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The incidence of extreme economic stress: Evidence from utility disconnections ☆

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ABSTRACT

This paper uses monthly zip code-level data on electricity disconnections in Illinois to document the socioeconomic correlates of extreme economic distress among 5 million customers. In 2018–2019, customers in Black and Hispanic zip codes were about 4 times more likely to be disconnected for non-payment, 2–3 times more likely to be on deferred payment plans, and 70% more likely to participate in utility-based low-income assistance programs, controlling for zip code distributions of income and other demographic characteristics. During the COVID-19 pandemic, there has been a ninefold expansion in low-income assistance to pay utility bills, but disconnections were double and deferred payment plans triple their historical averages in October 2020. Disconnection notices were served to 2.5% of commercial and industrial accounts, and 3.4% of residential accounts each month in late 2020. About 20% of all accounts were charged late fees. The odds for each of these measures were multiples higher in minority zip codes.

1. Introduction

Having one's power cut due to non-payment ceases access to modern life's basic necessities: light, refrigeration, telecommunications, and often heat to name a few. Beyond mere conveniences, access to heating and cooling are important predictors of mortality (Barreca et al., 2016; Chirakijja et al., 2020). This is especially the case during the COVID-19 pandemic (Jowers et al., 2021) as utilities constrain one's ability to stay at home (Wright et al., 2020). Lack of electricity also has especially acute consequences for children during periods of remote, computer-based education. While definitions of extreme poverty typically focus on dollar-based income and consumption thresholds (the widely-cited World Bank global poverty line is $1.90 per person, per day), there is a reasonable case to be made that lack of electricity is a sufficient condition. This paper tracks the incidence of electricity disconnections and other utility-based indicators of economic stress at the monthly-zip code level in Illinois and documents the disproportionate burden experienced by low-income and minority communities.

Both survey-based and administrative approaches to measuring extreme economic distress have distinct shortcomings. Surveys increasingly suffer from non-response, as well as the under-reporting of income and transfers (Meyer et al., 2015). Administrative datasets may miss those who are disconnected from formal employment and the social safety net. A recent major undertaking to link survey responses to administrative data has sought to improve the quality of data on extreme poverty in the United States (Medalia et al., 2019; Meyer et al., 2021), but high-frequency and spatially disaggregated measurements remain elusive. Given the general preference for consumption- rather than income-based measurements of poverty (Meyer and Sullivan,

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2003), the foundational role electricity plays in the consumption of a bundle of essential goods highlights the potential value of power disconnections as an indicator of extreme economic distress.[1]

I merge zip code-level data on disconnections, deferred payment agreements (DPAs), and participation in utility-based low-income assistance programs from Illinois' two largest utilities with demographic data from the U.S. Census Bureau's American Community Survey for over 1,300 zip codes. These data cover roughly five million households. I study two distinct periods, 2018–2019, and from September-December 2020, during the COVID-19 pandemic. Using logistic regressions that control for zip code distributions of income and other demographic characteristics, I find that the odds of being disconnected for non-payment are four times higher for customers in Black and Hispanic zip codes. Customers in these zip codes are 2–3 times more likely to be on deferred payment plans, and 70% more likely to participate in low-income assistance programs for electricity.

There has been a troubling increase in disconnections and deferred payment agreements during the COVID-19 pandemic. Though utilities announced a voluntary extension of disconnection moratoria for customers in economic distress, nearly 1% of all accounts were disconnected for non-payment in October 2020 (twice the usual amount). There has been a threefold rise in deferred payment agreements. These increases have occurred in spite of a ninefold expansion in low-income assistance. Utilities have been reporting additional outcomes during the COVID-19 pandemic, including details for 600,000 commercial and industrial customers. Each month from September-December 2020, about 20% of all accounts were charged non-payment fees, and disconnection notices were served to 3.4% and 2.5% of residential and commercial/industrial accounts, respectively. For each of these outcomes there is a strong disproportionate burden on minority communities. At the same time, the historical gradient between low- and middle-income neighborhoods has largely disappeared during the pandemic. This is due to a combination of expanded aid to low income customers while middle income customers have remained relatively exposed to the economic shock.

This paper reinforces recent work that has found the economic burden of the COVID-19 pandemic has fallen disproportionately on low-income and minority communities (Chetty et al., 2020; Baum et al., 2020; Couch et al., 2020; Han et al., 2020) and documented an expansion of the social safety net (Cox et al., 2020) that failed to buffer the impact for some of the most needy (Bitler et al., 2020). It is also complementary to recent surveys on energy insecurity during the pandemic (Carley and Konisky, 2020; Graff and Carley, 2020). The data from electric utilities, however, yield greater statistical power than surveys (to allow fine geographic mapping of outcomes, in particular), higher reporting frequency than annual administrative data, and broader coverage than electronic payment-based surveillance systems.

To be clear, this study does not reveal bias in utilities' treatment of poor and minority customers: Individual usage, payments, and balances are unobserved. My results would be consistent with utilities determining disconnections based upon billing and payments alone if customers in low-income and minority communities are more likely to fall farther behind on their utility bills holding the distribution of income and other demographic variables fixed. Instead of exposing potentially unequal treatment by utilities, this study reveals the disproportionate economic stress experienced in these communities, both in normal times, and especially during the COVID-19 pandemic.

The paper is organized as follows: I first describe the data sources in Section 2, then the econometric methods I employ in Section 3. The fourth section presents the results, and the final section concludes.

2. Data

In March 2020 the Illinois Commerce Commission (ICC) issued 20-NOI-01, "Notice of Inquiry Regarding Energy Affordability." It requires public utilities to file monthly reports with the commission that document economic stress among customers. At the zip code level, utilities report outcomes including the number of residential customers who are behind on their bills, disconnections for non-payment, and participation in programs that provide assistance to low-income households.[2] The first submissions required historical tallies going back to 2013, and have since been updated monthly during the pandemic, though the reports through August were mostly zeroes due to moratoria on disconnections and non-payment fees. Recent submissions include additional information, including disconnection notices and statistics for commercial customers. This paper uses data from Commonwealth Edison (ComEd) and Ameren, the two largest electric utilities in the state, with nearly five million residential customer accounts between them.

Table 1 provides summary statistics of the utility data, focusing on the month of October from 2018 to 2020.[3] Roughly 20% of customers were levied some form of fee for late payment in October 2020, regardless of customer class. Unfortunately, this statistic was not reported in prior years, so it is not possible to say whether this is unusually high. Disconnection notices were also not reported pre-pandemic, but it is nonetheless worrisome that nearly 4% of residential customers and 2–3% of commercial and industrial customers were on the brink of disconnection in October. Comparisons with historical statistics are possible for residential disconnections, which nearly doubled in October 2020 for ComEd customers, and were six times historical averages in Ameren territory.

In December 2020 arrears for both ComEd and Ameren customers were higher than previous years, though the share of residential customers with balances past due was relatively stable. The average balances for residential accounts past due rose 65% to over $300 in ComEd territory, and nearly 30% to over $550 past due for Ameren customers. Over 5% of ComEd commercial and industrial accounts are past due, with an average outstanding balance of $1200. Commercial and industrial accounts in Ameren territory were in better shape. These balances add up to nearly $150 million in residential arrearages, and $55 million due from commercial and industrial customers.

The rises in residential customers with deferred payment agreements were about four- and sixfold for ComEd and Ameren, respectively. There was also a large expansion in programs to assist low-income customers during the pandemic. 0.5% of customers were on such programs in 2018–2019, while over 4% participated in 2020. An important part of low-income assistance programs involves debt forgiveness, so it makes sense that a significant share of customers on these programs were also deferring payment to future dates. A curiously high 11% of ComEd customers on low-income

[1] Disconnections are a flow measure of the gross increase of customers without power (a stock). Absent an initial number of customers without power and statistics on reconnections, the stock is unobserved. However, disconnections become a better measure of the size of the disconnected population when long-term reconnection rates are high. Historical data from Commonwealth Edison report that about 75% of disconnections for non-payment are reconnected within 12 months.

[2] These programs are a combination of federal- and state-funded initiatives to provide heat and electricity bill assistance.

[3] I focus on October for these statistics because it is the last month before the winter/cold temperature shut-off moratoria kicked in, and a COVID-related moratorium was in effect through the summer of 2020. I use the years 2018–2020 because municipal aggregation programs affected the number of customers in earlier years (see Deryugina et al., 2020 for a recent evaluation of this episode), and zip code-level customer counts were only reported in 2020.

Table 1
October Summary Statistics from Illinois Utilities.

	Commercial 2020	All Residential 2020	All Residential 2018, 2019	Low-Income Residential 2020
A. Commonwealth Edison				
% Levied Late Fees	21.11	17.23		1.72
	[5.23]	[7.36]		[1.55]
% Served Disconnection Notice	1.66	3.64		11.30
	[0.95]	[2.54]		[4.93]
% Disconnected for Non-Payment	0.54	0.85	0.48	0.75
	[0.51]	[0.76]	[0.38]	[0.79]
% Balances Past Due	5.90	10.05	9.56	14.17
	[2.92]	[6.20]	[6.19]	[7.97]
Average Arrears	1199.41	306.73	185.96	426.53
	[1359.72]	[90.91]	[58.55]	[139.47]
% on Deferred Payment		4.19	1.36	13.25
		[3.12]	[1.09]	[5.84]
% on Low-Income Program		3.85	0.14	
		[3.61]	[0.23]	
Customers (thousands)	380	3695		142
B. Ameren				
% Levied Late Fees	20.97	20.30		8.86
	[5.12]	[5.60]		[4.14]
% Served Disconnection Notice	3.06	4.05		0.76
	[1.50]	[1.57]		[1.10]
% Disconnected for Non-Payment	0.31	1.26	0.20	0.94
	[0.35]	[0.80]	[0.19]	[1.14]
% Balances Past Due	1.60	8.02	7.95	26.27
	[1.62]	[4.00]	[3.95]	[8.26]
Average Arrears	366.69	565.33	442.59	588.62
	[583.52]	[183.54]	[121.43]	[257.06]
% on Deferred Payment	0.54	7.09	1.13	18.66
	[0.74]	[3.86]	[0.73]	[7.33]
% on Low-Income Program		6.12	1.50	
		[4.19]	[1.38]	
Customers (thousands)	212	1164		71

Note: Zip code level data are weighted by customer counts in 2020. Missing cells indicate non-reporting of the indicated statistic. All data are from October of the indicated year except arrears, which are reported in December of 2019 and 2020 only. Standard deviations in brackets.

assistance were served disconnection notices in October 2020, while the analogous figure was less than 1% for Ameren customers. This is also striking because Illinois utilities ostensibly extended their disconnection moratoria through March 2021 to customers who called the utility and claimed economic hardship (Crawford, 2020).

Fig. 1 shows that there has been an unprecedented increase in difficulty paying utility bills during the COVID-19 pandemic. It plots aggregate statistics for the three outcomes that are reported by both ComEd and Ameren back to 2013. The totals are expressed as a percent of the number of residential customer accounts in 2020, as Ameren does not report historical customer counts (and neither utility report the historical number of accounts at the zip code level). Data in 2020 are only reported in June and September-December. There are strong seasonal trends in all three outcomes. Assistance for low-income households is concentrated in the winter months, particularly during winter disconnection moratoria.[4] Deferred payment agreements peak once winter moratoria are lifted. There is strong evidence that these moratoria are binding, with large increases in disconnections each April. The historical patterns are entirely disrupted with the onset of the COVID-19 pandemic. In line with the summary statistics in Table 1, assistance, deferred liabilities, and disconnections are all multiples of their historical averages in October 2020. That said, the fact that a disconnection moratorium was mandatory for all but a couple of months (and technically in place for the entirety) of 2020 meant that total disconnections were lower than prior years. After about 125,000 and 150,000 customers were disconnected in 2018 and 2019, respectively, about 75,000 accounts were disconnected for nonpayment in 2020.

The wide dispersion of these outcomes is evident in Fig. 2, which presents a snapshot of outcomes for October 2020. For disconnections, there are 28 zip codes (with 16,000 customers) where over 4% of residential customers were disconnected in October, while 172 zip codes (with over 25,000 customers) had none at all. The figure also makes clear that Ameren more aggressively disconnected customers in 2020 than ComEd overall: The mid-state break in disconnection rates roughly corresponds to the territorial boundary between the companies. The south and west sides of Chicago are hard-hit relative to the surrounding suburbs, but there are zip codes throughout the state with comparable outcomes, or worse. For disconnection notices, there are roughly similar numbers of people (100,000) in zip codes with more than 10% and less than 1% on notice. In panel (B), the widespread prevalence of customers behind on their electricity bills is striking. With one out of five households levied late fees overall, about 200,000 people live in zip codes where the number is one out of three.

To explore the distributional incidence of these hardships, I merge the utility reports with zip code-level demographic and economic characteristics from the U.S. Census Bureau's American Community Survey (ACS). These estimates are based on data collected between 2015 and 2019, and were released in December, 2020 (U.S. Census Bureau, 2020a). Table 2 presents summary statistics separately for Ameren and ComEd service territories, with statistics weighted by the number of residential customers in 2020. ComEd serves the Chicagoland area, with roughly three times the population spanning one third as many counties as

[4] Shutoffs in Illinois are forbidden annually between December and March, as well as when the temperature is forecast to drop below 32^oF, or exceed 95^oF during the 24-h period in which the disconnection is scheduled. Illinois' low-income assistance program is primarily focused on providing winter heating.

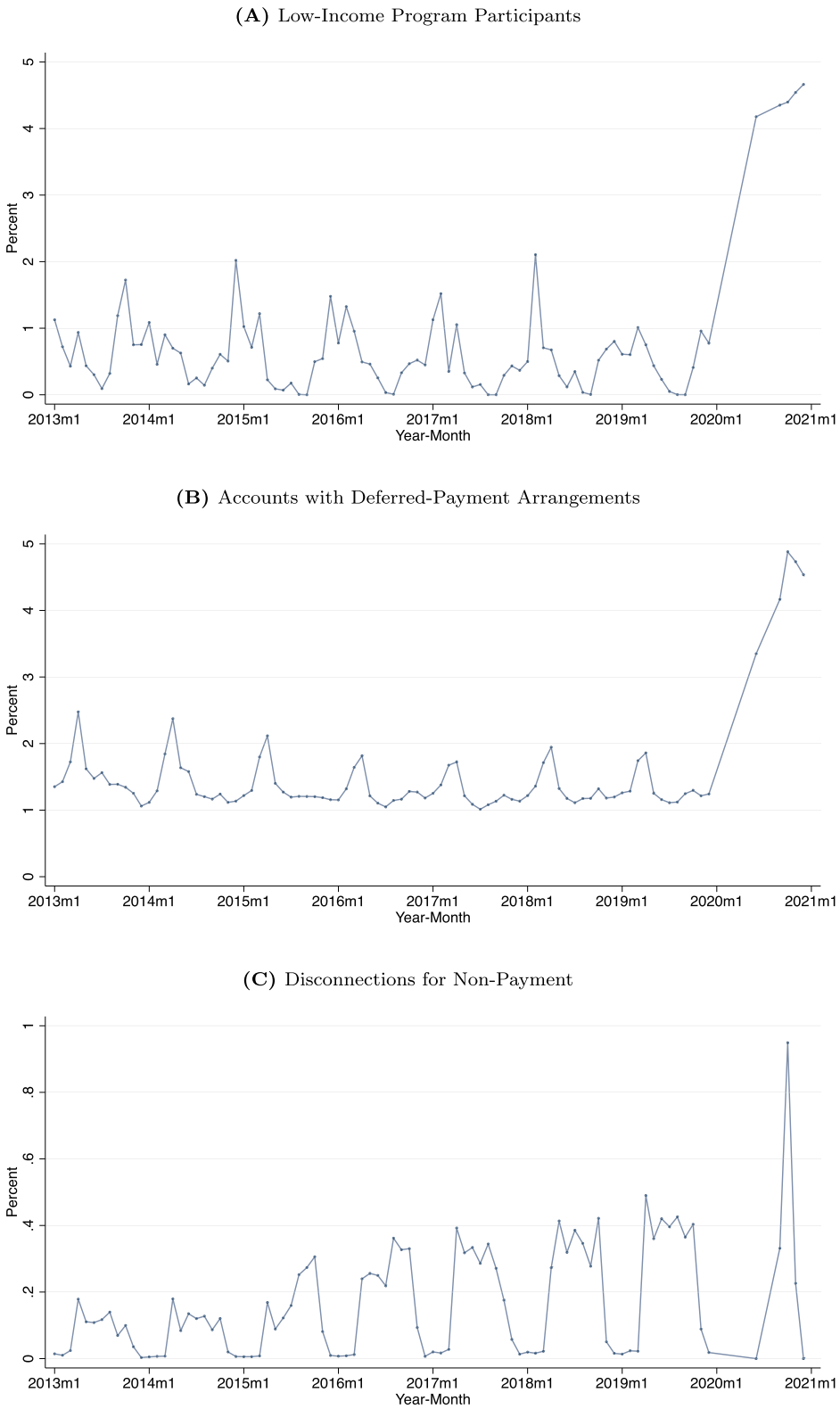

Fig. 1. Monthly Residential Outcomes in ComEd and Ameren Service Areas as a Percent of 2020 Accounts: 2013–2020. Note: Illinois' LIHEAP program is focused on winter heating. There is a mandatory disconnection moratorium between December and March each year, and when the temperature is below freezing. In 2020, this moratorium was extended through September.

Ameren. It has a larger minority composition, and the economy is more service sector-oriented, with much less agriculture than downstate. ComEd zip codes have roughly similar shares of households earning less than $15,000/year, but double the share earning more than $150,000/year. All told, the data reported to the Illinois Commerce Commission span over 1,300 zip codes in 102 counties.

To preview the disproportionate burden experienced by minority communities, Fig. 3 presents binned scatterplots of the main

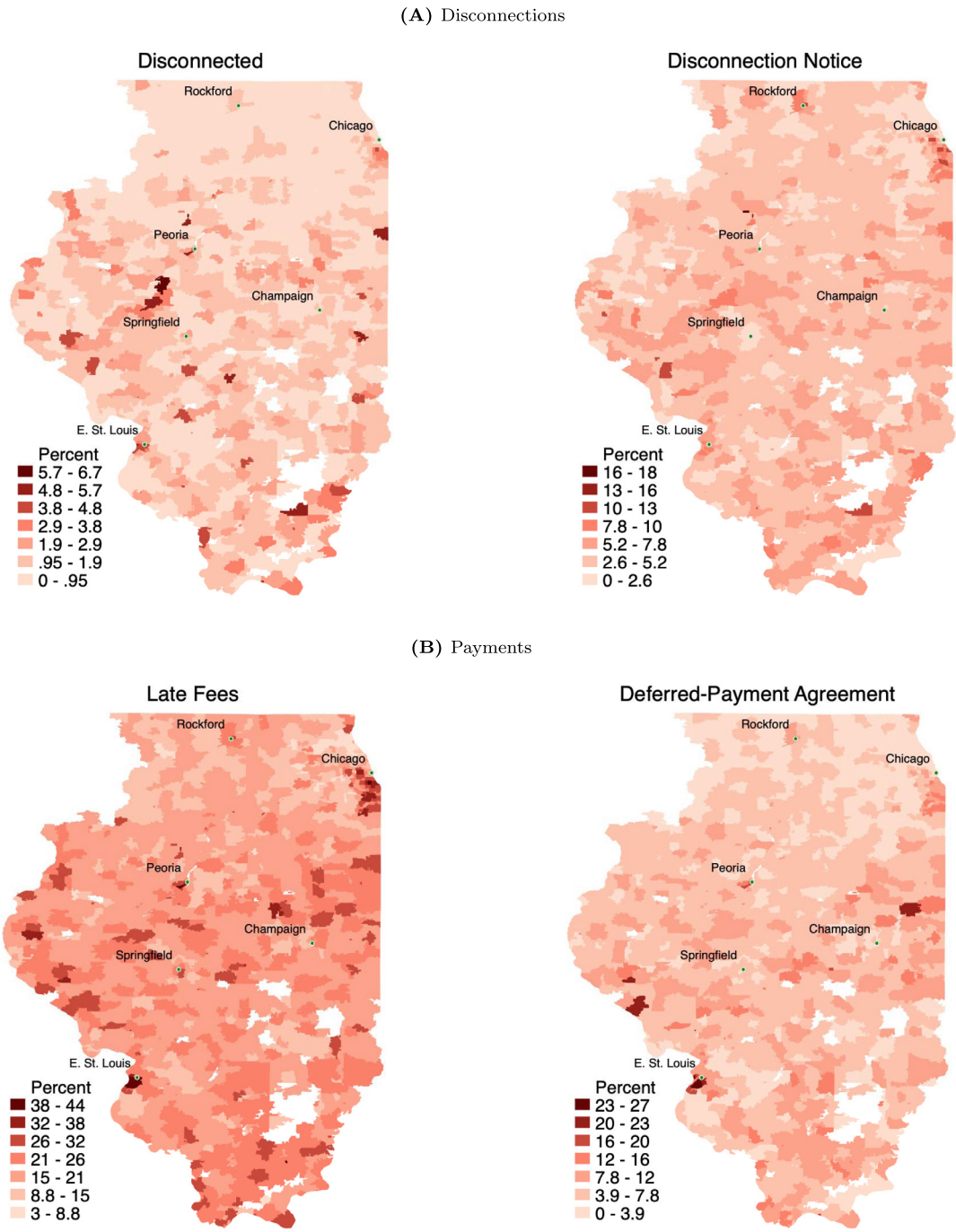

Fig. 2. Percent of Residential Accounts Behind on Electricity Bills in October 2020 by zip Code. Note: White space indicates zip codes outside of Comed and Ameren territories. Each sub-figure is scaled separately to allow for contrast. City indicators are placed centrally and do not indicate territorial boundaries.

outcomes with respect to the percent of zip code residents who identify as black (alone or in combination with other races) in the ACS. Each point represents about 240,000 residential customers, or 5% of the accounts reported in the data in October 2020. They are sorted along the x-axis according to the percent black in their respective zip codes. Within each ventile of racial composition the height represents the percent of the represented customers who experienced the indicated outcome in October 2020. The line represents the best fit in a bivariate regression of the outcome on zip code percent black.

For each outcome there is a strong gradient with respect to zip code racial composition. The mean disconnection rate in non-black zip codes was about 0.5%, while nearly 3% of customers were disconnected on average in the zip codes with the highest concentrations of African Americans. The rates for more mixed zip codes was close to the best fit line. This pattern repeats for the other outcomes, with disconnection notices and deferred-payment agreements each 5-fold higher in the communities with the highest share black. Customers in this highest ventile were levied late fees at are 2.5 times the rate of non-black zip codes. While these plots to not account for variables that are correlated with both the outcomes of interest and racial composition, they present stark descriptive pictures of the economic challenges that fall along racial lines in Illinois.

Table 2
Household Summary Statistics from the 2015 to 2019 American Community Survey.

	Ameren	ComEd
A. Demographics		
% Black	10.84	17.73
	[14.12]	[25.21]
% Hispanic: Any Race	3.73	20.36
	[3.64]	[19.13]
% Non-Citizen — Over 18	2.33	10.47
	[3.30]	[8.28]
Median Age	39.90	38.13
	[5.77]	[4.88]
Household Size	2.48	2.68
	[0.26]	[0.39]
Children under 15 per Household	0.44	0.50
	[0.11]	[0.16]
Adults over 65 per Household	0.43	0.38
	[0.10]	[0.12]
B. Economy		
% Agriculture	2.56	0.48
	[3.18]	[1.39]
% Construction	5.48	5.06
	[2.83]	[2.52]
% Manufacturing	11.97	11.55
	[5.53]	[5.16]
% Services	55.26	59.39
	[9.41]	[9.97]
% Other Industries	24.74	23.52
	[5.38]	[5.36]
Median Income (thousands)	56.83	75.13
	[17.28]	[28.58]
% Receiving SNAP Benefits	13.71	12.67
	[7.96]	[10.14]
% HH income < $15,000	12.18	9.61
	[7.33]	[6.37]
% HH income between $15,000 and $35,000	20.00	15.99
	[5.90]	[6.84]
% HH income between $35,000 and $75,000	31.79	27.09
	[5.56]	[6.20]
% HH income between $75,000 and $150,000	26.83	29.44
	[7.70]	[7.01]
% HH income >= $150,000	9.20	17.88
	[6.30]	[12.07]
Zip Codes	853	460
Counties	86	25
Households (thousands)	1282	3473

Note: Zip code level data are weighted by residential utility customer counts in 2020. Standard deviations in brackets.

3. Methods

I evaluate how indicators of economic stress correlate with zip code demographic and economic characteristics. This is a descriptive analysis using cross-sectional variation in differences across zip codes to estimate disproportionate burdens, holding the distribution of income fixed.

At the individual account level, these indicators are binary outcomes: either an account is disconnected for non-payment, or it is not. I observe these outcomes as counts aggregated to the zip code level. Each zip code c in month t has n_{ct} residential accounts, and there are y_{ct} accounts that experience the outcome of interest. Assuming that outcomes are determined by zip code characteristics $\mathbf{X}_{ct}$ and a logistic error term yields the log likelihood function:

$$l(\boldsymbol{\beta}) = \left[\sum_c \sum_t \left(y_{ct} \ln\left(\frac{\exp(\mathbf{X}_{ct}\beta)}{1+\exp(\mathbf{X}_{ct}\beta)}\right) + (n_{ct}-y_{ct}) \ln\left(\frac{1}{1+\exp(\mathbf{X}_{ct}\beta)}\right)\right)\right] \quad (1)$$

I estimate Eq. (1) via maximum likelihood separately for pre- and post-pandemic periods. Reported odds ratios are calculated as $e^{\hat{\beta}_j}$. For characteristics expressed as shares, this represents the predicted relative odds between a zip code entirely composed of the characteristic of interest and one completely lacking. Note that the odds ratio is invariant to the levels of the other neighborhood characteristics.[5] Estimates regarding the share of the population within household income bins are estimated relative to the share of households earning between $35,000 and 75,000 to avoid perfect collinearity.

Because the probability of each outcome of interest has changed significantly during the pandemic, changes in odds ratios do not reflect changes in the disproportionate burdens experienced by various groups. I therefore also report marginal probabilities based on the logistic distribution, or the predicted change in probabilities when characteristic x_j goes from zero to one, and the other characteristics are held at their sample means.[6] In the online appendix I estimate marginal probabilities based on OLS regressions of the share of accounts in a zip code experiencing a particular outcome on the same covariates used in the logistic specification. Weighting zip code-month observations by the number of customer accounts, this is a grouped data analog of a linear probability model.

To allow for within-county correlation in outcomes (due, for example, to county-level differences in policy), I calculate standard errors clustered at the county level. Results report 95% confidence intervals, which are asymmetric around the logit point estimates. They are based on the clustered standard errors. I further calculate p-values for the change in odds ratios between evaluation periods using these clustered standard errors.

4. Results

Table 3 presents estimates for neighborhood correlates with participation in utility-based low-income assistance programs. The mean probabilities at the bottom of the table reflect the massive expansion during the COVID-19 pandemic, going from 0.5% during 2018–2019 to 4.5% during the reported months of 2020. Zip codes with larger fractions of high income households are, of course, negatively associated with participation, with marginal probabilities predicting essentially zero enrollees in wealthy neighborhoods. The odds of participation are much higher in lower income neighborhoods, though the standard errors are quite large. Minority neighborhoods were about 70% more likely to participate in these programs, while larger shares of non-citizens are less likely to receive benefits. Relationships with the other demographic variables are all modest and not statistically different from zero. Controlling for demographic differences, ComEd was about half as likely to provide assistance under these programs before 2020. Comparing earlier years with the pandemic, the relative likelihood across groups is strikingly similar, while the breadth of participation has widely expanded.

Table 4 finds that deferred payment agreements (DPAs) are also more common in minority neighborhoods, though not with the share of non-citizens. While the lowest income neighborhoods

[5] With a logistic distribution, the log odds are

$$log\left[\frac{p}{1-p}\right] = \beta_0 + x_1\beta_1 + \ldots x_k\beta_k$$

The odds ratio between $x_j = 1$ and $x_j = 0$ is the exponentiated difference in log odds, which is e^{β_j} so long as the other characteristics are held fixed in the comparison.

[6] Letting $\bar{\mathbf{X}}_{-j}$ denote the sample means of characteristics other than j, the predicted change in probability when x_j goes from zero to one is

$$\Delta\hat{p}_j = \frac{e^{\bar{\mathbf{X}}_{-j}\boldsymbol{\beta}_{-j}+\beta_j}}{1+e^{\bar{\mathbf{X}}_{-j}\boldsymbol{\beta}_{-j}+\beta_j}} - \frac{e^{\bar{\mathbf{X}}_{-j}\boldsymbol{\beta}_{-j}}}{1+e^{\bar{\mathbf{X}}_{-j}\boldsymbol{\beta}_{-j}}}$$

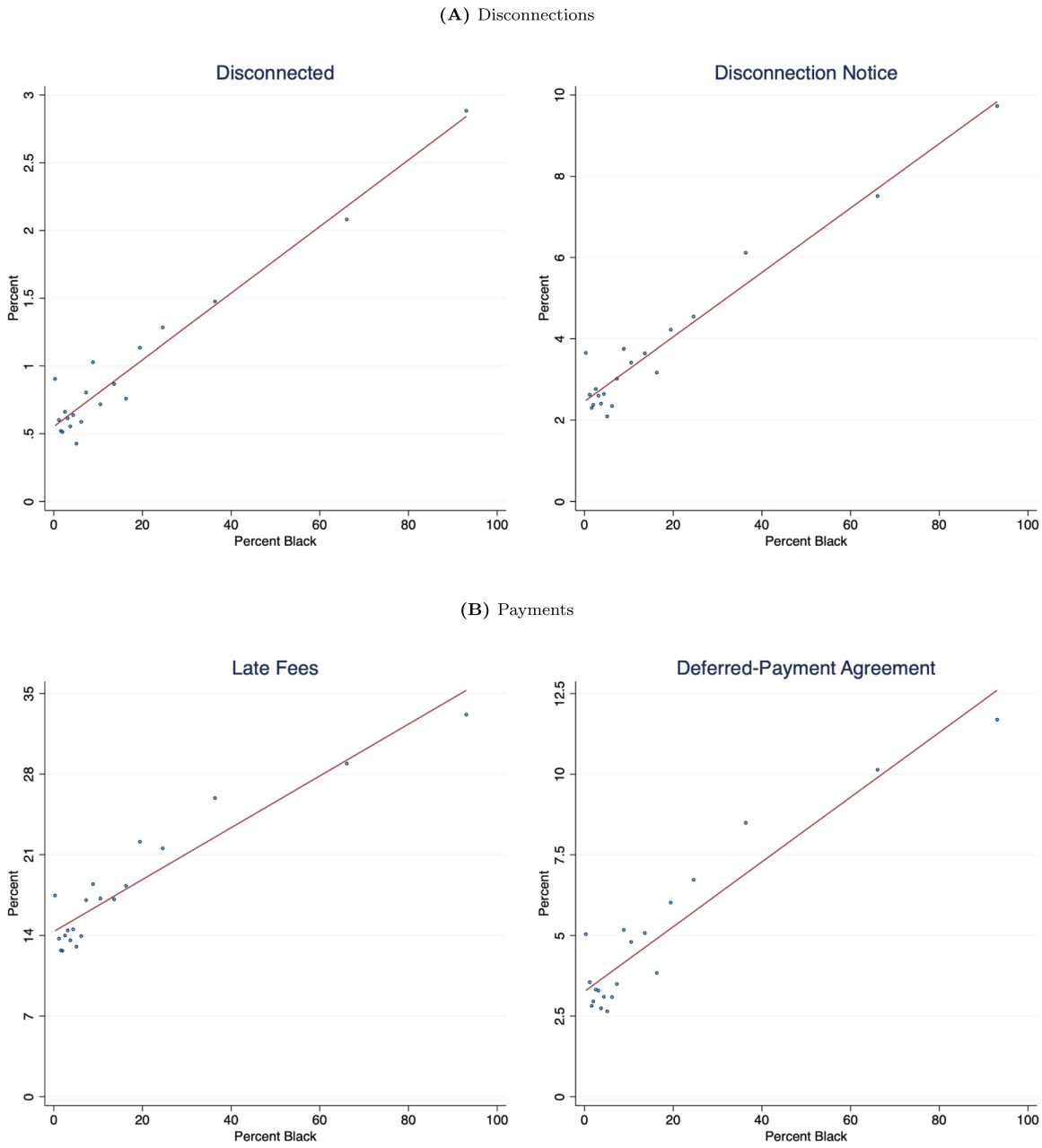

Fig. 3. Binned Scatterplots of payment distress in October 2020 and zip code percent black. Note: Each point represents the average of 5% of customers, or about 240,000 accounts. Zip code percent black is from the American Community Survey.

appear less likely to have DPAs, they are employed more often in zip codes with more children per household. The expansion of DPAs in 2020 amounts to a significant rise in debt owed by these households. An additional 4–6% of households in minority neighborhoods would be sufficiently behind on their electricity bill to require deferred payment. Although the change in odds ratios are not statistically different from zero, the marginal probabilities rose disproportionately and significantly for minority groups in 2020 (see Appendix Table A.2).

Table 5 presents the main estimates for residential electricity disconnections. All estimates are based on the month of October to keep estimates comparable across years with various disconnection moratoria in place during 2020. Controlling for the income distribution and other demographics, customers in minority neighborhoods were four to five times more likely to have their power disconnected, both in normal times and during the COVID-19 pandemic. An additional 2% of accounts are estimated to have been disconnected in minority zip codes, all else equal (over a mean of 0.9% in Illinois).

It is also interesting that low-income zip codes were not more likely to be disconnected during the pandemic, relative to neighborhoods with earners between $35,000 and 75,000. The combined forces of expanded assistance to low-income households and disconnections in middle-income zip codes has worked to essentially eliminate the gradient that exists in normal times. High income zip codes continue to have few disconnections, if any. Disconnection policies between utilities appear to have changed during the pandemic, as ComEd used to be nearly twice as likely to disconnect residential accounts, but has been 40% less likely during the pandemic.

In Tables 6 and 7 I examine correlates of disconnection notices and fees, and am able to include commercial and industrial

Table 3
Low Income Assistance Participation, September-December.

	2018–2019		2020		P-Value of Difference: Odds Ratio
	Odds Ratio (1)	Marginal Probability (2)	Odds Ratio (3)	Marginal Probability (4)	(5)
ComEd Territory	0.453	−0.004	0.728	−0.011	0.000
	[0.340,0.602]		[0.582,0.911]		
Share Black	1.681	0.002	2.366	0.038	0.015
	[1.027,2.752]		[1.578,3.548]		
Share Hispanic: Any Race	1.724	0.002	2.052	0.030	0.169
	[1.036,2.869]		[1.461,2.884]		
Share Non-Citizen — Over 18	0.402	−0.002	0.462	−0.019	0.574
	[0.181,0.895]		[0.246,0.869]		
Median Age	1.000	−0.000	1.003	0.000	0.489
	[0.981,1.019]		[0.991,1.016]		
Household Size	0.748	−0.002	0.957	−0.002	0.094
	[0.474,1.182]		[0.638,1.434]		
Children under 15 per Household	0.886	−0.000	0.889	−0.004	0.984
	[0.307,2.556]		[0.298,2.655]		
Adults over 65 per Household	0.979	−0.000	1.035	0.001	0.849
	[0.407,2.352]		[0.643,1.665]		
Share HH income < 15,000	2.105	0.004	2.736	0.050	0.282
	[0.465,9.541]		[0.816,9.176]		
Share HH income between 15,000 and 35,000	8.303	0.018	10.026	0.171	0.546
	[2.760,24.975]		[4.292,23.420]		
Share HH income between 75,000 and 150,000	0.043	−0.008	0.122	−0.053	0.001
	[0.011,0.169]		[0.033,0.455]		
Share HH income >= 150,000	0.075	−0.005	0.060	−0.049	0.492
	[0.023,0.242]		[0.027,0.133]		
Mean Probability	0.005	0.005	0.045	0.045	
Zip Code-Months	10208	10208	5108	5108	
Customer-Months (thousands)	38832	38832	19423	19423	

Note: 95% Confidence intervals in brackets are based on standard errors clustered at the county level. The mean probability is based on the overall share of account-months, while marginal probabilities are calculated as the difference in probabilities when the relevant explanatory variable equals one versus zero and all other variables are held at their sample means. Odds ratios are exponentiated logistic coefficients.

Table 4
Residential Accounts with Deferred Payment Agreements, September-December.

	2018–2019		2020		P-Value of Difference: Odds Ratio
	Odds Ratio (1)	Marginal Probability (2)	Odds Ratio (3)	Marginal Probability (4)	(5)
ComEd Territory	1.433	0.003	0.632	−0.018	0.000
	[1.210,1.696]		[0.523,0.763]		
Share Black	2.980	0.016	3.309	0.064	0.149
	[2.293,3.874]		[2.597,4.217]		
Share Hispanic: Any Race	1.986	0.009	2.257	0.038	0.141
	[1.705,2.313]		[1.705,2.988]		
Share Non-Citizen — Over 18	0.087	−0.011	0.089	−0.041	0.912
	[0.057,0.133]		[0.051,0.155]		
Median Age	1.014	0.000	1.020	0.000	0.053
	[1.006,1.023]		[1.010,1.030]		
Household Size	1.104	0.001	1.052	0.002	0.270
	[0.971,1.255]		[0.908,1.219]		
Children under 15 per Household	2.594	0.010	3.035	0.041	0.053
	[1.843,3.650]		[2.234,4.124]		
Adults over 65 per Household	0.403	−0.008	0.403	−0.030	0.991
	[0.283,0.573]		[0.254,0.639]		
Share HH income < 15,000	0.397	−0.006	0.225	−0.033	0.000
	[0.258,0.613]		[0.136,0.374]		
Share HH income between 15,000 and 35,000	1.204	0.002	0.799	−0.007	0.056
	[0.599,2.418]		[0.311,2.048]		
Share HH income between 75,000 and 150,000	0.566	−0.005	0.301	−0.035	0.016
	[0.181,1.764]		[0.116,0.779]		
Share HH income >= 150,000	0.014	−0.019	0.015	−0.068	0.590
	[0.007,0.025]		[0.007,0.030]		
Mean Probability	0.012	0.012	0.046	0.046	
Zip Code-Months	10208	10208	5108	5108	
Customer-Months (thousands)	38832	38832	19423	19423	

Note: 95% Confidence intervals in brackets are based on standard errors clustered at the county level. The mean probability is based on the overall share of account-months, while marginal probabilities are calculated as the difference in probabilities when the relevant explanatory variable equals one versus zero and all other variables are held at their sample means. Odds ratios are exponentiated logistic coefficients.

Table 5
Residential Accounts Disconnected for Non-Payment, October.

	2018–2019		2020		P-Value of Difference: Odds Ratio
	Odds Ratio (1)	Marginal Probability (2)	Odds Ratio (3)	Marginal Probability (4)	(5)
ComEd Territory	1.834	0.002	0.598	−0.005	0.000
	[1.501,2.242]		[0.518,0.691]		
Share Black	3.876	0.008	4.130	0.019	0.657
	[2.956,5.082]		[3.347,5.095]		
Share Hispanic: Any Race	5.666	0.012	3.908	0.017	0.079
	[4.182,7.676]		[2.957,5.164]		
Share Non-Citizen — Over 18	0.271	−0.003	0.176	−0.007	0.339
	[0.115,0.639]		[0.113,0.273]		
Median Age	1.007	0.000	1.013	0.000	0.434
	[0.994,1.020]		[1.005,1.020]		
Household Size	1.146	0.000	0.997	−0.000	0.257
	[0.880,1.492]		[0.841,1.181]		
Children under 15 per Household	0.670	−0.001	1.099	0.001	0.025
	[0.388,1.156]		[0.712,1.696]		
Adults over 65 per Household	0.797	−0.001	0.536	−0.005	0.167
	[0.455,1.396]		[0.338,0.852]		
Share HH income < 15,000	2.294	0.004	0.584	−0.003	0.001
	[1.022,5.147]		[0.250,1.364]		
Share HH income between 15,000 and 35,000	1.407	0.001	0.966	−0.000	0.761
	[0.309,6.400]		[0.262,3.559]		
Share HH income between 75,000 and 150,000	0.536	−0.002	0.116	−0.013	0.024
	[0.232,1.238]		[0.030,0.453]		
Share HH income >= 150,000	0.385	−0.002	0.096	−0.010	0.028
	[0.190,0.782]		[0.036,0.255]		
Mean Probability	0.004	0.004	0.009	0.009	
Zip Code-Months	2552	2552	1277	1277	
Customer-Months (thousands)	9708	9708	4854	4854	

Note: 95% Confidence intervals in brackets are based on standard errors clustered at the county level. The mean probability is based on the overall share of account-months, while marginal probabilities are calculated as the difference in probabilities when the relevant explanatory variable equals one versus zero and all other variables are held at their sample means. Odds ratios are exponentiated logistic coefficients.

accounts in the analysis. These outcomes were not provided in the historical data submissions, so I am unable to say how these relationships have changed during COVID-19 relative to historical averages. Both tables show a continued pattern for minority communities being disproportionately likely to have trouble paying electric bills. Businesses in these communities are also more likely to be behind on utility bills, on the order of 2–4 times more likely in Black and Hispanic zip codes. Interestingly, commercial accounts in zip codes with high shares of non-citizens are also modestly more likely to be served disconnection notices and charged late fees, while this characteristic is otherwise negatively associated with non-payment for residential accounts.

5. Discussion

In 2019, the National Association of Regulatory Utility Commissioners codified a set of best practices for the collection and dissemination of data on utility arrearages, disconnections, and low-income assistance participation (NARUC, 2019). The Illinois Commerce Commission has recently applied these principles, making available a wealth of data by zip code and month. As major real-time economic data collection efforts are underway (U.S. Census Bureau, 2020b; Buffington et al., 2020; Han et al., 2020), utility disconnections provide a valuable complementary resource to proxy for economic activity (Henderson et al., 2012). These data are the by-product of utilities' standard accounting operations, and generally not subject to business confidential dissemination constraints. Provided at the zip code level, they allow finer geographic detail than statistical surveys without compromising customer privacy. Although these data have little to say about homeless populations (as is the case for many benchmark consumption surveys (Meyer et al., 2021)), they provide greater coverage of groups that lack access to traditional banking or electronic payments. Disconnections may be especially useful as an indicator of severe economic distress: A comprehensive and responsive safety net might not register a change in utility arrears and disconnections during an economic shock. Instead, this measure is particularly useful in identifying gaps in the social safety net.

The picture that emerges from Illinois is a troubling one. Nearly 50,000 residential customers were disconnected for non-payment in October 2020, in spite of a voluntary moratorium that would exempt households experiencing financial hardship. Even after accounting for the distribution of income, these burdens fall disproportionately on minority communities—both in normal times and during COVID-19. The mean disconnection rate among 240,000 accounts in the zip codes with the largest share of black residents was 3%.

Looking forward, 3.4% of residences and 2.5% of businesses were served disconnection notices on a monthly basis in late 2020 before the regular winter disconnection moratorium began in December. An additional 3–5% of residences and businesses in minority zip codes is estimated to have received disconnection notices each month in late 2020. With deferred payment agreements accumulating balances due and higher residential consumption during the pandemic (Cicala, 2020), there was a significant risk of mass disconnection when moratoria expire at the end of March, 2021.

Detailed and regular public disclosure of utility arrears and disconnections provides researchers and policymakers with powerful tools to identify holes in the social safety net. Following media coverage of the working paper version of this article (Jaffe, 2021), the Illinois governor announced an $80M program to avoid disconnections with arrears relief. Importantly, the program works directly through utilities' disconnection lists to ensure that aid is delivered to households at the greatest risk of losing power. This helps

Table 6
Accounts Served Disconnection Notices, September-December 2020.

	Commercial & Industrial		Residential	
	Odds Ratio (1)	Marginal Probability (2)	Odds Ratio (3)	Marginal Probability (4)
ComEd Territory	0.556	−0.015	0.950	−0.001
	[0.503,0.614]		[0.840,1.074]	
Share Black: Alone or in Combination	3.842	0.051	2.709	0.040
	[3.235,4.563]		[2.265,3.241]	
Share Hispanic: Any Race	3.450	0.045	2.186	0.029
	[2.732,4.355]		[1.885,2.535]	
Share Non-Citizen — Over 18	1.492	0.011	0.149	−0.029
	[0.680,3.275]		[0.104,0.213]	
Median Age	0.995	−0.000	1.011	0.000
	[0.988,1.002]		[1.002,1.020]	
Household Size	0.837	−0.006	1.006	0.000
	[0.706,0.993]		[0.866,1.170]	
Children under 15 per Household	0.635	−0.010	2.163	0.023
	[0.412,0.979]		[1.550,3.019]	
Adults over 65 per Household	0.879	−0.003	0.488	−0.020
	[0.627,1.232]		[0.357,0.666]	
Share HH income < 15,000	0.949	−0.001	0.366	−0.021
	[0.420,2.145]		[0.186,0.718]	
Share HH income between 15,000 and 35,000	1.742	0.015	1.040	0.001
	[0.809,3.754]		[0.595,1.818]	
Share HH income between 75,000 and 150,000	0.907	−0.002	0.251	−0.032
	[0.395,2.085]		[0.119,0.531]	
Share HH income >= 150,000	1.510	0.011	0.058	−0.043
	[0.802,2.842]		[0.039,0.088]	
Mean Probability	0.025	0.025	0.034	0.034
Zip Code-Months	5276	5276	5232	5232
Customer-Months (thousands)	2362	2362	19435	19435

Note: 95% Confidence intervals in brackets are based on standard errors clustered at the county level. The mean probability is based on the overall share of account-months, while marginal probabilities are calculated as the difference in probabilities when the relevant explanatory variable equals one versus zero and all other variables are held at their sample means. Odds ratios are exponentiated logistic coefficients.

Table 7
Accounts Levied Non-Payment Fees, September-December 2020.

	Commercial & Industrial		Residential	
	Odds Ratio (1)	Marginal Probability (2)	Odds Ratio (3)	Marginal Probability (4)
ComEd Territory	0.823	−0.033	0.718	−0.049
	[0.759,0.893]		[0.665,0.775]	
Share Black: Alone or in Combination	2.220	0.155	2.554	0.158
	[1.947,2.530]		[2.302,2.833]	
Share Hispanic: Any Race	1.786	0.109	2.108	0.121
	[1.531,2.084]		[1.892,2.349]	
Share Non-Citizen — Over 18	1.475	0.071	0.502	−0.079
	[0.795,2.736]		[0.332,0.758]	
Median Age	0.997	−0.001	1.007	0.001
	[0.992,1.002]		[1.001,1.013]	
Household Size	0.903	−0.019	0.941	−0.009
	[0.833,0.980]		[0.861,1.028]	
Children under 15 per Household	0.751	−0.048	1.428	0.050
	[0.595,0.948]		[1.199,1.701]	
Adults over 65 per Household	0.875	−0.022	0.461	−0.102
	[0.658,1.162]		[0.374,0.569]	
Share HH income < 15,000	1.556	0.082	0.945	−0.008
	[0.951,2.545]		[0.688,1.298]	
Share HH income between 15,000 and 35,000	2.432	0.173	1.116	0.016
	[1.137,5.201]		[0.792,1.571]	
Share HH income between 75,000 and 150,000	1.530	0.075	0.489	−0.090
	[0.720,3.254]		[0.366,0.653]	
Share HH income >= 150,000	1.768	0.106	0.145	−0.175
	[1.072,2.915]		[0.105,0.200]	
Mean Probability	0.215	0.215	0.176	0.176
Zip Code-Months	5276	5276	5232	5232
Customer-Months (thousands)	2362	2362	19435	19435

Note: 95% Confidence intervals in brackets are based on standard errors clustered at the county level. The mean probability is based on the overall share of account-months, while marginal probabilities are calculated as the difference in probabilities when the relevant explanatory variable equals one versus zero and all other variables are held at their sample means. Odds ratios are exponentiated logistic coefficients.

improve targeting and reduce bureaucratic ordeals that might otherwise reduce take-up of benefits (Finkelstein and Notowidigdo, 2019).

Appendix A

Tables A.1–A.5.

Table A.1
OLS: Share of Accounts Participating in Low Income Assistance, September-December.

	2018–2019 Marginal Probability (1)	2020 Marginal Probability (2)	P-Value of Difference (3)
ComEd Territory	−0.005	−0.013	0.031
	(0.001)	(0.004)	
Share Black	0.001	0.052	0.000
	(0.002)	(0.008)	
Share Hispanic: Any Race	−0.000	0.016	0.010
	(0.001)	(0.007)	
Share Non-Citizen — Over 18	−0.005	−0.036	0.000
	(0.002)	(0.010)	
Median Age	0.000	0.001	0.032
	(0.000)	(0.000)	
Household Size	−0.000	0.000	0.933
	(0.002)	(0.010)	
Children under 15 per Household	0.003	0.025	0.351
	(0.004)	(0.027)	
Adults over 65 per Household	−0.006	−0.025	0.042
	(0.002)	(0.011)	
Share HH income < 15,000	0.028	0.173	0.000
	(0.010)	(0.043)	
Share HH income between 15,000 and 35,000	0.021	0.186	0.000
	(0.007)	(0.029)	
Share HH income between 75,000 and 150,000	−0.010	−0.051	0.029
	(0.004)	(0.022)	
Share HH income >= 150,000	0.001	−0.004	0.723
	(0.002)	(0.014)	
Mean Probability	0.005	0.045	
Zip Code-Months	10208	5108	
Customer-Months (thousands)	38832	19423	

Note: Estimates are weighted by number of customer accounts in each zip code-month. Standard errors are clustered at the county level.

Table A.2
OLS: Share of Residential Accounts with Deferred Payment Agreements, September-December

	2018–2019 Marginal Probability (1)	2020 Marginal Probability (2)	P-Value of Difference (3)
ComEd Territory	0.004	−0.022	0.000
	(0.001)	(0.005)	
Share Black	0.025	0.078	0.000
	(0.002)	(0.007)	
Share Hispanic: Any Race	0.008	0.027	0.000
	(0.001)	(0.005)	
Share Non-Citizen — Over 18	−0.025	−0.079	0.000
	(0.002)	(0.014)	
Median Age	0.000	0.001	0.040
	(0.000)	(0.000)	
Household Size	0.000	−0.002	0.421
	(0.001)	(0.004)	
Children under 15 per Household	0.013	0.051	0.000
	(0.002)	(0.009)	
Adults over 65 per Household	−0.008	−0.037	0.025
	(0.002)	(0.014)	
Share HH income < 15,000	−0.011	−0.064	0.034
	(0.007)	(0.032)	
Share HH income between 15,000 and 35,000	0.005	0.007	0.947
	(0.006)	(0.034)	
Share HH income between 75,000 and 150,000	−0.016	−0.084	0.001
	(0.003)	(0.023)	
Share HH income >= 150,000	−0.030	−0.099	0.000
	(0.002)	(0.016)	
Mean Probability	0.012	0.046	
Zip Code-Months	10208	5108	
Customer-Months (thousands)	38832	19423	

Note: Estimates are weighted by number of customer accounts in each zip code-month. Standard errors are clustered at the county level.

Table A.3
OLS: Share of Residential Accounts Disconnected for Non-Payment, October.

	2018–2019 Marginal Probability (1)	2020 Marginal Probability (2)	P-Value of Difference (3)
ComEd Territory	0.002	−0.005	0.000
	(0.000)	(0.001)	
Share Black	0.009	0.019	0.000
	(0.001)	(0.001)	
Share Hispanic: Any Race	0.008	0.010	0.043
	(0.001)	(0.001)	
Share Non-Citizen — Over 18	−0.005	−0.012	0.000
	(0.001)	(0.002)	
Median Age	0.000	0.000	0.000
	(0.000)	(0.000)	
Household Size	0.000	−0.000	0.576
	(0.001)	(0.001)	
Children under 15 per Household	0.000	0.005	0.011
	(0.001)	(0.002)	
Adults over 65 per Household	−0.001	−0.007	0.002
	(0.001)	(0.002)	
Share HH income < 15,000	0.005	0.010	0.355
	(0.002)	(0.006)	
Share HH income between 15,000 and 35,000	0.004	0.009	0.587
	(0.003)	(0.008)	
Share HH income between 75,000 and 150,000	−0.002	−0.016	0.011
	(0.001)	(0.006)	
Share HH income >= 150,000	−0.001	−0.006	0.102
	(0.001)	(0.003)	
Mean Probability	0.004	0.009	
Zip Code-Months	2552	1277	
Customer-Months (thousands)	9708	4854	

Note: Estimates are weighted by number of customer accounts in each zip code-month. Standard errors are clustered at the county level.

Table A.4
OLS: Share of Accounts Served Disconnection Notices, September-December 2020

	Commercial & Industrial Marginal Probability (1)	Residential Marginal Probability (2)
ComEd Territory	−0.013	−0.001
	(0.001)	(0.002)
Share Black: Alone or in Combination	0.036	0.050
	(0.003)	(0.003)
Share Hispanic: Any Race	0.027	0.023
	(0.003)	(0.003)
Share Non-Citizen — Over 18	0.009	−0.051
	(0.009)	(0.006)
Median Age	−0.000	0.000
	(0.000)	(0.000)
Household Size	−0.004	−0.002
	(0.002)	(0.003)
Children under 15 per Household	−0.007	0.030
	(0.005)	(0.006)
Adults over 65 per Household	−0.004	−0.020
	(0.004)	(0.005)
Share HH income < 15,000	0.015	−0.022
	(0.010)	(0.013)
Share HH income between 15,000 and 35,000	0.018	0.014
	(0.010)	(0.012)
Share HH income between 75,000 and 150,000	0.002	−0.052
	(0.009)	(0.012)
Share HH income >= 150,000	0.017	−0.056
	(0.006)	(0.010)
Mean Probability	0.025	0.034
Zip Code-Months	5276	5232
Customer-Months (thousands)	2362	19435

Note: Estimates are weighted by number of customer accounts in each zip code-month. Standard errors are clustered at the county level.

Table A.5
OLS: Share of Accounts Levied Non-Payment Fees, September-December 2020.

	Commercial & Industrial Marginal Probability (1)	Residential Marginal Probability (2)
ComEd Territory	−0.032	−0.048
	(0.007)	(0.006)
Share Black: Alone or in Combination	0.142	0.157
	(0.011)	(0.006)
Share Hispanic: Any Race	0.096	0.105
	(0.014)	(0.008)
Share Non-Citizen — Over 18	0.063	−0.095
	(0.053)	(0.028)
Median Age	−0.000	0.001
	(0.000)	(0.001)
Household Size	−0.017	−0.009
	(0.007)	(0.008)
Children under 15 per Household	−0.044	0.071
	(0.019)	(0.014)
Adults over 65 per Household	−0.023	−0.105
	(0.024)	(0.018)
Share HH income < 15,000	0.091	0.050
	(0.041)	(0.028)
Share HH income between 15,000 and 35,000	0.152	0.032
	(0.068)	(0.030)
Share HH income between 75,000 and 150,000	0.074	−0.135
	(0.063)	(0.025)
Share HH income >= 150,000	0.101	−0.191
	(0.044)	(0.024)
Mean Probability	0.215	0.176
Zip Code-Months	5276	5232
Customer-Months (thousands)	2362	19435

Note: Estimates are weighted by number of customer accounts in each zip code-month. Standard errors are clustered at the county level.

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