Housing Externalities

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Introduction

- Cities reflect the presence of agglomeration forces between agents
  - Literature has generally focused on agglomeration effects in production
  - Agglomeration effects also result from interactions between residents - decline with distance
  - Equilibrium allocations will differ from efficient outcomes

- Standard problem in measuring agglomeration forces: Circular causation
  - Firms/people locate in productive/pleasant areas BUT ... areas are productive/pleasant because firms/people chose to locate in those locations
  - Need exogenous source of variation
Introduction

- Neighborhoods-in-Bloom (NiB) programs - Richmond, VA 1999-2004
  - Federally funded targeted investments in housing in disadvantaged neighborhoods
  - Known location of homes that received funding
  - Information available on house prices and housing attributes

- Estimates of changes in land prices following NiB
  - Consistent with predictions of a simple theory of residential externalities
  - Externalities decline by 1/2 every 990 feet
  - Parameterized model predicts external effects with same order of magnitude
Introduction

- Unique aspect of this study: Control Neighborhood
  - Changes in land prices do not fall with distance
  - Increases in land prices are significantly lower than in treated neighborhoods
- Allows us to compute gains in land value associated with external effects induced by revitalization policy
- Literature on measuring externalities
  - None that document an experiment with as high a degree of spatial concentration
  - Generally broader neighborhood effects that include other social interactions (e.g. Benabou 1996, Ioannides 2004)
The Neighborhoods-in-Bloom Revitalization Program

- Effects of scattered investment approach (using federal funding) difficult to measure
- A more targeted approach
  - Identify potential areas for investment (HUD CDBG funds, LISC)
  - Funds disbursed through Community Development Corporations (CDC’s)
- Internal Planning task force identified 4 broad neighborhoods
  - Church Hill, Southern Barton Heights-Highland Park, Jackson Ward-Carver, Blackwell
  - Blackwell also affected by HOPE VI program
The NiB Program

- NiB neighborhoods demographics
  - Vacant structures, high crime, substantial poverty, low ownership rates
- Similar style and construction (row brick houses of similar size)
- Use of NiB funds: Acquisition, Demolition, Rehabilitation, New Construction in Impact Areas
- $14 million over 6 years
- Control Neighborhood - Bellemeade
  - Almost identical physically and demographically...
  - But no active CDCs
The NiB Program

When the policy started, of the 970 properties located within the target blocks, only 26 percent were owner occupied, 25 percent were vacant lots where houses had already been demolished, and 21 percent were vacant and abandoned structures. More than 70 percent of the properties had building or environmental code violations. The neighborhoods also had 11 drug hot spots and some of the highest crime rates in the city.

In general, Neighborhoods in Bloom employed seven independent and long-term strategies that required sustained commitment by participating leaders: 1) partnership development; 2) housing rehabilitation as well as new construction; 3) existing homeowner repairs; 4) proactive code enforcement; 5) resident empowerment; 6) public safety initiatives; and 7) leveraging of private investment.

Political Will

Richmond is an independent city, as are all cities in Virginia. Furthermore, a statewide moratorium on annexation prevents it from acquiring additional land for development and subsequent tax revenue generation. Until 2005, Richmond had a city manager form of government with a ward system that elected nine council representatives, with no at-large members.

The Ripple Effect

In 1999, City Council worked through its strategic plan goals, which included crime and blight reduction and economic development aimed at bolstering tax revenues. The acting city manager introduced the Neighborhoods in Bloom concept after a series of meetings with various community development partners. City Council first agreed to the concept of a limited number of “investment” communities and to the specific selection criteria to identify these neighborhoods. Quantitative and qualitative analyses were then conducted on more than 40 neighborhoods to aid in the ranking and selection process. When the final seven communities were presented to City Council, with unanimous approval from each of the three recommending groups, only five council districts received Neighborhoods in Bloom resources.

City Council provided leadership as it set aside the desires, and sometimes needs, of individual districts for the good of the city overall via an open community rebuilding process.

1600 block of Decatur Street before and after
## Table 1A: Demographics of selected neighborhoods

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Total Persons</th>
<th>Housing Units</th>
<th>Percent Non-White</th>
<th>Per. Below Poverty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Church Hill</td>
<td>1505</td>
<td>822</td>
<td>94.8</td>
<td>27.2</td>
</tr>
<tr>
<td>Blackwell</td>
<td>1376</td>
<td>651</td>
<td>97.0</td>
<td>35.8</td>
</tr>
<tr>
<td>Highland Park-Barton</td>
<td>2763</td>
<td>1227</td>
<td>97.2</td>
<td>26.3</td>
</tr>
<tr>
<td>Jackson Ward-Carver</td>
<td>1975</td>
<td>1332</td>
<td>81.7</td>
<td>29.5</td>
</tr>
<tr>
<td>Bellemeade</td>
<td>2742</td>
<td>947</td>
<td>90.2</td>
<td>31.6</td>
</tr>
<tr>
<td><strong>City of Richmond</strong></td>
<td><strong>197790</strong></td>
<td><strong>92282</strong></td>
<td><strong>61.5</strong></td>
<td><strong>20.3</strong></td>
</tr>
</tbody>
</table>
Table 1B: Characteristics of the housing stock in NiB neighborhoods

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Percent Vacant</th>
<th>Percent Owned</th>
<th>Avg. Plot Acreage</th>
<th>Median Price&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Price St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Church Hill</td>
<td>21.7</td>
<td>35.7</td>
<td>0.07</td>
<td>14,861</td>
<td>29,244</td>
</tr>
<tr>
<td>Blackwell</td>
<td>23.2</td>
<td>32.6</td>
<td>0.09</td>
<td>17,368</td>
<td>16,705</td>
</tr>
<tr>
<td>Highland PB</td>
<td>18.3</td>
<td>40.5</td>
<td>0.14</td>
<td>33,223</td>
<td>24,740</td>
</tr>
<tr>
<td>Jackson WC</td>
<td>31.5</td>
<td>36.0</td>
<td>0.06</td>
<td>37,914</td>
<td>46,548</td>
</tr>
<tr>
<td>Bellemeade</td>
<td>10.8</td>
<td>51.4</td>
<td>0.16</td>
<td>33,881</td>
<td>15,643</td>
</tr>
<tr>
<td>City of Richmond</td>
<td>8.4</td>
<td>46.1</td>
<td>0.17</td>
<td>74,394</td>
<td>121,539</td>
</tr>
</tbody>
</table>

<sup>a</sup>: expressed in 2000 constant dollars
A Model of Housing Externalities

- Neighborhood, $\mathcal{N} = [-R, R]$, with density of land 1
- All agents work at location 0, and are endowed with 1 unit of time. An agent commuting from location $\ell \in \mathcal{N}$ only works $e^{-\tau|\ell|}$ time units, $\tau > 0$
- Technology is linear: 1 unit of time gives $w$ units of a final good
- Agents’ preferences defined over housing services enjoyed at a given location, $\tilde{H}(\ell)$, and consumption, $c(\ell)$
- Agents live on a lot of size 1, which they rent at price $q(\ell)$ at location $\ell$
Housing Services

- Housing services obtained by owning a piece of land and directly improving it, $H(\ell)$
- Housing services produced at a given location affect housing services enjoyed elsewhere

$$\tilde{H}(\ell) = \delta \int_{-R}^{R} e^{-\delta|\ell-s|} H(s) \, ds + H(\ell)$$

- Housing services enjoyed at location $\ell$ reflect (in part) a weighted average of housing services produced at neighboring sites, with weights that decline with distance at an exponential rate $\delta > 0$
Consumer Problem

- An agent living at location $\ell$ solves:

$$\max_{c(\ell), H(\ell)} u(c(\ell), \tilde{H}(\ell)) = c(\ell)^\alpha \tilde{H}(\ell)^{1-\alpha}, \quad 0 < \alpha < 1,$$

subject to

$$c(\ell) + q(\ell) + H(\ell) = we^{-\tau|\ell|},$$

and

$$\tilde{H}(\ell) = \delta \int_{-R}^{R} e^{-\delta|\ell-s|} H(s) ds + H(\ell),$$
Neighborhood Equilibrium

- Agents have reservation utility $\bar{u}$, and can live anywhere, so
  \[
  \tilde{H}(\ell) \equiv \bar{H} = \bar{u} \left( \frac{1 - \alpha}{\alpha} \right)^{\alpha}
  \]

- Housing investments at different locations, $H(\ell)$, solve
  \[
  H(\ell) = \bar{H} - \delta \int_{-R}^{R} e^{-\delta |\ell-s|} H(s) \, ds, \quad \ell \in [-R, R]
  \]

- Land rents in the neighborhood solve
  \[
  q(\ell) = we^{-\tau |\ell|} + \delta \int_{-R}^{R} e^{-\delta |\ell-s|} H(s) \, ds - \frac{1}{1 - \alpha} \bar{H}
  \]
  and, at the boundary,
  \[
  \delta \int_{-R}^{R} e^{-\delta |\ell-s|} H(s) \, ds = \frac{1}{1 - \alpha} \bar{H} + q_R - we^{-\tau R}
  \]

- Unknowns are $\bar{H}, H(\ell), q(\ell)$ and $R$
Policy Intervention

- Federally funded program that aims to increase housing investments at all locations in $A = [-A, A] \subseteq \mathbb{N}$ by some fixed amount $\sigma > 0$
- Then $H_p(\ell)$ solves

$$
\bar{H} = H_p(\ell) + \delta \int_{-R}^{R} e^{-\delta |\ell-s|} H_p(s) \, ds + \sigma \delta \int_{-A}^{A} e^{-\delta |\ell-s|} \, ds,
$$

if $\ell \in \mathbb{N} \setminus A$ and we need to add $\sigma$ otherwise
- Then Cobb-Douglas utility function implies $H_p(\ell) - H(\ell) < 0 \ \forall \ell$
- Changes in land prices (net of the direct subsidy) satisfy

$$
q_p(\ell) - q(\ell) = \delta \int_{-R}^{R} e^{-\delta |\ell-s|} [H(s) - H_p(s)] \, ds + \sigma \delta \int_{-A}^{A} e^{-\delta |\ell-s|} \, ds > 0
$$

- So land rents increase at all locations: $q_p(\ell) - q(\ell) > 0 \ \forall \ell$
Policy Intervention

A. Housing investment

H(l) and Hp(l)

Distance

Impact Area

B. Land rents

q(l) and qp(l)

Distance

Impact Area

C. Changes in land rents

Percent land return

Distance from center of impact area

D. Distribution of land returns

Percent land return

Rossi-Hansberg, Sarte and Owens III

Housing Externalities

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Empirical Questions

- How did the price of land change in each neighborhood following NiB?
- Do the findings indicate external effects that decline with distance from the Impact Area?
- Are land price changes lower and more uniform across space in the control neighborhood?
Empirical Implementation

- Hedonic price equation:
  \[ p = Z\beta + q(\ell) + \varepsilon, \quad \ell = (x, y) \in \mathcal{R}^2 \]

  where
  - \( Z \) is a \( k \)-element vector such that \( \text{cov}(Z|\ell) = \Sigma_{z|\ell} \)
  - \( q(\ell) \) is the component of home prices directly related to location
  - \( \varepsilon \) is such that \( E(\varepsilon|\ell, Z) = 0 \) and \( \text{var}(\varepsilon|\ell, Z) = \sigma^2_\varepsilon \)

- We obtain estimates of \( q(\ell) \) before and after NiB comes into effect
  - Omit observations on homes that received direct capital improvements
Data Description

- City of Richmond records of all properties that benefited from NiB funding
  - Includes geo-coded locations, amount and type of funds
- Geo-coded listing of all properties sold between 1993 and 2004
  - Includes information on condition and age, construction descriptors (e.g. exterior materials etc.), dimensional attributes (e.g. lot size, living area)
  - We include a set of dummy variables to capture city-wide increases in home prices driven by aggregate factors (e.g. city growth and interest rate changes)
Table 2: Data Summary

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>St. dev.</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Price(^a)</td>
<td>74394</td>
<td>121539</td>
<td>11</td>
<td>8946680</td>
</tr>
<tr>
<td>Air Conditioning</td>
<td>0.5716</td>
<td>0.4949</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Brick Exterior</td>
<td>0.4611</td>
<td>0.4985</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Vinyl Exterior</td>
<td>0.0404</td>
<td>0.1970</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Gas Heating</td>
<td>0.1267</td>
<td>0.3326</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hot Water Heating</td>
<td>0.2167</td>
<td>0.4120</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Square Footage</td>
<td>1664.9</td>
<td>1190.3</td>
<td>319</td>
<td>63233</td>
</tr>
<tr>
<td>Age (in years)</td>
<td>63.78</td>
<td>26.46</td>
<td>0</td>
<td>205</td>
</tr>
<tr>
<td>Acreage</td>
<td>0.2337</td>
<td>0.3506</td>
<td>0.012</td>
<td>37.67</td>
</tr>
<tr>
<td>Good Condition</td>
<td>0.1789</td>
<td>0.3833</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Poor Condition</td>
<td>0.0196</td>
<td>0.1385</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Very Poor Condition</td>
<td>0.0137</td>
<td>0.1162</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No. Bathrooms</td>
<td>1.546</td>
<td>1.245</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

\(^a\): Expressed in constant 2000 dollars.
Estimation of the Parametric Effects

- We use the method proposed by Yatchew (2001)
- Re-order the data \((p_1, Z_1, \ell_1), (p_2, Z_2, \ell_2), \ldots, (p_n, Z_n, \ell_n)\) so that the \(\ell\)'s are close, and Lipschitz condition
  \[|q(\ell_a) - q(\ell_b)| \leq L||\ell_a - \ell_b||\]
- Then differencing removes the non-parametric effects, since
  \[p_i - p_{i-1} = (Z_i - Z_{i-1})\beta + q(\ell_i) - q(\ell_{i-1}) + \epsilon_i - \epsilon_{i-1}\]
- Higher-order differencing yields greater efficiency
  \[\Delta p = \Delta Z \beta + \sum_{s=0}^{m} d_s q(\ell_{i-s}) + \Delta \epsilon, \ i = m + 1, \ldots, n,\]
- Regressing \(\Delta p\) on \(\Delta Z\) yields an estimator, \(\beta_\Delta\) that approaches asymptotic efficiency as \(m\) becomes large
Estimation of Land Prices

- We can calculate home prices “purged” of the contribution from housing attributes
  \[ Y = p - Z \hat{\beta}_\Delta \]
- Since \( \hat{\beta}_\Delta \) is a consistent estimator of \( \beta \), standard kernel estimation methods yield consistent estimates of \( q(\ell) \)
- Nadaraya-Watson kernel estimator of \( q \) at location \( \ell_j \)
  \[ q(\ell_j) = n^{-1} \sum_{i=1}^{n} W_{hi}(\ell_j) Y_i \]
  where the weights are given by
  \[ W_{hi}(\ell_j) = \frac{K_h(\ell_j - \ell_i)}{n^{-1} \sum_{i=1}^{n} K_h(\ell_j - \ell_i)} \]
  with
  \[ K_h(u) = h^{-1} K\left(\frac{u}{h}\right) \]
Estimation of Land Prices

- We use the Epanechnikov kernel given by

\[ K\left(\frac{u}{h}\right) = \frac{3}{4} \left(1 - \left(\frac{u}{h}\right)^2\right) I\left(|\frac{u}{h}| \leq 1\right) \]

- The Bandwidth \( h \) solves

\[ \min_h CV(h) = n^{-1} \sum_{j=1}^{n} [Y_j - \tilde{q}_h(\ell_j)]^2, \]

where

\[ \tilde{q}_h(\ell_j) = n^{-1} \sum_{i \neq j} W_{hi}(\ell_j) Y_i \]

- In our case the optimal \( h \) is around 1350-1650 feet
Table 3: Estimates of the parametric effects on home prices

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Dummies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Cond.</td>
<td>0.094</td>
<td>7.752</td>
<td>0.078</td>
<td>7.900</td>
</tr>
<tr>
<td>Brick Exterior</td>
<td>0.152</td>
<td>11.386</td>
<td>0.186</td>
<td>16.173</td>
</tr>
<tr>
<td>Vinyl Exterior</td>
<td>-0.290</td>
<td>-8.636</td>
<td>-0.187</td>
<td>8.250</td>
</tr>
<tr>
<td>Gas Heating</td>
<td>0.092</td>
<td>5.610</td>
<td>0.154</td>
<td>10.317</td>
</tr>
<tr>
<td>Hot Water Heating</td>
<td>0.101</td>
<td>6.624</td>
<td>0.066</td>
<td>5.210</td>
</tr>
<tr>
<td>Sq. Ft.</td>
<td>0.055</td>
<td>6.237</td>
<td>0.027</td>
<td>5.496</td>
</tr>
<tr>
<td>Age</td>
<td>-0.007</td>
<td>0.218</td>
<td>0.149</td>
<td>5.972</td>
</tr>
<tr>
<td>Acreage</td>
<td>-0.815</td>
<td>-37.652</td>
<td>-0.423</td>
<td>-34.920</td>
</tr>
<tr>
<td>Good Cond.</td>
<td>0.095</td>
<td>6.524</td>
<td>0.137</td>
<td>11.087</td>
</tr>
<tr>
<td>Poor Cond.</td>
<td>-0.510</td>
<td>-11.864</td>
<td>-0.375</td>
<td>12.990</td>
</tr>
<tr>
<td>Very Poor Cond.</td>
<td>-0.867</td>
<td>-17.327</td>
<td>-0.613</td>
<td>-17.449</td>
</tr>
<tr>
<td>No. Bathrooms</td>
<td>0.003</td>
<td>0.479</td>
<td>0.010</td>
<td>2.251</td>
</tr>
<tr>
<td>No. obs.</td>
<td>18102</td>
<td></td>
<td>26310</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.64</td>
<td></td>
<td>0.68</td>
<td></td>
</tr>
</tbody>
</table>
### Land Prices

#### Table 4: Pre-NiB land price per square foot

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>10th Perc.</th>
<th>25th Perc.</th>
<th>50th Perc.</th>
<th>75th Perc.</th>
<th>90th Perc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Church Hill</td>
<td>0.81</td>
<td>1.84</td>
<td>5.21</td>
<td>13.32</td>
<td>21.02</td>
</tr>
<tr>
<td>Blackwell</td>
<td>0.76</td>
<td>1.84</td>
<td>3.83</td>
<td>7.04</td>
<td>12.15</td>
</tr>
<tr>
<td>Highland Park-Barton</td>
<td>1.29</td>
<td>2.61</td>
<td>5.22</td>
<td>8.05</td>
<td>11.59</td>
</tr>
<tr>
<td>Jackson Ward-Carver</td>
<td>2.22</td>
<td>4.85</td>
<td>11.77</td>
<td>21.66</td>
<td>31.36</td>
</tr>
<tr>
<td>Bellemeade</td>
<td>1.87</td>
<td>2.89</td>
<td>4.71</td>
<td>6.42</td>
<td>8.13</td>
</tr>
<tr>
<td>City of Richmond</td>
<td>3.09</td>
<td>5.11</td>
<td>8.29</td>
<td>14.94</td>
<td>27.40</td>
</tr>
</tbody>
</table>
Return to Land in Treated Neighborhoods

- Neighborhoods typically have more than one impact area
  - $K$-means criterion: Partitioning of funded locations into disjoint subsets, $A_1$ and $A_2$, satisfies
    \[
    \min \sum_{i=1}^{K} \sum_{n \in A_i} |\ell_n - \mu_i|,
    \]
    where $\ell_n$ and $\mu_i$ are a location and the geometric centroid of $A_i$

- Neighborhoods lie in $\mathcal{R}^2$. Need to interpret $\Delta q(\ell)$, where $\ell \in \mathcal{R}^2$, in terms of $\Delta q(d)$, where $d \in \mathcal{R}$
  - Define funding center of impact area as a convex combination of locations that received NiB funding within that cluster, $c_i$
  - Weights given by relative NiB funds received
  - Define $d(\ell) = \min_i \{||\ell - c_i||\}$. We then work with $\Delta q(d)$

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An Example: Blackwell
Return to Land in Treated Neighborhoods

A. Church Hill

B. Blackwell

C. Highland Park and South Barton Heights

D. Jackson Ward and Carver
Return to Land in Treated Neighborhoods

Church Hill

Blackwell

Highland Park and South Barton Heights

Jackson Ward and Carver

Distance from center of closest impact area, in feet

Distance from center of closest impact area, in feet
The Control Neighborhood

A. Percent change in land value in Bellemeade

B. Distribution of Returns: Bellemeade
The Control Neighborhood
The Control Neighborhood

- On average, land values increased by 3.88 percent (at an annual rate) in Bellemeade. Land price increases averaged between 5.93 percent (Blackwell) and 9.71 percent (Church Hill)
  - Sites near the funding center experienced (almost) a doubling of prices over 6 years. Land prices in Bellemeade increased only 24 percent over the same period.

- Note that land returns in the targeted neighborhoods tend to level out at the control neighborhood mean

- Are there gains driven by unmeasured simultaneous private investments?
  - Model predicts a crowding out of private investments, not a corresponding increase in capital improvements
  - Effects from gentrification would likely shift the entire land return gradient, \( q(\ell)p - q(\ell) \) upwards, inconsistent with empirical findings
  - Anyone investing privately over our sample period would likely have taken advantage of the NiB program
Calibration and the Rate of Decline in Externalities

- Share of income spent on housing, $1 - \alpha$, set to 0.32, from CPI weights.
- Set a daily wage of $w = \$80$ which corresponds to $\$10$ an hour.
- $R$ is set to 3500. We estimate the total size of impact areas in each neighborhood, $A$, and set radius so that $r = \sqrt{\frac{A}{\pi}}$.
  - Implies 1085’ in Church Hill, 1190’ in Blackwell, 1365’ in Highland Park-South Barton Heights, and 1400’ in Jackson Ward-Carver.
- Funding per square foot, $\sigma$, given by
  \[
  \sigma = \frac{\text{Total Funding in Neighborhood}}{\# \text{ of Units} \times \text{Mean Unit Acreage} \times \frac{\pi r^2}{\pi R^2} \times \left( \frac{4356}{6 \times 365} \right)}
  \]
  - Since NiB residents generally live on one-tenth acre plots (4356 square feet), and funding took place over a six-year period.
  - Implies $\$6.48$ in Church Hill, $\$5.61$ in Blackwell, $\$2.46$ in Highland Park-South Barton Heights, and $\$5.96$ in Jackson Ward-Carver.
Calibration and the Rate of Decline in Externalities

- $\tau$ is set to 0 so $w$ net of commuting (neighborhoods are small)
- $\bar{u} = 33$ implies land rent at the edge, $q_R$, equal to 26 dollars per day per acre, or equivalently 780 dollars a month for a typical lot
- With this calibration, $\delta = 0.0007$ makes the model perform well
  - External effects from housing services that fall by half approximately every 990 feet
  - Model does a good job in matching the total magnitude of the decline in land returns as a function of distance
- Blackwell is unique since the Hope VI program in that neighborhood was actively engaged in eradicating housing stock deemed “unfit” without replacing it with new construction
  - If we use funding $\sigma = \$3.1$, the model performs well
Model and Data

A. Church Hill

B. Blackwell

C. Highland Park and South Barton Heights

D. Jackson Ward and Carver

Rossi-Hansberg, Sarte and Owens III (2009) Housing Externalities

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# Gains in Land Value

Table 5A: Neighborhood land values in 1998

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>No. of units</th>
<th>Median plot value</th>
<th>Neighborhood value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackson Ward</td>
<td>2913</td>
<td>33,338</td>
<td>97,113,594</td>
</tr>
<tr>
<td>Highland Park</td>
<td>3471</td>
<td>42,170</td>
<td>146,372,070</td>
</tr>
<tr>
<td>Church Hill</td>
<td>2520</td>
<td>21,136</td>
<td>53,262,720</td>
</tr>
<tr>
<td>Blackwell</td>
<td>1411</td>
<td>31,081</td>
<td>43,855,291</td>
</tr>
</tbody>
</table>
## Gains in Land Value

### Table 5B: Overall land gains and returns

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Excess R.</th>
<th>Nh. Gain</th>
<th>NiB Funding</th>
<th>Gain/Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackson Ward</td>
<td>4.77</td>
<td>27,793,911</td>
<td>4,127,636</td>
<td>6.73</td>
</tr>
<tr>
<td>Highland Park</td>
<td>2.72</td>
<td>23,887,922</td>
<td>4,261,211</td>
<td>5.61</td>
</tr>
<tr>
<td>Church Hill</td>
<td>5.84</td>
<td>18,663,257</td>
<td>3,129,187</td>
<td>5.96</td>
</tr>
<tr>
<td>Blackwell</td>
<td>2.05</td>
<td>5,394,201</td>
<td>2,533,243</td>
<td>2.13</td>
</tr>
</tbody>
</table>

- Consider the effects of $1 spent at the center of an impact area.
- External effect obtained at distance $s$ is $\delta e^{-\delta s}$. Aggregate externality obtained within a radius $R$ is then

\[
\rho = \delta \int_0^{2\pi} \int_0^R e^{-\delta s} dsd\theta = 2\pi (1 - e^{-\delta R})
\]

- When $R$ is 3500 feet, and $\delta = 0.0007$, $\rho$ is 5.74.
Conclusion

- We have presented and interpreted evidence of residential externalities.
- These externalities are large, fall by 1/2 approximately every 990 feet, and considerably amplify the effects of revitalization programs.
- Effects we uncover are specific to NiB and the city of Richmond. But magnitudes points to a more general feature of residential neighborhoods.
- Could a developer have privately internalized the external effects induced by NiB?