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Daniel A. Brent
Louisiana State University

Katie Lorah
ioby

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Department of Economics
Louisiana State University
Baton Rouge, LA 70803-6306
http://www.bus.lsu.edu/economics/

The Geography of Civic Crowdfunding: Implications for Local Inequality

Daniel Brent[a*] *& Katie Lorah*[b]

[a] *Louisiana State University*

[b] *ioby*

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Abstract

This study analyzes fine-scale geographic data on civic crowdfunding, a method for private citizens to directly fund local public goods, to examine the implications for inequality. Traditional methods for provide neighborhood amenities produce significant local inequalities. Civic crowdfunding offers a new approach by empowering local citizens to initiate and fund local community projects. The results show that neighborhood characteristics of projects, including median household income, do not impact the ability to raise capital. The average distance of a donor to a project is over 300 miles and the median distance is 8 miles, indicating that while projects elicit donations from outside their community local donations are very important. The neighborhood income of donors does not influence whether they contribute to projects located in low income or high income neighborhoods. The findings indicate that civic crowdfunding has a promising role to play in alleviating neighborhood inequalities, and serve as a guide to future research that can inform how the expansion of this new funding mechanism can integrate into local government policy.

Keywords: civic crowdfunding; inequality; public goods; spatial analysis; urban planning

[*]Corresponding Author: email: dbrent@lsu.edu, mailing: 2300 Business Education Complex, Department of Economics, Louisiana State University Baton Rouge, LA, 70803. We thank Erin Barnes and David Palmer of ioby with generous help on accessing the data and providing insights about ioby and civic crowdfunding more generally.

1 Introduction

Crowdfunding is a relatively recent development of the digital economy where individuals or firms without access to traditional forms of capital raise money online through small contributions from many donors. Kickstarter, a well-known platform that funds creative projects including entrepreneurs and artists, has raised more than $3 billion from 11 million individuals to fund over 120,000 projects.[1] Civic crowdfunding borrows principles from both private crowdfunding and grassroots community organization by enabling citizens to develop community projects that are funded by donations through an online platform. Advocates of civic crowdfunding assert that it empowers community leaders to initiate worthwhile public projects in their neighborhoods and allows citizens to vote with their pocketbooks. In this sense, civic crowdfunding acts as a catalyst for citizens to improve their own neighborhoods as opposed to waiting for governments or external philanthropic organizations to intervene. Improving neighborhood amenities in underserved communities has the potential to reduce documented inequalities in environmental quality (Morello-Frosch et al. 2002;Downey 2007; Wen et al. 2013), access to nutritious food (Whelan et al. 2002; Wrigley 2002; Walker, Keane, and Burke 2010; Weatherspoon et al. 2013), and job accessibility (Shen 2000; Kawabata and Shen 2007), among other local disparities. Community decisions regarding the type of project to initiate and where to allocate personal resources serve as a guide to policy-makers for future investments.

However, challenges for civic crowdfunding include the possibility of increasing the unequal distribution of neighborhood amenities and the abrogation of government responsibilities (Davies 2015; Stiver et al. 2015). Before civic crowdfunding fills a major role in public policy it is critical to understand the mechanisms and distributional consequences of civic crowdfunding. We analyze data from ioby ("In our Backyards"), one of the leading civic crowdfunding platforms that targets projects in under-served communities. When considering the expansion of civic crowdfunding in improving local communities it is important to consider what types of projects are feasible to fund in this setting. Civic crowdfunding is not a replacement for traditional government spending on infrastructure. Projects are generally small scale in comparison to municipal capital budgets. The median

[1] Statistics for Kickstarter are available at https://www.kickstarter.com/help/stats.

funding level of a project is $3,190 and over 80% are less $5,000. Many of the projects involve local public goods such as parks, green infrastructure, and community gardens; streetscape enhancements such as crosswalks and bike lanes; and public art. Others are temporary or less place-based, such as volunteer cleanup days; youth after-school programs; and street festivals. Although civic crowdfunding does not typically provide large-scale public goods, the projects improve the lives of the community members and represent a shift to a more participatory form of urban planning.

One of the primary social challenges of our time is the presence and long term trends of economic inequality. Work by Thomas Piketty and Emmanuel Saez documents increasing trends of inequality in both wealth and earnings in the United States (Piketty and Saez 2001; Kopczuk, Saez, and Song 2010; Piketty and Saez 2014; Saez and Zucman 2016). Poverty related to economic inequality leads to serious adverse health consequences in life such as lower birth weights (Currie 2011), increased obesity (Singh, Siahpush, and Kogan 2010), and reduced life expectancy (Chetty et al. 2016). Inequality manifests itself in multiple dimensions, often taking a spatial form in metropolitan areas. (Shertzer, Twinam, and Walsh 2016) show how racially discriminatory zoning practices led more industrial activity to occur in minority neighborhoods. The spatial form also has implications for how income inequality affects educational outcomes (Gordon and Monastiriotis 2006) and crime (Whitworth 2013; Metz and Burdina 2016). A recent research project by Raj Chetty and Nathaniel Hernden analyzes the impact of a neighborhood on future earnings (Chetty et al. 2014), and suggest one of the primary ways to improve economic mobility is to move away from poor-quality neighborhoods (Chetty, Hendren, and Katz 2015). If the best and brightest are more likely to move away, migration may in fact exacerbate neighborhood inequalities. This research studies whether civic crowdfunding can operate as a mechanism to improve existing neighborhoods instead of using migration as a tool for addressing inequality.

We address two primary questions in this research that provides insight into the distributional effects of civic crowdfunding and how it may integrate into public policy. First, do neighborhood characteristics, such as median income, determine the ability for civic crowdfunding campaigns to raise capital? As opposed to being a force for social inclusion, one concern surrounding civic crowdfunding is that eliciting private funds to improve neighborhoods will exacerbate inequalities in the quality of public amenities if projects are disproportionately funded by wealthy donors in their own neighborhoods. Second, who are

the donors and to what types of projects do they choose to contribute? Understanding donor behavior is important to contextualize the type of projects that can be successfully funded and how the financial responsibility for projects is shared. Donor behavior is also related to the first question regarding the ability of civic crowdfunding to engage a wide cross section of the population, and attract resources from outside the immediate community. When analyzing the relationship between donors and projects, we pay particularly close attention to geographic distance. The spatial pattern of donors is important to both understand the ability of different types of neighborhood to attract funding for local projects, as well as the interpretation of donations as public support for specific types of public amenities.

The primary contribution of our research is bringing fine-scale spatial data on both project and donor locations: we have the exact address geocoded for all projects and donors. This fine scale spatial resolution allows us to merge in demographic data at the census block level, thereby generating a more accurate assignment of neighborhood characteristics to project locations. Additionally, access to spatial data on donors and the projects to which they donor allows us to assess both donor's characteristics and the linkage between donors and projects. Geocoding the exact address of both projects and donors allows us to calculate a very precise metric for distance.

With respect to the first question, we do not find any evidence for the concern that civic crowdfunding might exacerbate inequality; rather neighborhood characteristics are poor predictors of both the total donations to civic crowdfunding campaigns. This finding holds across a wide range of neighborhood income levels; the median income of neighborhoods for funded projects extends from under $10,000 to over $250,000. With respect to the donor characteristics, we find that donors from wealthier areas contribute more on average, however, donors from less affluent areas contribute a larger percentage of their neighborhood income.

Linking donors to projects also generates interesting results. The mean distance between a donor and project is 364 miles, while the median distance is only 8 miles. Therefore, while most donors are very local, some projects are able to attract donations from distant locations. Donors who are very close (< 5 miles) give more than donors within 5-100 miles, and then the size of donations increases for donors further than 100 miles away. The

income of the neighborhood where the project is conducted does not affect the size of the donation. This pattern is consistent for donations in dollar terms and as a percentage of income. Hyper-local donors likely receive direct benefit from the projects, and distant donors may be connected to the cause or the project leader's social network. Additionally, the demographic characteristics of donors' neighborhoods does not determine the neighborhood characteristics of the projects to which they donate. Therefore, donors from wealthy neighborhoods are just as likely to fund projects in either poor or wealthy neighborhoods. These findings are promising for utilizing civic crowdfunding as a tool to combat local disparities in neighborhood amenities.

2 Related Literature

Since civic crowdfunding is a relatively new phenomenon there is little research on the subject.[2] The closest research that explicitly explores civic crowdfunding is based on a master's thesis by Davies (2014). This research provides some of the background for civic crowdfunding and examines data from a variety of public-good crowdfunding on more general crowdfunding platforms such as Kickstarter and Indiegogo, as well as civic crowdfunding platforms including ioby. Stiver et al. (2015) also study civic crowdfunding and, among other insights, highlight the challenge of the potential for a "social wedge" where projects are only funded in wealthy areas.

There is somewhat more research on general crowdfunding models that fund private companies, products, or individuals. Belleflamme et al. (2013) explore pre-ordering crowdfunding, and Belleflamme, Lambert, and Schwienbacher (2014) investigate differences between for-profit and non-profit crowdfunding campaigns. Pitschner and Pitschner-Finn (2014) find that while non-profit campaigns have a higher probability of success and attract higher average contributions, for-profit campaigns raise more money from more donors. Agrawal, Catalan, and Goldfarb (2014) address the economic implications of equity crowdfunding in the context of current crowdfunding trends. Agrawal, Catalini, and Goldfarb (2015) analyze the role of geography in traditional crowdfunding, finding that funding comes from diverse and distant locations. Geography is still important in the context of initial funding as local donors are not responsive to initial funding, but distant

[2] A search on IDEAS on July 13, 2017 showed 1 English language paper matching the term "civic crowdfunding".

donors are much more likely to fund a project if others have previously contributed. The notion that early funding success leads to greater success in the future has been validated in a set of field experiments (van de Rijt et al. 2014). They find support for the rich-get-richer hypothesis by contributing to randomly selected Kickstarter campaigns and observing that these campaigns attract more funding than control campaigns. We extend the geographical analysis of crowdfunding to civic crowdfunding, where the spatial scope of the final project is fixed, unlike a physical or digital product produced via traditional crowdfunding campaigns.

In addition to the aforementioned research on national and local inequalities in outcomes, this research also fits into the broader literature on methods for combatting local inequalities. The literature on food deserts shows how introducing fresh food such as farmer's markets community gardens, or grocery stores produces mixed results (Wrigley et al. 2002; Larsen and Gilliland 2009; Wang, Qiu, and Swallow 2014). There has been a concerted effort to consider the distributional implications of job accessibility when considering new public transit policies (Martens, Golub, and Robinson 2012). However, there are still severe challenges to implement and study inclusionary transport as evidenced by recent summary articles (Lucas 2006; Jones and Lucas 2012). One promising approach of putting these concepts into practice is using green infrastructure to promote environmental justice. Schilling and Logan (2008) show how cities that experienced industrial decline can implement green infrastructure on vacant residential or industrial land. Communities finding a way to convert vacant urban land into green space is a particularly promising avenue for civic crowdfunding. There are still distributional concerns regarding gentrification (Wolch, Byrne, and Newell 2014) and the utilization rate of parks (Sister, Wolch, and Wilson 2010) as disadvantaged neighborhood work to resolve long-standing problems of environmental justice.

Another set of long-term questions about civic crowdfunding relate to interactions with public spending and sorting behavior. For example, does private provision of local goods crowd out public provision? Most of the literature focuses on the reverse question and Andreoni and Payne (2011) provide evidence that the crowding out effect for charities receiving government grants is due to a reduction in fundraising activities. While the long-term effects of civic crowdfunding are important, they are beyond the scope of this article.

We take a first approach at addressing distributional concerns by analyzing the set of communities able to attract funding in civic crowdfunding campaigns.

3 Civic Crowdfunding/ioby

The pooling of small monetary contributions, whether micro-investments or donations, toward a common goal is not a new concept, but the growing prevalence of online platforms in the past decade has caused "crowdfunding" to become a household word. More than 20% of Americans have participated in an online crowdfunding campaign as of 2016 (Smith 2016). Crowdfunding platforms comprise a broad spectrum focusing on areas ranging from creative projects to personal medical expenses. The sub-field of civic crowdfunding intersects private-interest crowdfunding and traditional philanthropy crowdfunding by targeting small contributions for public or community goods. Another distinguishing characteristic of civic crowdfunding is that projects are primarily planned, funded, and implemented by private citizens, residents and community groups looking to improve their own surroundings.

The data used here come from the civic crowdfunding platform ioby, or "In Our Backyards" a nonprofit organization primarily operating in the United States that uses the crowdfunding model as a community development tool, with an emphasis on neighborhoods with a history of public disinvestment. Fundraising campaigns must have a public benefit and occur in the neighborhood where the project leader lives or works. The organization operates through an online site that resembles most crowdfunding platforms, but a large portion of its service model is offline, with staff providing one-on-one coaching and resources in fundraising, community organizing, project implementation and other topics.

ioby's focus on historically under-served neighborhoods is a deliberate attempt to address a common fear that tech-based tools for civic engagement and investment are contributing to the "digital divide" and exacerbating inequality. This model of civic crowdfunding does not focus on advertising that leads to a diffuse and unknown network of investors or donors through online channels, as many others do. Instead, campaign leaders are trained in mobilizing their existing social networks, and in particular, the portion of their networks within their physical, local community. The fact that ioby specifically focuses on

combating social inequality needs to be considered when interpreting and extrapolating the empirical results in this article to civic crowdfunding conducted on alternative platforms.

This model of civic crowdfunding, and in fact the larger civic crowdfunding field, is unlikely to grow to such a degree that it becomes a viable replacement for public funding, or even traditional philanthropy. Nor is that a desirable goal for communities or government entities, as challenging as budget shortfalls may be. Instead, a primary question within the field is: how can civic crowdfunding be leveraged not as a replacement to, but as a way to indicate need and collective valuation within a community, to better guide investment from the government and philanthropic sectors?

It also bears mention that there is preliminary evidence that some of the primary benefits of participating in a place-based civic crowdfunding campaign, whether as a campaign leader or contributor, are non-monetary. Anecdotal evidence suggests that this participation contributes to a greater sense of social resilience; a greater sense of community agency; an increased knowledge of and connection to official decision-making processes; and increased awareness of other opportunities for civic participation, such as voting or running for office. These reports indicate a need to further study the non-monetary benefits of this kind of participation in order to truly quantify the value of civic crowdfunding.

4 Data

There are two data sources used in the analysis. The first is project and donor data obtained from ioby. The project data has information on each crowdfunding campaign. The variables of interest for this article are the project address, total number of donors, amount of money raised, and project budget. There are also additional variables such as the start date of the campaign and characteristics of the type of project (environmental, art, etc). There are 673 projects that have completed the funding round and an additional 165 that were currently fundraising at the time the data were obtained. When conducting analysis at the project level we focus on campaigns that have concluded fundraising. The total amount of funding raised at the time the data were pulled was $2,006,725.

The donor data has information on each unique donation to a campaign. The primary donor variables are the donor address, the beneficiary project, the size of the donation, and whether there were any matching funds. There are 18,478 individual donations, however 594 donations were not able to be geocoded. Of the remaining

donations, there are 13,184 unique donors, indicating that some donors contribute to multiple projects.

In order to calculate distances, we geocoded the addresses to acquire geographic coordinates (latitude-longitude) using the Data Science Toolkit in R. We performed several quality control checks to ensure that addresses were correctly geocoded.[3] Geographic coordinates for projects and donors generates precise distance calculations for each donor-project pair and allow us to obtain census data at the block level. We link the coordinates of projects and donors to census geographies using the Federal Communication Commission's geocoding API to obtain the Census FIPS code for each coordinate. Lastly, we download census block group level data from the American Community Survey (2010-2014) for several socioeconomic characteristics. A census block is a geographic area consisting of 600-3000 people. There are over 200,000 block in the U.S., representing a relatively fine geographic resolution. It is important to note that all demographic data are collected at the census block level, and that we use the terms "census block" and "neighborhood" interchangeably.

4.1 Summary Statistics

We begin by providing a basic set of summary statistics on projects and donors. Table 1 shows the mean, standard deviation, median, minimum and maximum values for several relevant variables. The average donation is $109, and the median donation is $30. The average and median amount raised for a campaign are $3,190 and $1,271 respectively.[4]

The distance variable is particularly interesting. The average distance between a donor and a project was over 364 miles, however the median distance was only 8 miles. This indicates that most donations are local, but many donors live far away from the project site. When weighting the distance from donor to project by the monetary value of the donation the average distance increases slightly to 388, indicating that more distant donors give larger amounts on average.

[3] For example, we checked if the state from the geocoded longitude and latitude matched with the administrative data. We also manually examined records that generated missing values for geographic coordinates.

[4] These values differ somewhat from the statistics that appear on ioby's website - https://www.ioby.org/about. The data on ioby's website may not include all the projects considered in this analysis, and the website may include data on cancelled campaigns, which this analysis excludes. In the future, it would be worthwhile analyzing which campaigns were cancelled to search for predictors of cancellation.

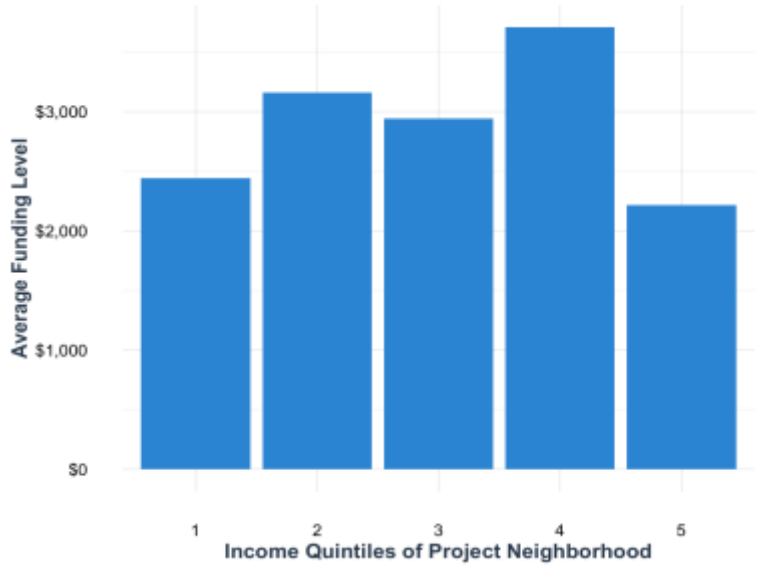
Table 1: Summary Statistics of Donations

Variable	Mean	Std. Dev.	Median	Min	Max	Observations
Donation ($)	109	598	30	0	24000	18478
Total Donations ($)	3190	5984	1271	2	68928	673
Total Donors (#)	23	35	13	1	453	673
Distance (miles)	364	786	8	0	10167	17873
Weighted Distance (miles)	388	780	-	-	-	17873

5 Project-Level Analysis

Our primary analysis of project characteristics examines if higher income areas are able to fund larger more expensive projects. Figure 1 shows the average value of funded projects by quintiles of the median household income of the project neighborhood. The average incomes within the quintiles in our sample ($24,342, $38,908, $50,840, $66,637, $108,383) are relatively similar to the entire country during the same period ($18,817, $31,282, $45,159, $64,617 $110,716). The figure shows that the largest projects are actually in middle-income neighborhoods. The lowest income neighborhoods actually fund slightly more expensive projects than the highest income neighborhoods. This could be due to the features of the projects or other correlated attributes of projects, so we continue the analysis in a multivariate regression framework.

Figure 1: Average Project Size by Median Household Income



5.1 Determinants of Total Donations

In order to understand how income and demographics affect campaign success we analyze the effect of neighborhood characteristics on the total value of donations that campaigns receive using multivariate regressions. The total level of funding that a campaign raises represents is our preferred measure of success. Other metrics, such as achieving the original funding goal, are complicated by ioby's flex funding model whereby a leader can increase or decrease the total level of funding midway through the campaign. The results are presented in Table 2. Median income is in thousands of dollars and the other neighborhood characteristics represent the change in the total donations for a 10% change in the characteristics. The standard errors are in parentheses below the estimated effect and the stars denote statistical significance. Column (1) shows that increasing the size of the budget by $1 is associated with $0.42 in extra donations. At the project level we also calculate the average and median distance of donors, neither of which is statistically significant.

Column (3) adds neighborhood characteristics to explain the funding level of projects. Most of the neighborhood characteristics are not statistically significant, indicating that neighborhood income and demographics are not the primary determinants of funding success. This is consistent with the results in Figure 1. We also examine project categories such as environmental improvements, safe streets or art to determine if certain types of projects attract more donations; none of the categories generated statistically different levels of funding.[5] Adding average donor income in column (4) shows that projects that attract donors from wealthier neighborhoods do not raise more money. The one neighborhood characteristic that is statistically significant is the percentage of active transportation - defined as the share of commuters either walking, biking, or using public transportation. Projects in these neighborhoods are smaller on average, which is perhaps a function of the type of project that these communities undertake. The primary lesson from the total donations regression models is that income and other neighborhood characteristics are not the primary drivers of total donations, which refutes the hypothesis that civic crowdfunding will exacerbate inequality due to larger private funding in wealthier areas. Since the projects are not randomly assigned to neighborhoods the estimates provide general associations and should not be interpreted as causal parameters.

[5] Regressions with project categories are not shown to conserve space and are available upon request.

Table 2: The Effect of Project Characteristics on Total Donations

	Model 1	Model 2	Model 3	Model 4
(Intercept)	810.09***	907.35***	610.04	23.97
	(243.05)	(212.51)	(815.28)	(1030.33)
Budget Size	0.42***	0.42***	0.41***	0.41***
	(0.02)	(0.02)	(0.02)	(0.02)
Avg. Distance	0.62		0.67	0.63
	(0.49)		(0.51)	(0.52)
Median Distance		0.58		
		(0.48)		
Median Income			2.92	1.69
			(7.08)	(7.30)
% Non-White			17.49	24.13
			(81.88)	(82.63)
% Active Transportation			-68.84	-74.08*
			(37.11)	(37.67)
% College Educated			144.39	151.37
			(202.81)	(204.20)
% Gov. Assistance			-31.56	-48.48
			(400.36)	(402.69)
Vacancy Rate			113.72	135.00
			(180.47)	(182.86)
Avg. Income of Donors				8.72
				(9.57)
R-squared	0.4	0.4	0.4	0.4
N	589	589	572	568

Notes: Budget size is measured in dollars, Avg. and Median Distance are measured in miles, Median income is measured in thousands of dollars, the percentage variables are in units of 10%, and the average income of donors is measured in thousands of dollars.

5.2 Project-level Cluster Analysis

As an extension to the regression models we also perform cluster analysis to group projects together. Cluster analysis is an unsupervised learning algorithm that iteratively groups observations together that are most similar. We use the partitioning around medioids (PAM) approach (Kaufman and Rousseeuw 1990), which is a more robust method of k-means clustering. PAM requires a user-defined number of clusters and we select the number of clusters using optimum average silhouette width criteria. In our setting the optimal number of clusters is two. The clusters are formed using standardized project neighborhood demographics; campaign characteristics are not used to generate the clusters. We then examine if clusters with different demographics vary in their project characteristics such as the total funding raised and the distance of donors. In this sense the demographics are our "input variables" and project characteristics are our "output variables".

Table 3 shows summary statistics for the demographics used to define the clusters (in italics) as well as the project characteristics for each of the clusters. Cluster 1 can roughly be defined as the "high socioeconomic status (SES) cluster" and Cluster 2 is the "low SES cluster". The projects in Cluster 1 have a higher average funding level of over $3,700 as compared to $2,800 for Cluster 2, and this difference is statistically significant at the 10% level (p=0.07). Projects in Cluster 1 also generate more donations and attract donors from further away, however, only the difference in median distance is statistically significant at conventional levels.

Upon further analysis, some of the differences in the clusters are primarily due to very large atypical projects. When comparing the projects across clusters after excluding projects that brought in over $20,000 in donations (only 2% of all projects), many of the differences disappear. After removing the large-budget projects the average project size is $2,700 in Cluster 1 and $2,400 in Cluster 2 - a difference that is not statistically significant (p=0.26). The number of donors are also relatively similar across clusters. The one feature of the projects themselves that is maintained after removing outliers is that projects in the low-income cluster are generated from donors who live closer to the project.

Table 3: Summary Statistics of Project Clusters

Project Cluster 1 (High SES)					
	Observations	Mean	Median	Std. Dev	SE
Median Income	294	74512	68986	37806	2205
% Non-White	294	0.26	0.23	0.18	0.01
% Degree	294	0.54	0.54	0.2	0.012
Vacancy Rate	294	0.11	0.091	0.099	0.0058
Total Donations	294	3705	1392	6678	389
# of Donors	294	28	16	38	2.2
Mean Distance	294	293	145	431	25
Median Distance	294	159	5.1	471	27
Project Cluster 2 (Low SES)					
	Observations	Mean	Median	Std. Dev	SE
Median Income	290	31079	27991	13843	813
% Non-White	290	0.77	0.83	0.23	0.013
% Degree	290	0.17	0.16	0.11	0.0065
Vacancy Rate	290	0.17	0.14	0.12	0.0073
Total Donations	290	2775	1391	5558	326
# of Donors	290	24	14	36	2.1
Mean Distance	290	253	148	343	20
Median Distance	290	96	7.3	337	20

Notes: Clustering is performed on the demographic variables of project locations in italics (Median Income, % Non-White, % Degree, and Vacancy Rate). The clusters are then used to examine project-specific outcomes (Total Donations, # of Donors, Mean Distance, and Median Distance).

In order to help visualize the cluster analysis we plot the neighborhood characteristics for each cluster in Figure 2. There is a clear pattern in the demographics data of the two clusters. Panel (a) of Figure 2 shows that Cluster 1 has projects in wealthier and less diverse neighborhoods, while panel (b) shows that there is no clear pattern across clusters in terms of the number of donors and total revenue generated. This supports the finding that demographics of the neighborhoods do not dictate project funding levels.

Figure 2: Visualizing Project Clusters

6 Donor-Level Analysis

This section moves to analyzing individual donor decisions, where the donor is the unit of analysis, as opposed to an entire campaign. Incorporating data on individual donations represents one of the contributions relative to existing research on civic crowdfunding (Davies 2014; Davies 2015; Stiver et al. 2015). Since all projects must be funded by individual donors, learning about donor behavior is critical to understand the viability and expansion of civic crowdfunding. It should be noted that similar to the project data our demographic data on donors are based on census data, so we are actually describing the characteristics of the donors' neighborhoods as opposed to the donors themselves.

6.1 Determinants of the Size of Donations

We analyze the determinants of donations to campaigns as a function of both donor and project neighborhood demographics. Similar to the regression analysis of project characteristics the parameters should not be interpreted as causal estimates. We also include the distance of the donor to the project as a predictor of the size of donations. Table 4 fits several regression models where the size of the donation is the dependent variable and the independent variables are donor and project neighborhood demographics. The variables represent the marginal change in the size of the donation for a one unit change in the variable of interest. Projects with larger budgets attract slightly larger donations, but more individual donors to a given project decreases the average size of the donation. Donors who are further away from the project site contribute more on average; these may be people with a personal connection to the campaign and/or the campaign leader. Having a matching fund increases the size of the donation by approximately 30%, however we do not control for any selection effects with regards to the type of campaigns that have matching funds. Column (3) replaces the distance variables with dummy variables specifying whether the donor lives in the same zip code or state as the project. The results are similar to the Columns (1) and (2); donors contribute less to projects located within the same zip code and state, though the impact for zip codes is not significant. The neighborhood median income of the project location does not have an impact on the size of the donation, but donors from wealthier neighborhoods donate more.

Table 4: The Effect of Donor Characteristics on the Size of Donations

	Model 1	Model 2	Model 3	Model 4
(Intercept)	70.57***	64.04***	81.67***	46.35***
	(3.36)	(3.40)	(5.26)	(6.75)
Budget Size	0.27***	0.26***	0.26***	0.26***
	(0.02)	(0.02)	(0.02)	(0.02)
# of Donors	-0.32***	-0.30***	-0.30***	-0.31***
	(0.04)	(0.04)	(0.04)	(0.04)
Distance	0.01	0.01*		0.01*
	(0.00)	(0.00)		(0.00)
Fund		0.34***	0.34***	0.29***
		(0.03)	(0.03)	(0.03)
Same State			-24.78***	
			(5.77)	
Same Zip			-8.28	
			(7.76)	
Project Median Income				0.03
				(0.08)
Donor Median Income				0.22***
				(0.06)
R-squared	0.0	0.0	0.0	0.0
N	13696	13696	13710	13276

Notes: The dependent variable is the size of the donation. Budget size is measured in dollars, Distance are measured in miles, Fund is a dummy for a matching fund, Same State and Same Zip are dummy variables. The median income of project and donor neighborhood is measured in thousands of dollars.

6.2 Donor-level Cluster Analysis

Similar to the project cluster analysis, we perform a cluster analysis using PAM for the donor data. In this specification, we cluster solely on the neighborhood demographics of the donors; the optimal number of clusters for the donor data is also two. Once we have clustered donors based on their neighborhood demographics we analyze if the clusters differ in terms of the average donation, distance from the project, and neighborhood demographics of projects that they fund. Table 5 shows the summary statistics of the two donor clusters, which, similar to the project clusters, can also be broadly defined by socioeconomic status of both donors and projects. Cluster 1 is the "low SES" cluster and Cluster 2 is the "high SES" cluster. Relative to Cluster 1, donors in Cluster 2 come from wealthier, less diverse, and more educated neighborhoods. Not surprisingly, the donors in the high SES cluster (Cluster 2) average larger contributions. Consistent with the previous results, the donors in the high SES cluster donate to projects that are further away on average, although the median distance is quite similar.

Importantly, the donors in the two clusters don't systematically donate to projects in different types of neighborhoods. The average neighborhood median income for a project funded by Cluster 1 donors is $49,000 compared to $56,000 by Cluster 2 donors.[6] The results are similar for other demographics of the project neighborhoods. This is a promising development because donors from both wealthy and less affluent areas donate to projects in similar types of neighborhoods.

Table 5: Summary Statistics of Donor Clusters

Donor Cluster 1

	Observations	Mean	Median	Std. Dev	SE
Donor Median Income	5738	43915	42364	17353	229
Donor % Non-White	5738	0.51	0.5	0.29	0.0039
Donor % Degree	5738	0.29	0.28	0.15	0.0019
Donor Vacancy Rate	5738	0.15	0.12	0.13	0.0017
Donations	5738	71	25	196	2.6
Distance	5738	331	7.7	661	8.7
Project Median Income	5738	49357	41313	29986	396
Project % Non-White	5738	0.52	0.49	0.32	0.0042
Project % Degree	5738	0.34	0.25	0.22	0.0029
Project Vacancy Rate	5738	0.15	0.12	0.12	0.0016

Donor Cluster 2

	Observations	Mean	Median	Std. Dev	SE
Donor Median Income	9193	91979	84219	39048	407
Donor % Non-White	9193	0.18	0.15	0.14	0.0014
Donor % Degree	9193	0.62	0.64	0.17	0.0017
Donor Vacancy Rate	9193	0.081	0.064	0.08	0.00084
Donations	9193	93	40	364	3.8
Distance	9193	371	9	730	7.6
Project Median Income	9193	55576	46797	33643	351
Project % Non-White	9193	0.46	0.41	0.31	0.0032
Project % Degree	9193	0.38	0.34	0.23	0.0024
Project Vacancy Rate	9193	0.14	0.11	0.11	0.0012

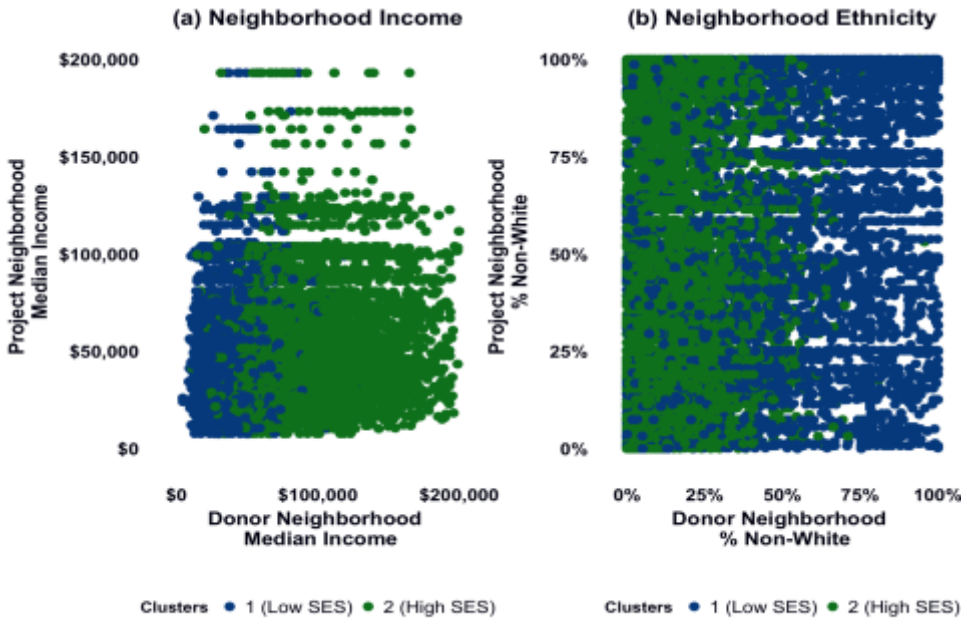
Notes: Clustering is performed on the demographic variables of donor locations in italics (Donor Median Income, Donor % Non-White, Donor % Degree, and Donor Vacancy Rate). The clusters are then used to examine project-specific outcomes (Donations and Distance) and project neighborhood demographics (Project Median Income, Project % Non-White, Project % Degree, and Project Vacancy Rate).

To help visualize the differences in the donor clusters we plot project and donor characteristics by cluster. Panel (a) of Figure 3 shows the donor and project median income by cluster and panel (b) shows donor and project racial composition. If the donors in wealthy areas only donated to projects in wealthy areas we would expect Cluster 2 (green) to be concentrated in the top right corner and Cluster 1 (blue) to be concentrated in the bottom left corner. Both graphs show that clusters are more concentrated horizontally (by

[6] The average median income of the projects in the donor sample is $53,000.

donor) compared to vertically (by project). Thus, the donors are from quite different neighborhoods but they contribute to projects in relatively similar neighborhoods, as evidenced by the vertical mix of the two clusters.

Figure 3: Visualizing Donor Clusters



7 Distance from Donors to Projects

In the previous sections, we summarized average and median distances as well as used distance as a determinant of project funding and donor behavior. In this section, we analyze distance in more detail and describe why distance is a particularly important characteristic in civic crowdfunding. We plot a histogram to show the full distribution of distances between donors and projects. Figure 4 restricts the distances to 3000 miles, which represent over 99% of all donations. The graph shows show that by far most donors live very close to the projects, and that there is small, but relatively consistent, support from about 50 to 3000 miles. Based on anecdotal and preliminary survey evidence, donors that contribute far from the project site are often from the primary and secondary social networks of the campaign leaders. Therefore, donors who are far away geographically may be quite close from the perspective of the project's social network.

Figure 4: Distance of Donors to Projects

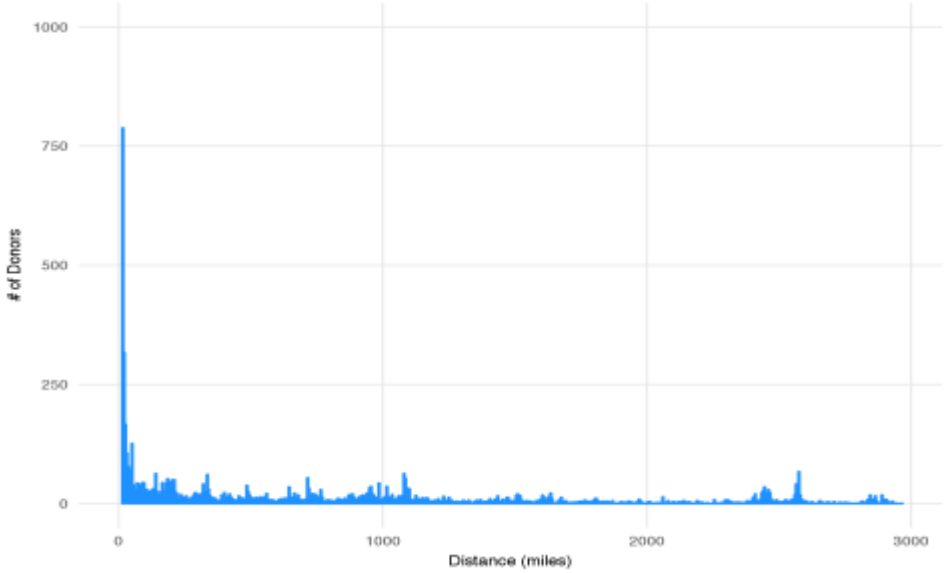
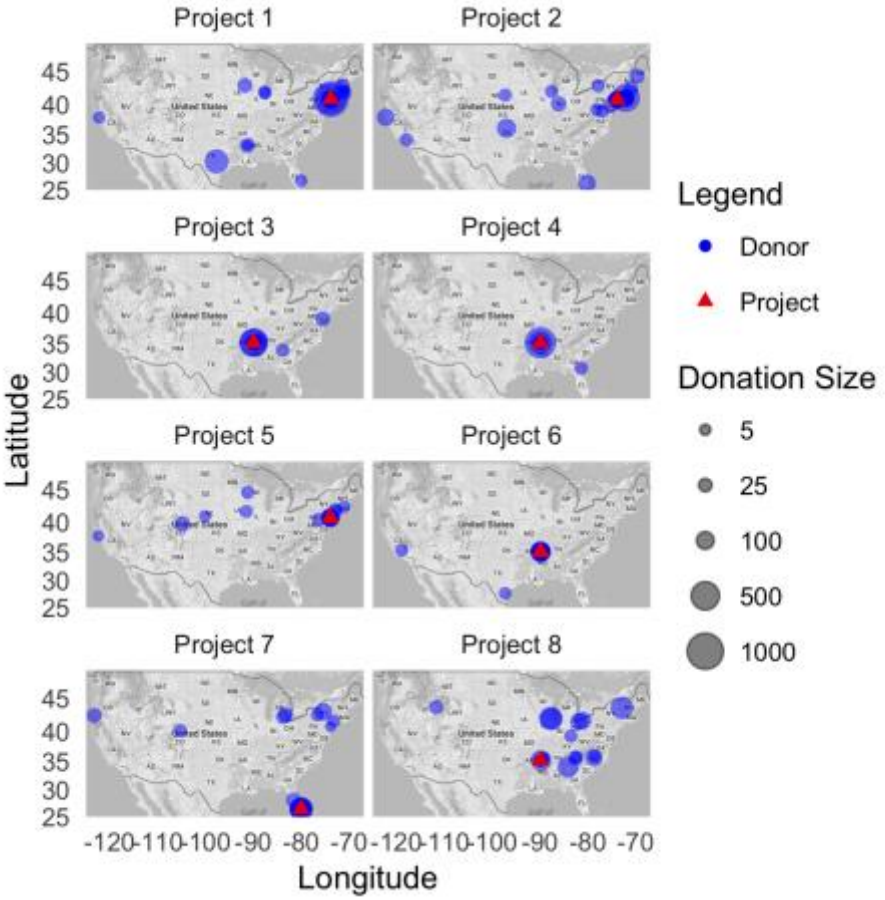


Figure 5 maps the spatial distribution of donors for several representative projects with the red triangle representing the project location and the blue circles are the location of donors. The size of the circle is scaled by the monetary value of the donation so the maps show both the quantity and intensity of donations across space. We define representative projects as having budgets within $75 of the average project budget and having at least 10 unique donors. The key takeaway from the map is the substantial heterogeneity with respect to the spatial distribution of donors. Projects 3, 4, and 6 primarily elicit donations from very local donors, whereas the rest of the projects raise funds from across the country. Identifying who is willing to contribute is important when considering policies that expand the role of civic crowdfunding. For example, if donations are used to communicate public support for a certain type of project that will determine how the local government allocates funding, how should officials treat donations from outside their jurisdiction? Are donations outside the city or state representative of the preferences for the local community? There is not an obvious answer, but having a clear understanding of the spatial distribution of donors is important for extrapolating the lessons of civic crowdfunding.

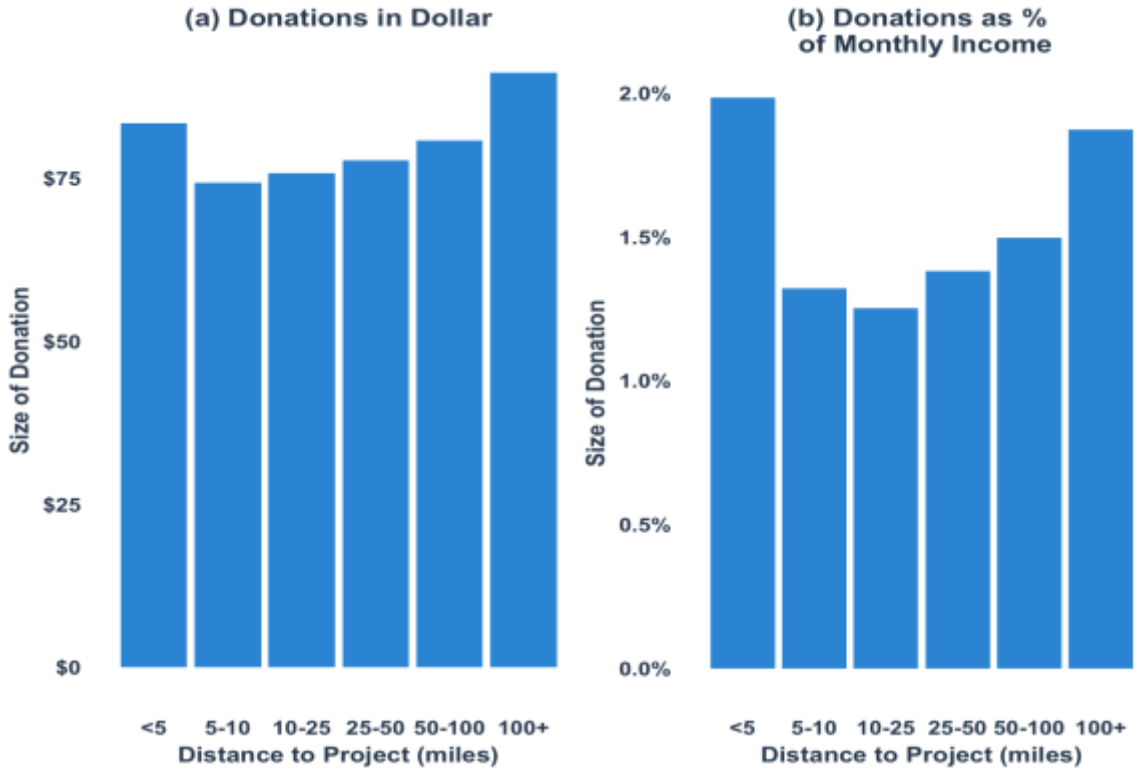
Figure 5: Mapping Representative Projects



Lastly, we relate the distance of the donors to the size of donations. We examine donations both in dollar terms and as a percentage of monthly median income. Panel (a) of Figure 6 shows the average donation size in dollars for different distance bins. The closest donors ($<$ 5 miles) give roughly \$83 dollars and this drops down to \$74 for donors between 5-10 miles from the project. The average donation then gradually increases as the distance from the projects increases. Donors who live more than 100 miles from the project average over \$90 per donation, which is more than the hyper-local donors give. This pattern is even more pronounced when considering donations as a percentage of neighborhood income, as seen in Panel (b) of Figure 6. Donations are highest for donors very close to the project, and then gradually increase with distance. One difference between panel (a) and panel (b) is that hyper-local donors actually give the most as a percentage of their neighborhood income whereas distant donors give more in absolute terms. This is likely due to the fact that on average the median household income of donor neighborhoods is greater than project

neighborhoods. One potential explanation for the pattern of donations by distance is that both very local and very distant donors have the strongest preferences for a project. The local donors are those who will likely benefit of the project, whereas a distant donor may strongly believe in the mission of the project or have a personal connection to the project community or leader.

Figure 6: Donation Size by Distance to Project



8 Conclusions

There are several interesting conclusions from the analysis. The characteristics of the project neighborhood are not strong drivers of total donations. Through graphical analysis, multivariate regression, and cluster analysis we find that features of the neighborhood where projects take place, such as median income and the racial composition, do *not* systematically affect the ability to raise capital for those projects. This addresses an important concern that civic crowdfunding might exacerbate inequalities in public amenities by predominantly funding projects in wealthy areas. Rather, we find that both poor and affluent neighborhoods are able to successfully fund projects, and the only impact of income on funding success comes from very large atypical projects.

Donor characteristics do have an impact on the size of donations. Donors from wealthy neighborhoods contribute more on average, but less as a proportion of their income. Cluster analysis grouping donors based on their neighborhood demographics shows two very different groups of donors. However, donors from both the high and low SES clusters fund projects in both high and low SES neighborhoods.

Distance plays an important role in donations. While the average distance between donor and project is over 300 miles, the median distance is roughly 8 miles. There is a nonlinear effect of distance on donation size. Very local donors give more on average, then the average donation size quickly falls, and at further distances the donations size gradually increases. This is most pronounced when considering donations as a percentage of household income. There is also substantial heterogeneity in the spatial distribution of donors across projects. Some projects are hyper local with almost all donations coming very close to the project site, whereas other projects attract donors from all over the United States and internationally as well. It is important to consider who is donating to the projects when using data from crowdfunding campaigns to inform broader investments in neighborhood amenities.

There are several important caveats to consider when interpreting the results of this research. All the results need to be interpreted in the context of analyzing data from only one civic crowdfunding platform. Additionally, ioby specifically works to address inequalities in disadvantaged communities, so some of the results regarding the equity implications of civic crowdfunding are to be expected. However, it is important to display that civic crowdfunding can be used as an effective tool to tackle social inequality. Lastly, the analysis does not represent a causal relationship between demographic characteristics and projects outcome.

The analysis provides an initial empirical assessment of some important features of civic crowdfunding. However, there are many interesting and worthwhile avenues to pursue. The fact that donors very close to the project give the most as a proportion of neighborhood income suggests that communities rally around the crowdfunding campaigns. While we analyze geographic distance, it is also important to consider the donors' social networks to account for donors that live far away from the project site but have strong ties to the projects' community and/or campaign leader. A long-term assessment of neighborhood

outcomes such as economic development, health and crime can determine both the impact of the projects and spillover effects surrounding increased social capital. Civic crowdfunding also has the potential for a nonmarket valuation tool to help guide public funding. Observing how citizens donate to campaigns reveals information on the preferences for various types of community projects. There are also several insights into charitable giving from civic crowdfunding. For example, exploring the relative merits of seed vs. matching funds or the effect of the cumulative donations or number of unique donors has important implications for the design of crowdfunding campaigns in conjunction with government or foundation funding. Lastly, the interaction of multiple campaigns is interesting in the context of a donor considering where to spend her money. All of these are worthy avenues of research that can build on the findings of this study and can help expand the role of civic crowdfunding in local community development policy.

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