Technical Appendix

Project Name: Reducing documentation burdens to accelerate and broaden access to rental assistance

Date Finalized: 6/18/2024

Overview

The purpose of this document is to provide technical details on the analysis that are not described in the analysis plan or in the project abstract. These include decisions not pre-specified in the plan and additional results and analyses not reported in the main abstract. See the analysis plan and abstract for all other details.

Details and decisions not pre-specified in analysis plan

Logged outcomes

We deviated from the analysis plan by taking the log of two of the outcomes analyzed in this study. When preparing our data for analysis, we found that two pre-registered outcomes — 1. the number of applications submitted in a given ZIP code and 2. the total amount paid to applicants in a given ZIP code — were significantly right-skewed due to the large number of small ZIP codes that received no applications. We ran a simulation study to test whether this non-normality could cause potential bias in our pre-registered models. These simulations demonstrated that our pre-registered models would encounter less bias on our parameter of interest if these outcomes were logged. The histograms below show that taking the log (plus one) decreases the skew of the data, though there are still a large number of near-zero values due to ZIP codes which received no applications.

Figure 1. Zip code-level counts of applications before and after log(x+1) transformation
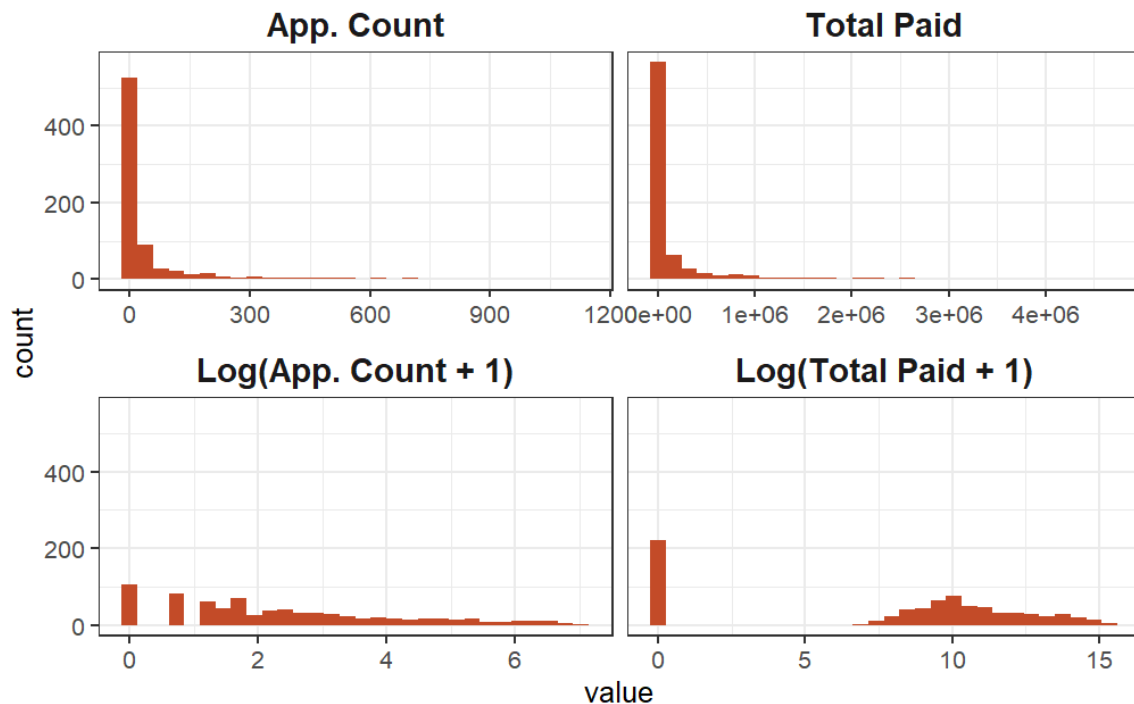
Individual-level models

The analysis plan pre-registered several models that use application data aggregated to the ZIP code level. We conduct two additional analyses that are substantively relevant at the individual level. We initially planned on estimating effects of the FSP on application processing time at the ZIP code level only. In this model, an estimated causal effect would be interpreted as the effect of FSP on the ZIP code-level average. For example, a negative coefficient on processing time would indicate that the FSP decreased processing time by some average, ZIP code-level amount, ignoring the population sizes of ZIP codes.

However, the FSP could make meaningful improvements at the individual level as well. For example, the FSP could decrease individuals' processing times and increase the probability of an individual application being approved. Individual level effects could potentially be hidden by estimating changes in proportions at the ZIP code level alone, since ZIP codes can receive vastly different numbers of applications. Individual-level models have the additional benefit of having greater statistical power. This is due to the large number of applications in our sample and the relatively small number of ZIP codes in Virginia. As a result, we report models for processing time for both individuals and ZIP codes.

We also fit models to estimate the effect of the FSP on application approval, an additional outcome that was not pre-registered. For similar substantive reasons, we fit models estimating this effect at both the individual level (estimating the effect of the FSP on approval probability) and the ZIP code level (estimating the effect of the FSP on the proportion of applications that are approved in the average ZIP code).

Additional exploratory analyses

Descriptive analysis

The table below reports applicant demographic characteristics across our sample of applications. Across the N=98,699 applications, we examine three statuses by group: (1) the number of applications; (2) the number and percentage of those applications that were approved; and (3) the percentage of those applications that were eligible for FSP. We code applications as FSP eligible based on the definition specified in the pre-analysis plan.[1]

The table shows how both the program in general and FSP in particular served members of underserved groups. The majority of the applications were from renters who self-identified as Black or African-American, and this group also had the highest rate of FSP eligibility based on their residential locations. For income status, we see many applications fall within the 51-80% AMI bucket and that many of these originated from FSP-eligible zip codes. There were also some applications with incomplete demographic reporting.

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[1] This involved three eligibility criteria: (1) the application was submitted from households with 3 or fewer members, (2) the application was processed after 6/10/2021, and (3) the application was submitted from an FSP-eligible ZIP code. FSP eligible zip codes were those with a median household income of less than $66,950 and that were not located in Chesterfield or Fairfax counties.

Table 1. Demographic characteristics of applicants and FSP eligibility

Characteristic	Group	# App. Submitted	# App. Approved	Approval Rate	Avg. HH Size	% App. FSP Eligible
Race	American-Indian or Alaska Native	491	264	53.80%	2.2	40.10%
	Asian	1,466	780	53.20%	2.9	10.60%
	Black or African-American	50,041	31,271	62.50%	2.1	49.70%
	Don't Know/Declined	4,746	2,791	58.80%	2.2	25.80%
	Multi-Racial	4,446	2,495	56.10%	2.2	38.20%
	Native Hawaiian or Other Pacific Islander	225	128	56.90%	2	32.90%
	White	22,238	10,464	47.10%	2	43%
	Race: Not Reported	15,046	9,973	66.30%	2	0.8%
Ethnicity	Don't Know/Declined	5,609	3,382	60.30%	2	34.90%
	Hispanic or Latino	5,738	3,266	56.90%	3	23.30%
	Non-Hispanic or Latino	71,829	41,545	57.80%	2	47.70%
	Ethnicity: Not Reported	15,523	9,973	64.20%	2	2%
Disability	Disability	6,996	4,463	63.80%	2	48.30%
	No Disability	76,135	43,622	57.30%	2	45.20%
	Disability Status: Not Reported	15,568	10,081	64.80%	2	0.8%
AMI	At or Below 30% AMI	59,454	50,577	85.10%	2.1	42.10%
	31-50% AMI	5,372	4,690	87.30%	3	5.5%
	51-80% AMI	3,340	2,899	86.80%	2.7	3.9%
	Over Income Threshold	411	0	0%	2.7	0%
	AMI: Not Reported	30,122	0	0%	2	41.30%
Veteran	Not Veteran	80,421	46,418	57.70%	2	45.70%
	Veteran	2,710	1,667	61.50%	2	38.80%
	Veteran Status: Not Reported	15,568	10,081	64.80%	1.8	0.80%

Effects on applications from underserved groups

We pre-registered an exploratory analysis that seeks to understand whether the FSP broadened access to ERA for several individual groups. To limit the degree of multiple testing, we use the AFC estimator, which is also more precise than the RDD. We focus on subgroup analyses by income status (between 0 and 30%, 31-50%, 51-80% of AMI, or over), racial categories (those who identify as Black, Asian, White, Hawaiian/Pacific Islander, Native American, or multi-racial), ethnicity categories (those who identify as Hispanic or Latino), veterans, and those who have a disability.

For each group identified below, we estimate effects on the following outcomes: application approval, number of applications, processing time, and total amount paid. As in other analyses, the number of applications and total amount paid are measured at the ZIP code level and logged (+1). Processing time and application approval are analyzed at the individual level.

These estimates are not corrected for multiple testing. We estimate effects among all groups separately and do not estimate differences in effect sizes between groups.

Table 2. Effects on approval: estimated separately by demographic group (individual-level model)

Characteristic	Group	Estimate	SE	p. value	95% CI
AMI	31-50% AMI	-0.043	0.076	0.58	[-0.197, 0.112]
	51-80% AMI	-0.078	0.107	0.472	[-0.296, 0.14]
	At or Below 30% AMI	0.044	0.027	0.107	[-0.01, 0.097]
	Over Income Threshold	-	-	-	-
Race	American-Indian or Alaska Native	-0.322	0.256	0.226	[-0.865, 0.221]
	Asian	0.155	0.154	0.324	[-0.162, 0.473]
	Black or African-American	0.105	0.038	0.008	[0.029, 0.182]
	Don't Know/Declined	0.181	0.084	0.036	[0.012, 0.349]
	Multi-Racial	0.062	0.062	0.326	[-0.064, 0.188]
	Native Hawaiian or Other Pacific Islander	0.027	0.256	0.919	[-0.557, 0.61]
	White	0.129	0.033	0	[0.063, 0.195]
Ethnicity	Don't Know/Declined	0.186	0.074	0.016	[0.037, 0.335]
	Hispanic or Latino	-0.032	0.061	0.597	[-0.155, 0.09]
	Non-Hispanic or Latino	0.129	0.027	0	[0.075, 0.183]
Disability	No Disability	0.122	0.027	0	[0.069, 0.175]
	Disability	0.07	0.062	0.263	[-0.054, 0.194]
Veteran	Not Veteran	0.115	0.026	0	[0.064, 0.166]
	Veteran	0.114	0.07	0.115	[-0.03, 0.258]

Table 3. Effects on number of applications: estimated separately by demographic group (zip code-level model)

Characteristic	Group	Estimate	SE	p. value	95% CI
AMI	31-50% AMI	-0.413	0.052	0	[-0.515, -0.311]
	51-80% AMI	-0.443	0.06	0	[-0.561, -0.324]
	At or Below 30% AMI	0.118	0.079	0.137	[-0.038, 0.273]
	Over Income Threshold	-0.172	0.039	0	[-0.249, -0.095]
Race	American-Indian or Alaska Native	0.037	0.038	0.33	[-0.037, 0.111]
	Asian	-0.02	0.035	0.575	[-0.089, 0.05]
	Black or African-American	0.055	0.074	0.461	[-0.091, 0.2]
	Don't Know/Declined	0.007	0.057	0.9	[-0.104, 0.118]
	Multi-Racial	0.072	0.062	0.24	[-0.049, 0.193]
	Native Hawaiian or Other Pacific Islander	-0.006	0.031	0.859	[-0.066, 0.055]
	White	0.116	0.083	0.163	[-0.047, 0.279]
	Don't Know/Declined	-0.029	0.068	0.669	[-0.163, 0.104]
Ethnicity	Hispanic or Latino	0.063	0.062	0.314	[-0.06, 0.185]
	Non-Hispanic or Latino	0.11	0.079	0.162	[-0.044, 0.264]
Disability	No Disability	0.123	0.079	0.118	[-0.031, 0.277]
	Disability	0.077	0.065	0.235	[-0.05, 0.203]
Veteran	Not Veteran	0.092	0.081	0.257	[-0.067, 0.251]
	Veteran	0.068	0.05	0.176	[-0.031, 0.167]

Table 4. Effects on processing time: estimated separately by demographic group (individual-level model)

Characteristic	Group	Estimate	SE	p. value	95% CI
AMI	31-50% AMI	-22.722	17.513	0.202	[-58.102, 12.657]
	51-80% AMI	-20.536	27.207	0.456	[-75.87, 34.798]
	At or Below 30% AMI	-13.238	7.926	0.1	[-29.103, 2.627]
	Over Income Threshold	-	-	-	-
	American-Indian or Alaska Native	9.216	37.74	0.81	[-70.858, 89.291]
	Asian	-8.886	20.832	0.673	[-51.875, 34.102]
	Black or African-American	-12.048	5.42	0.032	[-23.008, -1.089]
	Don't Know/Declined	-35.646	18.124	0.056	[-72.197, 0.905]
Race	Multi-Racial	-12.546	13.537	0.36	[-39.957, 14.864]
	Native Hawaiian or Other Pacific Islander	-42.106	55.312	0.467	[-168.294, 84.083]
	White	-17.159	6.832	0.014	[-30.793, -3.526]
	Don't Know/Declined	-15.499	20.782	0.46	[-57.463, 26.465]
Ethnicity	Hispanic or Latino	-21.409	14.836	0.156	[-51.346, 8.528]
	Non-Hispanic or Latino	-15.149	4.147	0.001	[-23.464, -6.833]
Disability	No Disability	-16.742	4.306	0	[-25.376, -8.107]
	Disability	-0.809	13.6	0.953	[-28.086, 26.468]
Veteran	Not Veteran	-15.463	4.602	0.001	[-24.684, -6.242]
	Veteran	-11.263	15.531	0.474	[-43.08, 20.553]

Table 5. Effects on total paid applications: estimated separately by demographic group (zip code-level model)

Characteristic	Group	Estimate	SE	p. value	95% CI
	31-50% AMI	-1.878	0.341	0	[-2.547, -1.209]
	51-80% AMI	-2.527	0.365	0	[-3.244, -1.81]
	At or Below 30% AMI	0.819	0.467	0.08	[-0.098, 1.735]
	Over Income Threshold	-	-	-	-
	American-Indian or Alaska Native	0.393	0.286	0.17	[-0.168, 0.954]
	Asian	-0.066	0.293	0.821	[-0.641, 0.508]
AMI	Black or African-American	0.145	0.433	0.738	[-0.705, 0.994]
	Don't Know/Declined	-0.067	0.341	0.845	[-0.737, 0.603]
	Multi-Racial	0.174	0.42	0.679	[-0.651, 0.999]
	Native Hawaiian or Other Pacific Islander	-0.062	0.248	0.802	[-0.548, 0.424]
	White	0.497	0.48	0.301	[-0.446, 1.441]
Race	Don't Know/Declined	0.029	0.399	0.942	[-0.755, 0.813]
	Hispanic or Latino	-0.073	0.384	0.85	[-0.826, 0.681]
Ethnicity	Non-Hispanic or Latino	0.748	0.485	0.124	[-0.205, 1.7]
	No Disability	0.53	0.453	0.243	[-0.36, 1.42]
Disability	Disability	0.571	0.427	0.182	[-0.267, 1.41]
	Not Veteran	0.669	0.465	0.151	[-0.244, 1.581]
Veteran	Veteran	0.346	0.348	0.321	[-0.337, 1.03]

Robustness checks for sample definition

Our pre-registered ZIP level models defined any application submitted after 12/22/2020 and before 6/10/2021 as "pre-FSP," and applications submitted on and after 6/10/2021 and before 12/1/2021 as "post-FSP." As a robustness check, we vary the "post-FSP" definition by weekly increments and re-calculate the model for each period. That is, the first estimate below defines the post-FSP period as all applications submitted between June 10th and June 17th, 2021. The second uses 6/10-6/24, and so on, until the final estimate using the 6/10-12/1 period replicates our primary analysis using the full sample.

For both the total number of applications submitted and the total amount paid, we find estimates consistent with the main results throughout this time period (failure to reject the null hypothesis). Note that the size of the confidence interval does not shrink as we add more applications because these analyses are run at the ZIP level.

Figure 2. Do results for the effect of FSP on total applications and total paid change when we alter the duration of the "post-FSP" study window?
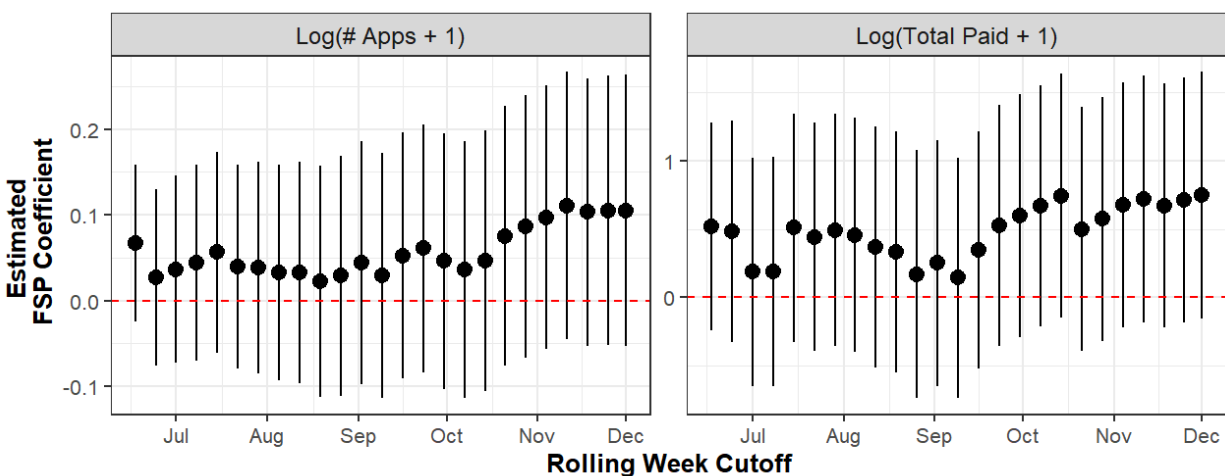
For our individual-level models on application approval and processing time, we take a slightly different approach. Our pre-registered analyses used a subset of applications that were submitted before FSP started on 6/10/2021, but were processed afterwards. We chose this sample to avoid post-treatment bias, as the probability of applying for this group was not affected by FSP.

To check robustness to this timeframe, we *decrease* the size of our window in weekly increments. For example, our main analysis uses the set of applications that were submitted after 12/20/2020 but before 6/10/2021 (when FSP started). For each estimate below, we re-run the same analysis but shrink this window by one week: the estimates furthest to the right only include applications submitted between 6/3-6/10, the next includes 5/27-6/10, and so on until our left estimates replicate the main results shown in our abstract.

Here, we see that our results for both application approval and processing time are consistent with the main results throughout these increasing sample windows. Notice here that our confidence intervals tend to increase as we move to the right and narrow the size of the sample

window. This is because these analyses are conducted at the individual level, rather than the ZIP level as before.

Figure 3. Do the results for the effect of FSP on approval rates and processing time change when we alter the duration of the study window?