
# ALTERNATIVE FINANCIAL SERVICE PROVIDERS AND THE SPATIAL VOID HYPOTHESIS: THE CASE OF NEW JERSEY AND DELAWARE

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## INTRODUCTION AND BACKGROUND

Many consumers use alternative financial service providers (AFSPs) – check cashing outlets, payday lenders, pawnshops, rent-to-own stores, auto title lenders, and money transmitters – to conduct some of their financial transactions. While AFSPs are typically found in commercial districts in low- and moderate-income urban neighborhoods, they are increasingly locating in suburban areas where low-wage workers are employed.[1] Many patrons of AFSPs lack a checking account (unbanked) or have one but, for various reasons, rarely use the services at their financial institution (underbanked). Estimates show that "in 2005, the unbanked and underbanked bought $3 trillion of goods and services with cash and money orders."[2] In addition to providing convenient hours for cashing checks, AFSPs offer other services and products, such as short-term payday loans, wire transfers, transit-fare passes, pre-paid telephone cards, bill paying, and lottery tickets. However, the fees for these services tend to be higher than those charged at mainstream financial institutions. The high fees, in turn, limit the asset-creating capability of those who frequent AFSPs. Since the services of AFSPs can be rather costly, why do consumers continue to patronize them? A 2004 Fannie Mae Foundation (FMF) study investigated the hypothesis that AFSPs serve the financial needs of patrons by filling a void created by the absence of traditional financial institutions.[3] This hypothesis, known as the *spatial void hypothesis*, was examined in the FMF study by concentrating on check cashing outlets, payday lenders, and pawnshops in eight locations across the country. The FMF study also analyzed whether AFSPs were disproportionately located in minority and low-income neighborhoods. Given the approach taken in the FMF study, the results cast doubt on the spatial void hypothesis in the areas studied.

A study by Tony E. Smith, Marvin M. Smith, and John Wackes (SS&W) also tested the spatial void hypothesis by focusing on four counties in the Commonwealth of Pennsylvania.[4] In addition to employing techniques used in the FMF study, the SS&W study developed "alternative statistical methods that [were] shown to yield sharper tests of the spatial void hypothesis."[5] In contrast with the FMF study, the SS&W study found support for the spatial void hypothesis in the counties investigated. To test the applicability of the SS&W findings to other geographical areas, this study applies the alternative methodology employed by SS&W to examine the spatial void hypothesis in selected counties in New Jersey and Delaware.

## METHODOLGY

As in the SS&W study, the present study focuses on the location patterns of traditional banking services (banks) and alternative financial service providers (AFSPs) (here taken to be either check cashers or pawnbrokers). The spatial relationship between these two financial entities, banks and AFSPs, is studied by observing their respective spatial clusters. According to the FMF study, "The use of clusters provides a more accurate picture of

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[1] Richard B. Kelsky, "Securing Customer Dignity," *Cheklist* (Fall 2003).

[2] Michael H. Jalili, "Unbanked: Why Some Say the Time Is Now," *American Banker*, June 7, 2006.

[3] Noah Sawyer and Kenneth Temkin, *Analysis of Alternative Financial Service Providers* (The Fannie Mae Foundation, 2004).

[4] Tony E. Smith, Marvin M. Smith, and John Wackes, "Alternative Financial Service Providers and the Spatial Void Hypothesis," *Regional Science & Urban Economics*, 38 (2008), pp. 205-27.

[5] Ibid, p. 206.

the geographic distribution of the marketplace served by traditional and alternative providers."[6] Here we employ two alternative approaches to identifying clusters. The first approach, which follows the FMF study, investigates the spatial void hypothesis using the nearest neighbor hierarchical clustering (NNHC) procedure developed by Levine.[7] The second employs a new method developed in the SS&W study and is based on Ripley's *K-function*.[8] Meaningful clusters of AFSPs or banks must involve at least five offices of AFSPs or banks, respectively. An added requirement is that a county must have at least one cluster of each type (AFSP and bank) in order to be included in the analysis. Given these prerequisites, four New Jersey counties — Atlantic, Mercer, Monmouth, and Passaic — met the qualifications, while only one Delaware county — New Castle — was eligible. The study uses U.S. census block-group data for these counties.

In addition to cluster analyses, we also compare the relative market areas of AFSPs and banks. Here we begin by examining markets from the demand side by considering the "relative access of AFSPs and Banks to the spatial distribution of incomes (as characterized by median incomes at the block-group level)."[9] Of interest is whether the income levels in markets served by AFSPs are significantly lower than those in markets served by banks. On the *supply side*, we first identify neighborhoods (block-groups) where residents "have significantly greater access to AFSPs than would be expected if AFSPs and Banks were indistinguishable."[10] We then ask whether the incomes of these neighborhoods are significantly lower than those of comparable random subsamples of neighborhoods. Banks are studied in a similar manner.

## DATA

The data for this study were drawn from sources comparable to those used in the SS&W study. Information on offices of AFSPs was obtained from New Jersey's and Delaware's Department of Banking state licensing data. The investigation of the demographic makeup of block-groups that comprise the locations of AFSPs and banks relied on block-group variables from the 2000 census. Bank addresses came from the Federal Deposit Insurance Corporation (FDIC) database, which includes all FDIC-insured full-service bank branches in New Jersey and Delaware.

## RESULTS

All of the counties in this study have five or more offices of banks for each AFSP (see Table 1). However, in our investigation of the spatial void hypothesis, we implement the approach taken in SS&W, which "looks beyond simply whether a neighborhood (or block-group) contains a Bank in addition to an AFSP and also accounts for population density."[11]

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[6] See Sawyer and Temkin (2004), p. 7.

[7] See N. Levine, *CrimeStat II.* (The National Institute of Justice, 2002).

[8] See B.D Ripley, "The Second-order Analysis of Stationary Point Patterns," *Journal of Applied Probability*, 13 (1976) pp. 255-66.

[9] See SS&W (2008), p. 207.

[10] Ibid.

[11] Ibid., p. 208.

**TABLE 1**
**NUMBER OF AFSP OFFICES AND BANK OFFICES**

| COUNTY | NUMBER OF AFSP OFFICES | NUMBER OF BANK OFFICES |
|---|---|---|
| New Castle County | 35 | 171 |
| Atlantic County | 14 | 79 |
| Mercer County | 13 | 141 |
| Monmouth County | 20 | 264 |
| Passaic County | 24 | 149 |

## Cluster Analyses

SS&W introduced an alternative to the NNHC procedure to identify clusters. This new procedure employs a local version of *K*-functions.[12] Unlike the nearest neighbor method, this approach allows an investigation of clustering at various spatial scales and takes into account population density. Consequently, instead of the concentration of financial institutions simply mirroring population clustering as in the NNHC method,[13] the SS&W approach focuses on "whether these concentrations are actually higher than would be expected given the local population."[14] By comparing the results of these two approaches, SS&W showed that the NNHC procedure can sometimes yield clustering results that are misleading.[15] Hence one objective of the present study is to determine whether this finding holds for the selection of counties in New Jersey and Delaware.

*Nearest Neighbor Hierarchical Clustering Procedure*

To identify clusters of AFSPs and banks under the nearest-neighbor procedure, we first mapped the locations of AFSPs and banks using the geocoding component in the ArcMap software. Figures 1A and 1B show the point locations of both AFSPs and banks for Passaic County. (While all counties will be discussed below, we focus here on Passaic County for illustrative purposes.) We then used the nearest neighbor hierarchical clustering (NNHC) procedure to identify clusters.[16] This procedure is based on the null hypothesis of "complete spatial randomness," which asserts that locations are randomly distributed within county boundaries. Hence, point pairs that are closer than would be expected under this hypothesis are initially identified and grouped as candidate clusters. However, the final clusters reflect collections of linked pairs that are grouped together as "first-order clusters." It should be noted that this procedure relies on the setting of two key parameters, taken from the SS&W

[12] For a derivation of this approach, see SS&W (2008).

[13] This is because clustering is defined relative to area rather than population, as discussed further below.

[14] See SS&W (2008), p. 210.

[15] Such misleading results might also arise, since the NNHC procedure ignores "edge effects." For a discussion of "edge effects," see SS&W (2008), p. 211-12.

[16] For more detailed discussions of this procedure, see Levine (2002) and SS&W (2008).

FIGURE 1A
PASSAIC AFSPs

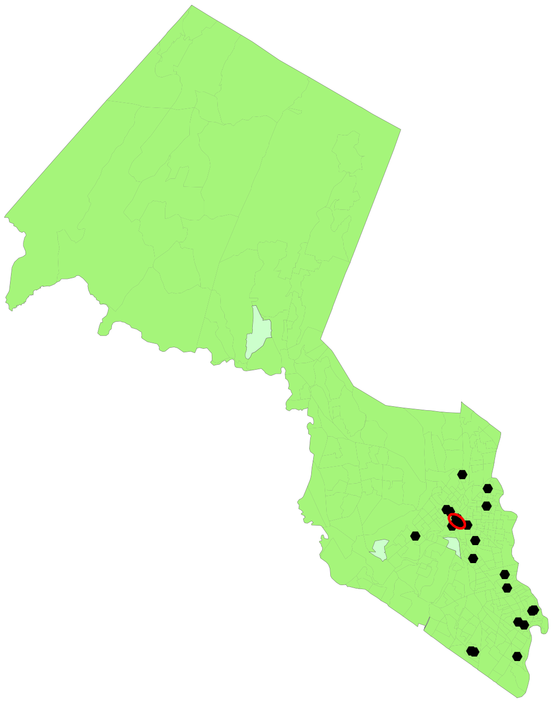
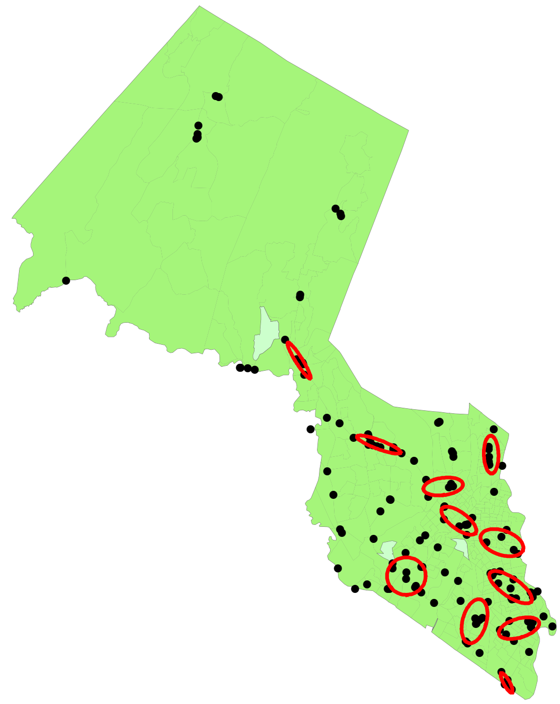


FIGURE 1B
PASSAIC BANKS



study: "The first is the *p-value threshold*, *p*, used to identify those pairs that are 'significantly' close together, and the second is the *cluster-size threshold*, *m*, used to define the minimum size of an 'admissible' cluster."[17] In this study, we employ the same values used in the FMF and SS&W studies, namely, $p = .01$ and $m = 5$. Each of the resulting clusters is shown in terms of its associated "dispersion ellipse," as depicted by the red ellipses in Figures 1A and 1B.

The SS&W paper noted that in the counties studied, many of the clusters identified for both AFSPs and banks were located in areas of high population density. Here the same pattern is found, as can be seen from the shaded population-density background for Passaic County in Figures 2A and 2B. In particular, the cluster for AFSPs and one of the clusters for banks are located in the city of Paterson — an area of high population density — while the remaining bank clusters are in or near other cities such as Passaic, Haledon, Clifton, and Hawthorne. According to SS&W, "This underscores the major limitation of this procedure, namely that concentrations of commercial services such as Banks are to be expected in areas of high density."[18] Thus, the critical question is whether concentrations are significantly high after controlling for local population.

*K-function Procedure*[19]

SS&W developed an alternative procedure that accounts for this and other shortcomings of the FMF procedure. In this method, rather than relying on the hypothesis of complete spatial randomness, it is postulated

[17] SS&W (2008), p. 209.

[18] Ibid.

[19] This section draws from material in SS&W (2008), pp. 211-12.

FIGURE 2A
PASSAIC AFSPs

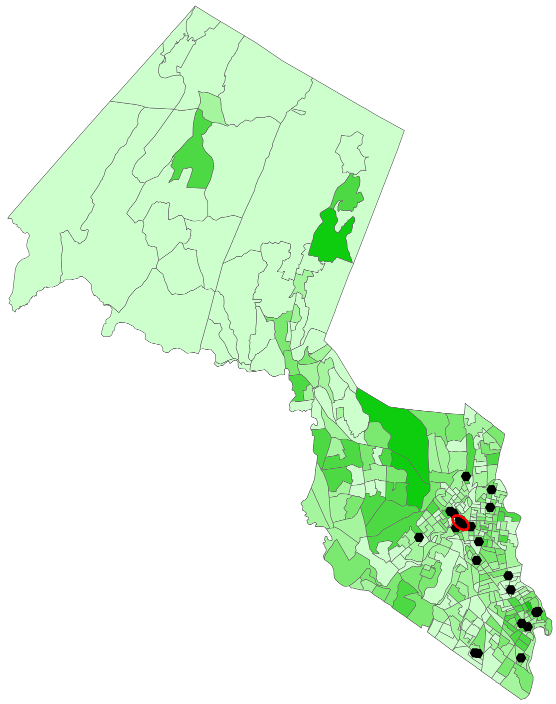
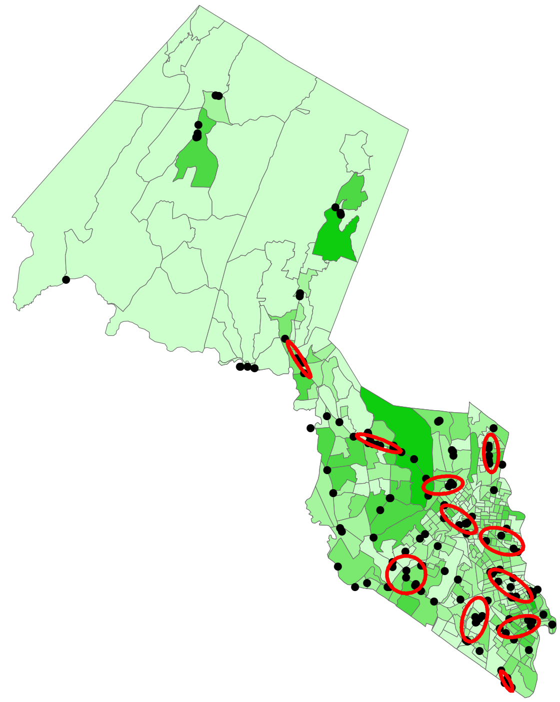


FIGURE 2B
PASSAIC BANKS



that probable locations are proportional to the underlying population distribution. SS&W motivates this *K*-function approach as follows: "Consider a given point pattern, $X^0 = \{x_i^0 : i = 1,..,n\}$, consisting of $n$ point locations (such as the [bank] locations in Figure 1B). For any point, $x_i^0$, let $K_i^0(d)$ denote the number of other points in $X^0$ within distance $d$ of $x_i^0$." As an illustration, they use the point $x_i^0$ in Figure 3 (reproduced from SS&W),[20] which represents an AFSP located near the edge of a county. In this example, *d* equals one-half mile and $K_i^0(d) = 2$ as shown by the two points in the figure.

SS&W then proceed "to test whether this observed count is 'unusually large' given the local population size (represented by the intensity of the shading of each block-group in the figure)." This is accomplished by using Monte Carlo methods to simulate a "large number of replicate point patterns, $X^{(s)} = \{x_i^{(s)}: i = 1,..., n\text{-}1\}$, s = 1,..., *N*, of size *n*-1, from a probability distribution proportional to population." SS&W point out that "each pattern $X^{(s)}$ then constitutes a possible set of locations for all points other than $x_i^0$, under the null hypothesis that location probabilities are proportional to population. If

FIGURE 3
POINT COUNTS
FOR PATTERNS

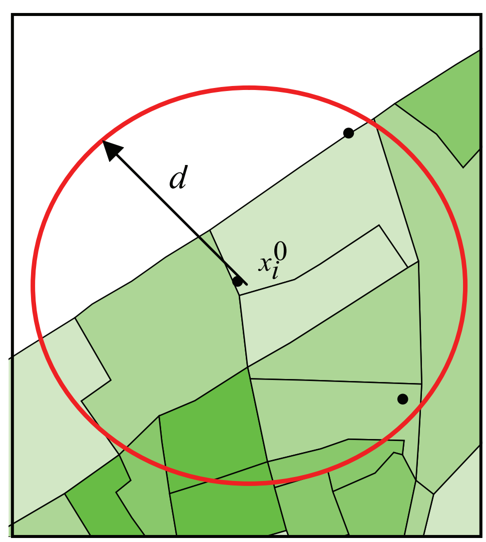



Figure is reprinted from Smith, Smith, and Wackes, "Alternative Financial Service Providers and the Spatial Void Hypothesis," *Regional Science & Urban Economics*, 38:3 (2008).

[20] This appears in SS&W (2008) as Figure 2 on page 212.

$K_i^{(s)}(d)$ denotes the number of points in each pattern, $X^{(s)}$, within distance $d$ of $x_i^0$, and if $K_i^0(d)$ were simply another sample from the distribution, then each possible ranking of this particular value in the list of values, $\{K_i^{(0)}(d), K_i^{(1)}(d), .., K_i^{(N)}(d)\}$, should be equally likely. Hence if $M_i(d)$ denotes the number of these $N$+1 values that are at least as large as $K_i^0(d)$, then the ratio

$$P_i(d) = \frac{M_i(d)}{N+1} \tag{1}$$

yields a (maximum likelihood) estimate of the probability of observing a count as large as $K_i^0(d)$ in a sample of size $N$+1 from the hypothesized distribution. By construction, $P_i(d)$ is thus the *p-value* for a (one-sided) test of this hypothesis." SS&W used the value N = 1000 for the simulations. As an example, they suggest that "if $M_i(d) = 10$, then $P_i(d) = 10/1001 < .01$ would imply that the estimated chance of observing a value as small as $K_i^0(d)$ is less than one in a hundred. Hence, in this case $K_i^0(d)$ might indeed be regarded as 'unusually large' after accounting for population." SS&W mapped these *p*-values to obtain a clear representation of where counts are unusually high. To compare the results from this approach with those of the NNHC procedure in their study, SS&W selected a *p-value threshold of p*= .01 and a *cluster-size threshold of m* = 5. Since one county in their study was more densely populated than the other three, SS&W used a *radial-distance threshold, d*, of one-half mile for the former and one mile for the latter.

*Comparison of NNHC and K-function Clustering Methods*

Following the SS&W study, we compare the NNHC and *K*-function clustering methods for our selection of counties. For the *K*-function approach, we use the same values for the *p-value threshold* and *cluster-size threshold* employed in SS&W, but we use a *radial-distance threshold* of one mile for all counties. All the counties in this study have one AFSP cluster under both methods. These counties have population densities similar to three of the four counties in SS&W, which also had the same result of a single AFSP cluster (see Table 2). The results of this *K*-function approach produced fewer bank clusters than the NNHC method, which parallels the findings of SS&W. A closer look reveals another difference between the two approaches. Some of the bank clusters in Passaic County using the NNHC method (Figure 4A) are *no longer significant* when population density is taken into account, as in the *K*-function approach (Figure 4B).[21] In particular, this is true of the bank clusters in areas such as Clifton, Hawthorne, Wayne, and Little Falls (Figure 4A).

**TABLE 2**
**COMPARISON OF CLUSTERS BETWEEN NNHC AND K-FUNCTION**

| COUNTY | NUMBER OF AFSP CLUSTERS | | NUMBER OF BANK CLUSTERS | |
|---|---|---|---|---|
| | NNHC | K-FUNCTION | NNHC | K-FUNCTION |
| New Castle County | 1 | 1 | 8 | 2 |
| Atlantic County | 1 | 1 | 4 | 1 |
| Mercer County | 1 | 1 | 5 | 2 |
| Monmouth County | 1 | 1 | 11 | 5 |
| Passaic County | 1 | 1 | 11 | 2 |

FIGURE 4A
PASSAIC BANKS (NNHC)

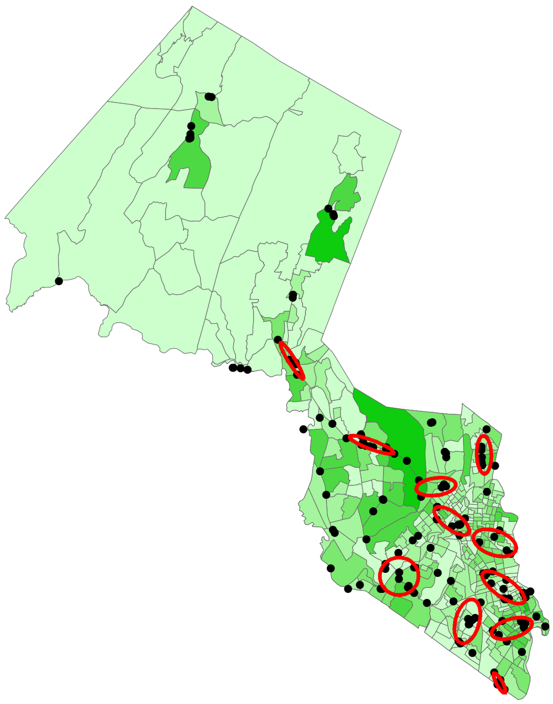
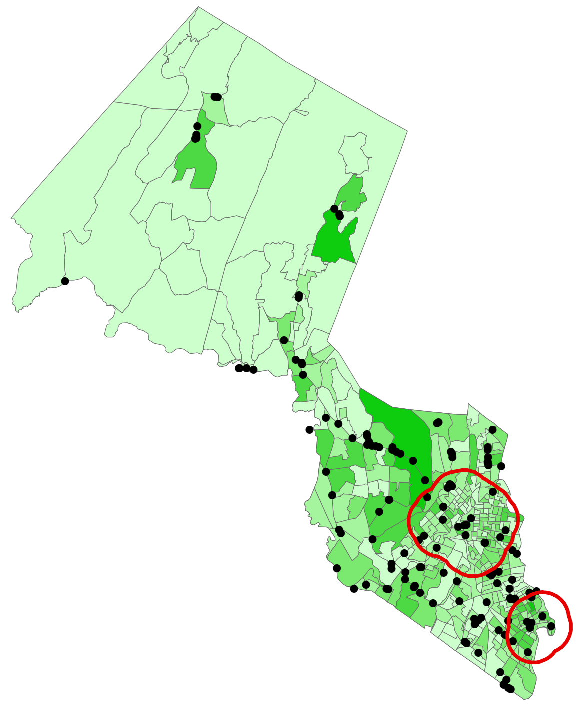


FIGURE 4B
PASSAIC BANKS (K-Function)



## Comparative Market Areas of AFSPs Versus Banks

To gain insight regarding the spatial void hypothesis for these counties, we next consider the locations of AFSPs relative to those of banks. In particular, we focus on the *market areas* served by AFSPs vis-à-vis banks and adopt the approach developed in SS&W. This approach compares market areas from both demand and supply viewpoints.

*Market Demand Side*

With respect to market demand, SS&W develop a spatial model that reflects "possible differences in the incomes of potential customers for financial institutions at different locations."[22] To do so, they approximate potential demand in each block-group based on the median-income level of that block-group. This, in turn, is used to "construct a measure of 'typical incomes' for potential customers for each financial institution."[23] SS&W assume that the likelihood that any individual in a specific block-group ($j$) is a customer of a particular institution ($i$) is based on the individual's accessibility to the institution, which is captured by the *individual's accessibility function*, $a(d_{ij})$.[24] In

[21] Here it is also important to note that rather than "dispersion ellipses," cluster boundaries in the *K*-function approach of SS&W are defined by the union of one-mile circles around each significant institution location. In this way, all institutions contributing to the significance of these locations are automatically included in the cluster. This convention also helps to identify cluster "shapes" as well as their size.

[22] Ibid.

[23] Ibid., p. 216.

[24] For a derivation of the *individual accessibility function*, see SS&W (2008) pp. 216-17.

keeping with SS&W, this function is assumed to take the following quadratic (kernel) form,

$$a(d) = a(d \mid b) = \begin{cases} \left[1-\left(d/b\right)^2\right]^2 & , d \le b \\ 0 & , d > b \end{cases} \tag{2}$$

which starts at $a(0)=1$ and declines to zero at some distance, *b*, representing the maximum distance at which a particular institution can expect to draw customers (in our case, *b* is taken to be one mile).[25] The expected number of customers for a particular institution (*i*) from a specific block-group (*j*) can be obtained by multiplying the individual accessibility function, $a(d_{ij})$, by the population of block-group (*j*). Next SS&W calculate the probability that any *i*-customer is from block-group *j* and use these probabilities together with the numbers of potential customers in each block-group to estimate the "typical income" of potential *i*-customers (based on "median incomes" for each block-group).[26] In the absence of specific information about true market sizes, we assume (as do SS&W) that banks and AFSPs have the same individual accessibility functions. Thus, the "analysis focuses mainly on differences between median-income values in the neighborhoods of these institutions."[27]

Using this spatial model of typical income levels, we now focus on the crucial question of "whether these incomes are higher for potential customers of Banks than AFSPs."[28] In doing so, however, SS&W point out that if one simply postulates that typical-income levels of potential customers are the same for banks and AFSPs, and tests this hypothesis by Monte Carlo methods, then one would overlook "many of the key factors constraining the actual locations of these institutions (such as the given street network and local zoning restrictions)."[29] Thus, they suggest "an alternative null hypothesis based on random-permutation tests. The key idea here is to take the full set of *institution locations*,

$$L = L_B \cup L_{AFSP} = \{i : i = 1,..,n_L\}, \; n_L = n_B + n_{AFSP} \tag{3}$$

as given [where $L_B$ denotes the set of $n_B$ bank locations, and $L_{AFSP}$ denotes the set of $n_{AFSP}$ AFSP locations], and to ask what expected income differences would look like if the location behavior of banks and AFSPs were completely indistinguishable. Here 'indistinguishable' is taken to mean that the specific locations called 'Banks' are simply one of the many equally-likely choices of $n_B$ sites from *L*."[30] According to SS&W, "Since each choice of these sites amounts to a random re-labeling of sites, the distribution of income differences for Banks and AFSPs under the *indistinguishability hypothesis* can readily be estimated by sampling a large set of *N* re-labelings" and computing the estimates of the expected values in equations (4) and (5) for each of these samples,[31]

$$Y_B^{\pi} = \frac{1}{n_B} \sum\nolimits_{i \in L_B} Y_i^{\pi} \tag{4}$$

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[25] Ibid.

[26] See SS&W (2008), p. 216, for the formulations.

[27] Ibid.

[28] Ibid.

[29] SS&W (2008), pp. 216-17.

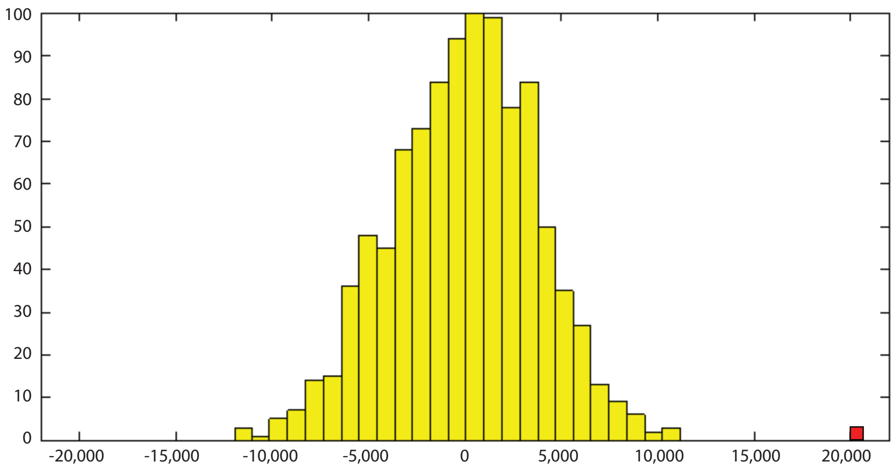
[30] SS&W (2008), p. 217. In other words, if the location behavior were truly indistinguishable, the expected income difference would be zero.

$$Y_{AFSP}^{\pi} = \frac{1}{n_{AFSP}} \sum_{i \in L_{AFSP}} Y_i^{\pi} \qquad (5)$$

where $\pi = [\pi(1),..,\pi(n_B),\pi(n_B+1),..,\pi(n_L)]$ represents a random permutation (re-labeling) of the numbers $(1,..,n_B,n_B+1,..,n_L)$ and for each $i = 1,..,n_L$, $Y_i^{\pi} = Y_{\pi(i)}$.[32]

In keeping with this approach, we focus on the difference between the expected typical income values in equations (4) and (5), denoted by $\Delta(\pi) = Y_B^{\pi} - Y_{AFSP}^{\pi}$. This leads to a one-sided test of the indistinguishability hypothesis.[33] For the case of Passaic County, the histogram of values in Figure 5 was "obtained for the observed difference, $\Delta(0)$, together with $N = 1000$ simulated differences, $[\Delta(\pi_1),..,\Delta(\pi_N)]$, at the same extent value."[34] Here the observed difference of $\Delta(0) \approx \$21{,}000$ between expected typical customer incomes for banks and AFSPs (as indicated by the red bar in Figure 5) is seen to be dramatically larger (with income associated with bank locations higher than income associated with AFSP locations) than what would be expected under the indistinguishability hypothesis.

**FIGURE 5**
**EXPECTED INCOME DIFFERENCES FOR PASSAIC COUNTY**




NOTE: The red bar represents the "observed difference." This is a histogram of expected income differences if bank and AFSP location behavior is indistinguishable vs. observed difference (Passaic County).

*Market Supply Side*

Although we have established that there is a significant difference between the expected typical incomes of potential customers for banks and AFSPs, this result provides no information about *where* these differences are occurring. But by focusing on the *supply side* of the market, we can address the "question of which block-groups of potential customers have significantly greater access to one type of institution than the other."[35] To answer this question, we adopt the approach taken by SS&W, who used a modification of the *K-function* method to analyze individ-

[31] Ibid.

[32] Ibid.

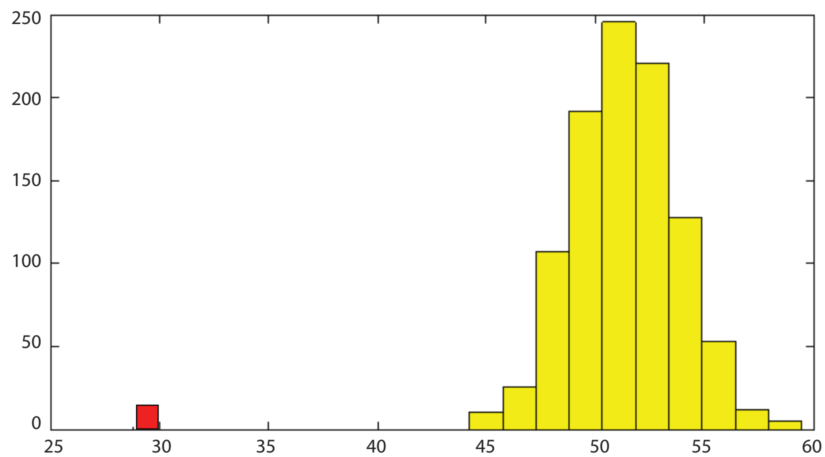
[33] For the derivation, see SS&W (2008), pp. 217-18.

[34] SS&W (2008), p. 218.

[35] SS&W (2008), p. 219.

ual clusters. For example, even though the absolute number of AFSPs in the Paterson area of Passaic County is not statistically significant given the area's high population density, one can still ask whether the *relative* number of AFSPs in this area is significant compared to banks.[36] As SS&W point out, information on the concentration of AFSPs relative to banks can in turn be used to revisit the "question of income differences between potential customers of Banks and AFSPs."[37]

## FIGURE 6
## INCOME TEST RESULTS FOR AFSPs




NOTE: This figure shows the observed average level of median income in the block-groups of Passaic County dominated by AFSPs (the red bar) and the histogram of levels of average median income for a comparable random sample of Passaic County block-groups dominated by AFSPs.

The histogram in Figure 6 shows the observed value of the average median income in the block-groups in Passaic County with a significantly high concentration of AFSPs relative to banks, $\overline{Y}_0$ = $28,780 (the red bar), compared to 1000 simulated average median income values for a comparable random sample of block-groups represented by the yellow bars. As in Figure 5, the result is again dramatic. In this case, the average median incomes in those areas dominated by ASFPs versus banks are seen to be much *lower* than what would be expected by chance alone. (It is notable that the average median income for all block-groups in Passaic County is $51,292 [see Table 3], which is essen-

[36] For the details of this approach, see SS&W (2008), pp. 219-21.

[37] The procedure for this re-examination can be found in SS&W (2008), pp. 222-24.

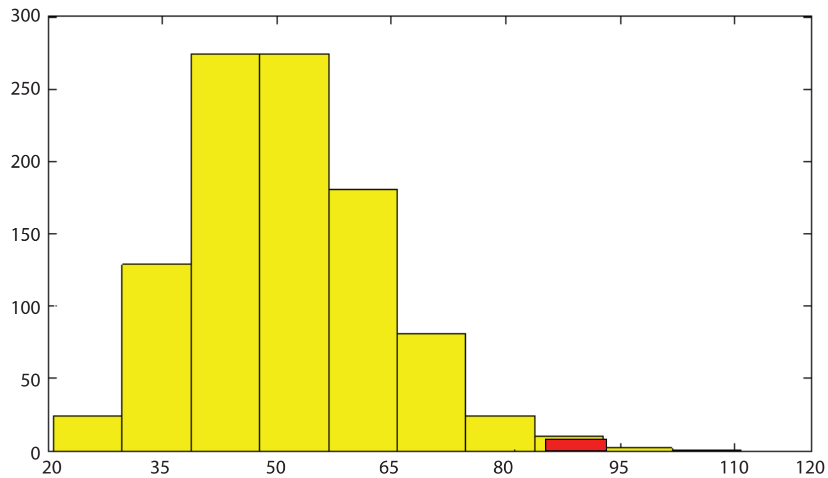
## TABLE 3
## MEDIAN INCOME OF BLOCK-GROUPS

| COUNTY | TOTAL NUMBER OF BLOCK-GROUPS | AFSP CLUSTERS | AFSP MEDIAN INCOME | COUNTY MEDIAN INCOME | P-VALUE |
|---|---|---|---|---|---|
| New Castle County | 347 | 16 | $34,659 | $54,675 | <.0001 |
| Atlantic County | 176 | 21 | $22,673 | $45,216 | <.0001 |
| Mercer County | 236 | 54 | $30,013 | $58,999 | <.0001 |
| Monmouth County | 525 | 52 | $32.497 | $68,996 | <.0001 |
| Passaic County | 376 | 68 | $28,780 | $51,292 | <.0001 |

tially at the center of the yellow bars.) Moreover, Table 3 shows that the average median incomes for the designated block-groups in *all* other counties are much lower than what would be expected by chance. Hence, these results provide strong support for the spatial void hypothesis in all counties studied.

Turning our attention to banks, we undertake essentially the same analysis. But here we ask whether the average median income of block-groups with significant relative concentrations of banks is *higher* than would be expected for comparable random block-group samples. In the case of Passaic, there are three block-groups in the former category (at the .05 level within a two-mile radius), with an average median income of $\overline{Y}_0$ = \$81,221 (the red bar in Figure 7). Figure 7 also shows yellow bars for the latter category. Though the results are less dramatic here, the average median income for areas dominated by banks relative to AFSPs is indeed significantly *higher* (p-value < .001) than would be expected for random block-group samples of the same size. A similar result is found for New Castle County, which has eight block-groups with significantly higher accessibility to banks relative to AFSPs (p-value < .001) for the same .05 significance level distance parameters. The average median income for the eight block-groups is \$88,092, compared to an average median income of \$54,675 for all block-groups in the county. Moreover, since Passaic and New Castle are the only two counties containing block-groups with significantly high relative access to banks, these results are again seen to be consistent with the spatial void hypothesis for all counties studied.

**FIGURE 7**
**INCOME TEST RESULTS FOR BANKS**




NOTE: This figure shows the observed average level of median income in the block-groups of Passaic County dominated by banks (the red bar) and the histogram of levels of average median income for a comparable random sample of Passaic County block-groups dominated by banks.

## Minorities and AFSP Locations

Finally, SS&W also explored the question of whether AFSPs are located predominantly in minority areas. For the four Pennsylvania counties studied, they presented pie charts that depict a "comparison of the ethnic or racial makeup of block-groups with significant relative access to AFSP clusters to the ethnic or racial makeup in the entire county."[38] SS&W found minorities to be over-represented in the designated block-groups.[39] We construct pie charts (see Figure 8) similar to those in SS&W and also find minorities to be disproportionately represented in the designated block-groups in our counties. For example, minorities make up 48.7 percent of Passaic County's

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[38] SS&W (2008), pp. 224-25.

[39] Ibid.

# FIGURE 8

# RACIAL OR ETHNIC COMPOSITION OF BLOCK-GROUPS


* Other includes American Indian Not-Hispanic, Other Race Not Hispanic, Hawaiian Pacific Islander Not-Hispanic, and Two or More Races Not-Hispanic.

population, yet they comprise 92.8 percent of those block-groups with significant relative access to AFSP clusters.

It is worth noting that among minorities as a group, African Americans are most over-represented in the designated block-groups in New Castle, Atlantic, and Mercer counties, while in Monmouth and Passaic counties, Hispanics are most over-represented.

## SUMMARY AND CONCLUSIONS

Many consumers forgo the services of traditional financial institutions to fulfill their financial needs and opt instead to use alternative financial service providers (AFSPs) such as check cashers and pawnbrokers. Their reliance on AFSPs raises the question of whether AFSPs are a substitute for the absence of mainstream financial institutions, which is known as the *spatial void hypothesis*. Smith, Smith, and Wackes (SS&W) developed an alternative approach — based on Ripley's *K-function* — to test this hypothesis in selected counties in the Commonwealth of Pennsylvania. Their results suggest that this *K*-function approach can overcome some of the shortcomings of the nearest neighbor hierarchical clustering procedure used in previous studies. In particular, this method yields a more meaningful definition of clustering relative to population density and, in addition, "permits a systematic evaluation of clustering at different spatial scales."[40]

The central objective of the present study has been to extend the application of this approach to four counties in New Jersey and one in Delaware. In all counties studied, our results are consistent with those of SS&W. With respect to incomes of potential customers, we again found that expected typical incomes for bank customers are dramatically higher than those for AFSP customers. In addition, with respect to the relative locations of these financial institutions, we again found that AFSPs are concentrated in areas with dramatically lower incomes than those areas where banks are concentrated. These results thus add further confirmation to those of SS&W in support of the spatial void hypothesis. As a partial explanation for these differences, we found (as have other studies) that AFSPs are disproportionately located in areas heavily populated by minorities.

Finally, it should be emphasized that these results also serve to underscore the efficacy of the alternative statistical methodology proposed by SS&W. In particular, they show that the distribution of population must be considered when identifying significant clusters of institutions serving this population. In addition, they show that a range of meaningful statistical comparisons between groups served by these institutions can be made by formulating appropriate null hypotheses of "indistinguishability" and testing these hypotheses by Monte Carlo methods.

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[40] SS&W (2008), p. 226.

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