Automatic Nutritional Stabilizers and the Role of Charitable Food Assistance during Times of Crisis

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Highlights

1. Food banks play a critical role in food assistance in normal and crisis operations
2. The COVID-19 pandemic temporarily increased in-kind food and monetary donations
3. During the pandemic, private donations increased more than government donations
4. Excess capacity in the charitable food system is important for refrigerated foods
5. The charitable food system can serve as an "automatic nutritional stabilizer"

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Abstract

We examine the role of charitable food assistance during periods of economic distress by looking at donations to a large Midwestern food bank. First, we explore the historical determinants of in-kind food and financial donations, including during the COVID-19 pandemic. We find that both in-kind and financial donations dramatically increased at the onset of the pandemic but these increases were not persistent. As a result, we argue that this is evidence of the charitable food system serving as an "automatic nutritional stabilizer" in accepting charitable donations on behalf of households in need during times of crisis.

Keywords

Food security; Food bank; Food pantry; Nutrition assistance; Food donations

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1 Introduction

Approximately 10.2% or 13.5 million US households were living with food insecurity in 2021 (Coleman-Jensen et al., 2022). Two complementary food systems have been created to meet the immediate needs of these households: the charitable food system (CFS) and the public food system (PFS).[1] Food banks play a critical role in ensuring the CFS is able to meet the needs of the food insecure. They collect, manage, and distribute donated bulk food products to food pantries, hot meal sites, and other direct-service providers that ultimately reach food insecure households (Bazerghi et al., 2016). While the PFS is orders of magnitude larger than the CFS, many households rely on the CFS to supplement their household's diet (Bhattarai et al. 2005; Daponte 2000).[2] For example, Feeding America estimates that over 53 million people turned to the CFS for food in 2021 and that its network distributed 5.2 billion meals to individuals facing food insecurity in fiscal year 2022 (Feeding America, 2022a). Food banks also play an important role in reducing food waste, which is especially important in times of economic crisis that increases both food insecurity and excess supply of food.[3]

Therefore, it is important to both donors and the food insecure that the CFS operate at a high level of efficiency and is responsive to the needs to its stakeholders. However, little is known about the capacity of food banks and pantries to respond to large exogenous shocks to food insecurity. We contribute to this literature by utilizing data from a large food bank in Indiana to provide descriptive evidence on an important question: how did the charitable food system respond to the pandemic-induced shock to food insecurity? Specifically, we explore the flow of donations into

[1] The CFS includes donors, food banks, food pantries, etc., while the PFS includes programs such as Supplemental Nutrition Assistance Program (SNAP), Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), the National School Lunch Program (NSLP), etc.

[2] The US Department of Agriculture (USDA) spent over $140 billion on SNAP in fiscal year 2022 and an estimated $153 billion in fiscal year 2023. For context, Feeding America, one of the largest food banking organizations in the country, had total revenue (including financial and in-kind donations) of approximately $4.5 billion in 2022. Some households solely rely on the CFS because they do not qualify for (or wish to avoid the stigma of) assistance from the PFS (Pinard et al., 2017).

[3] According to some estimates, the US food system wastes between 35 and 103 million tons of food annually (Bellemare et al., 2017) or 40% of the food it creates (Feeding America, 2022a).

the system, provide insights about the relative importance of both government and non-government donors, and comment on the extent to which the CFS acts as a kind of automatic nutritional stabilizer to food insecure households.

We rely on a Feeding America affiliated food bank in Indiana for our case study for a couple reasons. First, in 2023, Forbes named Feeding America the largest charity in the United States with $4.36 billion in revenue (Forbes, 2023). Second, we have access to all the food bank's in-kind and financial donations for the period 2013 - 2022. The service area of the food bank covers 23% of Indiana counties and 35% of the state's 6.8 million people. Additionally, the food bank accounted for 45.5% of total non-federal pounds of food distributed in Indiana in 2022. Third, Indiana is very close to the US averages for food security and missed meals among households in need, which is helpful for thinking about the generalization of our findings; 10.7% food insecurity rate (Coleman-Jensen et al., 2022) and $409 million budget shortfall (Feeding America, 2022c) in 2021. Finally, our data allow us to compare government and non-government donors as well as in-kind food and financial donations.

The questions posed above are addressed descriptively. In particular, we describe the trends in food bank donations over the sample period and present OLS estimates of the association between the COVID-19 pandemic and donations. We document four important findings. First, donations are positively related to food insecurity suggesting that the charitable food system has the capacity to play an automatic nutritional stabilizing role. Second, there has been a marked increase in the donation of food and agricultural products that require cold storage. This is an indicator that food donations have increased in nutritional quality over time. Third, we observe a noticeable difference in the timing of government and non-government donations to the CFS around the time of the pandemic shock. In particular, non-government donors increased their donations significantly over a very short time period followed by a sharp cutback on donations in subsequent periods. Government donations, on the other hand, increased more slowly and persisted a bit longer. Fourth, the donation response to the pandemic was not persistent. Donations increase significantly in 2020 before falling back to pre-pandemic levels over the next two years.

Our paper makes several important contributions. First, it reveals the magnitude and

highlights the importance of food banks in moving food from donors to the food insecure. Second, our findings suggests that while both government and non-government donors are important for the CFS, non-government donors played a relatively larger role in the food systems ability to respond to the pandemic shock. Importantly, we find that having excess capacity in the CFS, while appearing wasteful, is crucial for accommodating increased donations; this is especially true for refrigerated items. Third, the pandemic increased both the number of food-insecure households and the flow of food donations to the CFS, which allowed the CFS to quickly offset increased food insecurity through its normal operations without any significant changes to the system. This suggests the CFS has the capacity to operate as an "automatic nutritional stabilizer" in times of crisis similar to the PFS (Boushey et al., 2019; Caswell et al., 2013). Finally, we contribute to the very extensive literature on food insecurity and the charitable food system. We discuss our contribution to the literature in Section 2.

The paper is organized as follows. Section 2 provides a description of the literature and our contributions. We describe the data in Section 3 and include descriptive statistics in Section 4. We present an empirical framework in Section 5 and include the results of the empirical analysis. We conclude in Section 6 with policy implications and areas for future research.

2 Charitable Food System

US government agencies and charitable organizations have long provided a myriad of resources to food insecure households to alleviate food insecurity (Taylor et al., 2022). However, this section focuses on the charitable food system as an additional resource for households in need.

2.1 Food assistance

Food assistance system. The charitable food system is composed of a robust network of food banks, food pantries, hot-meal sites, after-school snack programs, and home-bound meal delivery services operated by non-profit organizations (see

Figure 1). Food banks are considered the "wholesale distributors" in the charitable food system because they solicit both in-kind and monetary donations to provide food at no-cost to food insecure households through direct-service organizations, such as food pantries, hot-meal sites, and shelters. As wholesale distributors, food banks often serve as food rescue, food storage, and food distribution centers for smaller direct food service providers (Feeding America 2022b; Ohls et al. 2002).

2.2 Charitable Donor Behavior.

Charitable organizations solicit contributions from three types of donors to operate their organizations and serve their clientele: firms, individuals and community organisations, and the government. In this section we briefly describe each type of donor and why they make in-kind food and monetary contributions to the CFS.

Non-Government In-Kind Donations. The CFS received in-kind donations from both firms and individuals. First, corporate food businesses provide in-kind food donations that typically arise as an alternative to the disposal of food waste (Gundersen and Ziliak, 2018; Ohls et al., 2002; Prendergast, 2017; Tarasuk and Eakin, 2005).[4] There is also evidence that corporate in-kind donations are a means of avoiding unprofitable promotions on fresh produce while simultaneously generating tax benefits from donations (Lowrey et al., 2020).

Second, individuals and community groups often source food donations from their own pantries or purchase food specifically to donate (Bennett et al., 2022). In studies of in-kind donations by private individuals and community organizations, researchers have found that there are three primary reasons for in-kind donations: 1) utilitarian value (e.g., cleaning one's pantry or closet), 2) hedonic value (e.g., avoiding guilt over unused items and waste), and 3) social responsibility value (Ha-Brookshire and Hodges 2009; Laitala 2014; Norum 2015). Furthermore, older individuals with higher levels of education, relatively higher incomes, who were previous volunteers, and who

[4]Corporate food businesses include farm operations, food retailers, food manufacturers, food processors, and food distributors. Food disposal generally occurs due to imperfection in sizing, coloring, and shape as well as overproduction or low prices for food products in the agricultural, processing, manufacturing, wholesale, and retail sectors of the food supply chain.

were approached more often to donate were more likely to be donors and, in certain cases, donate more (Bennett et al. 2022; Schlegelmilch et al. 1997; Verpy et al. 2003). These donors believed that donating food was "the right thing to do" to help with the social problem of food insecurity (Verpy et al., 2003).

Government in-kind donations. In-kind government donations include programs administered by the US Department of Agriculture (USDA), including the Emergency Food Assistance Program (TEFAP), the Commodity Supplemental Food Program (CSFP), the Food Distribution Program on Indian Reservations, etc. TEFAP provides states with in-kind food donations based on the state's unemployment and poverty rates (USDA FNS, 2020). State administrators often provide the TEFAP food donations to food banks that, in turn, distribute the food to direct-service providers. In fiscal year 2018, USDA spent $403.2 million on food commodities for TEFAP distributions, which included $64.4 million of spending appropriated to USDA Food & Nutrition Services (FNS) (USDA 2021; USDA FNS 2020). Donations via these federal programs also depend on international trade (dis)agreements such as the 2018 trade-war, which lead to a significant increase in donations via TEFAP.

Monetary donations. Food banks also require monetary donations to support their operations and warehousing activities (Bennett et al., 2022). Financial donations are important for three main reasons. First, financial donations are one way of addressing any excess demand for food in the CFS because it allows food banks to purchase food rather than rely solely on donated food. Second, financial donations give the CFS the flexibility over the kinds of food that are purchased; e.g., they can focus on nutrition rich food. Finally, the CFS needs financial resources for operational purposes. Both individuals and businesses donate financial resources (via donations and grants) to purchase foods that aren't often donated (e.g., culturally appropriate fresh produce, meat, and dairy) and to cover the operating expenses of distributing all foods (e.g., transportation costs, cold storage, staff salaries). The government also provides two types of financial donations: tax incentives to non-government donors and grants to the CFS.

Financial donations from individuals and firms are driven by both intrinsic and ex-

trinsic motivations. Intrinsic motivations include, for example, altruistic motives for making charitable donations (Andreoni 1990; Harbaugh et al. 2007; Ottoni-Wilhelm et al. 2017). Extrinsic motivations are generally connected to profits or disposable income. For example, corporate financial donations yield tax benefits via deduction for donations thus increasing profits for the donor. In this case, donors are rewarded through both tax deductions and goodwill generated via "corporate social responsibility" in the realm of food rescue and hunger relief. In the context of broader economic trends, it has been found donors are more likely to increase charitable contributions during favorable economic conditions while not likely to reduce contributions during economic decline (Mazodier et al. 2020; Muller and Kräussl 2011).

2.3 Charitable Food Assistance in Times of Crisis

Times of crisis increase demands on the charitable food system even further, as we have seen during the COVID-19 pandemic. The impetus is typically a sudden increase in demand for food from households in need, as they struggle to feed, clothe, and house themselves. For example, food banks are believed to have served an additional 55% more people as the result of financial hardship brought on by the COVID-19 pandemic (Friedman and Johnson 2021; Garrison et al. 2022). This section discusses the capacity of the system to respond automatically in these situations.

Emergency in-kind donations as automatic nutritional stabilizers. Beck and Gwilym (2022) argue that charitable food assistance has long been a safety net for households not served by government policy and programs even prior to the COVID-19 pandemic. They further argue that charitable assistance currently acts as a "vital provision" in the United Kingdom. It is a similar case in the United States and Canada, where charitable food assistance has perhaps become an "automatic nutritional stabilizer". In fact, several food system researchers and practitioners recognize the resiliency of charitable food system to meet the needs of households in times of crisis (Blessley and Mudambi 2022; Bruckner and Dasaro 2022).

The role of automatic stabilizer requires that donation flows into and distribution from the system automatically adjusts with demand from food insecure households.

It is not clear that this is the case for the CFS. According to Islam et al. (2013), in-kind charitable donations, including food, are often a challenge during crises. However, the COVID-19 pandemic was a unique type of economic shock that made "automatic stabilization" by the CFS possible though unclear. The pandemic led to massive unemployment that clearly increased food insecurity. However, the donation response, ex-ante, was unclear. On the one hand, panic buying among retail consumers led to reduced in-kind donation from retailers (Joshi et al., 2022). On the other hand, the pandemic led to reduced demand in the service sector (including restaurants), which then led to excess supply of many wholesale foods. A significant share of this excess supply was donated to the CFS and eventually distributed to households.

Emergency monetary donations. Financial donations also tend to be cyclical; they increase when the economy is in its growth cycle and decline with the economy is in its bust cycle. However, the pandemic posed an interesting economic situation. While many households lost their jobs and income, other households experienced little change to their employment status or income. As a financial remedy to the harsh economic situation for certain households, all households below a specific income threshold received three rounds of Economic Impact Payments (also known as "stimulus checks") (US Department of Agriculture, 2022). Consequently, many households found themselves with a lot of additional income and no way to consume said income because of various pandemic-related shutdown policies. While a lot of this money was used to increase bank account balances and lower loan balances, a non trivial share of it was donated to the CFS (Leary et al., 2022; Lee et al., 2021; Li et al., 2021).[5] The increased financial donations allowed food banks to increase their purchases in response to increased demand for food (Joshi et al., 2022).

Emergency government donations. As mentioned previously, USDA has a variety of programs to provide food assistance, including TEFAP and CFSP, which are

[5]This led to an interesting financial situation where one food bank manager believed private donors realized the economic hardship of others and may have given some portion of their stimulus payment to charitable causes, including charitable food system activities (authors' personal communication, November 11, 2020).

also used in emergency situations. During the pandemic, USDA approved Disaster Household Distribution to certain states and tribal organizations during the start of the pandemic, and provided boxes using existing inventories of USDA food commodities (USDA FNS, 2022). USDA also created the "Farmers to Families Food Box Program," which delivered 173 million boxes of produce, dairy, and cooked meats to US households between May 2020 through May 2021 (USDA AMS, 2022). Because these efforts are implemented through the CFS, they directly contribute to the CFS' ability to serve as a vehicle for automatically stabilizing the nutritional needs to food insecure households.

To summarize, the COVID-19 pandemic had some unique features that impacts the way donations respond to negative economic shocks. In particular, the pandemic increased both the demand for food from the CFS and the supply of food to the CFS making it possible that the CFS was able to "automatically" respond to the needs of food insecure households.

3 Data

We rely on data from several sources for our analysis. The main data set contains information on the inflow of monetary and in-kind food donations – at the donation-event level – from one of the largest food banks in the Midwest. This organization is a member of the Feeding America network and partners with over one hundred food pantries in Indiana.[6] We supplement this data with state and county-level socioeconomic information from the US Census Bureau. This section provides details on the data sources and variables used for the empirical analysis.

3.1 Food Bank Data

Our main source of food bank data contains information on all in-kind food and financial donations to a large Midwestern food bank for the period January 2010 to

[6]Feeding America is the largest hunger-relief organization in the United States with a network of 200 food banks across the country.

April 2022. Although we focus on one food bank, we argue that the food bank is large enough to provide insights about the state-wide impacts of COVID. First, the service area of the food bank in our study includes 23% of Indiana counties and 35% of the state's 6.8 million people. Second, the food bank reported distributing 99.4 million meals to its service area and food banks in 21 states in fiscal year 2023.[7]. Third, the food bank accounted for 43.5% of total non-federal pounds of food distributed in Indiana in 2022.

The data are at the donation-event level. This means that, for each donation, we are able to identify the date, type of donor (individual, business, or government), pallet weight, number of pallets, type of food, amount of money, and the donor's county and state of residence.[8]

Although donations are observed from multiple states, approximately 90% of the donations are from Indiana donors. Consequently, our analysis focuses on donations that originate within Indiana. The only exception to this rule is donations from The Emergency Food Assistance Program (TEFAP), which is sourced from the US Department of Agriculture (USDA) but recorded as being donated from Marion County in our dataset. We account for this by presenting our food-donation results with and without TEFAP donations. Isolating TEFAP in this way further allows us to compare the response of government and private donations to the pandemic.

We exclude food donation data before 2012 due to organizational changes undertaken at the food bank that add comparability challenges for the analysis. Regarding financial donations, we exclude seven observations that correspond to donations above a million dollars as they are considered outliers. This led to a sample of 168,939 in-kind and 454,674 monetary donation events, which we then collapse to the county-month level to build county-month measurements of food and monetary donations.

Our outcomes of interest are food donations measured in pounds and financial donations measured in nominal dollars. We measure the flow of food donations to the food bank in two ways that depend on the analysis we conduct: at the county-quarter

[7]Report published on the Gleaners website; [last accessed: February 2, 2024]

[8]Pallet weight and number of pallets are only observed for food donations. Dollar amount donated is only available for monetary donations.

and county-month level. The rationale for measuring food donations in pounds stems from the operation of the organization. Most of the food donations arrive on pallets of mixed items. While donations are categorized by type of item, we do not observe the market value of the donated items. The food bank assigns a scrap value to the donations, but these are mostly at fixed rates and consequently do not provide much useful information about the true market value of the items. Therefore, we base our analysis on the weight and number of donations, as seen in existing studies (Dunning et al., 2020; Prendergast, 2022).[9] We ultimately use the natural logarithm for both in-kind and financial donations.

A concern with using weight and number of donations rather than the value of donations is that we could be missing important changes in the quality of donations over time. This is especially problematic if the weight and number of donations are not positively correlated with the value of donations. Another concern is that our outcomes do not say much about the nutritional quality of the donations. We address these concerns with supplemental analysis where we explore the composition of donations over time. The data allows us to track the trend in donations of perishable products such as potatoes, fruits, vegetables, meat, and milk. We analyze these trends by looking at donations of these refrigerated items. Exploring these types of donations over time is a useful way of commenting on the nutritional quality of donations, which is arguably a more important indicator than monetary value.

4 Descriptive Statistics

This section describes the trends in donation behavior over the period 2013 to 2022. This exploration begins with a comment on the quality of food donated followed by a description of the historical trends in in-kind and financial donations. As we detail below, the COVID-19 pandemic represented a significant change in donations, thus we examine separately donation dynamics before and after March 2020. We also examine heterogeneity in the response to the pandemic driven by the size of

[9] It is worth noting that monetary value is not necessarily ideal given the inflationary environment that resulted from the COVID-19 pandemic.

charitable donations across Indiana counties.

4.1 Composition of In-Kind Donation

Our measure of food donations does not capture the nutritional quality or monetary value of food donations. However, we can comment on the quality of food by looking at the composition of donations over the sample period. In particular, we create several categories of food by type and plot the trends over the sample period. The left panel in Figure 3 shows the composition of in-kind donations depending on whether the items required dry, refrigerated, or freezer storage. The trends in the left panel of Figure 3 suggest that donation of items that require refrigeration increased by 20 percentage points between 2013 and 2021; from 54% to 74%.

This increase in donated food requiring refrigeration is a mixed blessing for the CFS. On the one hand, it is a good sign that the nutritional quality of food donations has increased. This follows from the fact that foods requiring refrigeration are generally fresh produce, dairy, and meats. On the other hand, it indicates that the cost of operating the CFS has increased over time since refrigeration requires specialized equipment and energy. This is important because food banks and food pantries may have to refuse donations if they do not have the capacity to store refrigerated foods.

We also examine the composition of donations according to the type of donor. This categorization sheds some light on the type of donors that engage in charitable giving. A couple of factors are worth underlining. First, food retailers, manufacturers, and distributors historically account for more than half of in-kind donations received by the food bank. However, their relevance in this market arguably has diminished due to the significant rise in donations from other Feeding America affiliated food banks. Figure 3 captures donations made through federal TEFAP. While in 2018 these items represented 10.8% of total in-kind donations, by the end of 2021 this figure was almost three times larger at 29.5%.

4.2 Historical Trends

Pre-Pandemic Food Donation. Panel A in Figure 4 shows the trend in food donation at the quarterly level from 2013 to 2022. Each point in the graph represents the natural logarithm of the sum of all donations (measured in pounds) from all counties.[10]

The data are presented with and without federal donations from TEFAP. The data show that total food donations fluctuated around a mean of approximately 15.5 log points. To put this in context, the average quarterly donation between 2013 and 2018 was 5.6 million pounds (approximately 2,567 metric tons). There is a noticeable increase in donations between 2018:Q3 and 2019:Q4. In fact, donations in 2019 were 41% higher than the average donation between 2013 and 2018.

The data show that the rapid increase in food donations between 2018 and 2019 was driven primarily by government TEFAP donations. In fact, Panel C in Figure 4 shows that TEFAP donations more than doubled between 2018:Q2 and 2019:Q4. The extraordinary increase in TEFAP during this period was driven by various US-China trade policies that were implemented by the Trump administration.[11] According to USDA data, the value of entitlement and bonus commodities delivered to state food banks increased by 14.9% between fiscal year 2018 and 2019. The corresponding increase for commodities delivered to Indiana food banks was 10.8%.[12]

[10]We aggregate at the quarterly level because the monthly time series is noisier. To be specific, the variables shown in Figure 4 were computed as follows. We denote y_{ct} as donations received from county c during quarter t. Total quarterly donations (in log) is defined as:

$$y_t = log\left(\sum_c y_{ct}\right)$$

[11]See Bown and Kolb (2022), Blessley and Mudambi (2022), and USDA (2018) for a detailed timeline of the trade war. The US-China trade war led to an increase in federal food commodity donations to food banks and other charitable food service providers that were purchased from US farmers impacted by trade retaliation (Blessley and Mudambi, 2022; USDA, 2018).

[12]These percentages are the authors' calculations based on data from the USDA FNS's website. The data are located at https://www.fns.usda.gov/pd/food-distribution-program-tables [last accessed on September 26, 2022 at 10AM EST].

Post-Pandemic Food Donation. Although total donations increased rapidly between 2018:Q2 and 2019:Q4, Panel A in Figure 4 shows that the rate of growth began to slow down by 2019:Q2. The pandemic hit in 2020:Q1 and Panel A shows a rapid increase in donations in response to the pandemic. In fact, donations increased quarter-over-quarter between 2019:Q4 and 2020:Q3, and donations in 2020:Q4 were only slightly lower than that of 2020:Q3. For reference, total donations in 2020 were 32% larger than the level observed in 2019. This is equivalent to an increase of 4,439 metric tons in food donated. The figure also shows that the pandemic response was not permanent with donations falling through the first three quarters of 2021; donations in 2021:Q3 were the same as 2019:Q3. However, donations increased in 2021:Q4 and remained high through 2022:Q1.

Interestingly, while the 2020 pandemic response was driven almost exclusively by private donations, the sustained level of donations in the first three quarters of 2021 was driven by TEFAP (see Panels A and C in Figure 4). Private donations decreased throughout 2021 while TEFAP donations increased. USDA data show that the total value of entitlement and bonus commodities delivered to Indiana food banks via TEFAP increased by 83% between fiscal year 2020 and 2021.[13]

Financial Donation. Panel B in Figure 4 shows the total financial donation made in each quarter. It seems to follow a seasonal pattern of peaking in Q4 with a mean donation level of about 1.87 million dollars throughout the 2013 - 2019 period. Like food donations, there was a sustained increase in 2020 financial donations. Contrasting with the average level between 2013 and 2019, annual financial donations in 2020 were approximately 200% larger, reaching a peak of $6.9 million in Q2 and holding fairly steady until Q4 before falling through the first two quarters of 2021. The 2021:Q4 donations were above the 2019:Q4 donations, and the mean donation in 2020-2021 was approximately $3.5 million greater than the mean in the pre-pandemic period.

[13]The federal fiscal year runs from October 1^{st} to September 30^{th} so fiscal year 2021 includes the last quarter of 2020 and the first three quarters of 2021.

4.3 Statistical Significance of Pre-Post Trends

To provide some point estimates on the magnitude of the jumps observed during the COVID-19 pandemic, we test whether donations in the post-pandemic period are statistically different from pre-pandemic levels using a simple t-test on the variables expressed in logarithms. Results are presented in Table 1 for the full sample. In each case, we compare the mean donation level in 2013:Q1-2020:Q1 with donation levels observed in 2020:Q2-2022:Q1.

The results presented in Figure 4 Panel A suggest that the average quarterly county-level in-kind donation observed a spike in response to the pandemic, yet point estimates for the full sample of counties at all Panels in Table 1 suggest this increase is not significant at the 5% level. These findings are not surprising given the trends presented above which shows that the response was not persistent. Because donations increased sharply and decreased just as sharply, comparing the averages between the two time periods simply suggests that the effect was not persistent.

To confirm this idea, we conduct another t-test to compare the average between 2013:Q1-2020:Q1 with donation levels observed in 2020:Q2-2020:Q4. Results are presented in Table A.4 in the Appendix. The results show that a larger mean difference, significant at traditional levels. For financial donations, point estimates confirm the increase observed in Panel B of Figure 4 is statistically significant.

4.4 Heterogeneity by County/Donation Size

Evidence from Panels A and C of Figure 4 suggests there was a significant increase in total in-kind donations in the wake of the pandemic. However, it remains unclear if the response to the pandemic shock was driven by heterogeneous regional factors.

To explore this issue we group counties into quartiles based on 2013 donation levels. We then track the donation behavior of each quartile over the sample period and express total donations in each period relative to the donation level observed in 2013. Panel D in Figure 4 shows the results of this exercise. This categorization allows us to compare counties that historically observed different donation levels. Table A.2

in the Appendix shows the distribution of counties across each quartile-group.[14]

Donations from counties across quartiles increased at different rates from 2013 until the onset of the COVID-19 pandemic. The evolution of donations after March 2020 varied across each quartile group. On one hand, counties in quartiles 1 and 2 had immediate sharp increases at the onset of the pandemic, with correspondingly sharp decreases throughout the aftermath of the pandemic. On the other hand, quartiles 3 and 4 responded more slowly but showed a more sustained increase in the post-pandemic period.

We test the statistical significance of these effects and presented the results in Table 1. With the exception of quartile 3, there is no statistical evidence of an increase in donations in the post-period when the post period includes 2020 - 2022. As described above, this lack of significance simply reflects the lack of persistence in donations. Restricting the post-pandemic period to 2020 reveals that the increase in in-kind donations from counties in quartiles 2 and 3 was statistically distinguishable from zero (see Table A.4 in the Appendix).

Panel C of Table 1 shows that financial donations increased for quartiles 3 and 4. However, when excluding 2021 and 2022 from the post-pandemic period to examine the persistence of the effect, we document a large and statistically significant increase in financial donations across counties.

5 Empirical Analysis

We extend the descriptive analyses presented in Section 4 by estimating a series of OLS regressions to add greater insights to the dynamics of donation before and after the pandemic. Our analysis is done in two parts. First, we explore the determinants of donation in the pre-pandemic era. Second, we explore the effect of the pandemic shock on donations to better understand how donors reacted to the pandemic-induced

[14]The quartiles are balanced over the sample period. Counties that appear in 2013 are present for the entire time period with few exceptions; quartile 3 excludes one county in 2017, 2018, and 2020. Quartile 1 excludes one county in 2019 and 2020, and Quartile 4 excludes one county in 2018. This suggests that the patterns we observe in the figure are not driven by composition effects.

shock to food insecurity and how donations evolved over the course of the pandemic.

5.1 Determinants of Donation Behavior

Model Specification. We estimate the following linear regression model using data from 2013 - 2019 to gain insights about the conditional correlation between donation and food insecurity in the pre-COVID period. In particular, we estimate Equation (1).

$$y_{imt} = \beta_0 + \beta_1 S_{imt} + \beta_2 Z_{imt} + \beta_3 X_{it} + a_m + b_t + e_{imt} \tag{1}$$

where y_{imt}, is the natural logarithm of total donations (measured in pounds for in-kind donations and in dollars for financial donations) received from county i in month m and year t and S the natural logarithm of the total number of SNAP beneficiaries.[15] Z_{imt} is a vector of economic controls, including the unemployment rate, average wage, and the food price index. Except for the unemployment rate which varies at the monthly level, the rest of the economic controls vary quarterly. X_{it} is a vector of demographic characteristics of county i during year t. Such characteristics include the percentage of female population, share of population across four major age groups (below 17 years old, between 18 and 44 years old, between 44 and 64 years old, and above 65 years old), percentage of the white population, and percentage of the Hispanic population.[16] The model also includes month-fixed effects (a_m) and a linear year-time trend (b_t). Statistical inference is performed using standard errors clustered at the county level. Summary statistics for all covariates are presented in Table A.1 in the Appendix.

[15] SNAP participation is used a measure of food insecurity. Studies have shown that SNAP beneficiaries often use the CFS in addition to SNAP benefits to improve household food security (Bhattarai et al., 2005; Harper et al., 2022; Mabli and Worthington, 2017).

[16] These covariates were retrieved from several public sources. Population estimates and demographic characteristics X_{it} come from the US Census Bureau. Monthly measurements of the unemployment rate and the average hourly wage come from the Bureau of Labor Statistics while the number of SNAP beneficiaries and the food price index were retrieved from USDA Food & Nutrition Services.

Table 2 describes the results from the estimation of Equation 1 where we explore the association between food insecurity and donations conditional on socioeconomic and demographic covariates. Models 1 and 2 differ from models 3 and 4 in the way donations are defined; models 1 and 2 exclude government food assistance programs (i.e., TEFAP) while models 3 and 4 do not. Our preferred specification includes demographic and economic covariates.

Food insecurity. We document a positive relationship between number of SNAP recipients (our measure of food insecurity) and in-kind donations. Results from column 2 in Table 2 show that a one percent increase in the number of SNAP recipients is associated with an increase in private in-kind donations of 0.34%. The estimates do not differ much when we account for TEFAP (see columns 3 and 4). A similar positive association is observed in columns 5 and 6 where we present the correlation between SNAP recipients and financial donations. However, the coefficients are not estimated precisely.

Economic covariates. We find that county unemployment rate and food price index are negatively correlated with both in-kind and financial donations. For instance, coefficients from columns 2 and 6 in Table 2 imply that a one percentage point increase in the unemployment rate is associated with an 18.20% decrease in in-kind donations (excluding TEFAP) and a 15.86% decrease in financial donation. Coefficients for food prices suggest that a one percent increase in prices leads to reductions between 3.40 - 3.63% for in-kind donations and 3.83% for financial donations.

Demographic covariates. The age, sex, racial, and ethnic profile of counties appear to be important for financial donations (see column 6 in Table 2). Including these covariates reduces the statistical significance of the estimates for unemployment and SNAP participation. However, the F-stats indicate that the correlation between donation and the set of covariates is jointly significant.

Overall, these findings are suggestive that the charitable food system automatically adjusts to the needs of the food insecure, particularly as unemployment rises. This is akin to an automatic nutritional stabilizing role. The system provides more donations

when need rises and less donations when need falls. Because the pandemic resulted in a significant increase in food insecurity, we would expect to see a significant increase in donations as well. We test for this response in the next section.

5.2 Effects of the COVID-19 Pandemic.

We extend the dataset to 2022 and examine the effect of the pandemic by adding a dummy variable, $Post_{mt}$, to Equation 1. $Post_{mt}$ is 0 before 2020:Q1 and 1 from 2020:Q1 to 2022:Q1. The regression equation is specified as follows.

$$y_{imt} = \beta_0 + \theta Post_{mt} + \beta_1 S_{imt} + \beta_2 Z_{imt} + \beta_3 X_{it} + a_m + b_t + e_{imt} \tag{2}$$

Our coefficient of interest is θ, which captures the change in charitable giving associated with the pandemic shock; i.e., difference in mean donation between 2013 to February 2020 and March to April 2022. We also explore the persistence of the pandemic effect by interacting $Post_{mt}$ with dummies for 2021 and 2022, which allows us to say whether the pandemic effect on donations persisted through 2021 and 2022.

Pandemic Response Table 3 shows the OLS estimates of Equation 2. We estimate an increase in private donations of 38.46% in our preferred specification (column 2). In the pre-pandemic period, the average county generated monthly private donations of approximately 31.54 metric tons so the implied effect is equivalent to 11.26 metric tons. While these coefficients are not significant at traditional levels, the magnitude is consistent with the trends observed in Panel A on Figure 4.

Columns 5 and 6 in Table 3 report results for the models on financial donations. Consistent with the visual evidence depicted in Panel B in Figure 4, these coefficients point towards a large and statistically significant increase in financial donations after the COVID-19 pandemic shock. Coefficients from the model with both sets of covariates (column 6) suggest financial donations were 112.54% larger in the post-pandemic period. In the pre-pandemic period, the average county generated monthly financial donations of $24,950, hence the implied effect is equivalent to additional donation inflows equivalent to $28,082.

Similar to the results in Table 2, coefficient estimates from the models without the vector of demographic covariates point towards a larger effect of the COVID-19 pandemic on charitable giving.

Persistence and Dynamic Effects The results presented in Panels A and B on Figure 4 are highly suggestive of donation responses that do not persist over time. To demonstrate this more clearly, we test the extent to which the effects of the pandemic persisted over time by modifying the definition of $Post_{mt}$ in Equation 2. Specifically, we define three pandemic era epochs s: (i) April 2020 - December 2020; (ii) January 2021 - December 2021; and (iii) January 2022 - May 2022. We create dummy variables that equal one after each epoch begins. This approach allows us to interpret each coefficient estimate as the incremental effect on charitable giving at each epoch, relative to the preceding period.[17] To be clear, the regression equation we estimate is the following.

$$y_{imt} = \beta_0 + \sum_{s=1}^{3} \theta_s Post_{mt}^{s} + \beta_1 Z_{imt} + \beta_2 X_{it} + a_m + b_t + e_{imt} \tag{3}$$

Table 4 shows the point estimates for $\hat{\theta}_s$ for each epoch s. As a further examination, we test the null hypothesis of pairwise differences between the coefficients $\hat{\theta}_s$. This allows us to measure the extent to which changes observed across epochs are statistically significant. We report the p-values of such tests at the bottom of Table 4.

Across all models, we find evidence consistent with a large spike in in-kind donations during 2020, relative to the pre-pandemic period. In our preferred specification, we estimate private in-kind donations increased 65.07% during 2020. When including charitable giving channeled through TEFAP, this estimate drops to 61.28%. This is consistent with the results described in Table 3.

Estimates from the second epoch imply a 37.12% contraction (significant at the 1%

[17] To avoid multicollinearity problems with the interaction terms of interest, for this estimation we exclude the number of SNAP recipients and the from the set of covariates.

level) in charitable giving during 2021, relative to the levels observed during the pre-pandemic period and during 2020. This number reflects the trend depicted in Panel A from Figure 4 that shows a slowdown in donations during 2021. Furthermore, results from the dummy variable associated with the third epoch confirm the slowdown persisted during the first part of 2022 as we document negative estimates equivalent to a reduction of 5.47% in private in-kind donations for the preferred econometric specification (see column 2 in Table 4).

Results for financial donations illustrate how the rise in charitable giving dissipated after the pandemic shock. Point estimates imply a 152.79% increase in donations during 2020 relative to the pre-pandemic period, significant at the 1 percent level. However, we calculate a reduction of 26.01% in financial donations in 2021.

6 Conclusion

6.1 Discussion

Our empirical analysis uncovered four main findings. First, donations are positively related to food insecurity suggesting that the CFS could potentially play an automatic nutritional stabilizing role. Second, there has been a marked increase in the donation of food and agricultural product donations that require cold storage. These are both indicators that food donations have increased in nutritional quality over time. Third, the system handled a significant increase in in-kind and financial donations from both government and non-government donors in response to the pandemic with the largest increases coming from counties that are traditionally big donor counties. Fourth, the donation response to the pandemic was not persistent. Donations increased significantly in 2020 before falling back to pre-pandemic levels over the next two years.

Interestingly, the trade war between the US and China led to an increase in in-kind food donations to the CFS in the 2018-2019 period. This event further supports the case that the CFS plays an immensely important role in moving food from donors to the food insecure given that household demand for charitable assistance consistently

exceeds supply.

There are several important policy implications connected to our findings. First, there is a need for food banks to develop and maintain capacity to handle fresh food and agricultural products that require cold storage. This is based on recent trends toward increased donation of perishable foods. Second, the lack of persistence suggest that the charitable food system needs to invest in the flexibility that allows for quick and easy ramp up and down of operating capacity. The federal government might also consider the timing of its donations given the structure and limited persistence of private donations. Finally, it is important that policymakers consider the broader impact of geopolitical policies on food systems.

6.2 Future Research

There are limitations to our study. First, although a large food bank with considerable storage capacity, the primary food bank analyzed is only one of a few hundred food banks in the United States. We assume the results of this study can only be generalized to food banks with similar infrastructure and staffing resources to handle an influx of in-kind donations during a crisis period.

In order to disentangle the impact of the trade war immediately preceding the pandemic, future analysis should include a comparison of UK and Canadian food banks to US food banks during the same time period to understand the impact of the trade war on increasing in-kind donations and subsequent charitable food assistance capacity to prior to the pandemic.

Qualitative analysis of food bank operators can shed light on whether the TEFAP donations prepared the operation for the donation influx during the pandemic or hindered the operation with resources that were meant to support farmers but not necessarily food insecure households. Additionally, a critical avenue of future research on the topic of charitable food assistance donations during times of crisis is whether the food resources reached households in need of assistance given the known demand. Our analysis simply assumed demand for charitable assistance exceeds supply based on Feeding America's Map the Meal Gap estimates and perceptions of CFS

stakeholders.

The CFS does have the desire to serve as an "automatic nutritional stabilizer" for household in crisis regardless of whether it is the result of a broader local, regional, or global crisis. Further qualitative and quantitative analysis can shed light on whether the CFS served this role during the pandemic and can serve this role in future crises with its networks of food banks, food pantries, and hot meal sites providing food to under-resourced households across the United States.

Relatedly, the COVID-19 pandemic was unprecedented in its nature and impacts. Therefore, the responses documented in our paper might not apply to other kinds of economic shocks. It would be valuable to do similar analyses that include the time of the Great Recession (2007-2009) and compare responses between health and economic shocks. It is possible that the automatic nutritional stabilizer role was only possible because of the unique features of the COVID-19 pandemic.

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7 Figures

Figure 1: The Charitable Food System with Food Banks

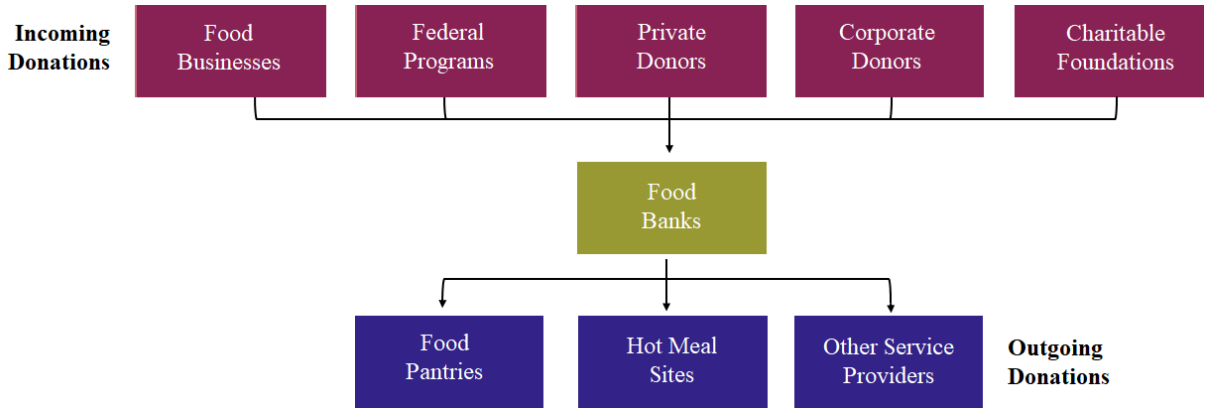
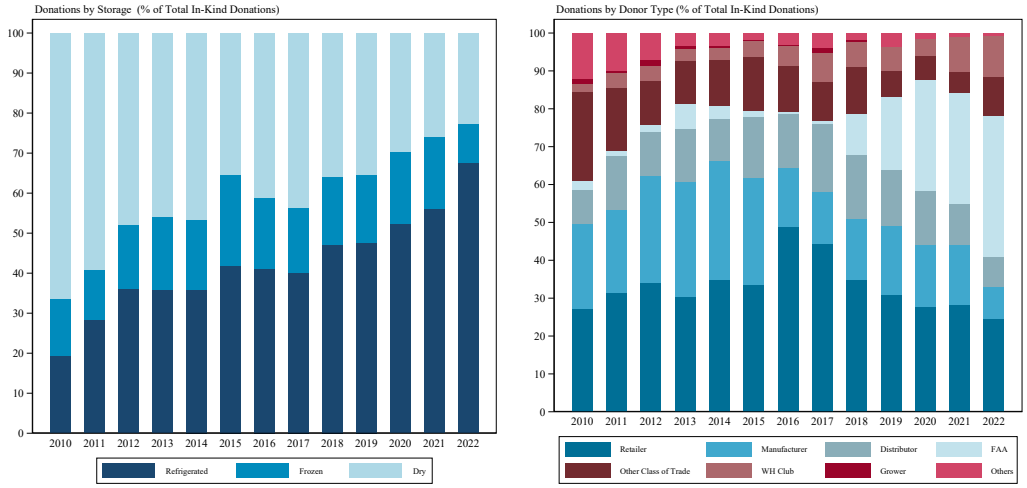


Figure 2: In-Kind Donation Characteristics

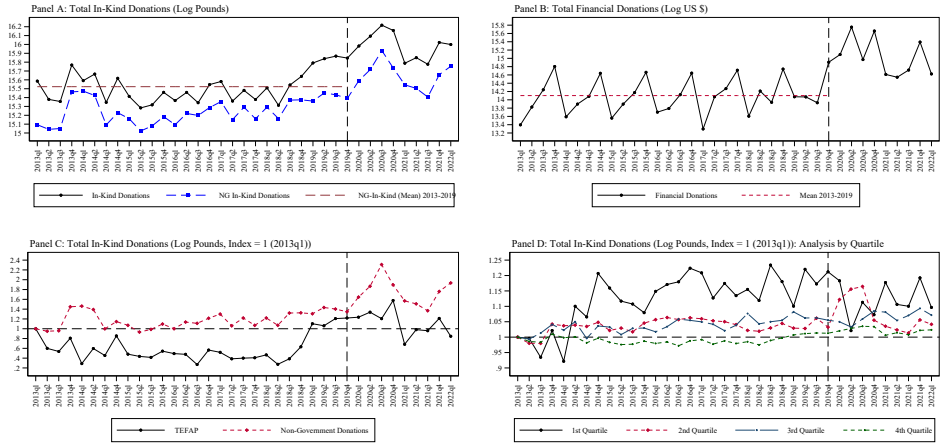


Notes: For both panels, each bar represents the distribution of donations (in pounds) within that year. The panel on the right shows the distribution of in-kind donations according to the storage type (e.g., dry, refrigerated, and freezer). The panel on the right shows the composition of in-kind donations by type of donor. FAA stands for Feeding America Affiliate. Donors categorized as others include drugstores, restaurants, supermarkets, and wholesalers.

Figure 3: In-Kind Donation Characteristics - Type of Storage

Notes: For both panels, each bar represents the distribution of donations (in pounds) within that year by product type. We map the products description to the donation categories proposed by Schwartz et.al((2020). The panel on the right shows the distribution of in-kind donations for items that reported being stored in a dry place, while the panel on the left shows the distribution for the products that required some refrigeration.

Figure 4: Charitable Giving in the Midwest: Trends for In-Kind and Financial Donations



Notes: These graphs show the trends for total in-kind and monetary donations. Units are expressed as the natural logarithm of total (sum) donations in pounds and dollars, respectively. Panel A and Panel B display the historical trend of total donations. Red dashed line shows the average of donations in the period before the COVID-19 pandemic. Panel C and Panel D display indices that express the total donations in terms of their 2013 level.

8 Tables

Table 1: In-Kind and Financial Donations: Mean Comparison Before and After the COVID-19 Pandemic by Donation Quartile

	(1)	(2)	(3)
	2013:Q1-2020:Q1	2020:Q2-2022:Q1	P-value
Panel A: In-Kind (Log Pounds)			
Full Sample	9.8897	10.0471	0.0561
	(0.0381)	(0.0764)	
1st Quartile	8.2353	8.2784	0.7828
	(0.0737)	(0.1253)	
2nd Quartile	9.2490	9.3102	0.3313
	(0.0276)	(0.0686)	
3rd Quartile	10.0685	10.3759	0.0022
	(0.0452)	(0.0988)	
4th Quartile	11.6131	11.8135	0.1457
	(0.0623)	(0.1344)	
Panel B: In-Kind NG (Log Pounds)			
Full Sample	9.8671	10.0220	0.0513
	(0.0368)	(0.0736)	
4th Quartile	11.5265	11.7163	0.1207
	(0.0553)	(0.1195)	
Panel C: Financial (Log US $)			
Full Sample	7.7222	8.2370	0.0000
	(0.0488)	(0.1020)	
1st Quartile	6.1878	6.3693	0.2391
	(0.0672)	(0.1595)	
2nd Quartile	6.6074	6.6822	0.4307
	(0.0459)	(0.0807)	
3rd Quartile	8.2002	8.9168	0.0000
	(0.0555)	(0.0994)	
4th Quartile	9.5980	10.6969	0.0000
	(0.1110)	(0.1874)	

Notes: This table shows the mean estimation for each outcome variable at the full sample and by each quartile, in the period before the pandemic (2013:Q1 - 2020:Q1) and the period after (2020:Q2 - 2022:Q1) in our sample. Outcome variables are expressed in logarithms. Standard errors are reported in parentheses. The reported p-value corresponds to the t-test of the mean difference between each period.Since TEFAP donations are registered at Marion County (4th quartile), the distribution of in-kind donations for quartiles 1-3 is the same with and without government donations. Hence, to examine non-governmental donations we only report results from the full sample and quartile 4.

Table 2: Determinants of Charitable Giving (Model 1)

	(1) NG In-Kind	(2) NG In-Kind	(3) In-Kind	(4) In-Kind	(5) Financial	(6) Financial
Unemployment Rate	-0.4960***	-0.2009	-0.4926***	-0.1854	-0.7898***	-0.1727
	(0.1122)	(0.1426)	(0.1123)	(0.1431)	(0.2062)	(0.1068)
Log SNAP Persons	0.7995**	0.3425	0.8689**	0.3300	0.8531*	0.0934
	(0.2158)	(0.3657)	(0.2397)	(0.3666)	(0.3478)	(0.2689)
Food Price Index	-0.0731**	-0.0370	-0.0722**	-0.0347	-0.1089**	-0.0391
	(0.0243)	(0.0311)	(0.0248)	(0.0312)	(0.0359)	(0.0209)
Percent Female		9.9170		10.7759		13.3183
		(9.8409)		(9.7953)		(12.5487)
Percent White		-7.0175		-8.4814		-18.0081***
		(6.6111)		(6.6201)		(4.7397)
Percent Hispanic		1.5385		2.1458		-19.0175*
		(12.5363)		(12.3973)		(7.8756)
Age < 17		23.5226		23.1764		63.7016***
		(11.4977)		(11.5619)		(9.2960)
Age 18-44		22.7359		23.1308		30.0114**
		(11.9649)		(11.8735)		(9.9684)
Age 44-64		42.3717		45.0086		57.0745**
		(22.4062)		(22.2863)		(18.3972)
Demographic Controls	No	Yes	No	Yes	No	Yes
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	9.8645	9.8645	9.8869	9.8869	7.7321	7.7321
Std.Dev. of DV	1.5797	1.5797	1.6375	1.6375	2.1285	2.1285
Coeff. of Variation	0.1595	0.1595	0.1650	0.1650	0.2716	0.2716
Observations	1,722	1,722	1,722	1,722	1,724	1,724
F-Stat	12.2822	34.9286	12.5621	32.8780	7.1721	72.5574

Notes: Columns 1 and 2 report coefficients for in-kind donations (excluding TEFAP) as dependent variable. Columns 3 and 4 report coefficients for in-kind donations (including TEFAP) as dependent variable. Columns 5 and 6 show the coefficients using financial donations as the dependent variable. Standard errors are reported in parentheses. A */**/*** indicates significance at the 10/5/1% levels.

Table 3: COVID-19 Effects on Charitable Donations (Model 2)

	(1) NG In-Kind	(2) NG In-Kind	(3) In-Kind	(4) In-Kind	(5) Financial	(6) Financial
Post April 2020	1.0297*	0.3255	0.9988*	0.3054	2.2306**	0.7540*
	(0.3731)	(0.3954)	(0.3859)	(0.3968)	(0.7166)	(0.2942)
Unemployment Rate	-0.1596**	-0.0382	-0.1570**	-0.0341	-0.2282*	0.0118
	(0.0528)	(0.0411)	(0.0534)	(0.0413)	(0.1013)	(0.0352)
Log SNAP Persons	0.7552**	0.2191	0.8257**	0.2084	0.8460*	0.1104
	(0.2346)	(0.3472)	(0.2598)	(0.3475)	(0.3415)	(0.2542)
Food Price Index	-0.0564*	-0.0265	-0.0552*	-0.0246	-0.0827*	-0.0299
	(0.0202)	(0.0227)	(0.0208)	(0.0229)	(0.0329)	(0.0179)
Percent Female		10.9384		11.7554		14.3943
		(9.4658)		(9.3794)		(13.3088)
Percent White		-7.6077		-9.1936		-17.1812**
		(6.4425)		(6.4466)		(4.5943)
Percent Hispanic		4.0457		4.3998		-18.8998*
		(13.2910)		(13.1143)		(8.0739)
Age < 17		27.9720*		27.2051*		71.5919***
		(10.5306)		(10.6560)		(8.6339)
Age 18-44		24.6542		24.8057*		33.0388**
		(12.0946)		(11.9584)		(9.6528)
Age 44-64		42.2847		44.7566		56.4821**
		(22.7690)		(22.5586)		(19.6119)
Demographic Controls	No	Yes	No	Yes	No	Yes
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean of DV	9.8919	9.8919	9.9151	9.9151	7.8053	7.8053
Std.Dev. of DV	1.5797	1.5797	1.6375	1.6375	2.1285	2.1285
Coeff. of Variation	0.1595	0.1595	0.1650	0.1650	0.2716	0.2716
Observations	2,073	2,073	2,073	2,073	2,075	2,075
F-Stat	8.1827	23.4499	8.3049	23.9110	7.6973	89.2942

Notes: Columns 1 and 2 report coefficients for in-kind donations (excluding TEFAP) as dependent variable. Columns 3 and 4 report coefficients for in-kind donations (including TEFAP) as dependent variable. Columns 5 and 6 show the coefficients using financial donations as the dependent variable. Standard errors are reported in parentheses. A */**/*** indicates significance at the 10/5/1% levels.

Table 4: Persistence of COVID-19 Effects on Charitable Donations

	(1) NG In-Kind	(2) NG In-Kind	(3) In-Kind	(4) In-Kind	(5) Financial	(6) Financial
Apr 2020 -Dec 2020	1.0893*	0.5012	1.0387*	0.4780	2.4647**	0.9274**
	(0.4408)	(0.3281)	(0.4774)	(0.3297)	(0.8711)	(0.2724)
Jan 2021- Dec 2021	-0.7488**	-0.4737*	-0.7329*	-0.4641*	-0.9911*	-0.3013
	(0.2661)	(0.2033)	(0.2773)	(0.2051)	(0.4522)	(0.1460)
Jan 2022- May 2022	-0.0147	-0.0563	-0.0175	-0.0560	0.6339*	0.5615
	(0.2045)	(0.2371)	(0.2033)	(0.2377)	(0.3033)	(0.3079)
Demographic Controls	No	Yes	No	Yes	No	Yes
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Dep. Variable	9.8998	9.8998	9.9233	9.9233	7.8351	7.8351
Pval Test 2020	.012	.052	.024	.064	.016	.004
Pval Test 2021	.008	.088	.012	.092	.004	.028
Observations	2,211	2,211	2,211	2,211	2,213	2,213
F-Stat	3.1906	25.4523	2.8376	26.7526	13.8068	83.4823

Notes: This model excludes SNAP recipients as covariate. P-values describe the result of testing the null hypothesis of the difference between the reported coefficients being equal to zero. Pval Test 2020 compares pre-pandemic period relative to Apr-Dec 2020. Pval Test 2021 compares Apr-Dec 2020 relative to Jan 2021-May 2022. Standard errors are reported in parentheses. A */**/*** indicates significance at the 10/5/1% levels.

(Online) Appendix

A Descriptive Statistics

Table A.1 shows the descriptive statistics for the sample used in the regression analysis. This sample is comprised of an unbalanced panel of 24 counties observed at 113 month-year periods from January 2013 to May 2022. The first three rows display the dependent variables of the analysis, expressed in a natural logarithm. For interpretation, however, we describe the results converting to metric tons and US dollars. The average county in our sample observed monthly in-kind donations of approximately 48.08 metric tons. When excluding donations made through the TEFAP program, the mean of this variable is equivalent to 35.03 metric tons. Financial donations observed a sample mean of 33 thousand dollars a month.

Regarding the demographics of the counties studied in our sample, we observe that the average county government in the analyzed period is characterized by 50.47% female population, where 92.1% of the population is white, and 3.56% is Hispanic. The age distribution in these Indiana counties shows that 18.5% of the population is less than 17 years old, 36% is between 18 and 44 years old, and 28.5% is between 44 and 64 years old. For these variables, we observe a relatively low standard deviation, which suggests there is little heterogeneity in these characteristics across counties. The average unemployment rate observed in these counties was 4.59% and the average number of SNAP beneficiaries in a given county-month in our sample is approximately 2,176 recipients. We also observe an unprecedented spike in the unemployment rate around the timing of the lockdown (see Table A.3 in the Appendix).[18]

[18]Table A.3 reports the mean difference between the period preceding the COVID-19 shock (January 2019 - March 2020) and the months following it (April 2020 - May 2022) for the main variables used for the analysis.

Table A.1: Descriptive Statistics

	Mean	SD	P25	P50	P75	N
Total In-Kind Donations (Log Pounds)	9.9246	1.6374	9.0040	9.7205	11.0036	2291
Total In-Kind Donations NG (Log Pounds)	9.9014	1.5797	9.0040	9.7205	11.0036	2291
Financial Donations (Log US $)	7.8360	2.1284	6.2538	7.4764	9.1800	2293
Percent Female	0.5047	0.0095	0.5004	0.5052	0.5093	2293
Percent White	0.9209	0.0730	0.8931	0.9431	0.9693	2293
Percent Hispanic	0.0356	0.0227	0.0200	0.0280	0.0417	2293
Age < 17	0.1852	0.0179	0.1757	0.1853	0.1943	2293
Age 18–44	0.3603	0.0341	0.3403	0.3512	0.3736	2293
Age 44–64	0.2852	0.0177	0.2775	0.2859	0.2972	2293
Unemployment Rate	4.5944	2.3522	3.0999	4.0000	5.4000	2213
Food Price Index	253.5382	12.6610	245.8459	249.7489	259.0799	2233
SNAP Beneficiaries (Log)	6.6128	1.1368	5.9763	6.4645	6.9450	2075

Notes: This panel shows the descriptive statistics of the main variables used for the analysis. The first two columns show the sample mean and standard deviation. P25, P50 and P75 show the 25, 50 and 75 percentiles, respectively. Variables representing total donations are expressed in logarithms. Demographic covariates are expressed as a percentage of the population.

Table A.2: Distribution of Counties Across Quartile Group

Quartile Group	FIPS Code	County Name	Quartile Group	FIPS Code	County Name
1	18003	Allen	3	18005	Bartholomew
1	18079	Jennings	3	18059	Hancock
1	18095	Madison	3	18063	Hendricks
1	18105	Monroe	3	18109	Morgan
1	18137	Ripley	3	18157	Tippecanoe
1	18139	Rush	3	18177	Wayne
2	18031	Decatur	4	18011	Boone
2	18041	Fayette	4	18035	Delaware
2	18071	Jackson	4	18057	Hamilton
2	18077	Jefferson	4	18081	Johnson
2	18133	Putnam	4	18097	Marion
2	18143	Scott	4	18145	Shelby

Notes: Distribution across quartiles is determined by the observed level of in-kind donations during 2013.

Table A.3: Descriptive Statistics - Mean Comparison

Variable	(1) 2013-2019 N	(1) 2013-2019 Mean/SE	(2) 2020-2021 N	(2) 2020-2021 Mean/SE	T-test P-value (1)-(2)	Normalized difference (1)-(2)
In-Kind Donations (Log)	1802	9.914	507	10.048	0.117	-0.082
		(0.038)		(0.076)		
NG In-Kind Donations (Log)	1802	9.892	507	10.023	0.111	-0.083
		(0.036)		(0.074)		
Financial Donations (Log)	1804	7.701	507	8.237	0.000***	-0.251
		(0.049)		(0.102)		
Percent Female	1804	0.505	507	0.505	0.496	0.033
		(0.000)		(0.000)		
Percent White	1804	0.921	507	0.917	0.346	0.048
		(0.002)		(0.003)		
Percent Hispanic	1804	0.035	507	0.038	0.054*	-0.099
		(0.001)		(0.001)		
Age < 17	1804	0.186	507	0.182	0.000***	0.245
		(0.000)		(0.001)		
Age 18-44	1804	0.362	507	0.355	0.000***	0.190
		(0.001)		(0.001)		
Age 44-64	1804	0.286	507	0.281	0.000***	0.317
		(0.000)		(0.001)		
Unemployment Rate	1804	4.499	427	5.040	0.005***	-0.230
		(0.042)		(0.190)		
Food Price Index	1804	248.185	447	274.697	0.000***	-2.095
		(0.161)		(0.344)		
Log SNAP Persons	1804	6.711	289	6.155	0.000***	0.481
		(0.027)		(0.067)		

Notes: The value displayed for t-tests are p-values. Standard errors are robust. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A.4: In-Kind and Financial Donations: Mean Comparison Before and After the COVID-19 Pandemic by Donation Quartile

	(1)	(2)	(3)
	2013:Q1-2020:Q1	2020:Q2-2020:Q4	p-value
Panel A: In-Kind (Log Pounds)			
Full Sample	9.8897	10.1478	0.0466
	(0.0381)	(0.1329)	
1st Quartile	8.2353	8.1300	0.6869
	(0.0737)	(0.1880)	
2nd Quartile	9.2490	9.5389	0.0037
	(0.0276)	(0.1568)	
3rd Quartile	10.0685	10.3769	0.0433
	(0.0452)	(0.1475)	
4th Quartile	11.6131	11.9048	0.1715
	(0.0623)	(0.2293)	
Panel B: In-Kind NG (Log Pounds)			
Full Sample	9.8671	10.1186	0.0443
	(0.0368)	(0.1273)	
4th Quartile	11.5265	11.7935	0.1575
	(0.0553)	(0.1992)	
Panel C: Financial (Log US $)			
Full Sample	7.7222	8.5419	0.0000
	(0.0488)	(0.1807)	
1st Quartile	6.1878	6.6777	0.0492
	(0.0672)	(0.2963)	
2nd Quartile	6.6074	6.8206	0.1573
	(0.0459)	(0.1513)	
3rd Quartile	8.2002	9.2676	0.0000
	(0.0555)	(0.1870)	
4th Quartile	9.5980	11.0416	0.0001
	(0.1110)	(0.3154)	

Notes: This table shows the mean estimation for each outcome variable at the full sample and by each quartile, in the period before the pandemic (2013:Q1 - 2020:Q1) and the period after (2020:Q2 - 2020:Q4) in our sample. Outcome variables expressed in logarithms. Standard errors are reported in parentheses. Reported p-value correspond to the t-test of mean difference between each period. Since TEFAP donations are registered at Marion County (4th quartile), the distribution of in-kind donations for quartiles 1-3 is the same with and without government donations. Hence, to examine non-governmental donations we only report results from the full sample and quartile 4.

Heterogeneity by County's Donation Size To examine the potential underlying heterogeneity, we expand Equation 2 by interacting $Post_{mt}$ with the set of dummy variables that identify the quartile assigned to each county in the sample. The coefficient on each interaction captures the difference in donations after the pandemic for each quartile, relative to the difference in donations observed for quartile 1. In this sense, shows the heterogeneity in the effect of the pandemic on charitable giving across Indiana. Table A.5 displays the results of this exercise.

Consistent with the results in Table 3 for in-kind donations, we find positive estimates for the coefficients on the interaction terms, which imply an increase in charitable giving relative to the magnitude of the pandemic shock in quartile 1. Results from our preferred specification suggest that the largest increase was among counties in the third quartile of the 2013 in-kind donations distribution. Counties with a history of larger contributions to regional in-kind donations experienced larger increases in response to the COVID-19 pandemic.

Results for financial donations provide suggestive evidence of a stronger monotonic relationship between historical financial donations and the response of financial donations to the pandemic. In particular, counties that historically contributed more financial donations to the region observed larger increases in financial donations in the post-pandemic period. These point estimates provide suggestive evidence of the heterogeneous response in charitable giving during the COVID-19 pandemic.

Table A.5: COVID-19 Effects on Charitable Donations: Analysis by Quartile

	(1) NG In-Kind	(2) NG In-Kind	(3) In-Kind	(4) In-Kind	(5) Financial	(6) Financial
Post April 2020	0.0510	0.0491	0.0332	0.0475	0.2214	-0.1536
	(0.2846)	(0.2854)	(0.2926)	(0.2912)	(0.6710)	(0.6188)
Interaction (Quartile 2)	0.1293	0.1453	0.1136	0.1313	0.1665	0.5292
	(0.3272)	(0.3301)	(0.3317)	(0.3312)	(0.6740)	(0.5903)
Interaction (Quartile 3)	0.1909	0.2698	0.1652	0.2567	0.1795	0.6404
	(0.3156)	(0.2787)	(0.3247)	(0.2794)	(0.6830)	(0.6010)
Interaction (Quartile 4)	0.1897	0.1238	0.1909	0.1187	0.5950	0.9294
	(0.2727)	(0.2604)	(0.2813)	(0.2647)	(0.6594)	(0.5759)
Demographic Controls	No	Yes	No	Yes	No	Yes
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Dep. Variable	9.8919	9.8919	9.9151	9.9151	7.8053	7.8053
Observations	2,073	2,073	2,073	2,073	2,075	2,075
F-Stat	32.0955	89.0941	29.7456	93.3152	38.2515	101.4244

Notes: Columns 1 and 2 report coefficients for in-kind donations (excluding TEFAP) as dependent variables. Columns 3 and 4 report coefficients for in-kind donations (including TEFAP) as dependent variables. Columns 5 and 6 show the coefficients using financial donations as the dependent variable. Standard errors are reported in parentheses. A */**/*** indicates significance at the 10/5/1% levels.

Table A.6: Determinants of Charitable Donations During the Pandemic: Analysis by Quartile

	(1) NG In-Kind	(2) NG In-Kind	(3) In-Kind	(4) In-Kind	(5) Financial	(6) Financial
Covid-19 Cases Per Capita	-0.0400	-0.0024	-0.0420	-0.0016	0.0831*	0.0947**
	(0.0219)	(0.0188)	(0.0236)	(0.0189)	(0.0381)	(0.0272)
Interaction (Quartile 2)	-0.0226*	-0.0135	-0.0240*	-0.0141	-0.0649***	-0.0683***
	(0.0091)	(0.0099)	(0.0096)	(0.0101)	(0.0119)	(0.0128)
Interaction (Quartile 3)	-0.0204	0.0033	-0.0235	0.0029	-0.0827***	-0.0804***
	(0.0192)	(0.0116)	(0.0209)	(0.0119)	(0.0128)	(0.0139)
Interaction (Quartile 4)	-0.0280**	-0.0123	-0.0306**	-0.0134	-0.0484**	-0.0542**
	(0.0078)	(0.0094)	(0.0089)	(0.0095)	(0.0130)	(0.0178)
Demographic Controls	No	Yes	No	Yes	No	Yes
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Dep. Variable	10.0451	10.0451	10.0714	10.0714	8.3186	8.3186
Observations	289	289	289	289	289	289
F-Stat	14.5402	283.3635	15.1707	170.3673	41.2660	174.3850

Notes: Columns 1 and 2 report coefficients for in-kind donations (excluding TEFAP) as dependent variables. Columns 3 and 4 report coefficients for in-kind donations (including TEFAP) as dependent variables. Columns 5 and 6 show the coefficients using financial donations as the dependent variable. Standard errors are reported in parentheses. A */**/*** indicates significance at the 10/5/1% levels.