accessed the survey via a link and a personal participation code provided in the recruiting email in the appendix. This code could only be used once, thus ensuring that there was no possibility for multiple participations or treatment spillover. After logging in, participants were informed about the duration of the survey and the payment. Only after completing the unrelated household survey, subjects were, for the first time, confronted with the possibility of donating their remuneration earned in the survey. They could choose whether to donate all or a share of their effort remuneration (15 Euro) to one or both of the two charities mentioned in the fundraising drive. The data was collected between March 6 and 20, 2017.

Within this setting, we test for the presence of crowding and spillover effects through experimentally varying central aspects of the donation appeal. As a steppingstone to establishing these relationships, we first identify the extent of donor sorting, i.e., the presence of a 'home bias'. As common in framed field experiments, participants encounter one of five different versions of a donation appeal, randomly assigned without their knowledge (between subjects). The five different appeals result from varying two treatment dimensions (see Table 1). One dimension varied the relative price of giving between the charities through the presence or absence of 1:1 matches for donations to one charity. The other dimension varied whether the charities' location, and hence the social distance to the potential donor, was disclosed in the name. This variation allows us to study the same charities in two competition settings, once with and once without spatial differentiation, and to detect, as a preliminary step, the presence of a potential 'home bias' in giving.

At equal relative prices between the two charities (no match), the treatments T1 and T2 manipulate social distance. In *T1: Neutral*, charities are referred to by their official names, which do not disclose their location (Caritas Foodbank Shop, Foodbank of the German

[5] See Gee and Meer (2020), Lohse and Scharf (2021) and Cage and Guillot (2022) for summaries.

[6] See Section 2 in Deck and Murphy (2019) for a summary.

[7] This allows us to exploit the advantages of a framed field experiment (Harrison and List 2004) such as observing decision behavior in a specific but natural environment while maintaining a high level of control and providing detailed information about all relevant outcome variables. We use an anonymous online setting to avoid confounding factors such as social image concerns which have shown to play a role in fundraising campaigns that operate via door-to-door collections (DellaVigna et al. 2012).

[8] They are registered as 'Caritas Foodbank Shop' and 'Foodbank of the German Red Cross'.

[9] The subject pool covers a broad spectrum of different citizens from the Mannheim and Heidelberg region. It includes citizens of different age and income groups, religious affiliations, voting behavior as well as educational level. Initially, the subject pool was established at the ZEW – Leibniz Centre for European Economic Research. In the last recruitment wave before we conducted this experiment, we distributed 12,000 invitation letters in Mannheim and Heidelberg. This was done in 2015. In the first study conducted right after this recruitment initiative, we collected full data from 616 subjects (Gallier et al. 2019).

Table 1
Summary of experimental design.

	Location Not Know (Neutral)	Location Known (Label)	
		Home	Away
No Match	*T1: Neutral (n = 76)*	*T2: City Label (n = 73)*	
Match	*T3: NeutralMatch (n = 53)*	*T4: HomeMatch (n = 78)*	*T5: AwayMatch (n = 67)*
Total			
***N* = 347**			

Note: Description of treatment conditions T1 to T5 and the corresponding number of observations available for analysis.

Red Cross). In the *T2: CityLabel* condition, charities are referred to by their publicly displayed names, which contain a locational designator (Tafel Mannheim e.V, Tafel Heidelberg e.V).[10] Both *T1: Neutral* and *T2: CityLabel*, therefore, feature competition between the same two charities with an equal price of giving. But only *T2: CityLabel* features spatially differentiated competition: Donors, themselves located in A or B, are asked to donate to a 'home' (A to A or B to B) and an 'away' (A to B or B to A) charity. Treatment conditions (T3 – T5) vary the relative prices of giving through either one of the two competing charities offering to match donations as a fundraising tool. The tool is always a 1:1 match, i.e., each donation made will be doubled before the charity receives it.[11] Condition *T3: NeutralMatch* examines the baseline case of undifferentiated competition. That is, either charity A or B receives a match in T3. As in treatment *T1: Neutral*, the charities lack spatial designators and can only compete on the price of giving. In conditions *T4: HomeMatch* and *T5: AwayMatch*, competition is spatially differentiated: Charities are referred to by spatial designators as in treatment *T2*. In *T4: HomeMatch*, donations to the donor's socially close 'home' charity are matched. In *T5: AwayMatch*, the offer is to match donations to a donor's socially more distant 'away' charity. Table 1 shows the five between-subjects treatment conditions and displays their name used in the main text in column 4. Figure A4 of the appendix provides a schematic diagram of the experimental procedure.

A total of 347 individuals from Heidelberg (168) and Mannheim (179) finished the survey and the experiment.[12] On average participants completed the household survey and the subsequent experiment in approximately 13 min. After the experiment participants received the parts of their remuneration not donated in form of a voucher (Edenred payment card) which is redeemable for purchases at most major retail chains, petrol stations, and online shops.[13] Amounts donated were passed on to the respective charities including matches. The initial survey collected information on core demographics, i.e., age, sex, income, and education. We provide summary statistics of these demographics in Table A1 of the appendix. Importantly, as shown in Table A2 of the appendix, our treatment randomization resulted in balanced conditions with respect to these observable outcomes. In our sample of potential donors, there are more males than females (58.5 %) and the average age is 40 years. The average age of our sample matches that in the population of the respective cities; there are fewer females in our sample than in the corresponding population. The income in our sample is higher than the population average and we oversample individuals with high education levels.

3. Results

Across all treatments, just under half (46 percent) of the participants made a positive donation (158 out of 347).[14] Among the donors, 40 percent (63 participants) gave to both charities and 60 percent (95 participants) gave to only one of the two charities. These shares differ between treatments, varying from 33 to 60 percent at the extensive margin, for instance. We will explore these extensive margin variations more thoroughly below as well as investigating the effects of our treatments at the intensive margin.

A theoretical framework motivating our approach is outlined in Appendix A1.8. There we extend a common model of impure

[10] In both conditions potential donors are informed that both charities provide foodbank services within the region but only in the *CityLabel* conditions charities' exact locations are observable. Depending on treatment there was also a hyperlink to the homepage of the respective charity. Links to charities were only included in treatments revealing the city label due to location disclosure concerns in neutral treatments T1 and T3. We could not track direct website traffic but relied on time stamp data, which showed no significant difference in survey completion time between treatments with and without links (without: 1078.4s vs with: 1006.2s, p = 0.3099), suggesting no differences in information seeking behaviour.

[11] As common in the literature on matching (Karlan and List 2007; Huck and Rasul 2011), the match was casually introduced: The donation screen simply informed participants that – thanks to a campaign – one euro would be added to each euro donated to the matched charity. A match of 1:1 is the most common matching rate in the literature, possibly reflecting the observation that higher matching rates are typically not more effective (Karlan and List 2007; Kesternich et al. 2016).

[12] There are further participants (55) who did not complete the study or did not clearly identify as inhabitants of the respective cities and thus had to be dropped from the final analysis.

[13] The participants were already familiar with this kind of payment procedures from a previous study and were reminded of procedures in detail in the recruiting email. This procedure has the large advantage that payments can be made without personal contact and without exchanging bank details. For procedural reasons, all experimental payments were implemented with a time delay of four weeks. Since this was constant across treatments, we do not expect this to affect treatment effects. It is however possible that this affected the level of donations as shown in previous studies (e.g., Andreoni & Serra-Garcia, 2021).

[14] This share is lowest in T1 (32.9%, 25 out of 76 subjects) and highest in T4 (60.3%, 47 out of 78 subjects). See Table A3 and Figure A.4 in the Appendix.

altruism (Andreoni, 1990) to a situation in which both potential donors and potential recipient organizations can be characterized, among other dimensions, by their location in (physical) space. When we extend a decision maker's utility function to allow for different (warm glow or altruistic) utility derived from providing a good at the home or the away location, the model predicts that charities which provide perfectly substitutable services in a spatially differentiated market face spatially sorted donors. In other words, we expect donors to give preferentially to the charity located relatively close to them when this is observable through a spatial designator, since this provides them with a higher altruistic or warm glow utility. By the same logic, potential donors are predicted to be less inclined to give to charities located further apart from the donor. We validate this core prediction in Section 3.1.

Notably, without making further assumptions about core functional form parameters of the utility function, our augmented model of impure altruism does not generate tight theoretical predictions regarding potential crowding and spillover effects. As theory and prior empirical evidence neither rules in or out crowding or spillovers effects, we instead explore their existence in Sections 3.2 and 3.3. respectively.

3.1. Sorting in a spatially differentiated charitable sector

A comparison of giving in *T1: Neutral*, in which charities' names do not reveal their location, and hence their social distance to the potential donor, with *T2:CityLabel*, in which they do, provides direct evidence that donors sort spatially. We first pool data across charity and donor location – thus ignoring any location-specific effects – and ask if giving to the 'home' charity (from A to A or B to B) differs from giving to the 'away' charity (from A to B or B to A) in *T1:Neutral* and *T2:CityLabel* (see Fig. 1). In *T1:Neutral*, donors give approximately the same amount on average to the charity in their 'home' location (2.45) as they give to the charity in their 'away' location (1.99); i.e., there is no statistically significant sorting (Sign-Rank Test; $p = 0.74$). We also see that in *T1:Neutral* 17.1 % of all participants give to both charities. In *T2:CityLabel*, however, there is a significant (Sign-Rank Test; $p < 0.001$) preference for giving higher amounts to the 'home' charity (4.17) than to the 'away' charity (0.53). A closer investigation of the entire distribution of giving (see Section A1.2 of the appendix) reemphasizes these patterns of giving. Furthermore, this analysis reveals that the observed sorting effects occur mainly at the extensive margin: while the propensity to give zero to the home charity decreases by 10 percentage points, in *T2:CityLabel,* the propensity to give zero to the away charity increases by 15 percentage points. This provides strong evidence for the presence of a 'home bias' in giving. We summarize these observations in our first result.[15]

Result 1. *In a spatially differentiated market for charitable giving, overall giving and charity receipts were the same as in a spatially undifferentiated one. However, donors sorted spatially in the sense that they preferentially gave to charities in the socially close 'home' location and not preferentially to charities in the socially more distant 'away' location.*

The presence of a strong sorting effect is robust to further disaggregation that accounts for the possibility that there could be location specific effects through unobserved charity or donor characteristics. We find no location-specific effects (i.e., significant differences in giving at the extensive or intensive margin between charity A and B) that could imply systematic differences in whether and how much subjects donate to charity A or B (see Appendix A1.1.). Therefore, subjects' prior knowledge or preferences about the charities' location or mission (under the no label condition) does not seem to interfere with spatial sorting provoked by the label.

The demonstration that spatial differentiation in a charitable sector causes no change in overall giving, but causes donor sorting not only sheds light on the particular donor environment in which the main treatment intervenes. It also provides two additional insights. One is that this significant shift in underlying donor behavior can be induced by a rather subtle change in the fundraising environment that moves the same charity from a spatially undifferentiated market into a differentiated market by disclosing their locations. Small changes in the market structure may, therefore, lead to big changes in patterns of giving among the potential donor population, and therefore in the context in which fundraising tools are studied. This also implies that charities need to carefully consider their donor population's spatial distribution before they partake in spatially differentiated competition. The second insight is that when fundraising methods are studied, the conclusions can differ significantly, depending on the specific donor-charity flow under investigation. Comparing local donations, i.e., where donor and charity are in the same location, in the undifferentiated and the differentiated setting, we see that differentiation raises local donations considerably. This mirrors the results of Kessler and Milkman (2018), who find that charities can attract additional local donations by emphasizing social proximity via spatial designators. However, once either 'away' contributors to the local charity or 'away' donations from the local donors are taken into account, local differentiation has no impact on total donations received by the sector as a whole. Spatial differentiation, donor sorting, and the joint effects of crowding and spillovers in such a setting, therefore, merit further investigation through the main treatment.

3.2. Crowding and spillover effects of matches in a spatially differentiated charitable sector

Against the background of spatially sorted donors, we now turn to the core empirical interest of this paper. This is to assess the full impacts of one charity deploying the classic fundraising tool of a match for donations in such a market setting. We first study the presence and magnitude of crowding effects, i.e., the effect of the match on the matched charity (Section 3.2.1). Following these intra-

[15] In a further robustness check, we acknowledge that Result 1 is based on the results of two tests (2.45 vs. 1.99, p = 0.74 and 4.17 vs. 0.53, p = 0.004). We therefore correct for multiple hypothesis testing when calculating p-values using different corrections methods including Bonferroni and Holm (see List et al. 2019). Applying the most conservative correction, which in our sample is the Bonferroni correction, does not change our main results (2.45 vs. 1.99, p = 1.00 and 4.17 vs. 0.53, p = 0.008).

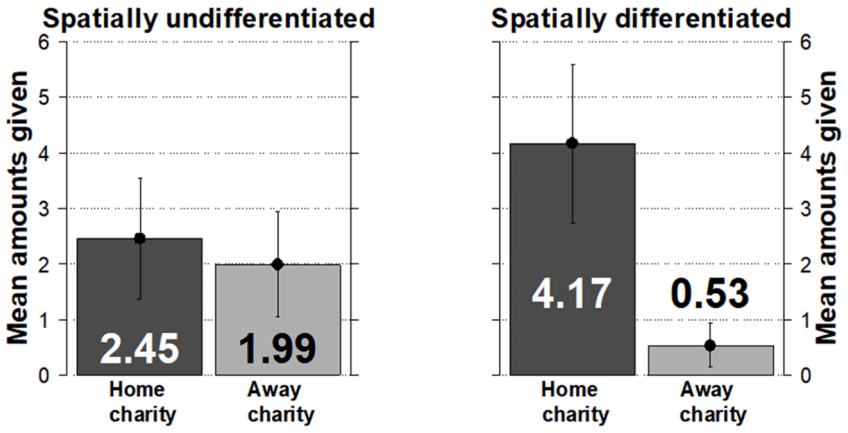

Fig. 1. Sorting effect
Note: Average checkbook donations to a donor's 'home' and 'away' charity under a spatially undifferentiated market structure T1 (left) and a spatially differentiated market structure T2 (right). Confidence intervals at the 95 %-level.

charity effects, we continue with the spillover effects, i.e., the presence and magnitude of inter-charity effects of the match on the unmatched charity (Section 3.2.2). We relegate the discussion of crowding and spillover effects for charities competing without spatial differentiation to Appendix A1.6.

3.2.1. Intra-charity effects: crowding

Starting with the intra-charity effects of a match, the main results are summarized in Fig. 2. This figure shows the grand total effect of a 1:1 match for the average donation flowing to the charity applying the match. This ignores any location-specific effects and simply compares donation flows from 'home' donors to 'home' charities in the absence (*T2: CityLabel*) and presence (*T4: HomeMatch*) of a match (left panel). Likewise, the right panel illustrates the effects of a match on donations flows from 'away' donors to 'away' charities.

Both comparisons deliver consistent evidence for (partial) crowding-in or, conversely, strong evidence against crowding-out. For 'home' charities, the presence of a match increases checkbook giving from 4.17 to 6.17 ($p = 0.017$, M.W. Rank Sum Test). For the 'away' charities we observe complete crowding-in: when a match is applied to the 'away' charity, checkbook giving increases from 0.53 to 3.27 ($p < 0.001$, M.W. Rank Sum Test).

Table 2 summarizes the results of a set of regression models that provide further evidence for the presence of (partial) crowding-in. Models 1 and 3 show the results of a simple OLS regression in which the amount of checkbook giving is regressed on a treatment dummy indicating the presence of a match in T4 or T5 respectively. For both the 'home' charities (model 1) and 'away' charities (model 3) the match significantly increases checkbook giving by 2.00 and 2.73, respectively. Models 2 and 4 follow Huck and Rasul (2011) in using the two-step estimation procedure of a hurdle model to separately estimate treatment effects on participants' propensity to donate and the amount donated conditional on a positive donation being made. For the first stage (i.e., the extensive margin), we estimate a probit model for whether any positive donation is made or not. For the second stage (i.e., the intensive margin), we use a truncated regression model conditional on any positive donation being made.

The first stages of models 2 and 4 account for the fact that the decision to donate (i.e., the extensive margin choice) may react differently to the presence of a match than the decision of how much to donate (i.e., the intensive margin choice). This conditional choice is derived in the second stage of the model. At the extensive margin, we find for both 'home' and 'away' charities a substantial and statistically significant increase in the propensity to give if a match is applied: The propensity to give increases by 23 percentage points from 37 percent in *T2: City Label* to 60 percent in *T4 HomeMatch* for the 'home' charity (see model 4 and A1.2 in the supplementary material). For the 'away' charity, the propensity to receive a donation increases by 26 percentage points from 10 percent in *T2: CityLabel* to 36 percent in *T5: AwayMatch* (see model 2 and A1.2 in the supplementary material). At the intensive margin, by contrast, results differ between a match applied to the 'home' charity and a match applied to the 'away' charity. For the 'home' charity, we do not find that conditional giving increases if a match is applied. For the 'away' charity, donors give significantly more conditional on giving a positive amount (see model 2 and 4). These differences imply that the full crowding-in observed for the 'away' charity is driven both by a significant increase in the number of donors and a significant increase in the average gift size by each donor while for the 'home' charity, the full crowding effect is driven by the extensive margin only.

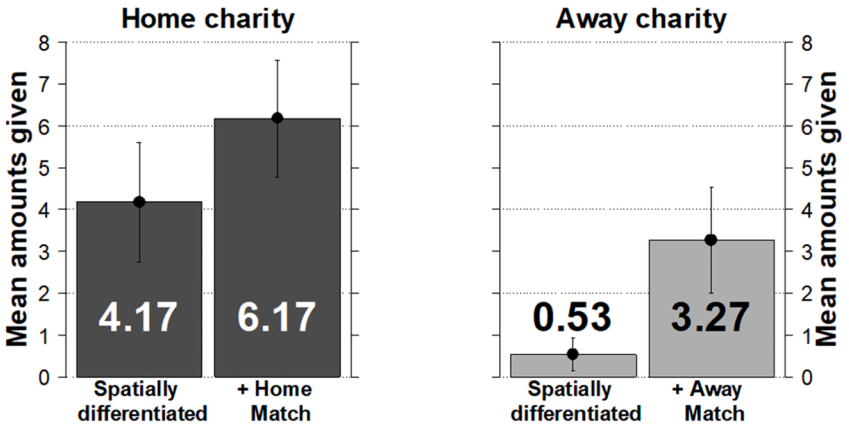

Fig. 2. Crowding effects on the matched charity
Note: Average checkbook donations to the matched charity in the absence (left bar) or presence of a match (right bar). The left panel shows this comparison for a match applied to the 'home' charity (T2 vs T4) and the right panel shows the same for a match applied to the 'away' charity (T2 vs T5). Confidence intervals at the 95 %-level.

Table 2
Regression results crowding effect.

	Home Charity				Away Charity			
	(1) OLS	(2) Two stage			(3) OLS	(4) Two stage		
	Donation				Donation			
		Extensive Margin		Intensive Margin		Extensive Margin		Intensive Margin
		Coefficients	Average marginal effects			Coefficients	Average marginal effects	
MATCH (1=Yes)	2.00** (1.002)	0.592*** (0.207)	0.232*** (0.079)	−1.044 (1.112)	2.73*** (0.644)	0.905*** (0.250)	0.264*** (0.069)	3.26* (1.874)
CONSTANT	4.17*** (0.720)	−0.332** (0.150)		11.278*** (0.886)	0.53 (0.447)	−1.229*** (0.195)		5.5*** (1.656)
Obs.	151	151	151	74	140	140	140	32

Note: Models (1) and (3) OLS regressions. The dependent variable is the amount donated. Models (2) and (4) two-stage hurdle models. First stages, probit regression models, where the dependent variable is equal to one for positive donations and zero otherwise. Coefficients in column 2 and 6. Average marginal effects in column 4 and 7. Second stages (column 3 and 6), truncated regression models, where the dependent variable is the amount donated, conditional on donations being positive. Standard errors in parentheses. *$p < 0.1$, **$p < 0.05$ and ***$p < 0.01$.
151 = T2 vs. T4 Mannheim oder T5 Heidelberg.
140 = T2 vs. T4 Heidelberg oder T5 Mannheim.

This raises the question whether the crowding effect is stronger for a match applied to the 'home' charity or a match applied to the 'away' charity. To answer this question, we compare the respective regression coefficients in the different panels of Table 2. First, comparing the size of coefficients in columns (1) and (3), we do not find a significant difference in the overall strength of the crowding effect (2.00 vs. 2.73, $p = 0.529$). For the different margins of giving (column (2) vs. column (4)), we find no significant differences at the extensive margin (0.59 vs. 0.97, $p = 0.185$) but significant differences at the intensive margin (−1.13 vs. 4.70, $p<0.001$). All regression results continue to hold if we control for a set of donor characteristics and city-fixed effects as shown in Table A5 of the appendix. In Appendix A1.3 we furthermore show that the central message of Fig. 2 and Table 2 also holds, when we disaggregate results by charity and donor location (Table A4). We sum up these observations in the following result.[16]

[16] The gist of result 2 is also borne out when focusing on the cumulative distribution function (see Figure A1.1) and particularly on the effects on giving at the extensive margin. Overall, this suggests that the match operates both at the intensive and extensive margin but also that the size of these effects differs depending on the kind of match ('home' or 'away') as well as location and charity-specific idiosyncrasies. The 'away' match increases giving at both margins, while the 'home' match mainly operates at the extensive margin. Result 2 is based on the results of two tests (4.17 vs. 6.17, p = 0.017 and 0.53 vs. 3.27, p = 0.001). Using the most conservative correction for multiple hypothesis testing (here: Bonferroni - see footnote 13) does not change our main results (4.17 vs.6.17, p = 0.034 and 0.53 vs. 3.27, p = 0.002).

Result 2. *In a setting of competition with spatial differentiation, a match-based fundraising instrument crowds-in giving to the matched charity* i.e. *there are higher average donations to the charity applying the match. Relative to the baseline, crowding-in tends to be larger for the socially distant charity.*

3.2.2. Inter-charity effects: spillovers

Do the match-based fundraising activities of one charity cannibalize giving to the other charity that also competes for donations? In other words, are there negative spillover effects of one charity's match to another, spatially differentiated charity that provides the same charitable good?

The spillover effects, i.e., the inter-charity effects of a match, can be derived from the experimental evidence reported in Fig. 3. As in the previous section, Fig. 3 displays the grand total spillover effect from applying a match to the competing charity. The left panel hence displays how the presence of a match for the 'away' charity (T5: AwayMatch) impacts giving to the (unmatched) 'home' charity compared to a situation without applying any matches for either charity (T2: CityLabel). Giving to the (unmatched) 'home' charity decreases insignificantly from 4.17 to 3.04 (−27 percent; $p = 0.56$, M.W. Rank Sum Test). This is consistent with no spillover effects as well as weak negative spillover effects. For the 'away' charity, on the other hand, checkbook giving increases when the competing 'home' charity applies a match (T4: HomeMatch) compared to T2: CityLabel without a match. This positive spillover effect significantly increases checkbook giving from 0.53 to 1.32 (149 percent, $p = 0.037$, M.W. Rank Sum Test). In sum, we find no evidence for negative spillover effects. To the contrary, we even find evidence that a match applied to subjects' socially close 'home' charity leads to additional donations flowing to the socially more distant 'away' charity - a positive spillover effect.[17]

The results of a set of regression models, which we summarize in Table 3, provide further evidence for the absence of a clear negative spillover effect. We follow the same estimation strategy as for Table 2, now taking giving to the unmatched charity as the dependent variable. Models 1 and 3 thus show results for the size and direction of the average spillover effect on giving to the unmatched charity. Offering a match on donations to the 'away' charity does reduce giving to the 'home' charity non-significantly by 1.13 (model 1). A match on donations to the 'home' charity, however, significantly increases donations to the unmatched socially more distant 'away' charity by 0.79 (model 3).

Models 2 and 4 report the results from applying the hurdle model. The two-stage procedure of the hurdle model again reveals subtle differences for the two possible margins of giving. At the intensive margin, donations to the unmatched 'home' charity are significantly lower when the 'away' charity offers a match (i.e., a significant reduction at the intensive margin), while the propensity to give is unaffected (37 percent in *T2: CityLabel* vs. 36 percent in *T5: AwayMatch*) (i.e., no extensive margin effect). For the unmatched 'away' charity this pattern reverses. Here, the overall positive spillover effect results from a significant increase in extensive margin giving, while giving at the intensive margin also increases but only by an insignificant amount. The propensity to give increases by 12 percentage points from 10 percent in *T2: CityLabel* to 22 percent in *T4: HomeMatch*. That is the unmatched charity benefits from the match of another charity mainly through (passively) attracting new donors. All regression results continue to hold if we control for a set of donor characteristics and city-fixed effects as shown in Table A5 of the appendix. We summarize these observations in our third result.[18]

Result 3. *In a setting of competition with spatial differentiation, there is no compelling evidence that a match-based fundraising instrument used by one charity results in negative spillovers on giving to the unmatched charity.*

To investigate the results at the intensive and extensive margin in more detail, we summarize cumulative distribution of donations in section A1.1 in the supplementary material (Panel C of Figure A2). Furthermore, our main finding - summarized in Fig. 3 - carries through further ways of disaggregating the data produced by our experiment summarized in Table A6 of the appendix.

In Appendix A1.5 we discuss potential channels through which differences in spillover effects could materialize. There we study the degree to which the presence of a match affects the propensity to give both to the matched and the unmatched charity. Then we decompose the propensity to give to both charities into the propensity to give to the matched charity and the propensity to give to the unmatched charity for those who give to the matched charity. This decomposition exercise reveals positive spillovers on donations from socially distant donors when the socially close charity is matched and no spillovers on donations from socially close donors when the socially more distant charity is matched: Matching the socially close *'home'* charity increases the propensity to give to both the 'home' charity and the 'away' charity of those who give to the *'home'* charity. The *'away'* match also increases the propensity to give to the 'away' charity, but it decreases the propensity to give to the *'home'* charity of those who give to the *'away'* charity.

3.3. Sector-wide charitable giving in a spatially differentiated market

Finally, we look at the sector-wide effects; i.e., the effects of the match by one charity on total checkbook giving. Section 3.1. has already concluded that in the absence of matches to donations, the charities jointly do not raise more funds in a spatially differentiated

[17] This result is even more surprising when considering that participants have a fixed budget for donations. This fixed budget should enhance negative spillover effects while limiting positive spillover effects.

[18] Result 3 is based on the results of two tests (4.17 vs. 3.04, p = 0.5460 and 0.53 vs. 1.32, p = 0.037). Using the most conservative correction for multiple hypothesis testing (here: Bonferroni – see footnote 13) does not change our main results (4.17 vs. 3.04, p = 1.000 and 0.53 vs. 1.32, p = 0.074).

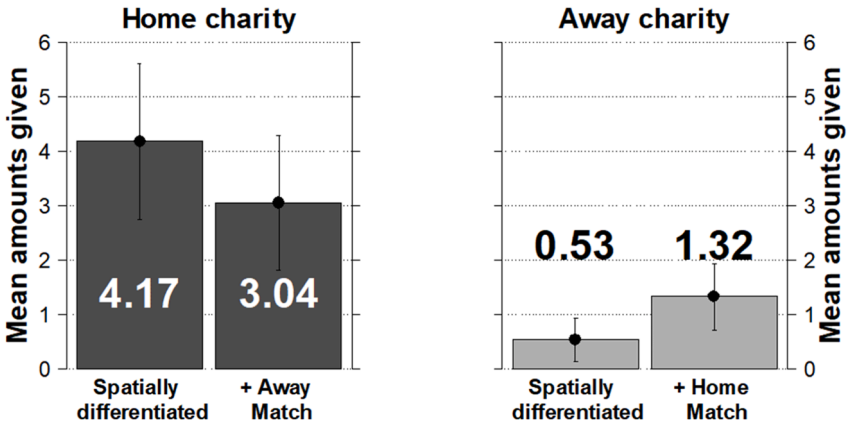

Fig. 3. Spillover effects on the unmatched charity
Note: Average checkbook donations to the unmatched charity in the absence (left bar) or presence of a match offered by the competing charity (right bar). The left panel shows this comparison for a match offered by the competing 'away' charity (T2 vs. T5) on giving to the 'home' charity and the right panel shows the same comparison for giving to the unmatched 'away' charity when a match is offered by the competing 'home' charity (T2 vs. T4). Confidence intervals at the 95 %-level.

Table 3
Regression analysis spillover effects.

	Home Charity				Away Charity			
	(1) OLS	(2) Two stage			(3) OLS	(4) Two stage		
	Donation	Extensive Margin		Intensive Margin	Donation	Extensive Margin		Intensive Margin
		Coefficients	Average marginal effects			Coefficients	Average marginal effects	
MATCH	−1.13	−0.050	−0.012 (0.081)	−2.778**	0.79**	0.817* (0.464)	0.111* (0.062)	0.559
(1=Yes)	(0.953)	(0.352)		(1.329)	(0.372)			(0.890)
CONSTANT	4.17***	0.242**		11.278***	0.53**	−2.095***		5.5***
	(0.659)	(0.242)		(0.911)	(0.268)	(0.375)		(0.749)
Obs.	140	140	140	51	150	151	151	24

Note: Models (1) and (3) OLS regressions. The dependent variable is the amount donated. Models (2) and (4) two-stage hurdle models. First stages, probit regression models, where the dependent variable is equal to one for positive donations and zero otherwise. Coefficients in column 2 and 6. Average marginal effects in column 4 and 7. Second stages (column 3 and 6), truncated regression models, where the dependent variable is the amount donated, conditional on donations being positive. Standard errors in parentheses. *$p < 0.1$, **$p < 0.05$ and ***$p < 0.01$.

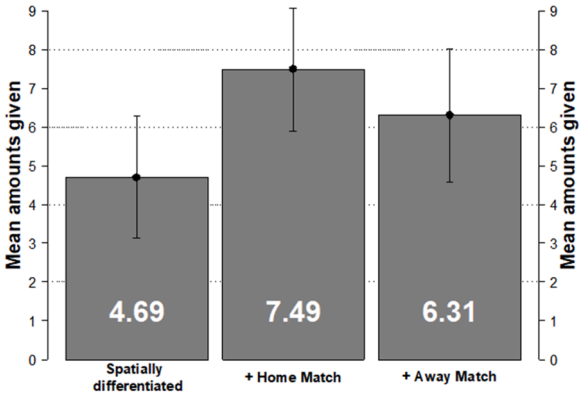

Fig. 4. Total donations
Note: Average total checkbook donations to both charities in a spatially differentiated sector in the absence (T2: left bar) or the presence of a home match (T4: middle bar) or an 'away' match (T5: right bar). Confidence intervals at the 95 %-level.

market than in an undifferentiated one. Spatial differentiation simply leads to sorting among donors. We complement this discussion of the main results with a look at additional results at the 'sector' level. This involves comparing total giving to both spatially differentiated charities in *T2: CityLabel* with total giving in *T4: HomeMatch*, and with total giving in *T5: AwayMatch*. This perspective thus complements the analysis of individual crowding (see Section 4.2.1) and spillover effects (see Section 4.2.2) by examining the effectiveness and efficacy of match-based fundraising by one charity for total giving to the sector as a whole.

Fig. 4 displays the average of total charitable donations made to both charities by each donor across the three main treatment conditions. As expected per result 2, the positive crowding-in effect on the matched charity in combination with the absence of significant negative spillovers on the unmatched charity (result 3) raises total donations to both charities above the baseline of a spatially differentiated charitable sector. However, for the unmatched 'away' charity we do not only observe the absence of a negative spillover effect, but rather a positive spillover effect when the 'home' charity receives a match. In sum, this significantly increases total donations from 4.69 to 7.49 in case the match targets charities' 'home' donors ($p = 0.007$, M.W. Rank Sum Test). In case the match targets charities' 'away' donors, it also increases total giving from 4.69 to 6.31, this increase, however, does not reach the conventional levels of significance ($p = 0.114$, M.W. Rank Sum Test). These observations are summarized as result 4.[19]

Result 4. *In a setting of competition with spatial differentiation, total charitable donations made to both charities are significantly higher in the presences of a 'home' match. Total donations are also higher under an 'away' match, but not significantly so.*

From the vantage point of managing a spatially differentiated charity with multiple branches, result 4 implies that match-based fundraising targeting charities' socially close 'home' donors raises its charitable income by the highest amount. Donors respond to such fundraising activities by giving more to the matched 'home' charity (result 2), but also by giving more to the unmatched 'away' charity (result 3). From the perspective of the public economist, none of the matching schemes under investigation can be called efficacious in the sense that total checkbook giving more than doubles through the presence of the 1:1 match.

4. Discussion and conclusion

Given the major advances in the 'science of philanthropy' that have given fundraising activities a new evidence base, a natural question for lead donors, managers of charitable organizations, and the public economist is how the applications of these insights play out in richer market structures in the charitable sector. We introduce spatially differentiated competition, a commonly encountered market structure in the charitable sector, into the literature and conduct a framed field experiment to understand how fundraising in a spatially differentiated sector affects crowding to and spillovers between two competing charities.

As predicted by theory, we establish as a first result that donors display 'home bias' that leads to spatial sorting. Against the background of this 'home bias', the match-based fundraising drive by one charity results, at the intra-charity level, in crowding-in effects, but fails to generate negative spillovers at the inter-charity level. Matching the donations of 'away' donors leads to particularly strong crowding-in effects while matching the donations of 'home' donors leads to positive spillover effects on donations of the 'away' charity. On aggregate, a 'home' match is most effective in raising donation income. One result, which is fully in line with the existing literature, is that even when optimally configured for a spatially sorted donor landscape, matching still fails the efficacy test.

The absence of a negative spillover effect is surprising, and so is the suggestive evidence for positive spillovers when matches are applied to home donations. If confirmed by further studies, this could have major ramifications for the optimal management of spatially differentiated charities. But how much weight should practitioners and scholars place on a finding emanating from a single study with a limited number of observations? We follow the procedure proposed by Maniadis et al. (2014) to illustrate our answer by two examples. An expert who is skeptical about the presence of a positive spillover effect may attach a prior of 1 % that the positive spillover is true. This expert would update her prior to 14 % after observing our first study. Another expert may hold a prior of 5 % (10 %) that the positive spillover is true. Despite being only slightly less skeptical than the first, this expert would update her prior to 46 % (64 %), giving the positive spillover effect even odds of being true. Additional replication studies would dramatically improve confidence in the evidence base, which is currently derived from only a small number of previous (field-) experiments.[20]

In sum, should further studies confirm our results in particular when it comes to the (non-existence) of negative spillover effects, they have important implications for different stakeholders in the 'science of philanthropy'. For a lead donor, they suggest that his matching strategy does not have to be overly sensitive to the social distance between potential donors and his preferred charity. For those managing a spatially differentiated charity with branches at multiple locations, the results suggest that matching 'home' donations will maximize their overall charitable income. To the public economist, who is interested in the provision of public goods, they suggest that matching in a spatially differentiated sector – just as its counterpart in a spatially non-differentiated sector – is not efficacious despite harnessing social identity, raising questions as to the popularity of matching in the fundraiser trade. In our experiment, competition cannot explain its popularity. For the theoretical analysis of giving preferences our results provide a starting point for thinking about where and how spatial dimensions should be reflected in a giving function (Crumpler and Grossman, 2008).

Declaration of Competing Interest

All authors wish to declare no conflicts of interest

[19] Result 4 is based on the results of two tests (7.48 vs. 4.69, $p = 0.0068$ and 6.31 vs. 4.69, $p = 0.1144$). Using the most conservative correction for multiple hypothesis (here: Bonferroni – see footnote 13) does not change our main results (7.48 vs. 4.69, $p = 0.0136$ and 6.31 vs.4.69, $p = 0.2288$).

[20] For more details see Supplementary Material A1.7.

Data availability

Data will be made available on request.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jebo.2023.10.013.

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