Bridging the Gap: Do Farmers’ Markets Help Alleviate Impacts of Food Deserts?

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BRIDGING THE GAP: DO FARMERS’ MARKETS HELP ALLEVIATE IMPACTS OF FOOD DESERTS?

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Food Access, Availability, and Choice: Critical research and Policy Issues
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Food assistance programs (SNAP, WIC/Senior FMNP) have the demonstrated potential to influence behavior and improve health. This study addressed access and constraints to access from a spatial perspective with particular focus on farmers' markets, as they are embedded in local food systems.
Project Objectives:

• Quantify the utilization of food assistance programs at farmers’ markets.
  ▪ Identify variability based on market location (Urban and Rural).

• Evaluate the extent by which farmers’ markets alleviate or perpetuate traditionally conceived food deserts.

• Identify the site selection tendencies of farmers’ markets in relation to other food outlets.

• Evaluate whether farm security and food security are mutually achievable goals, particularly in rural and small market communities.
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Today’s Focus:

• Explore what is meant by ‘Access Inequality’.
• Determine if we have reason to suggest farmers’ markets are ‘bucking the trend’.
• Assess how access impacts the usability of food assistance programs.
What do we already know?

• Access to supermarkets is a problem for a small percentage of households.

• Supermarkets generally have lower prices than smaller stores.

• Low-income households shop where food prices are lower, when they can.

• Market conditions contribute to food access.
  • Economies of Scale, Scope, and Agglomeration
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Who are these households and why do we care?

• Access is a twofold issue:
  • Distance
  • Ability to traverse the distance

• Poverty tends to be concentrated.

• Poverty and restricted access tend to be related
  • Manifested differently in Urban and Rural environments
Poverty appears to be clustered, but is it?

- Moran's I: A global test of Spatial Autocorrelation
  - $I = 0.4794 \ (p < 0.001)$
Clustered globally, what about locally?

- LISA: Local Indicator of Spatial Autocorrelation
Does spatial autocorrelation exist in relation to vehicle access?

• Moran's I
  • $I=0.5332 \ (p<0.001)$

• Multivariate Moran
  • Do poverty and vehicle access share a similar clustering pattern?
  • $I=0.3383 \ (p<0.001)$
Defining Food Deserts:

- Two different phenomena taking place:
  - Urban
    - Use a 1 km walking distance (Euclidean)
  - Rural
    - Use a 10 mile (16.1km) Network distance

- Tracts in excess of this distance are considered low access.
  - Those that additionally have a poverty rate in excess of 20% are deemed ‘Food Deserts’
The Question is, are these point patterns the same?
Spatial Point Pattern Analysis

• A point pattern is the locations of events (Grocers, Farmers’ Markets, etc.) generated by a point process in the area of study.

• Generally, a test of *Complete Spatial Randomness (CSR)* is warranted to examine the points.
What may CSR look like in WA?
What doesn’t CSR look like in WA?
Farmers’ Markets vs. Supermarkets

\( f \)  
\( n=169 \)

\( s \)  
\( n=504 \)
Random Labeling Hypothesis (RLH):

- Each point type \((s,f)\) depend on some factors that \textit{a posteriori} produced a differentiation between the two types of points.

- Define a Bivariate K-Function:

\[
K_{sf}(r) = \lambda_f^{-1} E\{\text{Number of points of Type } s \text{ falling at a distance } \leq r \text{ from an arbitrary Type } f \text{ point}\}
\]

- Under RLH:

\[
K_{sf}(r) = K(r) = K_{fs}(r)
\]
Random Labeling Hypothesis (RLH):

• Rejection of RLH arises where:

\[ K_{sf}(r) > K(r) \]

▪ Here we suggest the presence of agglomeration or attraction.

▪ What would we expect to see if Farmers’ Markets are breaking the ‘trend’ of retail food location?
Test of Random Labeling
So what are we observing?

• At all distances, out to about 50 miles, the observed difference is above the simulation envelope => Attraction.
Does it matter if farmers’ markets replicate supermarket distribution patterns?
Can we test how the spatial relationship between market location and low income consumers results in market participation?

- WIC FMNP
  - We know where the markets are located.
  - We know the rate of redemption of various WIC clinics.
- What is the influence of distance?
Develop an appropriate regression model:

- Multiple mechanisms for spatial dependence:
  1. Endogenous interaction of the dependent variable redemption rate of WIC vouchers, spatial autoregressive;
  2. Exogenous interaction of the explanatory variables;
  3. Correlated residuals.

- Spatial Durbin Model

\[ Y = \alpha + \rho W Y + X \beta + W X \theta + u, \]

\[ u = \lambda W u + \varepsilon, \]
<table>
<thead>
<tr>
<th>Case/Estimation Variable</th>
<th>OLS</th>
<th>SLM</th>
<th>SEM</th>
<th>SDM</th>
</tr>
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<tbody>
<tr>
<td>(Intercept)</td>
<td>0.656</td>
<td>0.412</td>
<td>0.657</td>
<td>0.492</td>
</tr>
<tr>
<td></td>
<td>(0.072)***</td>
<td>(0.107)***</td>
<td>(0.072)***</td>
<td>(0.166)***</td>
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<tr>
<td>Quantity Distributed to Clinic</td>
<td>1.13E-05</td>
<td>1.08E-05</td>
<td>1.14E-05</td>
<td>1.03E-05</td>
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<tr>
<td></td>
<td>(3.05E-06)***</td>
<td>(2.75E-06)***</td>
<td>(2.8E-06)***</td>
<td>(2.920E-06)***</td>
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<tr>
<td>Proportion of Population Identified as Latino</td>
<td>0.986</td>
<td>0.713</td>
<td>0.655</td>
<td>0.329</td>
</tr>
<tr>
<td></td>
<td>(0.376)**</td>
<td>(0.341)**</td>
<td>(0.368)*</td>
<td>(0.402)</td>
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<tr>
<td>Proportion of Population Living under the Poverty Line</td>
<td>1.31</td>
<td>1.359</td>
<td>1.377</td>
<td>1.09</td>
</tr>
<tr>
<td></td>
<td>(0.485)***</td>
<td>(0.434)***</td>
<td>(0.427)***</td>
<td>(0.465)***</td>
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<tr>
<td>Proportion of Population between 100-200% of Poverty Line</td>
<td>-1.546</td>
<td>-1.331</td>
<td>-1.542</td>
<td>-1.383</td>
</tr>
<tr>
<td></td>
<td>(0.446)***</td>
<td>(0.409)***</td>
<td>(0.409)***</td>
<td>(0.449)***</td>
</tr>
<tr>
<td>Average Distance to Grocer (&gt;50 employees)</td>
<td>0.004</td>
<td>0.002</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>(0.002)*</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
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<tr>
<td>Average Distance to Farmers’ Market</td>
<td>0.009</td>
<td>0.012</td>
<td>0.012</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.006)**</td>
<td>(0.006)**</td>
<td>(0.006)*</td>
</tr>
<tr>
<td>Distance from Clinic to Nearest Market Accepting WIC</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(0.001)*</td>
<td>(0.001)**</td>
<td>(0.001)**</td>
<td>(0.001)**</td>
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<tr>
<td>Proportion of the Population with no Vehicle</td>
<td>-0.084</td>
<td>-0.133</td>
<td>-0.112</td>
<td>-0.004</td>
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<tr>
<td></td>
<td>(0.18)</td>
<td>(0.106)</td>
<td>(0.110)</td>
<td>(0.123)</td>
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<tr>
<td>Total Number of Area Markets</td>
<td>-0.068</td>
<td>-0.063</td>
<td>-0.06</td>
<td>-0.056</td>
</tr>
<tr>
<td></td>
<td>(0.020)***</td>
<td>(0.018)***</td>
<td>(0.018)***</td>
<td>(0.019)***</td>
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<tr>
<td>Number of WIC Accepting Markets</td>
<td>0.078</td>
<td>0.077</td>
<td>0.07</td>
<td>0.064</td>
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<tr>
<td></td>
<td>(0.026)***</td>
<td>(0.023)***</td>
<td>(0.023)***</td>
<td>(0.023)***</td>
</tr>
<tr>
<td>Interaction: Proportion Latino &amp; Proportion in Poverty</td>
<td>-2.564</td>
<td>-1.843</td>
<td>-1.25</td>
<td>-0.199</td>
</tr>
<tr>
<td></td>
<td>(1.575)</td>
<td>(1.412)</td>
<td>(1.514)</td>
<td>(1.578)</td>
</tr>
<tr>
<td>Interaction: Proportion in Poverty &amp; Weighted Distance to Market</td>
<td>-0.053</td>
<td>-0.061</td>
<td>-0.06</td>
<td>-0.05</td>
</tr>
<tr>
<td></td>
<td>(0.031)*</td>
<td>(0.027)**</td>
<td>(0.027)**</td>
<td>(0.028)*</td>
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<tr>
<td>Lagged Error (λ)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lagged Percent Redeemed (ρ)</td>
<td>0.335</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>(0.114)***</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lagged Independent Variables (θ)</td>
<td>None</td>
<td></td>
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<td></td>
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<tr>
<td>Log Likelihood</td>
<td>73.2</td>
<td>76.74</td>
<td>77.35</td>
<td>82.71</td>
</tr>
<tr>
<td>Moran’s I (error)</td>
<td>0.166***</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lagrange Multiplier</td>
<td>7.214***</td>
<td>7.514***</td>
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<tr>
<td>Robust LM</td>
<td>0.448</td>
<td>0.746</td>
<td></td>
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</tbody>
</table>

(Std Error);* p<0.1; **p<0.05; ***p<0.01
What does the model show us?

• Poverty influences the effect of distance.
  ▪ Increasing levels of poverty have increasingly negative impacts on the influence of weighted distance to the market.

• The number of WIC accepting markets in a market area has a positive relationship to the redemption rate.
General Observations:

• Despite a dialogue of a new ethic with local-foods, they still face economic constraints.
  ▪ Most farmers have a limited number of markets in which they can participate.
    – Does this leave the rural and smaller markets disadvantaged?

• Does this imply that Farmers’ Markets do not and cannot locate in Food Deserts?
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• Review the observations:
  ▪ There is spatially significant structure to poverty.
  ▪ There is spatially significant structure to industrial location.
    – Supermarkets are no exception.
  ▪ Food Deserts, using Supermarket location, are suggested to exist based on the available data.
  ▪ There is significant attraction of farmers’ markets to the areas where supermarkets are also found.

• So, we cannot categorically say that farmers’ markets increase access to ‘good food’.
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  ▪ Most farmers have a limited number of markets in which they can participate.
    – This leaves the rural and smaller markets disadvantaged.
  
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