Small Businesses and the Paycheck Protection Program in the Inland Empire (Part II of III: Spatial Patterns)

We devote three issue briefs to our recent study on the allocation of the Paycheck Protection Program (PPP) in the Inland Empire. The PPP is a Small Business Administration (SBA)-backed loan program that helps businesses keep their workforce employed during the COVID-19 crisis. In Issue 1, we provide an introduction of the PPP and examine the characteristics of small businesses that have received the PPP loans. Then we look at the geographical distribution of PPP loans at the neighborhood level in Issue Brief 2. In Issue Brief 3, we address the question of what neighborhoods received more PPP loans.

QUICK FACTS:

- 3 out of 822 census tracts in the Inland Empire did not receive any PPP loans.
- 3 census tracts received more than 1000 loans while the average number is 146 and the median is 111 .
- Census tracts receiving a larger number of PPP loans from the First Draw were likely to receive Second Draw PPP loans.
- A tract in the City of Rancho Cucamonga received 1,832 PPP loans — the largest number in the Inland Empire, as well as the largest total loan value at $260 million.
- The average PPP loan value received among all census tracts is $9.2 million.
- Census tracts in southwestern San Bernardino County and western Riverside County received a larger number of PPP loans compared with other areas.
- In general, the larger the number of loans received by a census tract, the larger the number of loans received by the neighboring tracts.
- The cities of Murrieta, Rancho Cucamonga, Ontario, Chino, and Victorville are hot spots for large numbers of PPP loans. In contrast, cold spots are found in the eastern unincorporated Inland Empire, the City of Riverside, and Cathedral City.

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Introduction

In Research Brief I – An Overview (ICSD, 2021), we provided an introduction of the Paycheck Protection Program (PPP) program, and the general statistics about the PPP loans received by small businesses from April 3, 2020 to May 31, 2021 in the Inland Empire. An important question is: Has the PPP reached the intended beneficiaries and addressed small businesses' most urgent needs? Experiences of previous natural disasters have demonstrated suggest that vulnerable communities face significant challenges in access to resources for recovery and building resilience. During COVID-19, both the public and academic research have expressed concerns about equity in distribution and efficiency of government assistance. For instance, these government assistance programs may disproportionately benefit some businesses over others. The latter include extremely small businesses that are struggling the most with the pandemic disruption, the minority- and women-owned businesses, and those in the traditionally underinvested communities (Office of Evaluation Science, 2021; Santellano, 2021). Researchers even argue that the disparities in PPP lending have widened pre-pandemic economic inequalities across racial groups (Ong et al., 2021). In other words, financial channels and government aids are not exogenous as assumed in the standard empirical approach for estimating their impacts on businesses. Therefore, it is fundamental to identify the possible biases in program distribution and implementation before evaluating the effects of the programs.

In this brief (Spatial patterns) and the next brief (Neighborhood context), we conducted a series of analyses at the census tract level to provide insights into the spatial equity in the PPP allocation in the Inland Empire. Specifically, we first look at the spatial patterns of the PPP loans, and then we place them within the neighborhood socioeconomic context and evaluate whether vulnerable neighborhoods received fewer PPP loans.

Data and Methodology

Our data source about the PPP loans in the Inland Empire is the micro PPP loans data (one record for each PPP loan). The data set is made available to the public by SBA and covers the entire lifecycle of the PPP loan program with loans starting on April 3, 2020, and ending on May 31, 2021.

Geocoding and aggregating to census tracts

Census tracts are used as a proxy for neighborhoods following existing neighborhood segmentation and neighborhood change research. Census tracts are designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions and average about 4,000 inhabitants. Since each loan record provides a detailed address, we geocoded the addresses and link the coordinates to census tracts for aggregation. This was done by first converting the addresses to geographic coordinates with the Mapbox Geocoding API. The loan was further assigned to a specific census tract by determining which tract contains the associated coordinates with the help of the spatial join operation. Out of a total of 822 tracts in the Inland Empire, 3 did not receive any PPP loans.

Global and local indicators of spatial association

We use spatial statistics to detect the spatial clustering effect, namely, whether nearby tracts received a similar number of PPP loans. The widely used global and local indicators of spatial association, Moran's I and local Moran's I statistics, are adopted to accomplish this task. The spatial structure is defined using queen contiguity spatial weights where census tracts sharing a common vertex or a common edge are considered as neighbors. The permutation-based computational technique is used to conduct inferences about these statistics. 99,999 random permutations or conditional permutations are used for simulating the reference distribution under the null hypothesis of spatial randomness. We then obtain the pseudo-p-value which indicates the likelihood of the occurrence of the observed spatial pattern under the null hypothesis.

Results and Conclusions

General Characteristics

For all the census tracts which have received PPP loans, the average number of loans is 146 and the median is 111. The distribution had a wide range of [2, 1832] and was highly skewed to the right, meaning that most tracts received a small number of loans. Only 3 tracts received more than 1000 loans. This pattern holds if we differentiate First from Second Draw PPP loans.

For 269 tracts, not a single business that received a PPP loan reported to be in low- and moderate-income (LMI) communities, while for another 104 tracts, all the businesses receiving a PPP loan reported being in LMI communities. An average tract received as many Second Draw loans as 30.4% of First Draw loans. Only 2 tracts that received PPP loans from the First Draw (2 and 5 loans) did not receive any from the Second Draw. Out of all the tracts that received any Second Draw loans, a tract in unincorporated San Bernardino County received 16 loans, accounting for 84% of First Draw loans received - the largest percentage. Tracts receiving a larger number of PPP loans from the First Draw were likely to receive Second Draw PPP loans (Pearson's correlation coefficient = 0.958, p-value=0). This is expected as only borrowers which have received a PPP loan might be eligible for a Second Draw PPP loan[1]. The percentage of overlap between Second Draw loans and First Draw loans is visualized in Figure 2.

A tract in the City of Rancho Cucamonga received 1,832 PPP loans - the largest number in the Inland Empire, as well as the largest total loan value at $260 million. It should also be noted that the number of small businesses as of 2019 based on the County Business Patterns from the Census Bureau was also one of the highest. The average PPP loan value received among all census tracts is $9.2 million.

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[1] U.S. SBA Second Draw PPP loan. Retrieved from https://www.sba.gov/funding-programs/loans/covid-19-relief-options/paycheck-protection-program/second-draw-ppp-loan on July 7, 2021.

Spatial Patterns

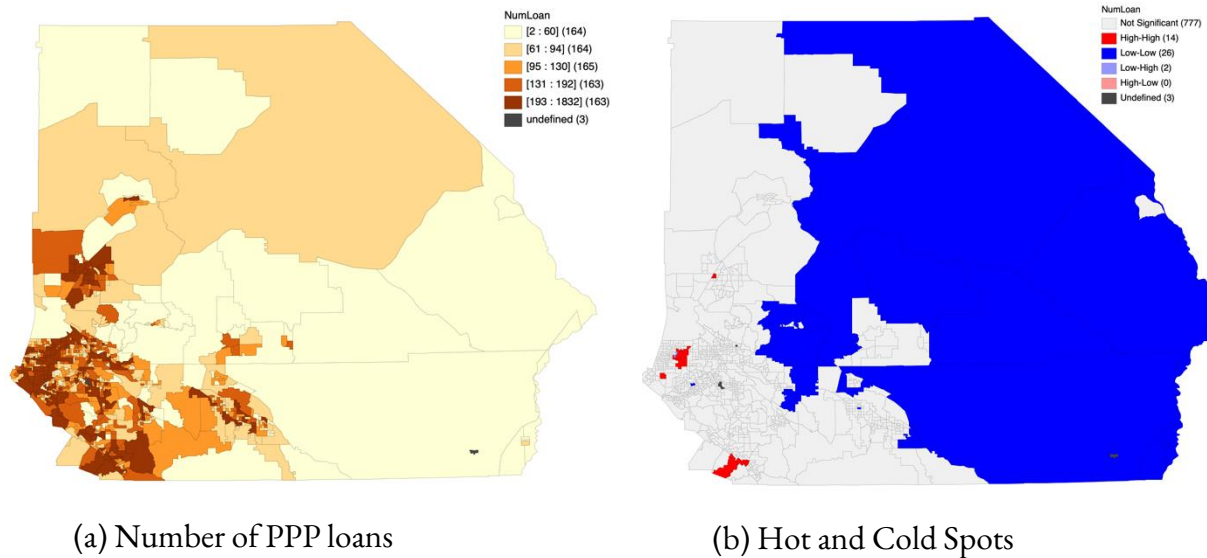(a) Number of PPP loans   (b) Hot and Cold Spots

Figure 1. Spatial patterns of PPP loans at the census tract level

As shown in the choropleth maps in Figure 1 (a), census tracts in southwestern San Bernardino County and western Riverside County received a larger number of PPP loans compared with other areas. This applies to both First and Second Draw PPP loans (Figure A1). The pattern is slightly different if self-employed businesses (defined as reporting 1 job) are excluded - the PPP loans are a bit more dispersed, but, still, census tracts in southwestern San Bernardino County and western Riverside County received more PPP loans.

The Moran's I statistic for the number of PPP loans is estimated to be 0.26 with a pseudo-p-value of 0.00001 under 99,999 permutations, indicating significant positive spatial autocorrelation. In other words, the larger the number of loans received by a census tract, the larger the number of loans received by the neighboring tracts. This clustering effect is also found in the spatial distribution of the number of Second Draw PPP loans as well as those (either First or Second Draw) received by businesses reporting to have more than more jobs. Further application of the local Moran's I statistics reveals hot and cold spots as shown in Figure 1(b)[2]. Hot spots are census tracts receiving many PPP loans surrounded by those also receiving many PPP loans. One hot spot is found to be located in southwestern Riverside County, part of which is within the boundary of the City of Murrieta. Another large hot spot is found to be in the City of Rancho Cucamonga and the City of Ontario. Two other hots spots are located in the City of Chino and the City of Victorville. Cold spots are found in the eastern unincorporated Inland Empire where a cluster of tracts received a small number of PPP loans. Two other cold spots are in the northwestern corner of the City of Riverside and in Cathedral City.

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[2] These local spatial statistics are significant at the 5% significance level after accounting for multiple testing with the technique of False Discovery Rate (FDR).

The spatial statistics and the maps reveal interesting patterns of PPP loan allocation at the census tract level. While we do observe spatial disparities as well as clusters of cold and hot spots, the underlying reason and the implication for spatial equity are unclear. For instance, the pattern could match how small businesses are distributed in the Inland Empire and thus the program reached its target population as intended. Or they are not proportionate to the number of small businesses in each census tract and some other forces were at work. For the next brief, we pull together a set of data sets about businesses, demographics, and socioeconomic characteristics to formally probe the neighborhood context and address the question of what neighborhoods received more.

References

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Santellano, K. (2021). Compounded inequality: How the US Paycheck Protection Program is failing Los Angeles Latino small businesses. Ethnic and Racial Studies, 44(5), 794–805.

Ong, P., Gonzalez, S., Domínguez-Villegas, R., Ong, J., & Pech, C. (2021). Disparities in the Distribution of Paycheck Protection Program Funds in California's Congressional Districts. https://latino.ucla.edu/wp-content/uploads/2021/02/LPPI_PPP-Congressional-Analysis-Report_03.03.21.pdf

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Appendix

**Table A1 Characteristics of PPP loans received by census tracts**

	Number of Loans	Loan Value	LMI Rate (%)	Number of Jobs
mean	146	9,240,289	37.32	1,131

std	145	20,316,969	40.29	2,258
min	2	28,956	0	6
25%	68	2,236,769	0	266
50%	111	4,122,549	20.63	552
75%	174	8,929,708	76.54	1,149
max	1,832	2.6E+08	100	29,590
n	819	819	819	819

Table A2 Characteristics of First and Second Draw PPP loans at the census tract level

	First Draw						Second Draw					
	Number of loans		Loan Value ($)	LMI Rate (%)	Number of jobs	Rate (%)	Number of loans		Loan Value	LMI Rate (%)	Number of jobs	Rate (%)
	All	>1 job					All	> 1 job				
mean	111	45	6,836,494	37.17	855	77.04	35	18	2,403,794	37.76	276	22.96
std	106	72	15,024,680	40.41	1,696	5.14	41	32	5,434,389	40.8	578	5.14
min	2	0	28,956	0	6	54.29	0	0	0	0	0	0
25%	53	14	1,598,724	0	194	73.7	15	5	480,810.4	0	54	19.62
50%	86	26	3,079,264	20.31	415	77.06	25	10	1,049,741	21.05	126	22.94
75%	132	52	6,474,925	77.23	893	80.38	40	20	2,367,331	79.17	288	26.3

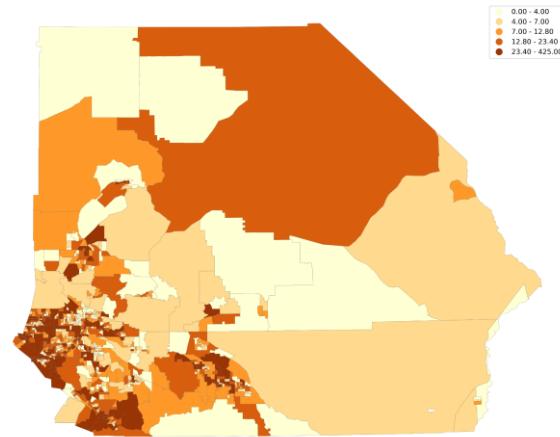|											
max	1,272	922	1.91E+08	100	22,167	100	560	425	69,628,973	100	7,423	45.71
n	819	819	819	819	819	819	819	819	819	819	819	819
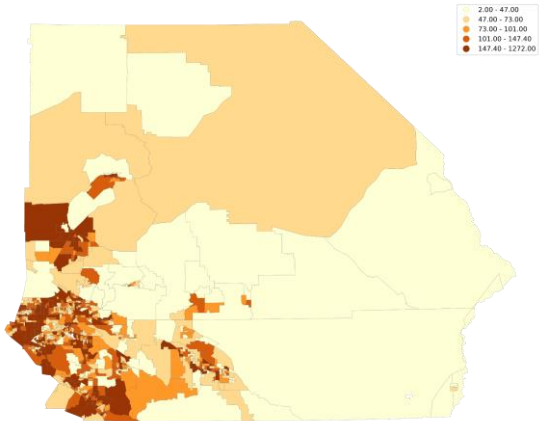
(a) Number of First Draw PPP loans (NumLoan1)
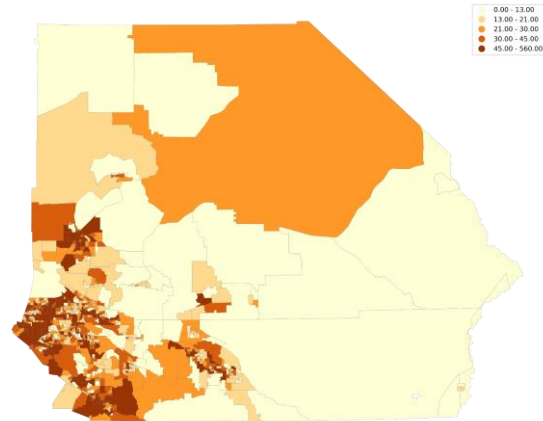
(b) Number of Second draw PPP loans (NumLoan2)
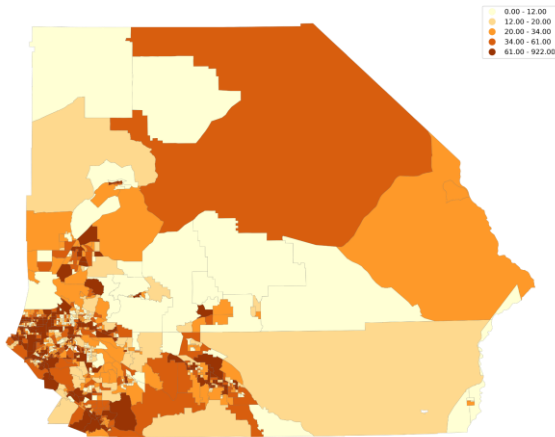
(c) Number of businesses receiving First Draw PPP loans and reporting more than one job (NumLoanMore1)

(d) Number of businesses receiving Second Draw PPP loans and reporting more than one job (NumLoanMore2)

Figure A1. Spatial distribution of PPP loans and small business recipients