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Pet Ownership Ties as Indicators for Giving Behavior

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ABSTRACT

Social ties play an important role in driving philanthropic behavior. However, there is scant research on how pet ownership may be an indicator of giving behavior. Leveraging a database of 787,877,198 donation transactions to charities over 10 years, how pet ownership impacts the amount, frequency, and diversity of donations to charities and nonprofits was investigated. It was found that non-pet owners donate the most, but pet owners donate the most frequently. Cat owners donate more than dog owners and they donate the most diversely. Of the variables studied, a CatBoost regression revealed that pet ownership was the fourth most important factor, after income, education, and gender. Interestingly, politically, pet owners were more likely to be independents, whereas non-pet owners were more likely to be non-partisans. This study offers insight into how pet ownership can serve as a complex indicator for personality and engages with the larger literature around social ties, tie strength, and social information in philanthropy.

KEYWORDS

Charitable giving; gradient-boosting trees; human–animal interaction; pet ownership; relatedness; social ties

Are you a dog person or a cat person? Despite the popularity of this question, limited research has explored the behavioral differences of pet ownership. Surveys on psychological traits largely affirm the stereotypes: "dog people" are more social, energetic, outgoing, and rule-following, while "cat people" are more neurotic, introverted, sensitive, and non-conformist (Applebaum et al., 2020; Gosling et al., 2010; Guastello et al., 2017; Herzog, 2020). Cat people are also more open, meaning they are creative and willing to engage with new ideas. In US political demographics, people in red (Republican) states have more dogs, while those in blue (Democrat) states keep more cats (Ivanski et al., 2021), and prior studies show that dog owners have higher incomes (Saunders et al., 2017). Crucially, pets are considered members of the household and they help cultivate social environments, which in turn may affect our behavior.

Social environments play a significant role in philanthropy. Of the eight common mechanisms that drive charitable giving, four are directly related to a person's social environment: altruism, reputation, psychological benefit, and values (Bekkers & Wiepking, 2011). As such, research efforts also target upstream factors that lead to the activation of these mechanisms, such as social ties and social information, or cues from other people's

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behavior. However, while social ties and social information are similar, there are a few crucial differences.

A recent systematic review on social information produced mixed results, with some studies reporting no or even negative effects (Van Teunenbroek et al., 2020). To help explain these discrepancies, the authors of the review present three moderators: the source, the amount, and immediate context. In these studies, social ties are characterized as the source. For instance, Wilhelm et al. (2008) showed that generosity flowed through parental ties, particularly with religious giving. This was validated by Herzog and Yang (2018), who also found no effect from friendship and spousal ties. Membership ties also moderate giving behavior and asymmetrically affect women and men in philanthropic societies (Qu & Steinberg, 2017).

While social information is important, what is less explored is the value of ties themselves. Social ties can be seen as part of an individual's social environment, where the removal of a tie (e.g., spousal ties for widows) can influence giving (McGranahan, 2009), which underpins the theory of structural holes (Burt, 2007). We thus delineate two ways ties appear in charitable giving: first, as conduits for information, or moderators for mechanisms that generate charitable giving; second, as complex indicators for underlying proclivities, such as personality, wellbeing, or values, the same way gender can serve as a proxy (Einolf, 2011). In practice, it is often unclear whether to treat ties as a condition for information or features of an individual's environment. Pet ownership is a rare social tie where the latter is far more likely: pets do not ask their owners to donate, nor donate themselves, and provide cues for their owners. Moreover, it engages with the ongoing debate: the differences between dog owners and cat owners.

The question about dog people versus cat people is popular because pet ownership may be a sensitive indicator for personality and the psychological need of relatedness – the desire to feel connected to others and meaningfully involved (Ryan & Deci, 2017). There is also mixed evidence that pet ownership is associated with higher levels of well-being and satisfaction (Bao & Schreer, 2016; Parslow & Jorm, 2003; Scoresby et al., 2021; Wells et al., 2022). As "man's best friend," pets occupy the same domestic space and share social ties (Charles & Davies, 2008). Pets are members of a household and exhibit social behaviors like that of kin and friends (Banks & Tanner, 1999). In comparing donation willingness between kin, friends, and strangers, Oda et al. (2014) show that willingness to donate across each social tie depends on a certain trait: conscientiousness means altruism to kin, agreeableness to friends, and openness to strangers.

A natural question then arises: can these differences in personality and pet preferences toward certain ties have downstream implications on charitable giving? Leveraging a database of 62,763,634 donors and 787,877,198 donation transactions over a decade in the United States, we investigated the level of giving centered on pet ownership. Our research questions were:

1. Do cat owners or dog owners donate more?
2. How does pet ownership status influence the frequency of giving?
3. What type of pet owner is the most diverse in charitable giving?

The first question involves two dueling hypotheses. As donations are given to indirect recipients, people with higher openness would make more donations. In other words, cat people donate more. However, since higher income positively correlates with the amount donated (Havens et al., 2006), we may also expect dog owners to donate more given their higher household income and sociality.

The second research question addresses a common typology in categorizing givers: planners, habitual, selective, and impulsive (Herzog & Price, 2016). While not a perfect proxy for regularity, frequency over a 10-year period can reveal important trends toward giving.

Lastly, we investigated whether there are differences in the breadth of donations by pet ownership. In lieu of greater openness observed in cat people, we expected a greater level of diversity.

Methods

This study received exemption status from the Dartmouth Committee for the Protection of Human Subjects (STUDY00033213).

Data

Records for donations were obtained from a database maintained by a nonprofit marketing company that specializes in nonprofit fund-raising, donor acquisition, and marketing. Records spanned more than 30 years and hundreds of individual nonprofits. Data were accessed using Snowflake, a cloud-computing data management service. The database consisted of 62,763,634 donors, 787,877,198 transactions, and $69,735,444,096.73 in donations between January 1 2013 and December 31 2022, covering one decade. All transactions occurred within the United States. Donors for nonprofits were primarily acquired through various acquisition mailings or online outreach. Depending on the campaign, once donors are acquired, subsequent campaigns would seek to move them to regular giving levels. Donation incidents include donor donations to multiple nonprofits over the years and the donors' demographic information, including pet ownership. Donors undergo a one-way hash to preserve anonymity.

Nonprofits that exist in the dataset include health and diseases, military, wildlife, religious, racial and ethnic, sports, gender identity, and political groups, for a total of 33 subgroups. Animal welfare is one of these sub-groups, but it represents a small portion of the total donations.

Hypothesis Testing and Aggregation

Due to the amount of data, the analysis consisted of a cross-sectional analysis of variables, including pet ownership status and demographic variables, such as age, number of children, education, income, and gender. To visualize the cumulative distribution of donors by pet ownership category, we took the log of the total donated per donor due to the log-normal distribution of overall donations. We then rounded this number to two digits to generate discretized quantiles. These values are summarized in Table 1.

Table 1. Summary statistics for variables used in the regression analysis.

	Mean	*SD*	Min	Max	Skew	Kurtosis
Total donated	2,368.70	120,968.85	0.12	211,936,900.00	973.98	1,330,762.00
*Clipped [20, 100k]	1,716.43	3,957.97	20.04	99,989.00	9.99	150.17
Donation frequency	44.43	56.92	11.00	9,372.00	8.60	321.16
Total donated (log)	2.90	0.51	−0.92	8.33	0.46	0.93
Donation frequency (log)	1.48	0.35	1.04	3.97	0.82	0.15
Age	72.27	14.72	18.00	99.00	−0.66	0.36
Education	1.64	0.96	0.00	4.00	0.05	−0.87
Income	6.07	2.30	0.00	9.00	−0.50	−0.57

Note: Bold indicates inclusion in the regression model.

Table 2. Bivariate correlations in the regression model.

Variable 1	Variable 2	Correlation
Age	Education	0.035
Age	Income	−0.14
Education	Income	0.17

The first thing done was to clip the range of total donations to between $20 and $100,000, which retained 99.8% of all donors. This improved model convergence by removing outliers, although the full range of values were also included as robustness checks. Both the skewness and the kurtosis indicated the distributions were suitably normal for our regression.

Our independent variable of choice, "Pet Ownership," included No Pets (39%), Both Cats and Dogs (34%), Dogs Only (18%), and Cats Only (9%). The "Race" category consisted of White (85%), Hispanic (7%), Black (5%), and Asian (3%). The "Partisanship" category included Democrats (40%), Republicans (28%), Non-partisans (10%), Independent (10%), and Unknown (12%). Marital status consisted of Married (65%) and Single (35%). The bivariate correlations of continuous and ordinal variables are included in Table 2, all of which are sufficiently non-collinear.

Gradient-Boosting Regression and Shapley Explainers

As demonstrated by Van Teunenbroek et al. (2020), the way social information or features influence charitable giving behavior depends on a wide range of factors, possibly due to nonlinear interactions between variables. Advances in machine learning, especially tree-based regression methods such as random forest, XGBoost, and LightGBM are particularly apt for capturing these nonlinearities and achieving higher accuracies than canonical statistics (Chen & Guestrin, 2016; Ke et al., 2017).

In this study, CatBoost was used, which is known to be well suited for regressing with categorical variables through combinations of them (Prokhorenkova et al., 2018). To train our CatBoost model, we sampled 280,000 for each log-bracket for a total of 1,120,000 samples. We then included a 75–25 train-test split, where the model was trained on 75% of the data and then validated on a 25% random sample. The learning rate was set to 0.01 with a total of 1,500 epochs, with the tree depth set to 12. This yielded a root mean square error of 0.83 and R2 of 0.18. While this coefficient may seem low, note that most of our variables are ordinal or categorical, and all the variables are statistically significant with a 99.7% confidence interval.

While machine learning techniques yield higher accuracies than canonical statistics, their "black box" nature has limited their interpretability to social scientific research. In recent years, SHAP (SHapley Additive exPlanations) Explainers have become a useful tool for computing feature importance. Based on Shapley Values in game theory, the idea is to calculate the utility contributions of each player to a coalition based on different power sets of players (Hart, 1987). Instead of players, SHAP evaluates power sets of features and their contribution to minimizing error in the model (Lundberg & Lee, 2017).

Measuring Diversity

Donors can choose to donate to multiple sources. To quantify this at the individual level, we relied on the Shannon entropy measure, first developed in the biological sciences (Magurran, 1988) but now more commonly used in human behavioral science (Chang et al., 2025; Chetty et al., 2022; Gallagher, 2017). Entropy is the sum of the log-proportions of all locations. This is given in Equation (1):

$$H(x) = \sum -p(x) \log p(x) \tag{1}$$

where each *p(x)* denotes the proportion an individual donates to a single nonprofit or charity *x*. Since *p(x)* represents a proportion, the sum of all *p(x)* is 1, the normalized contribution of an individual. We computed entropy for donations to different sources and also the frequency to different sources as a robustness check.

We then measured the distance between the cumulative distribution of diversity using the Wasserstein metric, colloquially known as Earth Mover's Distance (EMD). EMD measures the aggregate distance between two cumulative probability densities (CDF); the one-dimensional case can be expressed using the integral in Equation (2):

$$EMD(u, v) = \int |U - V| \tag{2}$$

We approximated this by rounding the entropy measures to two decimal places, using the rounded values as bins and the CDF as the cumulative relative frequency. This combination of diversity and EMD has been used to study the diversity of consumption in other large databases, such as social media (Chang et al., 2025). A distribution is drawn for each pet ownership status.

Limitations of the Data

There are two weaknesses of the dataset. The first is this select into people who are already donors. For instance, a sizable portion of non-pet owners could not donate at all, while the ones that did, donated significantly. As such, the results should be interpreted with this selection in mind. The second issue is that these demographics were collected at the beginning of data ingestion but not updated. A possible follow up would be a more rigorous causal investigation of adding a cat or a dog to a person's donation trends.

Results

Non-Pet Owners Give More but Less Frequently

Figure 1 shows the overall donation trends across the four pet ownership groups. Due to the significant size of the database, we draw direct aggregate summaries. Figure 1(a) shows that non-pet owners donated the most, on average more than $1,000 total over the past 10 years. Cat owners donated more than dog owners, whereas owners of both pets donated the least.

While non-pet owners donated the most, Figure 1(b) shows that pet owners tended to donate more frequently. Cat owners donated more than 14 times compared with non-pet owners, who donated around 11 times over the 10-year period. Given cat owners in the dataset also tended to be female, this may agree with known tendencies in survey research (De Wit & Bekkers, 2016). If we are to treat frequency as a proxy for habitual donations, then cat owners appear to be more closely aligned with habitual donors. However, further study should be done to investigate the regularity and diversity of these donations.

Figure 2 shows more directly the regression on total amount donated. Figure 2(a) shows the SHAP values for each of the features from a sample of 5,000 data points, with features listed in importance top to bottom. A positive SHAP value indicates a positive increase for the amount donated. Each point represents the feature of one sample. Red indicates a high feature value and blue a low feature value. There is a clear positive relationship between income and amount donated. Gender also predicts donated amount, with men (encoded as 0 hence blue) donating more. Note the regression was performed on absolute dollars donated, rather than dollars to income and time (McGranahan, 2007).

Education is the third most important feature. Interestingly, the red at both ends indicate higher education may predict both positive and negative impact on the amount given. Pet status is fourth in feature importance, over age, partisanship, and marital status. Categorical variables are grayed out as they are not ordinal, and apart from pet status have limited impact on the model.

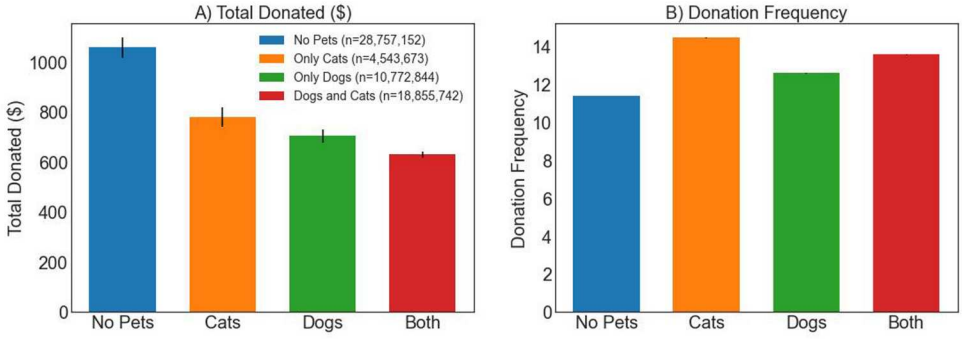

Figure 1. Total donations (a) and frequency of donations (b) across pet ownership categories. The black line indicates the confidence intervals; all results are statistically significant at a 99.7% confidence.

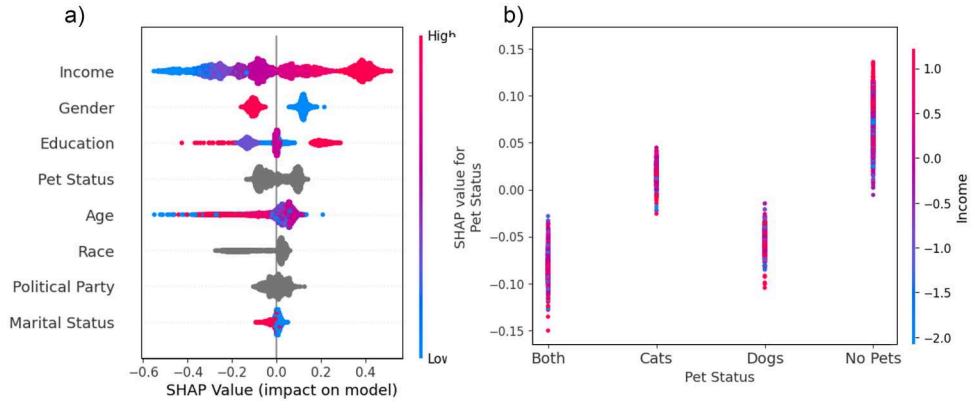

Figure 2. SHAP (SHapley Additive exPlanations) values for features of the CatBoost model regressing on total dollars donated. Each point denotes a donor. (a) shows the Beeswarm plot of each feature and its SHAP value, where red indicates a high feature value and blue a low value. For gender, 0 encodes men and 1 encodes women. (b) shows the interaction between pet status and income on SHAP values.

Figure 2(b) shows the interaction of pet ownership with income. The *x*-axis shows pet ownership status and the *y*-axis the impact on the model, where an SHAP value of greater than 0 indicates a positive increase in donated amount. The colors represent income, our interaction variable. As expected from the results of Figure 1, non-pet owners have the highest average increase on donations, followed by cat owners. Owners of both pets have the lowest and a negative contribution to donation predictions. Together, these figures answer research questions 1 and 2.

Cat Owners Donate the Most Diversely

Figure 3(a) shows the cumulative densities for donation diversity based on pet ownership status. The starting point for all CDFs indicate that for all groups more than 50% of all donors donated to just one nonprofit or charity, as an entropy of 0 indicates donation to just one target. In particular, around 63% of non-pet owners donated to just one entity, whereas 52% of cat owners donated to just one. In general, a lower curve indicates more diversity, as a greater proportion of that group donated to more diverse sources. We find cat owners donated the most diversely, whereas non-pet owners donated the least diversely. This indicates non-pet owners relative to others are potentially more selective, based on Herzog and Price's typology (2016).

Certain values of entropy frequently occur. For instance, an entropy of 1.0 indicates donating to two charities or nonprofits with an equal amount of dollars. Breaks in these distributions can be important to understanding the quanta for which people donate at. The EMD for no pets to dog owners is 6.9%, from dog owners to both is 9.8%, and both to cat owners is 12.7%. These are all significant differences in the distribution.

Lastly, Figure 3(b) shows most donors lean Democrat, followed by Republican. In line with previous surveys, cat owners lean Democrat whereas dog owners have a higher percentage of Republicans. However, the most interesting difference exists between pet

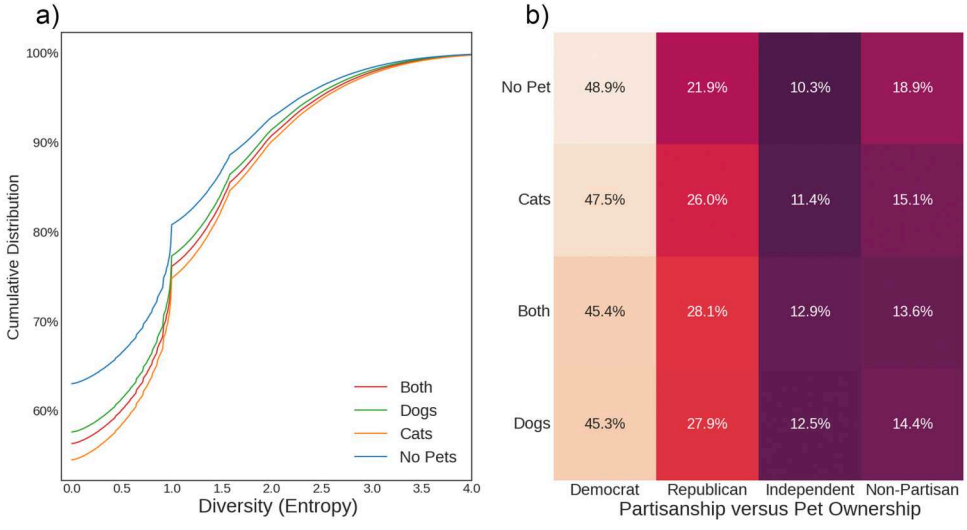

Figure 3. Comparisons across pet ownership. (a) shows the cumulative distribution for donation diversity, with cat owners the most diverse in donation targets and non-pet owners the least. (b) shows pet ownership against partisanship.

owners and non-pet owners. Non-pet owners boast the highest level of non-partisans (and lowest independents). This is flipped for both pet owners, who have the highest level of independents and lowest number of non-partisans.

While the terms independent and non-partisan may feel interchangeable, there is a crucial difference (Miller & Wattenberg, 1983). Independents are often politically engaged and usually lean a certain way. They can even be members of a party, may vote in their party's primaries, but may vote across party lines during presidential elections. Non-partisans, however, are characterized by similarly not being formally part of any party, non-preferentiality, and often being apolitical. Thus if party membership or civic engagement indicates a predilection for social relatedness, then this confirms pet owners have a stronger psychological need for social ties, need for belonging, and party loyalty (Feinberg & Willer, 2019).

Discussion and Conclusion

In this study, we investigated the role of pet ownership on charitable giving over the period of 2013–2022. The results reveal significant behavioral differences across pet ownership categories. Leveraging a decade-long dataset of over 787 million donation transactions, we observed that pet ownership serves as an indicator for giving patterns, influencing donation frequency, amount, and diversity.

First, in regard to pet ownership and giving patterns, our findings demonstrate that non-pet owners donate the highest amounts on average, while cat owners exhibit the greatest donation frequency and diversity. These trends align with established personality traits associated with pet ownership. Cat owners, characterized by higher openness, may be more willing to engage with diverse donation opportunities, reflecting creativity and

acceptance of novel ideas. Notably, these results run somewhat contrary to findings specific to animal protection groups, where dog owners tend to donate more. In conjunction with our findings, this suggests that cat owners diversify significantly to non-animal-related nonprofits relative to dog owners (Rowan, 2024). Conversely, non-pet owners, who donated less frequently but more selectively, appear to embody a more targeted approach to philanthropy (Herzog & Price, 2016). These findings echo prior research on donor typologies, where habitual donors prioritize regular contributions, while selective donors focus their efforts on fewer causes. In other words, we find some evidence of alignment of donor typology and pet ownership.

Unlike traditional social ties that provide direct cues or influence (e.g., friends or family members), pet ownership functions as an indicator of intrinsic personality traits and social needs. This distinction underscores the potential for pet ownership to serve as a proxy for understanding underlying motivations and behaviors in charitable giving. The existence of the ties themselves can be indicators of divergences in personality, habit, and approach to philanthropy. More research can treat ties as tangible elements that drive behavior, rather than just a condition of communication.

Pet ownership also appears to be linked to political and social orientations. Ownership of both pets is associated with independents; non-pet ownership is associated with non-partisans. As independents and non-partisans diverge by party membership, this is likely a mutual trend of a greater psychological need for relatedness. Indeed, Republicans have the greatest number of dogs. We posit this is likely related to population density in red states (Rowan, 2024) and possibly partisan values, which aligns with Republican emphasis on loyalty (Levendusky, 2009). Future research should consider survey experiments that measure the intersection of moral foundations and values (Haidt & Graham, 2013) with pet ownership and giving behavior. As mentioned in the methods, the subset of these data also contains selection bias for those who donate, which may skew results. For instance, the census finds 23% of households have cats and 40% have dogs (U.S. Census, 2022). This could possibly be explained by our period of analysis – reports of pet ownership over a 10-year period – but also possibly an overrepresentation of pet owners amongst donors.

This study has a few other limitations. The dataset primarily includes individuals who are already donors, potentially skewing results toward those with higher philanthropic tendencies. Additionally, demographic data were collected at the point of data ingestion and may not reflect changes over time. Future research could explore causal relationships by examining how the acquisition of a pet influences donation behavior. We also did not consider the influence of other pets. Future research could also consider specifically how human–animal relationships shape specific targets of philanthropy, specifically toward political, wildlife, and animal welfare. Additionally, ones that consider the modality of donations, such as direct mail fund-raising with gift, and therefore the expectation of reciprocity, could help us understand the context of these donations.

In sum, while previous work emphasizes the role of human relationships in driving charitable behavior, our findings suggest that nonhuman ties can similarly reflect giving patterns. By viewing pet ownership as both a social tie and an indicator of individual proclivities, we contribute to ongoing debates on the mechanisms underlying social information and altruistic behavior. Pragmatically for nonprofit organizations and

fundraisers, tailored strategies that account for pet ownership could improve retention. Campaigns targeting cat owners, for example, could emphasize regularity and smaller amounts.

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Data Availability Statement

Code use for replication will be made available upon publication.

Disclosure Statement

No potential conflict of interest was reported by the author.

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