Market Structure and Product Quality in the U.S. Daily Newspaper Market

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This paper studies the effect of ownership consolidation in the U.S. daily newspaper market

- standard merger analyses typically focus on price effects only
- this paper takes into account both price effects and the effects on newspaper characteristics
For a specific market,

- what happens to the characteristics and the prices of newspapers after an ownership consolidation?
  - the space devoted to news (news hole)
  - the number of opinion-section staff
  - the number of reporters
  - newspaper subscription price and advertising rate

- what are the welfare implications?

What is the correlation between the effects of ownership consolidation and the underlying market characteristics?
Outline

- Build a structural model of the daily newspaper market (Model)
  - oligopoly market (vs. Crawford and Shum (2006))
  - continuous choice set for product choice (vs. Draganska, Mazzeo and Seim (2006))
  - profit function derived from demand systems (vs. Mazzeo (2002))

- Collect newspaper and market data to estimate the model (Estimation)

- Use estimated model to address the two research questions (Simulation)
  - the Minneapolis market
  - all duopoly and triopoly markets in the 2005 sample

- Conclude (Conclusion)
Newspaper Demand

Readers — Newspapers — Advertisers
Newspaper Demand

Price (p)
Characteristics (x)

Demand for newspaper (q)

\[ u_{ijt} : p_{jt}, x_{jt}, D_{ct} (demographics), \xi_{jct} (unobservable), \epsilon_{ijt} \]

\[ u_{i0t} = \rho(t - t_0) + \epsilon_{i0t} \]
Advertising Demand

Demand for newspaper (q)

Readers

Newspapers

Advertisers

Demand for advertising (a)

Price (p)
Characteristics (x)

Ad Rate (r)
Circulation (q)
Supply

Price (p)
Characteristics (x)

Readers

Newspapers

Ad Rate (r)
Circulation (q)

Advertisers

Demand for newspaper (q)

Demand for advertising (a)

Choose

Subscription price (p)
Advertising rate (r)
Newspaper Characteristics (x)
Supply

Price (p)
Characteristics (x)

Readers

Newspapers

Ad Rate (r)
Circulation (q)

Advertisers

Demand for newspaper (q)

Demand for advertising (a)

Choose

Subscription price (p)
Advertising rate (r)

News hole
Opinion staff
Reporters
Estimation Equations

Readers

[mean utility]

Newspapers

[Ad Rate FOC]
[Price FOC]
[Characteristic FOC]

Advertisers

[ad lineage]
Endogeneity and Instrument

- **Endogeneity:** Prices \((p, r)\) and characteristics \((x)\) are endogenous, i.e. correlated with unobservable taste shocks and cost shocks.
Endogeneity and Instrument

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- **Instruments**: Demographics
  
demographics \(\rightarrow\) demand \(\rightarrow\) profit function \(\rightarrow\) prices and characteristics
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- **Excluded instruments**: Demographics of other counties covered by a newspaper
  Demographics of competitors’ counties
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demographics → demand → profit function → prices and characteristics

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  Demographics of competitors’ counties

![Diagram showing relationships between counties and demographics](image-url)
Endogeneity and Instrument

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- **Instruments:** Demographics
demographics \(\rightarrow\) demand \(\rightarrow\) profit function \(\rightarrow\) prices and characteristics

- **Excluded instruments:**
  - Demographics of other counties covered by a newspaper
  - Demographics of competitors’ counties

![Diagram](image_url)
Data (1997 - 2005)

- **Quantities**
  - circulation
  - annual advertising lineage

- **Prices**
  - newspaper subscription price
  - display advertising rate

- **Newspaper characteristics**
  - pages, opinion staff, reporters, frequency

- **Demographics**
  - households
  - high education % of population over 25
  - median income
  - median age
  - urbanization
# Empirical Results

## Utility

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\alpha$</th>
<th>$\beta_1$</th>
<th>$\beta_2$</th>
<th>$\beta_3$</th>
<th>$\sigma_1$</th>
<th>$\sigma_2$</th>
<th>$\sigma_3$</th>
<th>$\psi_1$</th>
<th>$\psi_2$</th>
<th>$\psi_3$</th>
<th>$\varphi_1$</th>
<th>$\varphi_2$</th>
<th>$\varphi_3$</th>
<th>$\varphi_4$</th>
<th>$\varphi_5$</th>
<th>$\rho$</th>
<th>$\kappa$</th>
</tr>
</thead>
<tbody>
<tr>
<td>price ($100$)</td>
<td>-0.560**</td>
<td>0.069</td>
<td>1.128**</td>
<td>0.198*</td>
<td>0.013</td>
<td>0.008</td>
<td>0.009</td>
<td>-1.395**</td>
<td>0.161</td>
<td>-2.117</td>
<td>6.616**</td>
<td>4.744**</td>
<td>-1.506*</td>
<td>0.165**</td>
<td>2.699**</td>
<td>1.909</td>
<td>46.258**</td>
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<tr>
<td>log(1+newshole), mean</td>
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<td>log(1+opinion), mean</td>
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<td>log(1+reporter), mean</td>
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<tr>
<td>log(1+newshole), std. dev.</td>
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</tr>
</tbody>
</table>

## Display Ad Demand

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\lambda_1$</th>
<th>$\lambda_2$</th>
<th>$\phi_1$</th>
<th>$\phi_2$</th>
<th>$\mu_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>circulation</td>
<td>1.758**</td>
<td>-1.015**</td>
<td>-1.824*</td>
<td>0.029</td>
<td>-0.0001**</td>
</tr>
<tr>
<td>ad rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>constant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>median income</td>
<td></td>
<td></td>
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<td></td>
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</table>

## MC of circulation

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\gamma_1 - \mu_1$</th>
<th>$\gamma_2$</th>
<th>$\gamma_3$</th>
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<tbody>
<tr>
<td>const</td>
<td>-575.810**</td>
<td>1.656**</td>
<td>1.831</td>
</tr>
<tr>
<td>frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000 pages</td>
<td></td>
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</table>

## Marginal ad sales cost

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\zeta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal ad sales cost</td>
<td>3.963**</td>
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</tbody>
</table>

## Slope of fixed cost

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\tau_20$</th>
<th>$\tau_21$</th>
<th>$\tau_30$</th>
<th>$\tau_31$</th>
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<tbody>
<tr>
<td>opinion</td>
<td>1329509**</td>
<td>113940</td>
<td>194435</td>
<td>1430</td>
</tr>
<tr>
<td>opinion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>reporter</td>
<td></td>
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<tr>
<td>reporter</td>
<td></td>
<td></td>
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## Preprint Profit

<table>
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<tr>
<th>Variable</th>
<th>$\mu_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preprint Profit</td>
<td>-0.0001**</td>
</tr>
</tbody>
</table>

** Indicates 95% level of significance.

* Indicates 90% level of significance.
Simulation: Outline

- **Question**: For a specific market, what happens to the characteristics and the prices of newspapers after an ownership consolidation? What are the welfare implications?

- **Simulation**: Ownership consolidation of *Star Tribune* and *Pioneer Press*
Simulation: Outline

- **Question:** For a specific market, what happens to the characteristics and the prices of newspapers after an ownership consolidation? What are the welfare implications?

- **Simulation:** Ownership consolidation of *Star Tribune* and *Pioneer Press*

- **Question:** What is the correlation between the effects of ownership consolidation and the underlying market characteristics?

- **Simulation:** Welfare analysis of mergers in duopoly and triopoly markets
Newspaper Coverage

County Circulation of Star Tribune

Home County: Hennepin 172615
30000 – 31000: Anoka, Ramsey, Dakota
8000 – 12000: Wright, Carver, Scott, Washington
<5000: Sherburne, Stearns, McLeod, Rice
Newspaper Coverage

County Circulation of *Pioneer Press*

Home County: Ramsey 75655
29000 – 31000: Washington, Dakota
11752: Hennepin
<7000: Anoka, St. Croix
Newspaper Coverage

St. Cloud Times (24578)
Stearns, Benton, Sherburne

Stillwater Gazette (3341)
Washington

Faribault Daily News (6384)
Rice
Findings and Intuitions

Table 6. **Without** Quality Adjustment

<table>
<thead>
<tr>
<th></th>
<th>price ($/year)</th>
<th>ad rate ($/column inch)</th>
<th>circulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>before</td>
<td>after</td>
<td>change</td>
</tr>
<tr>
<td>Star Tribune</td>
<td>173</td>
<td>182</td>
<td>9</td>
</tr>
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<td>Pioneer Press</td>
<td>172</td>
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<td>other newspapers</td>
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Table 7. **With** Quality Adjustment

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<table>
<thead>
<tr>
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<th>news space (pages/year)</th>
<th>opinion</th>
<th>reporter</th>
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<tbody>
<tr>
<td>news space</td>
<td>11639</td>
<td>11788</td>
<td>149</td>
</tr>
<tr>
<td>opinion</td>
<td>29.08</td>
<td>28.86</td>
<td>-0.22</td>
</tr>
<tr>
<td>reporter</td>
<td>110.92</td>
<td>110.09</td>
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## Findings and Intuitions

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<td>12794</td>
<td>14690</td>
<td>1896</td>
</tr>
<tr>
<td>other newspapers</td>
<td>...</td>
<td>...</td>
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</tr>
</tbody>
</table>

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### Welfare Implications

**Overall Welfare Changes**

<table>
<thead>
<tr>
<th></th>
<th>$\Delta (\text{Reader Surplus})$</th>
<th>$\Delta (\text{Publisher Surplus})$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>with quality adjustment</strong></td>
<td>-7.94 million</td>
<td>0.52 million</td>
</tr>
<tr>
<td><strong>without quality adjustment</strong></td>
<td>-7.93 million</td>
<td>0.91 million</td>
</tr>
</tbody>
</table>

**Avg Change in Reader Surplus per Household (with quality adjustment)**

<table>
<thead>
<tr>
<th>county</th>
<th>$\Delta RS_{ct}$</th>
<th>county</th>
<th>$\Delta RS_{ct}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anoka</td>
<td>-4.36</td>
<td>Rice</td>
<td>-3.18</td>
</tr>
<tr>
<td>Benton</td>
<td>-0.70</td>
<td>Scott</td>
<td>-3.74</td>
</tr>
<tr>
<td>Carver</td>
<td>-3.25</td>
<td>Sherburne</td>
<td>-1.59</td>
</tr>
<tr>
<td>Dakota</td>
<td>-9.83</td>
<td>Stearns</td>
<td>0.43</td>
</tr>
<tr>
<td>Hennepin</td>
<td>-4.48</td>
<td>Washington</td>
<td>-5.44</td>
</tr>
<tr>
<td>McLeod</td>
<td>-2.02</td>
<td>Wright</td>
<td>-2.30</td>
</tr>
<tr>
<td><strong>Ramsey</strong></td>
<td><strong>-14.58</strong></td>
<td><strong>St. Croix, WI</strong></td>
<td><strong>-9.10</strong></td>
</tr>
</tbody>
</table>
Welfare Analysis of Duopoly Mergers

40 duopoly markets in the 2005 sample

Change in Avg Per-household Reader Surplus

-120
-100
-80
-60
-40
-20
0
(dollars)

with quality adjustment
no quality adjustment
Welfare Analysis of Triopoly Mergers

13 triopoly markets in the 2005 sample

Change in Avg Per-household Reader Surplus

(dollars)

-25
-20
-15
-10
-5
0
5

-25
-20
-15
-10
-5
0
5

(dollars)

-25
-20
-15
-10
-5
0
5

-25
-20
-15
-10
-5
0
5

with quality adjustment
no quality adjustment

Ying Fan (Univ. of Michigan)
## Market Characteristics and Welfare Effects

### Regression of avg per household readers’ change ($\Delta RS$)

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>overall newspaper penetration</td>
<td>-</td>
</tr>
<tr>
<td>overlap of the two largest newspapers</td>
<td>-</td>
</tr>
<tr>
<td>asymmetry of the two largest newspapers</td>
<td>+</td>
</tr>
<tr>
<td>triopoly dummy</td>
<td>+</td>
</tr>
<tr>
<td>triopoly × (overlap of the merged newspapers and their competitor)</td>
<td>+</td>
</tr>
</tbody>
</table>

Negative sign: readers' welfare loss ($-\Delta RS$) increases
Regression of the bias in avg per household readers’ change

Bias = (ΔRS, no quality adjustment) - (ΔRS, quality adjustment)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>triology dummy</td>
</tr>
<tr>
<td>overall newspaper penetration</td>
</tr>
<tr>
<td>price elasticity</td>
</tr>
</tbody>
</table>
Quality matters for merger analysis. For example, ignoring quality adjustment typically leads to an underestimation of the welfare loss.

The effect of a merger depends on the underlying market structure. Reader’s welfare loss is positively correlated with taste for newspapers in general, overlapping and negatively correlated with the asymmetry of newspaper size and the number of competitors.

Profit function is convex in circulation, implying that a multiple-newspaper publisher has an incentive to shift circulation from small newspapers to its larger newspapers.
Newspaper | Publisher
---|---
Star Tribune | McClatchy
Pioneer Press | Knight Ridder
St. Cloud Times | Gannett
Stillwater Gazette | American Community Newspapers
Faribault Daily News | Huckle Publishing

Ownership consolidation

Newspaper | Publisher
---|---
Star Tribune | McClatchy
Pioneer Press | McClatchy
St. Cloud Times | Gannett
Stillwater Gazette | American Community Newspapers
Faribault Daily News | Huckle Publishing

Minneapolis Star Tribune

St. Paul Pioneer Press
Newspaper Industry

- Ownership consolidations are common
  - for example, the number of independently owned newspapers dropped by 55% in the past 25 years
- Newspaper characteristics matter
- Price data and characteristics data are available
Household $i$

- compares $u_{ij}, j = 1, ..., J$ with $u_{i0}$
  
  $u_{ij}$: utility from newspaper $j$
  $u_{i0}$: utility from the outside choice

- if newspaper $j$ is the best choice, compares $u_{ih} - \kappa, h \neq j$ with $u_{i0}$

  $\kappa$: diminishing utility
Utility

Utility from newspapers

\[ u_{ijt} = p_{jt}\alpha + x_{jt}\beta_i + y_{jct}\psi + D_{ct}\varphi + \xi_{jct} + \varepsilon_{ijt} \]
Utility

Utility from newspapers

\[ u_{ijt} = p_{jt} \alpha + x_{jt} \beta_i + y_{jct} \psi + D_{ct} \varphi + \xi_{jct} + \varepsilon_{ijt} \]

- Newspaper features
Utility from newspapers

\[ u_{ijt} = p_{jt} \alpha + x_{jt} \beta_i + y_{jct} \psi + D_{ct} \varphi + \xi_{jct} + \varepsilon_{ijt} \]

- **Newspaper features**
  - Annual subscription price \((p_{jt})\)
Utility from newspapers

\[ u_{ijt} = p_{jt} \alpha + x_{jt} \beta_i + y_{jct} \psi + D_{ct} \varphi + \xi_{jct} + \varepsilon_{ijt} \]

- **Newspaper features**
  - Annual subscription price \( (p_{jt}) \)
  - Endogenous newspaper characteristics \( (x_{jt}) \)
    - news space
    - opinion staff
    - reporters
Utility from newspapers

\[ u_{ijt} = p_{jt} \alpha + x_{jt} \beta_i + y_{jct} \varphi + D_{ct} \phi + \xi_{jct} + \varepsilon_{ijt} \]

- **Newspaper features**
  - Annual subscription price \((p_{jt})\)
  - Endogenous newspaper characteristics \((x_{jt})\)
  - Exogenous characteristics \((y_{jct})\)
    - market size
    - morning edition dummy
    - distance b/w county \(c\) and the head county of newspaper \(j\)
Utility from newspapers

\[ u_{ijt} = p_{jt} \alpha + x_{jt} \beta_i + y_{jct} \psi + D_{ct} \varphi + \xi_{jct} + \varepsilon_{ijt} \]

- **Newspaper features**
  - Annual subscription price \((p_{jt})\)
  - Endogenous newspaper characteristics \((x_{jt})\)
  - Exogenous characteristics \((y_{jct})\)
- **Demographics** in county \(c\) \((D_{ct})\)
Utility from newspapers

\[ u_{ijt} = p_{jt} \alpha + x_{jt} \beta_i + y_{jct} \psi + D_{ct} \varphi + \xi_{jct} + \varepsilon_{ijt} \]

- **Newspaper features**
  - Annual subscription price \((p_{jt})\)
  - Endogenous newspaper characteristics \((x_{jt})\)
  - Exogenous characteristics \((y_{jct})\)

- **Demographics** in county \(c\) \((D_{ct})\)

- **Shocks**
  - \(\xi_{jct}\): unobservable county/year-specific taste for newspaper \(j\)
  - \(\varepsilon_{ijt}\): utility shocks, i.i.d. from extreme value distribution
Utility

Utility from newspapers

\[ u_{ijt} = p_{jt}\alpha + x_{jt}\beta_i + y_{jct}\psi + D_{ct}\varphi + \xi_{jct} + \varepsilon_{ijt} \]

- **Newspaper features**
  - Annual subscription price \((p_{jt})\)
  - Endogenous newspaper characteristics \((x_{jt})\)
  - Exogenous characteristics \((y_{jct})\)

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- **Shocks**
  - \(\xi_{jct}\): unobservable county/year-specific taste for newspaper \(j\)
  - \(\varepsilon_{ijt}\): utility shocks, i.i.d. from extreme value distribution

Utility from the outside choice: \(u_{i0t} = \rho (t - t_0) + \varepsilon_{i0t}\)
Aggregation and Extension to BLP

■ Demand for newspapers

aggregation \[ \implies \]
market share: \( s_j(\delta_{ct}, x_{ct}) \), where \( \delta_{jct} \) is the mean utility

circulation: \( q_j = \sum_c \text{market size}_{ct} \cdot s_j(\delta_{ct}, x_{ct}) \)

\[ \text{county circulation} \]
Aggregation and Extension to BLP

- **Demand for newspapers**
  
  aggregation \(\rightarrow\) market share: \(s_j(\delta_{ct}, x_{ct})\), where \(\delta_{jct}\) is the mean utility
  
  circulation: \(q_j = \sum_c \text{market size}_{ct} \cdot s_j(\delta_{ct}, x_{ct})\)

- **Estimation equation [S]**
  
  - generalization of BLP: \(s_{jct} = s_j(\delta_{ct}, x_{ct}) \rightarrow \delta_{jct}\)
  
  - estimation equation:

    \[
    \delta_{jct} = p_{jt} \alpha + x_{jt} \beta + y_{jct} \psi + D_{ct} \varphi - (t - t_0) \rho + \xi_{jct}
    \]
Appendix

Theorem 1 (Generalization of BLP)

Theorem 1. For any \((s, x) \in \mathbb{R}^J \times \mathbb{R}^{KJ}, \sigma \in \mathbb{R}^K, \kappa \in \mathbb{R}^+\) and distribution functions \(P_\varsigma (; \sigma)\), define operator \(F : \mathbb{R}^J \rightarrow \mathbb{R}^J\) pointwise as
\[
F_j (\delta) = \delta_j + \ln s_j - \ln s_j (\delta, x; P_\varsigma, \sigma, \kappa),
\]
where
\[
s_j (\delta, x; P_\varsigma, \sigma, \kappa) = \int \Psi_j^{(1)} dP_\varsigma (\varsigma; \sigma) + \sum_{j' \neq j, 0} \int \int (\Psi_{j,j'}^{(2)} - \Psi_j^{(3)}) dP_\varsigma (\varsigma; \sigma),
\]
and \(\vartheta_{ij} = \sum_{k=1}^K \sigma_k x_{kj} \varsigma_{ki},\)
\[
\Psi_j^{(1)} (\delta_c, x_c, \varsigma_i; \sigma) = \exp(\delta_{jc} + \vartheta_{ij}) \over 1 + \sum_{h=1}^{Jc} \exp(\delta_{hc} + \vartheta_{ih}),
\]
\[
\Psi_{j,j'}^{(2)} (\delta_c, x_c, \varsigma_i; \sigma, \kappa) = \exp(\delta_{jc} + \vartheta_{ij}) \over \exp(\kappa) + \sum_{h \neq j'} \exp(\delta_{hc} + \vartheta_{ih}),
\]
\[
\Psi_j^{(3)} (\delta_c, x_c, \varsigma_i; \sigma, \kappa) = \exp(\delta_{jc} + \vartheta_{ij}) \over \exp(\kappa) + \sum_{h=1}^{Jc} \exp(\delta_{hc} + \vartheta_{ih}).
\]

If (1) \(0 < s_j < 1\) for \(\forall j = 1, \ldots, J\) and (2) \(\sum_{j=1}^J s_j < 2\), then the operator \(F\) has a unique fixed point.
Heterogenous Taste

Household $i$’s taste for characteristics $k$:

$$\beta_{ki} = \beta_k + \sigma_k \nu_{ki},$$

where $\beta_k$, $\sigma_k$ are the mean and standard derivation and $\nu_{ki}$ follows a standard normal distribution.
Market Penetration Function

- Probability of $j$ being chosen by $i$:

$$
\Pr\left( u_{ijc} \geq \max_{h=0,\ldots,J_c} u_{ihc} \right) \\
+ \sum_{j' \neq j, 0} \Pr\left( u_{ij'c} \geq u_{ijc} \geq \max_{h=1,\ldots,J_c} u_{ihc} \& u_{ijc} - \kappa \geq u_{i0c} \right)
= \Psi_j^{(1)}(\delta_{ct}, x_{ct}, \varsigma_i; \sigma) + \sum_{j' \neq j, 0} \left[ \Psi_{j,j'}^{(2)}(\delta_{ct}, x_{ct}, \varsigma_i; \sigma, \kappa) - \Psi_j^{(3)}(\delta_{ct}, x_{ct}, \varsigma_i; \sigma, \kappa) \right]
$$

where

$$
\Psi_j^{(1)}(\delta_{ct}, x_{ct}, \varsigma_i; \sigma) = \frac{\exp(\delta_{jct} + \vartheta_{ijt})}{1 + \sum_{h=1}^{J_c} \exp(\delta_{hct} + \vartheta_{iht})},
$$

$$
\Psi_{j,j'}^{(2)}(\delta_{ct}, x_{ct}, \varsigma_i; \sigma, \kappa) = \frac{\exp(\delta_{jct} + \vartheta_{ijt})}{\exp(\kappa) + \sum_{h \neq j'} \exp(\delta_{hct} + \vartheta_{iht})},
$$

$$
\Psi_j^{(3)}(\delta_{ct}, x_{ct}, \varsigma_i; \sigma, \kappa) = \frac{\exp(\delta_{jct} + \vartheta_{ijt})}{\exp(\kappa) + \sum_{h=1}^{J_c} \exp(\delta_{hct} + \vartheta_{iht})}.
$$

and \( \vartheta_{ijt} = \sum_{k=1}^{K} \sigma_k x_{kj} \varsigma_{ki} \).
County market penetration is the aggregation of households’ newspaper choices in a county, i.e.

\[
s_{jct}(\delta_{ct}, \mathbf{x}_{ct}; \sigma, \kappa) = \int \Psi_j^{(1)} d\Phi(\varsigma_i) + \sum_{j' \neq j, 0} \int \left( \Psi_{j,j'}^{(2)} - \Psi_j^{(3)} \right) d\Phi(\varsigma_i).
\]
Demand for Advertising

- **Ad demand**
  Following Rysman (2004), the demand for advertising in newspaper $j$:

  \[ a (r_j, q_j, \eta_j) = e^{\eta_j} q_j^{\lambda_1} r_j^{\lambda_2} \]

  where $r_j$ is advertising rate and $\eta_j = \sum_c \frac{q_{jc}}{q_j} D_c \phi$ captures the demographics of $j$’s market

- **Estimation equation [ADV]**

  \[ \log a_j = \sum_c \frac{q_{jc}}{q_j} D_c \phi + \lambda_1 \log q_j + \lambda_2 \log r_j + \nu_j \]

  ad linage \quad \text{demographics of $j$’s mkt} \quad \text{circulation} \quad \text{ad rate} \quad \text{measurement error}
An Advertiser’s Problem

- A representative advertiser

\[
\max_{\{a_j\}} \sum_j \left( \eta_j' q_j^{\lambda_1} A_j^{\lambda_2} a_j^{\lambda_3} - r_j a_j \right), \quad 0 < \lambda_2 < 1, \eta_j' > 0,
\]

- \(r_j\): advertising rate, \(q_j\): circulation, \(A_j\): total advertising space, \(\eta_j'\): demographics of counties covered by \(j\)
An Advertiser’s Problem

- A representative advertiser

\[ \max_{\{a_j\}} \sum_{j} \left( \eta'_j q_j^{\lambda'_1} A_j^{\lambda'_2} a_j^{\lambda'_3} - r_j a_j \right) , \quad 0 < \lambda_2 < 1, \eta'_j > 0, \]

- Demand: \( a_j = \left( \lambda'_3 \eta_j \right)^{\frac{1}{1-\lambda'_3}} q_j^{\frac{\lambda'_1}{1-\lambda'_3}} A_j^{\frac{\lambda'_2}{1-\lambda'_3}} r_j^{\frac{1}{\lambda'_3-1}} \)
An Advertiser’s Problem

- A representative advertiser

\[
\max \{a_j\} \sum_j \left( \eta'_j q_j A_j^2 a_j^3 \right) - r_j a_j), \ 0 < \lambda_2 < 1, \eta'_j > 0,
\]

- Demand: \( a_j = (\lambda'_3 \eta'_j)^{\frac{1}{1-\lambda'_3}} q_j^{\frac{\lambda'_1}{1-\lambda'_3}} A_j^{\frac{\lambda'_2}{1-\lambda'_3}} r_j^{\frac{1}{\lambda'_3-1}} \)

- Aggregation: \( A_j = (\lambda'_3 \eta'_j)^{\frac{1}{1-\lambda'_2-\lambda'_3}} q_j^{\frac{\lambda'_1}{1-\lambda'_2-\lambda'_3}} r_j^{\frac{\lambda'_2}{\lambda'_2+\lambda'_3-1}} \)

- \( r_j \): advertising rate, \( q_j \): circulation, \( A_j \): total advertising space, \( \eta'_j \): demographics of counties covered by \( j \)
Supply (Set of Players)

- Defining a set of players (example)

A, B
County 1

B, C
County 2

D, E
County 3
Supply (Set of Players)

- Defining a set of players (example)

A, B
County 1

B, C
County 2

D, E
County 3
Supply (Set of Players)

- Defining a set of players (example)

- A, B
  - County 1

- B, C
  - County 2

- D, A
  - County 3
Supply (Set of Players)

- Defining a set of players (example)

- A, B
  County 1

- B, C
  County 2

- D, A
  County 3

- B
  County 4
Supply (Set of Players)

- Defining a set of players (example)
  - A, B
    - County 1
  - B, C
    - County 2
  - D, A
    - County 3
  - B
    - County 4

- Partial overlapping — a real example:

[Map of counties with overlapping areas labeled Star Tribune and Pioneer Press]
A two-stage complete information game

Stage 1 | Stage 2

Ownership, County Coverage | Unobservable Taste \([\xi]\)

County Demographics \([D]\) | Shocks to marginal cost of increasing \(q\) or \(a\) \([\omega, \zeta]\)

Exogenous Characteristics \([\gamma]\) | Shocks to marginal cost of increasing \(x\) \([\nu]\)
Appendix

Supply (Timing and Information)

A two-stage complete information game

<table>
<thead>
<tr>
<th>Ownership, County Coverage</th>
<th>Unobservable Taste ( \xi )</th>
<th>Product Choice ( x )</th>
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<td>County Demographics ( D )</td>
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<td>Shocks to marginal cost of increasing ( x ) ( V )</td>
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Supply (Timing and Information)

A two-stage complete information game

Ownership, County Coverage

County Demographics $[D]$

Exogenous Characteristics $[Y]$

Unobservable Taste $[\xi]$

Shocks to marginal cost of increasing $q$ or $a$ $[\omega, \xi]$

Shocks to marginal cost of increasing $x$ $[\nu]$

Stage 1

Stage 2

Product Choice $[x]$

Price Decision $[p, r]$
Supply (Second Stage: Price Decision)

- Profit function for the second-stage decision:

\[
\pi^{II}(p, r, x) = \sum_j \left( p_j q_j - mc_j^{(q)} q_j \right)
\]

- Circulation profit

- Display ad profit

- Preprint profit

- Advertising profit (\(\pi(a)\))

Optimality conditions:

- Price affects ad profit through affecting circulation

- Price rate:

\[
a_j + \sum_h \left( r_j - mc_j^{(a)} a_j \right) \frac{\partial a_j}{\partial r_j} - \frac{\partial mc_j^{(q)} q_j}{\partial a_j} q_j = 0
\]

- More ads lead to higher printing cost
Supply (Second Stage: Price Decision)

- Profit function for the second-stage decision:

\[ \pi_{II}(p, r, x) = \sum_j \left( p_j q_j - mc_j^{(q)} q_j \right) + \left( r_j a_j - mc_j^{(a)} a_j \right) \]

- Circulation profit
- Display ad profit
- Advertising profit \( (\pi(a)) \)
Supply (Second Stage: Price Decision)

- Profit function for the second-stage decision:

\[ \pi^{II}(p, r, x) = \sum_{j} (p_j q_j - mc^{(q)}_j q_j) + (r_j a_j - mc^{(a)}_j a_j) + \left( \mu_1 q_j + \frac{1}{2} \mu_2 q_j^2 \right) \]

- Circulation profit
- Display ad profit
- Preprint profit

Optimality conditions:

- (price foc) 
  \[ \frac{\partial \pi^{II}}{\partial p_j} + \sum_{h} \left( \frac{\partial \pi^{II}}{\partial a_j} \right) \frac{\partial q_h}{\partial p_j} = 0 \]

- (adrate foc) 
  \[ \frac{\partial \pi^{II}}{\partial r_j} - \frac{\partial mc^{(q)}_j}{\partial a_j} q_j = 0 \]
Supply (Second Stage: Price Decision)

Profit function for the second-stage decision:

\[
\pi^{II}(p, r, x) = \sum_j \left( p_j q_j - mc_j^{(q)} q_j \right) + \left( r_j a_j - mc_j^{(a)} a_j \right) + \left( \mu_1 q_j + \frac{1}{2} \mu_2 q_j^2 \right)
\]

- Circulation profit
- Display ad profit
- Preprint profit
- Advertising profit (\(\pi^{(a)}\))
Supply (Second Stage: Price Decision)

- **Profit function for the second-stage decision:**
  \[ \pi^{II}(p, r, x) = \sum_j \left( p_j q_j - mc_j^{(q)} q_j \right) + \left( r_j a_j - mc_j^{(a)} a_j \right) + \left( \mu_1 q_j + \frac{1}{2} \mu_2 q_j^2 \right) \]
  - Circulation profit
  - Display ad profit
  - Preprint profit
  - Advertising profit (\( \pi^{(a)} \))

- **Optimality conditions:**
  - **(price foc)** \[ q_j + \sum_h \left( p_h - mc_h^{(q)} \right) \frac{\partial q_h}{\partial p_j} + \sum_h \frac{\partial \pi^{(a)}_h}{\partial p_j} = 0 \]
    - Price affects ad profit through affecting circulation
  - **(adrate foc)** \[ a_j + \left( r_j - mc_j^{(a)} \right) \frac{\partial a_j}{\partial r_j} - \frac{\partial mc_j^{(q)}}{\partial a_j} \frac{\partial a_j}{\partial r_j} q_j = 0 \]
    - More ads lead to higher printing cost
Supply (First Stage: Characteristics Decision)

- **Profit function for the first-stage decision:**

\[
\pi^I(x) = \pi^{II}(p^*(x), r^*(x), x) - fc(x)
\]

where:
- **\( \pi^I \)** variable profit
- **\( \pi^{II} \)** fixed cost
Supply (First Stage: Characteristics Decision)

- **Profit function for the first-stage decision:**

\[
\pi^I (x) = \pi^{II} \left( p^*(x), r^*(x), x \right) - fc(x)
\]

- **Optimality condition (wrt characteristic \( k \))**

\[
\sum_{h \text{ belongs to a owner}} \left( \frac{\partial \pi^{II}_h}{\partial x_{kj}} \right) + \sum_{j' \text{ in a game}} \left( \frac{\partial \pi^{II}_h}{\partial p_{j'}} \cdot \frac{\partial p^*_{j'}}{\partial x_{kj}} + \frac{\partial \pi^{II}_h}{\partial r^*_h} \cdot \frac{\partial r^*_h}{\partial x_{kj}} \right) - mc^{(x)}_{k,j} = 0
\]
Marginal Cost Functions

\[ mc_j^{(q)} = \gamma_1 + \gamma_2 f_j + \gamma_3 n_j f_j + \omega_j, \]

\[ mc_j^{(a)} = (1 + 1/\lambda_2) (\bar{\zeta} + \zeta_j) \]

\[ mc_j^{(x)} = \tau_0 k + \tau_1 k x_{kj} + \nu_{kj} \]

- \( f_j \): publication frequency (issues per year)
- \( n_j \): average pages per issue
Formal Definition of the Set of Players

Assumptions

- Assumption 1. A newspaper competes only with the newspapers in its Newspaper Designated Market (NDM).
  NDM: the geographic area which a newspaper considers to be the market it serves

- Assumption 2. Marginal cost of increasing circulation is independent of circulation. Marginal advertising sales cost is independent of advertising sales.

- Assumption 3. The behavior of the three national newspapers Wall Street Journal, New York Times and USA Today are taken as given in the model.
Formal Definition of the Set of Players

The set of players

- **interacting directly**: there exists at least one county that is in the NDMs of both newspapers
Formal Definition of the Set of Players

The set of players

- **interacting directly**: there exists at least one county that is in the NDMs of both newspapers

- **interacting**: if either $j$ and $j'$ interact directly or there exist a set of newspapers $\{h_n\}_{1}^{N}$ such that $j$ interacts with $h_1$ directly, $h_n$ interacts with $h_{n+1}$ directly for $n = 1, ..., N - 1$, and $h_N$ interacts with $j'$ directly
Formal Definition of the Set of Players

The set of players

- **interacting directly**: there exists at least one county that is in the NDMs of both newspapers.

- **interacting**: if either $j$ and $j'$ interact directly or there exist a set of newspapers $\{h_n\}_{1}^{N}$ such that $j$ interacts with $h_1$ directly, $h_n$ interacts with $h_{n+1}$ directly for $n = 1, ..., N - 1$, and $h_N$ interacts with $j'$ directly.

- **the set of players**: the publishers of a closure with respect to the operation “interacting”
Model Parameters

- **Demand for newspapers:** \((\alpha, \beta, \psi, \varphi, \sigma, \rho, \kappa)\)

\[
u_{ijct} = p_{jt} \alpha + x_{jt} \beta_i + y_{jct} \psi + D_{ct} \varphi + \xi_{jct} + \varepsilon_{ijt}
\]

\[
u_{i0t} = \rho(t - t_0) + \varepsilon_{i0t}
\]
Model Parameters

- **Demand for newspapers**: \((\alpha, \beta, \psi, \varphi, \sigma, \rho, \kappa)\)
  \[
  u_{ijct} = p_j \alpha + x_j \beta_i + y_{jct} \psi + D_{ct} \varphi + \xi_{jct} + \varepsilon_{ijt}
  \]
  \[
  u_{i0t} = \rho (t-t_0) + \varepsilon_{i0t}
  \]

- **Demand for display advertising**: \((\lambda_1, \lambda_2, \phi)\)
  \[
  a_j = e^{\eta_j} q_j^{\lambda_1} r_j^{\lambda_2}, \eta_j = \sum_{c \in C_j} q_{jc} \frac{q_j c}{D_c} D_c \phi
  \]
Model Parameters

- **Demand for newspapers:** \((\alpha, \beta, \psi, \varphi, \sigma, \rho, \kappa)\)
  \[
u_{ijct} = p_{jt} \alpha + x_{jt} \beta_i + y_{jct} \psi + D_{ct} \varphi + \xi_{jct} + \epsilon_{ijt}\]
  \[u_{i0t} = \rho(t-t_0) + \epsilon_{i0t}\]

- **Demand for display advertising:** \((\lambda_1, \lambda_2, \phi)\)
  \[a_j = e^{\eta_j} q_j^{\lambda_1} r_j^{\lambda_2}, \eta_j = \sum_{c \in C_j} \frac{q_{jc}}{q_j} D_c \phi\]

- **Preprint profit:** \(\mu_2\)
  \[\mu_1 q_j + \mu_2 q_j^2 / 2\]
Model Parameters

- **Demand for newspapers**: \((\alpha, \beta, \psi, \varphi, \sigma, \rho, \kappa)\)
  
  \[
  u_{ijct} = p_{jt} \alpha + x_{jt} \beta + y_{jct} \psi + D_{ct} \varphi + \xi_{jct} + \varepsilon_{ijt}
  \]
  
  \[
  u_{i0t} = \rho(t-t_0) + \varepsilon_{i0t}
  \]

- **Demand for display advertising**: \((\lambda_1, \lambda_2, \phi)\)
  
  \[
  a_j = e^{\eta_j q_j \lambda_1} r_j^{\lambda_2}, \eta_j = \sum_c: c \in C \frac{q_j c}{q_j} D_c \phi
  \]

- **Preprint profit**: \(\mu_2\)
  
  \[
  \mu_1 q_j + \mu_2 q_j^2 / 2
  \]

- **Cost**: \((\gamma_1 - \mu_1, \gamma_2, \gamma_3, \zeta, \tau_0, \tau_1)\)
  
  \[
  mc_j^{(q)} = \gamma_1 + \gamma_2 f_j + \gamma_3 n_j f_j + \omega_j
  \]
  
  \[
  mc_j^{(a)} = (1+1/\lambda_2)(\zeta + \zeta_j)
  \]
  
  \[
  mc_{kj}^{(x)} = \tau_0 k + \tau_1 k x_{kj} + \nu_{kj}
  \]
  
  \[
  \pi^{II} = \sum_j \left[ p_j q_j - mc_j^{(q)} q_j \right] + \left[ r_j a_j - mc_j^{(a)} a_j \right] + [\mu_1 q_j + \mu_2 q_j^2 / 2]
  \]
Estimation Equations

[S] $\delta_{jct} (s_{ct}; \sigma, \kappa) = p_{jt}\alpha + x_{jt}\beta + y_{jct}\psi + D_{ct}\varphi - (t - t_0)\rho + \xi_{jct}$

[ADV] $\log a_{jt} = \sum_c \frac{q_{jct}}{q_{jt}} D_{ct}\phi + \lambda_1 \log q_{jt} + \lambda_2 \log r_{jt} + \upsilon_{jt}$

[RFOC] $r_{jt} = \bar{\zeta} + \frac{\gamma_3}{1+1/\lambda_2} q_{jt} + \zeta_{jt}$

[PFOC] $p_{jt} = -\left[ \left( \frac{\partial q_m'}{\partial p_m} \right)^{-1} \left( q_m - \frac{1}{\lambda_2} \frac{\partial a_m'}{\partial p_m} r_m \right) \right]_{jt}$

$+ \gamma_1 + \gamma_2 f_{jt} + \gamma_3 n_{jt} f_{jt} - (\mu_1 + \mu_2 q_{jt}) + \omega_{jt}$

[XFOC] $\sum_{h \in J_m t} \left( \frac{\partial \pi_{ht}}{\partial x_{kjt}} + \sum_{j' \in J_{g(jt)}} \frac{\partial \pi_{ht}}{\partial p_{j't}} \frac{\partial p_{j't}}{\partial x_{kjt}} + \frac{\partial \pi_{ht}}{\partial r_{ht}} \frac{\partial r_{ht}}{\partial x_{kjt}} \right)$

$= \tau_0 + \tau_k x_{kjt} + \nu_{kjt}$
# Data Description and Sources

<table>
<thead>
<tr>
<th>Variable Data Description</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Newspaper Demand</strong></td>
<td></td>
</tr>
<tr>
<td>$q_{jct}$ County circulation</td>
<td>ABC, SRDS</td>
</tr>
<tr>
<td><strong>Display advertising Demand</strong></td>
<td></td>
</tr>
<tr>
<td>$a_{jt}$ Annual Display Advertising linage (column inch)</td>
<td>TNS</td>
</tr>
<tr>
<td><strong>Price of Newspaper</strong></td>
<td></td>
</tr>
<tr>
<td>$p_{jt}$ Annual Subscription Price (1997 $)</td>
<td>E&amp;P</td>
</tr>
<tr>
<td><strong>Price of Display Advertising</strong></td>
<td></td>
</tr>
<tr>
<td>$r_{jt}$ Adverting Rate (1997 $/column inch)</td>
<td>E&amp;P</td>
</tr>
<tr>
<td><strong>Newspaper Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>$x_{2jt}$ Weighted sum of reporters and correspondents</td>
<td>Bacon</td>
</tr>
<tr>
<td>$x_{3jt}$ Weighted sum of columnists and editorial editors</td>
<td>Bacon</td>
</tr>
<tr>
<td>$f_{jt}$ Frequency of publication (issues/52 week)</td>
<td>E&amp;P</td>
</tr>
<tr>
<td>$y_{2jt}$ Edition (morning or evening)</td>
<td>E&amp;P</td>
</tr>
<tr>
<td>$n_{jt}$ Average pages per issue</td>
<td>E&amp;P</td>
</tr>
<tr>
<td><strong>County Distance</strong></td>
<td></td>
</tr>
<tr>
<td>$y_{3jct}$ Distance between county $C$ and the head county of newspaper $j$ (100km)</td>
<td>E&amp;P, Census</td>
</tr>
<tr>
<td><strong>Owner</strong></td>
<td></td>
</tr>
<tr>
<td>Publisher</td>
<td>Bacon</td>
</tr>
<tr>
<td><strong>County Demographics</strong></td>
<td></td>
</tr>
<tr>
<td>$D_{2c}$ % of population over 25 with bachelor's degree or higher</td>
<td>Census</td>
</tr>
<tr>
<td>$D_{3c}$ Median income (1997 $)</td>
<td>Census</td>
</tr>
<tr>
<td>$D_{4c}$ Median age</td>
<td>Census</td>
</tr>
<tr>
<td>$D_{5c}$ % of urban population</td>
<td>Census</td>
</tr>
<tr>
<td>$D_{6ct}$ Number of households</td>
<td>ABC</td>
</tr>
</tbody>
</table>

ABC: County Circulation Report by Audit Bureau of Circulation

Bacon: Bacon's Newspaper Directory

E&P: Editor and Publisher International Year Book

SRDS: SRDS Circulation

TNS: TNS Media Intelligence
## Summary Statistics

### Summary Statistics of Player Newspapers in Sample

<table>
<thead>
<tr>
<th></th>
<th>mean</th>
<th>median</th>
<th>std</th>
<th>min</th>
<th>max</th>
<th>obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>market penetration (%)</td>
<td>19.13</td>
<td>11.77</td>
<td>18.62</td>
<td>0.3</td>
<td>97.08</td>
<td>23877</td>
</tr>
<tr>
<td>county distance (100km)</td>
<td>0.71</td>
<td>0.47</td>
<td>0.81</td>
<td>0</td>
<td>6.64</td>
<td></td>
</tr>
<tr>
<td>total circulation</td>
<td>22,729</td>
<td>9,849</td>
<td>43,847</td>
<td>1,132</td>
<td>783,212</td>
<td>6316</td>
</tr>
<tr>
<td>price of newspapers ($)</td>
<td>101.47</td>
<td>97.15</td>
<td>33.75</td>
<td>15</td>
<td>365.31</td>
<td></td>
</tr>
<tr>
<td>price of display advertising ($/column inch)</td>
<td>26.58</td>
<td>13.31</td>
<td>45.19</td>
<td>3.27</td>
<td>748.70</td>
<td></td>
</tr>
<tr>
<td>frequency (issues/52 weeks)</td>
<td>310.70</td>
<td>312</td>
<td>53.87</td>
<td>208</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>pages (pages/issue)</td>
<td>28.93</td>
<td>23.71</td>
<td>20.79</td>
<td>8</td>
<td>254.57</td>
<td></td>
</tr>
<tr>
<td>opinion staff</td>
<td>2.11</td>
<td>1</td>
<td>2.92</td>
<td>0</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>reporters</td>
<td>22.28</td>
<td>4</td>
<td>43.04</td>
<td>0</td>
<td>218.67</td>
<td></td>
</tr>
</tbody>
</table>
## Summary Statistics

### Summary Statistics of the Demographic Characteristics of Counties in Sample

<table>
<thead>
<tr>
<th></th>
<th>mean</th>
<th>median</th>
<th>std</th>
<th>min</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td>high education % of pop over 25</td>
<td>17.11</td>
<td>15.22</td>
<td>7.26</td>
<td>5.64</td>
<td>60.48</td>
</tr>
<tr>
<td>median income ($1,000)</td>
<td>34.25</td>
<td>32.85</td>
<td>7.31</td>
<td>16.36</td>
<td>80.12</td>
</tr>
<tr>
<td>median age</td>
<td>36.52</td>
<td>36.70</td>
<td>3.82</td>
<td>20.70</td>
<td>54.30</td>
</tr>
<tr>
<td>urbanization (%)</td>
<td>49.82</td>
<td>50.96</td>
<td>26.51</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Households</td>
<td>36687</td>
<td>15588</td>
<td>85687</td>
<td>710</td>
<td>3282266</td>
</tr>
</tbody>
</table>
Demographics in Counties with Only One Newspaper

Educational level in counties with only one newspaper (year 2000)

Median income in counties with only one newspaper (year 2000)

Median age in counties with only one newspaper (year 2000)

Urbanization in counties with only one newspaper (year 2000)
First-stage Regression Results

- **Estimation equation:**
  \[(\text{mean utility})_{jc} \text{ linear in } (\text{price})_j, (\text{characteristics})_j, (\text{demographics})_c\]

- **First-stage regression of price on instruments**

<table>
<thead>
<tr>
<th></th>
<th>const</th>
<th>edu</th>
<th>income</th>
<th>age</th>
<th>urban</th>
<th>educ</th>
<th>income</th>
<th>age</th>
<th>urban</th>
<th>urban</th>
<th>hhl</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>est</strong></td>
<td>62.55</td>
<td>34.12</td>
<td>26.33</td>
<td>27.74</td>
<td>9.46</td>
<td>92.84</td>
<td>-10.55</td>
<td>59.35</td>
<td>8.58</td>
<td>-3.90</td>
<td>12.20</td>
</tr>
<tr>
<td><strong>se</strong></td>
<td>3.76</td>
<td>5.69</td>
<td>5.70</td>
<td>8.88</td>
<td>1.49</td>
<td>10.10</td>
<td>8.87</td>
<td>6.18</td>
<td>2.21</td>
<td>1.57</td>
<td>1.36</td>
</tr>
</tbody>
</table>

iv1: mean of demographics over counties covered by \(j\) except county \(c\)
iv2: mean of demographics of counties covered by \(j\)'s competitors but not covered by \(j\)
iv3: mean of the number of households in counties covered by \(j\)
Appendix

Correlation of Demographics in Neighboring Counties

<table>
<thead>
<tr>
<th>correlation</th>
<th>educational level</th>
<th>median income</th>
<th>median age</th>
<th>urbanization</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1725</td>
<td>0.2388</td>
<td>0.1179</td>
<td>0.1369</td>
<td></td>
</tr>
</tbody>
</table>

correlation between \( D_{jc} \) and \( \text{mean of } D_{jc'}, c' \neq c \text{ covered newspaper } j \)
## Changes in Coverage

<table>
<thead>
<tr>
<th>Coverage areas*</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage**</td>
<td>47%</td>
<td>28%</td>
<td>10%</td>
<td>5%</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
</tr>
</tbody>
</table>

*: number of observed different coverage areas of a newspaper between 1997 and 2005

**: percentage of newspapers with this number of different coverage areas
## Changes in Owner, Characteristics, Prices

<table>
<thead>
<tr>
<th>year</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>15%*</td>
<td>10%</td>
<td>12%</td>
<td>6%</td>
<td>6%</td>
<td>8%</td>
<td>6%</td>
<td>12%</td>
</tr>
<tr>
<td>opinion</td>
<td>39%</td>
<td>33%</td>
<td>39%</td>
<td>45%</td>
<td>43%</td>
<td>41%</td>
<td>42%</td>
<td>39%</td>
</tr>
<tr>
<td>reporter</td>
<td>53%</td>
<td>48%</td>
<td>50%</td>
<td>59%</td>
<td>58%</td>
<td>68%</td>
<td>66%</td>
<td>65%</td>
</tr>
<tr>
<td>price</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>adrate</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>nominal price</td>
<td>19%</td>
<td>24%</td>
<td>47%</td>
<td>48%</td>
<td>5%</td>
<td>2%</td>
<td>1%</td>
<td>41%</td>
</tr>
<tr>
<td>nominal adrate</td>
<td>72%</td>
<td>64%</td>
<td>78%</td>
<td>59%</td>
<td>58%</td>
<td>46%</td>
<td>44%</td>
<td>79%</td>
</tr>
</tbody>
</table>

*: percentage of newspapers with a different owner in 1998 (different from 1997)
Ownership Consolidation between 1997 and 2005

There are 122 ownership consolidation cases in the sample, involving 406 year/papers

<table>
<thead>
<tr>
<th>year</th>
<th>consolidation cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>26</td>
</tr>
<tr>
<td>1999</td>
<td>26</td>
</tr>
<tr>
<td>2000</td>
<td>19</td>
</tr>
<tr>
<td>2001</td>
<td>11</td>
</tr>
<tr>
<td>2002</td>
<td>11</td>
</tr>
<tr>
<td>2003</td>
<td>7</td>
</tr>
<tr>
<td>2004</td>
<td>11</td>
</tr>
<tr>
<td>2005</td>
<td>11</td>
</tr>
</tbody>
</table>
Appendix

Estimation Details: Characteristic FOC

- **Chara FOC**: MB of increasing $x_{kj} = \text{MC of increasing } x_{kj}$
Estimation Details: Characteristic FOC

- **Chara FOC**: MB of increasing $x_{kj} = MC$ of increasing $x_{kj}$

- **MB of increasing $x_{kj}$**:

\[
MB = \frac{\partial \pi_h^I}{\partial x_{kj}} + \sum_{j' \text{ in a game}} \left( \frac{\partial \pi_h^I}{\partial p_{j'}} \frac{\partial p_{j'}^*}{\partial x_{kj}} + \frac{\partial \pi_h^I}{\partial r_h} \frac{\partial r_h^*}{\partial x_{kj}} \right)
\]

- Impact of product choice on the eqm prices
Appendix

Estimation Details: Characteristic FOC

- **Chara FOC**: MB of increasing $x_{kj} = MC$ of increasing $x_{kj}$

- MB of increasing $x_{kj}$:

\[
MB = \frac{\partial \pi^I}{\partial x_{kj}} + \sum_{j'} \frac{\partial \pi^I}{\partial p_{j'}} \frac{\partial p^*_j}{\partial x_{kj}} + \frac{\partial \pi^I}{\partial r^*_h} \frac{\partial r^*_h}{\partial x_{kj}}
\]

- The impact of product choice on eqm prices

The impact of product choice on eqm prices
Estimation Details: Characteristic FOC

- **Chara FOC**: MB of increasing \( x_{kj} = \) MC of increasing \( x_{kj} \)

- **MB of increasing \( x_{kj} \)**:

\[
MB = \frac{\partial \pi^I}{\partial x_{kj}} + \sum_{j' \text{ in a game}} \frac{\partial \pi^I}{\partial p_{j'}} \frac{\partial p_{j'}}{\partial x_{kj}} + \frac{\partial \pi^I}{\partial r_h} \frac{\partial r^*_h}{\partial x_{kj}}
\]

impact of product choice on the eqm prices

- **The impact of product choice on eqm prices**

**Price FOC**: 
\[
F^\prime(p^*(x), x) = 0
\]
Appendix

Estimation Details: Characteristic FOC

- **Chara FOC:** MB of increasing \( x_{kj} = \) MC of increasing \( x_{kj} \)

- **MB of increasing** \( x_{kj} \):

\[
MB = \frac{\partial \pi^II_h}{\partial x_{kj}} + \sum_{j'} \text{in a game} \frac{\partial \pi^II_h}{\partial p_{j'}} \frac{\partial p'_{j'}}{\partial x_{kj}} + \frac{\partial \pi^II_h}{\partial r_h} \frac{\partial r^*_{h}}{\partial x_{kj}}
\]

- **The impact of product choice on eqm prices**

**Price FOC:**

\[
F^I^I (p^* (x), x) = 0
\]

**Total Derivative:**

\[
\nabla_p F (p^* (x), x) \cdot \nabla_x p^* (x) + \nabla_x F (p^* (x), x) = 0
\]
Estimation Details: Characteristic FOC

- **Chara FOC:** MB of increasing $x_{kj} = \text{MC of increasing } x_{kj}$

- MB of increasing $x_{kj}$:

  $$MB = \frac{\partial \Pi_h}{\partial x_{kj}} + \sum_{j'} \frac{\partial \Pi_h}{\partial p_{j'}} \frac{\partial p_{j'}}{\partial x_{kj}} + \frac{\partial \Pi_h}{\partial r_h} \frac{\partial r_h}{\partial x_{kj}}$$

  - impact of product choice on the eqm prices

- **The impact of product choice on eqm prices**

  **Price FOC:**
  $$F(p^*(x), x) = 0$$

  **Total Derivative:**
  $$\nabla_p F(p^*(x), x) \cdot \nabla_x p^*(x) + \nabla_x F(p^*(x), x) = 0$$

  At data points:
  $$p^*(x_{data}) = p^{data}$$
Estimation Details: Characteristic FOC

- **Chara FOC**: MB of increasing \( x_{kj} \) = MC of increasing \( x_{kj} \)

- MB of increasing \( x_{kj} \):

\[
MB = \frac{\partial \Pi}{\partial x_{kj}} + \sum_{j'} \text{in a game} \frac{\partial \Pi}{\partial p_{j'}} \frac{\partial p^*_{j'}}{\partial x_{kj}} + \frac{\partial \Pi}{\partial r_h} \frac{\partial r^*_h}{\partial x_{kj}}
\]

Impact of product choice on the eqm prices

- The impact of product choice on eqm prices

**Price FOC**: \( F(p^*(x), x) = 0 \)

**Total Derivative**: \( \nabla_p F(p^*(x), x) \cdot \nabla_x p^*(x) + \nabla_x F(p^*(x), x) = 0 \)

Known at data points

**At data points**: \( p^*(x_{data}) = p_{data} \)
Estimation Details: Characteristic FOC

- **Chara FOC**: MB of increasing \( x_{k,j} = \text{MC of increasing } x_{k,j} \)

- MB of increasing \( x_{k,j} \):

\[
MB = \frac{\partial \pi_{h}^{\Pi}}{\partial x_{k,j}} + \sum_{j'} \text{in a game} \frac{\partial \pi_{h}^{\Pi}}{\partial p_{j'}} \frac{\partial p_{j'}^{*}}{\partial x_{k,j}} + \frac{\partial \pi_{h}^{\Pi}}{\partial r_{h}} \frac{\partial r_{h}^{*}}{\partial x_{k,j}}
\]

- **The impact of product choice on eqm prices**

**Price FOC:**
\[
F(p^{*}(x), x) = 0
\]

**Total Derivative:**
\[
\nabla_{p} F(p^{*}(x), x) \cdot \nabla_{x} p^{*}(x) + \nabla_{x} F(p^{*}(x), x) = 0
\]

At data points:
\[
p^{*}(x_{data}) = p^{data}
\]
Empirical Implications

- **Taste for characteristics:**
  - Halve news space $\iff 8.5$ dollars
  - Halve opinion staff $\iff 140$ dollars
  - Halve reporters $\iff 24.5$ dollars

- **Demographics on taste for newspapers**
  - $+$ education, median age, urbanization
  - $-$ median income

- **Ad demand** ($a_j = e^{\eta_j} q_j^{\lambda_1} r_j^{\lambda_2}$):
  - $\hat{\lambda}_1 > 1$: convex in circulation
March 2006, McClatchy bought Knight Ridder
McClatchy-Knight Ridder Merger

- March 2006, McClatchy bought Knight Ridder
- Before the transaction, the *Star Tribune* - McClatchy; the *St. Paul Pioneer Press* - Knight Ridder
McClatchy-Knight Ridder Merger

- March 2006, McClatchy bought Knight Ridder
- Before the transaction, the *Star Tribune* - McClatchy; the *St. Paul Pioneer Press* - Knight Ridder
- June 2006, the Department of Justice filed a complaint
McClatchy-Knight Ridder Merger

- March 2006, McClatchy bought Knight Ridder
- Before the transaction, the *Star Tribune* - McClatchy; the *St. Paul Pioneer Press* - Knight Ridder
- June 2006, the Department of Justice filed a complaint
- August 2006, McClatchy sold the *Pioneer Press* to the Hearst Corporation
Welfare Measures

- **Reader surplus**

Expected compensating variation (Small and Rosen (1981))

\[ CV_{ct} = E_i \left( \frac{V_{ict}^0 - V_{ict}^1}{\alpha} \right), \]

where

\[ V_{ict}^0 = \ln \left( \sum_{j=0}^{J_{ct}} e^{U_{ijct}^0} \right) \]

\[ + \sum_{j=1}^{J_{ct}} \ln \left( \sum_{h \neq 0, j} e^{U_{ihct}^0 - \kappa} + 1 \right) - (J_{ct} - 1) \ln \left( \sum_{h \neq 0} e^{U_{ihct}^0 - \kappa} + 1 \right), \]

where \( U_{ijct}^0 = u_{ijct}^0 - \varepsilon_{ijct} \) is the utility before the merger net of the extreme value taste shock.
Welfare Measures

- **Advertiser surplus**

\[ AS = \left( \frac{1}{\lambda_3'} - 1 \right) a_j r_j, \]

where \( \frac{1}{\lambda_3'-1} \) is the representative advertiser’s demand elasticity with respect to price

- **Publisher surplus**: profit
### Change in Advertiser Surplus and Publisher Surplus

**Overall welfare change for advertisers**

<table>
<thead>
<tr>
<th></th>
<th>$\Delta$ (Advertiser Surplus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>with quality adjustment</td>
<td>-5.59%</td>
</tr>
<tr>
<td>without quality adjustment</td>
<td>-4.96%</td>
</tr>
</tbody>
</table>

**Change in publisher surplus with quality adjustment**

<table>
<thead>
<tr>
<th>Newspapers</th>
<th>$\Delta$ (Publisher Surplus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Star &amp; Pioneer</td>
<td>374000</td>
</tr>
<tr>
<td>Stillwater Gazette</td>
<td>84460</td>
</tr>
<tr>
<td>Faribault Daily News</td>
<td>29500</td>
</tr>
<tr>
<td>St. Cloud Times</td>
<td>24110</td>
</tr>
</tbody>
</table>
### Annual Newspaper Advertising Expenditure

<table>
<thead>
<tr>
<th>Year</th>
<th>Print ($Mill)</th>
<th>Online ($Mill)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>$41,330</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>$43,925</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>$46,289</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>$48,670</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>$44,305</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>$44,102</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>$44,939</td>
<td>$1,216</td>
</tr>
<tr>
<td>2004</td>
<td>$46,703</td>
<td>$1,541</td>
</tr>
<tr>
<td>2005</td>
<td>$47,408</td>
<td>$2,027</td>
</tr>
<tr>
<td>2006</td>
<td>$46,611</td>
<td>$2,664</td>
</tr>
<tr>
<td>2007</td>
<td>$42,209</td>
<td>$3,166</td>
</tr>
</tbody>
</table>

Source: NAA

<table>
<thead>
<tr>
<th>Media</th>
<th>Expenditures ($Mill)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newspapers</td>
<td>44,939</td>
<td>18.3</td>
</tr>
<tr>
<td>Magazines</td>
<td>11,435</td>
<td>4.7</td>
</tr>
<tr>
<td>Broadcast television</td>
<td>41,932</td>
<td>17.1</td>
</tr>
<tr>
<td>Cable television</td>
<td>18,814</td>
<td>7.7</td>
</tr>
<tr>
<td>Radio</td>
<td>19,100</td>
<td>7.8</td>
</tr>
<tr>
<td>Direct mail</td>
<td>48,370</td>
<td>19.7</td>
</tr>
<tr>
<td>Yellow pages</td>
<td>13,896</td>
<td>5.7</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>31,990</td>
<td>13.0</td>
</tr>
<tr>
<td>Business papers</td>
<td>4,004</td>
<td>1.6</td>
</tr>
<tr>
<td>Out of home</td>
<td>5,443</td>
<td>2.2</td>
</tr>
<tr>
<td>Internet</td>
<td>5,650</td>
<td>2.3</td>
</tr>
<tr>
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Source: Facts about Newspapers 2004 (NAA)
Entry and Exit of Daily Newspapers

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