Countervailing Power in a Vertical Market Experiment

Manfred KÖNIGSTEIN* and Konstantinos G. PAPADOPOULOS**

*University of Erfurt  **Aristotle University of Thessaloniki

CRETE2022, 14.07.2022
Countervailing Power Hypothesis

- Galbraith (1952): *American capitalism; the concept of countervailing power*
Countervailing Power Hypothesis

- Galbraith (1952): *American capitalism; the concept of countervailing power*
- Power of a monopoly producer will be counterbalanced by buyer power exercised by large retail firms

At that time, CP-Hypothesis was criticized:
- Implausible
- Not backed by a formal theoretical model
- No empirical evidence
Galbraith (1952): *American capitalism; the concept of countervailing power*

- Power of a monopoly producer will be counterbalanced by buyer power exercised by large retail firms
- Retail firms act on behalf of consumers and pass through wholesale price savings to consumers in the retail market
Countervailing Power Hypothesis

- Galbraith (1952): *American capitalism; the concept of countervailing power*

- Power of a monopoly producer will be counterbalanced by buyer power exercised by large retail firms

- Retail firms act on behalf of consumers and pass through wholesale price savings to consumers in the retail market

- Increasing concentration in the retail market (reduction in the number of retailers e.g through M&A) is beneficial for consumers („countervailing power hypothesis“)
Galbraith (1952): *American capitalism; the concept of countervailing power*

- Power of a monopoly producer will be counterbalanced by buyer power exercised by large retail firms
- Retail firms act on behalf of consumers and pass through wholesale price savings to consumers in the retail market
- Increasing concentration in the retail market (reduction in the number of retailers e.g through M&A) is beneficial for consumers („countervailing power hypothesis“)
- Countervailing power can substitute for anti-trust legislation
Galbraith (1952): *American capitalism; the concept of countervailing power*

- Power of a monopoly producer will be counterbalanced by buyer power exercised by large retail firms.
- Retail firms act on behalf of consumers and pass through wholesale price savings to consumers in the retail market.
- Increasing concentration in the retail market (reduction in the number of retailers e.g. through M&A) is beneficial for consumers ("countervailing power hypothesis")
- Countervailing power can substitute for anti-trust legislation.
- At that time, CP-Hypothesis was criticized.
Countervailing Power Hypothesis

- Galbraith (1952): *American capitalism; the concept of countervailing power*
- Power of a monopoly producer will be counterbalanced by buyer power exercised by large retail firms
- Retail firms act on behalf of consumers and pass through wholesale price savings to consumers in the retail market
- Increasing concentration in the retail market (reduction in the number of retailers e.g. through M&A) is beneficial for consumers ("countervailing power hypothesis")
- Countervailing power can substitute for anti-trust legislation
- At that time, CP-Hypothesis was critisized
  - Implausible
Galbraith (1952): *American capitalism; the concept of countervailing power*

- Power of a monopoly producer will be counterbalanced by buyer power exercised by large retail firms
- Retail firms act on behalf of consumers and pass through wholesale price savings to consumers in the retail market
- Increasing concentration in the retail market (reduction in the number of retailers e.g. through M&A) is beneficial for consumers ("countervailing power hypothesis")
- Countervailing power can substitute for anti-trust legislation
- At that time, CP-Hypothesis was criticized
  - Implausible
  - Not backed by a formal theoretical model
Galbraith (1952): *American capitalism; the concept of countervailing power*

- Power of a monopoly producer will be counterbalanced by buyer power exercised by large retail firms.
- Retail firms act on behalf of consumers and pass through wholesale price savings to consumers in the retail market.
- Increasing concentration in the retail market (reduction in the number of retailers e.g. through M&A) is beneficial for consumers („countervailing power hypothesis“).

Countervailing power can substitute for anti-trust legislation.

At that time, CP-Hypothesis was criticized:

- Implausible
- Not backed by a formal theoretical model
- No empirical evidence
Evidence on Countervailing Power Hypothesis

- 2 basic research questions

1. Do more concentrated retailers achieve better input prices from suppliers?
2. If yes, do retailers pass input cost-savings on to consumers?

Many answers:
- Empirical studies provide mixed results
- Since the 50s: advancement of game theory
- Experimental studies since 2000
Evidence on Countervailing Power Hypothesis

2 basic research questions

1. Do more concentrated retailers achieve better input prices from suppliers?

Empirical studies provide mixed results

Since the 50s: advancement of game theory

Experimental studies since 2000
2 basic research questions

1. Do more concentrated retailers achieve better input prices from suppliers?
2. If yes, do retailers pass input cost-savings on to consumers?
Evidence on Countervailing Power Hypothesis

- 2 basic research questions

1. Do more concentrated retailers achieve better input prices from suppliers?
2. If yes, do retailers pass input cost-savings on to consumers?

Many answers:
Evidence on Countervailing Power Hypothesis

2 basic research questions

1. Do more concentrated retailers achieve better input prices from suppliers?
2. If yes, do retailers pass input cost-savings on to consumers?

Many answers:
- Empirical studies provide mixed results
Evidence on Countervailing Power Hypothesis

- 2 basic research questions

1. Do more concentrated retailers achieve better input prices from suppliers?
2. If yes, do retailers pass input cost-savings on to consumers?

- Many answers:
  - Empirical studies provide mixed results
  - Since the 50s: advancement of game theory
Evidence on Countervailing Power Hypothesis

2 basic research questions

1. Do more concentrated retailers achieve better input prices from suppliers?
2. If yes, do retailers pass input cost-savings on to consumers?

Many answers:

- Empirical studies provide mixed results
- Since the 50s: advancement of game theory
- Experimental studies since 2000

**Theoretical studies:** Greenhut and Ohta (1976), Tyagi (1999): wholesale pricing does not depend on retail market structure, Von Ungern-Sternberg (1996) CP works only if downstream competition is fierce, Dobson and Waterson (1997), Chypty Snyder (1999) merger beneficial to retailers, Christou and Papadopoulos (2015) CP does not work if modeled as a exogenous bargaining power, Gaudin (2016, 2018) CP works when increasing pass-through that depends on contract type and curvature of demand function.

**Ruffle (2005):** “One question left unanswered by most of this literature is whether the lower prices obtained by a large buyer or a highly concentrated buying side of the market are passed on to final consumers... These theoretical models beg experimental tests that include not only the usual negotiation between wholesalers and retailers, but an additional stage of competition between retailers for consumer demand”
Related Literature


- **Ruffle (2005):** “*One question left unanswered by most of this literature is whether the lower prices obtained by a large buyer or a highly concentrated buying side of the market are passed on to final consumers... These theoretical models beg experimental tests that include not only the usual negotiation between wholesalers and retailers, but an additional stage of competition between retailers for consumer demand*”

- What’s missing: Human participants for all three parties (especially, no consumer demand).
A Lab Experiment to investigate the CP-Hypothesis

- Our experimental design is close to the theoretical model of von Ungern-Sternberg (1996)
A Lab Experiment to investigate the CP-Hypothesis

- Our experimental design is close to the theoretical model of von Ungern-Sternberg (1996)
- Game theoretic analysis of a vertical market structure (wholesale market combined with a retail market)
A Lab Experiment to investigate the CP-Hypothesis

- Our experimental design is close to the theoretical model of von Ungern-Sternberg (1996)
- Game theoretic analysis of a vertical market structure (wholesale market combined with a retail market)
- Analysis of different scenarios regarding behavioral assumptions of retailer behavior (Cournot behavior versus perfectly competitive behavior)
A Lab Experiment to investigate the CP-Hypothesis

- Our experimental design is close to the theoretical model of von Ungern-Sternberg (1996)
- Game theoretic analysis of a vertical market structure (wholesale market combined with a retail market)
- Analysis of different scenarios regarding behavioral assumptions of retailer behavior (Cournot behavior versus perfectly competitive behavior)
- Conclusion: Countervailing power might be beneficial for consumers „if there is fierce competition at the retail level“
A Lab Experiment to investigate the CP-Hypothesis

- 3 Treatments: Varying the degree of retailer power

Main Hypothesis 1: Higher CP, decreases consumer price p.
A Lab Experiment to investigate the CP-Hypothesis

- 3 Treatments: Varying the degree of retailer power
- Main Hypothesis 1: Higher CP, decreases consumer price $p$. 

<table>
<thead>
<tr>
<th>LOW</th>
<th>MID</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 wholesaler</td>
<td>1 wholesaler</td>
<td>1 wholesaler</td>
</tr>
<tr>
<td>$\bar{w} = 23000$</td>
<td>$\bar{w} = 23000$</td>
<td>$\bar{w} = 17000$</td>
</tr>
<tr>
<td>4 retailers</td>
<td>2 retailers</td>
<td>2 retailers</td>
</tr>
<tr>
<td>4 consumers</td>
<td>4 consumers</td>
<td>4 consumers</td>
</tr>
</tbody>
</table>

Wholesaler

R1 R2 R3 R4

C1 C2 C3 C4

R1R3 R2R4

C1 C2 C3 C4

R1R3 R2R4

C1 C2 C3 C4
Hypotheses

The countervailing power effect hinges on three partial effects: i) $CP \uparrow \Rightarrow w \downarrow$, retail power increase decreases $w$, ii) $w \downarrow \Rightarrow p \downarrow$, reduction in $w$ is passed-through to consumers iii) $N \downarrow \not\Rightarrow p \uparrow$ the decrease in the number of retailers does not increase collusion among retailers.

- **Main Hypothesis 1**: Higher CP, decreases retail price $p$. 

- **Hypothesis 2**: The wholesale price $w$ is lower in treatment MID than in LOW and is lower in HIGH than in LOW.

- **Hypothesis 3**: Wholesale price $w$ and retail price $p$ are positively correlated such that reductions in $w$ pass-through to consumers.

- **Hypothesis 4**: Reducing the number of retailers increases collusion; i.e., collusion is higher in treatments MID and HIGH compared to treatment LOW.
Hypotheses

The countervailing power effect hinges on three partial effects: i) $CP \uparrow \Rightarrow w \downarrow$, retail power increase decreases $w$, ii) $w \downarrow \Rightarrow p \downarrow$, reduction in $w$ is passed-through to consumers iii) $N \downarrow \not\Rightarrow p \uparrow$ the decrease in the number of retailers does not increase collusion among retailers.

1. **Main Hypothesis 1**: Higher CP, decreases retail price $p$.
   - the retail price decreases due to a decreasing number of retailers in treatment MID versus LOW
Hypotheses

The countervailing power effect hinges on three partial effects: i) $CP \uparrow \Rightarrow w \downarrow$, retail power increase decreases $w$, ii) $w \downarrow \Rightarrow p \downarrow$, reduction in $w$ is passed-through to consumers iii) $N \downarrow \Rightarrow p \uparrow$ the decrease in the number of retailers does not increase collusion among retailers.

1 **Main Hypothesis 1**: Higher CP, decreases retail price $p$.
   1 the retail price decreases due to a decreasing number of retailers in treatment MID versus LOW
   2 the retail price decreases due to a decreasing outside option wholesale price $\bar{w}$ in treatment HIGH versus LOW
Hypotheses

The countervailing power effect hinges on three partial effects: i) $CP \uparrow \Rightarrow w \downarrow$, retail power increase decreases $w$, ii) $w \downarrow \Rightarrow p \downarrow$, reduction in $w$ is passed-through to consumers iii) $N \downarrow \not\Rightarrow p \uparrow$ the decrease in the number of retailers does not increase collusion among retailers.

1. **Main Hypothesis 1**: Higher CP, decreases retail price $p$.
   - the retail price decreases due to a decreasing number of retailers in treatment MID versus LOW
   - the retail price decreases due to a decreasing outside option wholesale price $\bar{w}$ in treatment HIGH versus LOW

2. **Hypothesis 2**: The wholesale price $w$
Hypotheses

The countervailing power effect hinges on three partial effects: i) \( CP \uparrow \Rightarrow w \downarrow \), retail power increase decreases \( w \), ii) \( w \downarrow \Rightarrow p \downarrow \), reduction in \( w \) is passed-through to consumers iii) \( N \downarrow \not\Rightarrow p \uparrow \) the decrease in the number of retailers does not increase collusion among retailers.

1 **Main Hypothesis 1**: Higher CP, decreases retail price \( p \).
   1 the retail price decreases due to a decreasing number of retailers in treatment MID versus LOW
   2 the retail price decreases due to a decreasing outside option wholesale price \( \bar{w} \) in treatment HIGH versus LOW

2 **Hypothesis 2**: The wholesale price \( w \)
   1 is lower in treatment MID than in LOW
Hypotheses

The countervailing power effect hinges on three partial effects: i) $CP \uparrow \Rightarrow w \downarrow$, retail power increase decreases $w$, ii) $w \downarrow \Rightarrow p \downarrow$, reduction in $w$ is passed-through to consumers iii) $N \downarrow \not\Rightarrow p \uparrow$ the decrease in the number of retailers does not increase collusion among retailers.

1. **Main Hypothesis 1**: Higher CP, decreases retail price $p$.
   - the retail price decreases due to a decreasing number of retailers in treatment MID versus LOW
   - the retail price decreases due to a decreasing outside option wholesale price $\bar{w}$ in treatment HIGH versus LOW

2. **Hypothesis 2**: The wholesale price $w$
   - is lower in treatment MID than in LOW
   - and is lower in HIGH than in LOW
Hypotheses

The countervailing power effect hinges on three partial effects: i) $CP \uparrow \Rightarrow w \downarrow$, retail power increase decreases $w$, ii) $w \downarrow \Rightarrow p \downarrow$, reduction in $w$ is passed-through to consumers iii) $N \downarrow \not\Rightarrow p \uparrow$ the decrease in the number of retailers does not increase collusion among retailers.

1. **Main Hypothesis 1**: Higher $CP$, decreases retail price $p$.
   1. the retail price decreases due to a decreasing number of retailers in treatment MID versus LOW
   2. the retail price decreases due to a decreasing outside option wholesale price $\bar{w}$ in treatment HIGH versus LOW

2. **Hypothesis 2**: The wholesale price $w$
   1. is lower in treatment MID than in LOW
   2. and is lower in HIGH than in LOW

3. **Hypothesis 3**: Wholesale price $w$ and retail price $p$ are positively correlated such that reductions in $w$ pass-through to consumers.
Hypotheses

The countervailing power effect hinges on three partial effects: i) \( CP \uparrow \Rightarrow w \downarrow \), retail power increase decreases \( w \), ii) \( w \downarrow \Rightarrow p \downarrow \), reduction in \( w \) is passed-through to consumers iii) \( N \downarrow \not\Rightarrow p \uparrow \) the decrease in the number of retailers does not increase collusion among retailers.

1 **Main Hypothesis 1**: Higher CP, decreases retail price \( p \).
   1 the retail price decreases due to a decreasing number of retailers in treatment MID versus LOW
   2 the retail price decreases due to a decreasing outside option wholesale price \( \bar{w} \) in treatment HIGH versus LOW

2 **Hypothesis 2**: The wholesale price \( w \)
   1 is lower in treatment MID than in LOW
   2 and is lower in HIGH than in LOW

3 **Hypothesis 3**: Wholesale price \( w \) and retail price \( p \) are positively correlated such that reductions in \( w \) pass-through to consumers.

4 **Hypothesis 4**: Reducing the number of retailers increases collusion; i.e., collusion is higher in treatments MID and HIGH compared to treatment LOW
Experimental Design

- Wholesale Market:
  - Wholesale price offer: Take-it-or-leave-it offer of wholesaler to retailers (ultimatum bargaining)
  - Each retailer individually accepts offered price or decides for outside option wholesale price
  - Quantity is produced according to sales in the retail market

- Retail Market:
  - Retailers know only their own cost function.
  - Consumers have individual multi-unit demands driven from a scheme of reservation values.
  - Quantity sold by retailers to consumers is determined via double auction.
  - Non-uniform retail prices: We look at average retail price.
Experimental Design

- Wholesale Market:
  - Wholesale price offer: Take-it-or-leave-it offer of wholesaler to retailers (ultimatum bargaining)
Experimental Design

- Wholesale Market:
  - Wholesale price offer: Take-it-or-leave-it offer of wholesaler to retailers (ultimatum bargaining)
  - Each retailer individually accepts offered price or decides for outside option wholesale price
Wholesale Market:

- Wholesale price offer: Take-it-or-leave-it offer of wholesaler to retailers (ultimatum bargaining)
- Each retailer individually accepts offered price or decides for outside option wholesale price
- Quantity is produced according to sales in the retail market
Experimental Design

- **Wholesale Market:**
  - Wholesale price offer: Take-it-or-leave-it offer of wholesaler to retailers (ultimatum bargaining)
  - Each retailer individually accepts offered price or decides for outside option wholesale price
  - Quantity is produced according to sales in the retail market

- **Retail Market:**
Experimental Design

- Wholesale Market:
  - Wholesale price offer: Take-it-or-leave-it offer of wholesaler to retailers (ultimatum bargaining)
  - Each retailer individually accepts offered price or decides for outside option wholesale price
  - Quantity is produced according to sales in the retail market

- Retail Market:
  - Retailers know only their own cost function.
Experimental Design

- Wholesale Market:
  - Wholesale price offer: Take-it-or-leave-it offer of wholesaler to retailers (ultimatum bargaining)
  - Each retailer individually accepts offered price or decides for outside option wholesale price
  - Quantity is produced according to sales in the retail market

- Retail Market:
  - Retailers know only their own cost function.
  - Consumers have individual multi-unit demands driven from a scheme of reservation values
Experimental Design

- Wholesale Market:
  - Wholesale price offer: Take-it-or-leave-it offer of wholesaler to retailers (ultimatum bargaining)
  - Each retailer individually accepts offered price or decides for outside option wholesale price
  - Quantity is produced according to sales in the retail market

- Retail Market:
  - Retailers know only their own cost function.
  - Consumers have individual multi-unit demands driven from a scheme of reservation values
  - Quantity sold by retailers to consumers is determined via double auction
Experimental Design

- Wholesale Market:
  - Wholesale price offer: Take-it-or-leave-it offer of wholesaler to retailers (ultimatum bargaining)
  - Each retailer individually accepts offered price or decides for outside option wholesale price
  - Quantity is produced according to sales in the retail market

- Retail Market:
  - Retailers know only their own cost function.
  - Consumers have individual multi-unit demands driven from a scheme of reservation values
  - Quantity sold by retailers to consumers is determined via double auction
  - Non-uniform retail prices: We look at average retail price
Retailers submit ask prices and consumers submit bid prices.
The Double Auction (Vernon Smith 1962)

- Retailers submit ask prices and consumers submit bid prices.
- Bids and asks are denoted in separate queues shown on the computer screen.
The Double Auction (Vernon Smith 1962)

- Retailers submit ask prices and consumers submit bid prices.
- Bids and asks are denoted in separate queues shown on the computer screen.
- A trade is concluded if a retailer accepts a bid or a consumer accepts an ask.

<table>
<thead>
<tr>
<th>Buyer 3</th>
<th>29000</th>
<th>Ask Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seller 2</td>
<td>32000</td>
<td></td>
</tr>
<tr>
<td>Seller 1</td>
<td>31250</td>
<td></td>
</tr>
<tr>
<td>Buyer 1</td>
<td>30500</td>
<td></td>
</tr>
<tr>
<td>Buyer 3</td>
<td>31000</td>
<td></td>
</tr>
<tr>
<td>Seller 2 (Accepts 31000)</td>
<td></td>
<td>Trade 1 at 31000</td>
</tr>
<tr>
<td>Buyer 4</td>
<td>30750</td>
<td></td>
</tr>
<tr>
<td>Buyer 2</td>
<td></td>
<td>Accepts 30750</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td>Trade 2 at 30750</td>
</tr>
</tbody>
</table>
Further Experimental Details

- 283 student participants from Erfurt University, recruited with ORSEE, Greiner (2015)
Further Experimental Details

- 283 student participants from Erfurt University, recruited with ORSEE, Greiner (2015)
- Computer network Z-tree (FIschbacher 2007)
283 student participants from Erfurt University, recruited with ORSEE, Greiner (2015)

Computer network Z-tree (Fischbacher 2007)

2 trial periods, 15 paid periods, 12, 12 and 13 sessions for treatments LOW, MID and HIGH
Further Experimental Details

- 283 student participants from Erfurt University, recruited with ORSEE, Greiner (2015)
- Computer network Z-tree (Fischbacher 2007)
- 2 trial periods, 15 paid periods, 12, 12 and 13 sessions for treatments LOW, MID and HIGH
- Each participant was randomly assigned the role of wholesaler or retailer or consumer and was involved only in a single treatment.
Further Experimental Details

- 283 student participants from Erfurt University, recruited with ORSEE, Greiner (2015)
- Computer network Z-tree (Fischbacher 2007)
- 2 trial periods, 15 paid periods, 12, 12 and 13 sessions for treatments LOW, MID and HIGH
- Each participant was randomly assigned the role of wholesaler or retailer or consumer and was involved only in a single treatment.
- A single consumer (seller) was allowed to buy (sell) up to 9 (36) units.
283 student participants from Erfurt University, recruited with ORSEE, Greiner (2015)

Computer network Z-tree (Fischbacher 2007)

2 trial periods, 15 paid periods, 12, 12 and 13 sessions for treatments LOW, MID and HIGH

Each participant was randomly assigned the role of wholesaler or retailer or consumer and was involved only in a single treatment.

A single consumer (seller) was allowed to buy (sell) up to 9 (36) units.

All entries of retail and wholesale prices were restricted to the range 8,000 to 36,000
Further Experimental Details

- 283 student participants from Erfurt University, recruited with ORSEE, Greiner (2015)
- Computer network Z-tree (Fischbacher 2007)
- 2 trial periods, 15 paid periods, 12, 12 and 13 sessions for treatments LOW, MID and HIGH
- Each participant was randomly assigned the role of wholesaler or retailer or consumer and was involved only in a single treatment.
- A single consumer (seller) was allowed to buy (sell) up to 9 (36) units.
- All entries of retail and wholesale prices were restricted to the range 8,000 to 36,000
- A session took about 50 minutes including instruction phase and practice periods.
Further Experimental Details

- 283 student participants from Erfurt University, recruited with ORSEE, Greiner (2015)
- Computer network Z-tree (Flischbacher 2007)
- 2 trial periods, 15 paid periods, 12, 12 and 13 sessions for treatments LOW, MID and HIGH
- Each participant was randomly assigned to the role of wholesaler or retailer or consumer and was involved only in a single treatment.
- A single consumer (seller) was allowed to buy (sell) up to 9 (36) units.
- All entries of retail and wholesale prices were restricted to the range 8,000 to 36,000
- A session took about 50 minutes including instruction phase and practice periods.
- On average, wholesalers earned 46.92 EUR, while retailers and consumers earned 13.79 EUR and 8.42 EUR, respectively
Theoretical Model

- Implementation of a discrete version of the following continuous model
Theoretical Model

- Implementation of a discrete version of the following continuous model
- $k = 10,000$ wholesaler’s unit production cost,
Theoretical Model

- Implementation of a discrete version of the following continuous model

\[ k = 10,000 \] wholesaler’s unit production cost,

\[ \pi_0 = \sum_i \lambda_i (w_i - k) q_i, \lambda_i = 0 \text{ or } 1 \]

\[ C_i(q_i) = w_i q_i + cq_i^2 \]

\[ \pi_0 = p(Q_i) q_i \]

\[ C_i(q_i) = a b Q_i \] with \( Q_i = \sum_i q_i \),

\[ a = 36,000, b = 250. \]
Theoretical Model

- Implementation of a discrete version of the following continuous model
- \( k = 10,000 \) wholesaler’s unit production cost,
- \( \pi_0 = \sum_i \lambda_i (w_i - k) q_i \), \( \lambda_i = 0 \) or 1
- \( C_i(q_i) = w_i q_i + c q_i^2 \), retailer total cost with \( c = 875 \)
Theoretical Model

- Implementation of a discrete version of the following continuous model
- \( k = 10,000 \) wholesaler’s unit production cost,
- \( \pi_0 = \sum_i \lambda_i (w_i - k)q_i, \lambda_i = 0 \text{ or } 1 \)
- \( C_i(q_i) = w_i q_i + cq_i^2 \), retailer total cost with \( c = 875 \)
- \( \pi_0 = p(Q_i)q_i - C_i(q_i) \)
Theoretical Model

- Implementation of a discrete version of the following continuous model
  \[ k = 10,000 \text{ wholesaler's unit production cost,} \]
  \[ \pi_0 = \sum_i \lambda_i (w_i - k) q_i, \lambda_i = 0 \text{ or } 1 \]
  \[ C_i(q_i) = w_i q_i + c q_i^2, \text{ retailer total cost with } c = 875 \]
  \[ \pi_0 = p(Q_i) q_i - C_i(q_i) \]
  \[ p(Q) = a - bQ \] with \( Q = \sum_i q_i, a = 36,000, b = 250. \]

<table>
<thead>
<tr>
<th>Table 1: Theoretical benchmark functions and values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>Retail Cartel</td>
</tr>
<tr>
<td>Cournot with 2 Retailers</td>
</tr>
<tr>
<td>Cournot with 4 Retailers</td>
</tr>
<tr>
<td>Perfect Competition</td>
</tr>
<tr>
<td>Consumer Cartel</td>
</tr>
</tbody>
</table>
On-screen information for the wholesaler comprised production cost, the outside option wholesale price, the number of retailers and, at the end of each period, the quantity sold and profit made.

On-screen information for retailers comprised the wholesale price offered, the outside option wholesale price, the retail cost schedule given the accepted wholesale price, the number of retailers, the bid and ask price queues in the retail market (without buyer and seller labels), the profit made on each own trade, and, at the end of each period, the quantity sold and profit made.

On-screen information for consumers comprised the valuation schedule (multi-unit demand), the bid and ask price queues in the retail market (without buyer and seller labels), the profit made on each own trade, and, at the end of each period, the quantity sold and profit made.
On-screen information for the wholesaler comprised production cost, the outside option wholesale price, the number of retailers and, at the end of each period, the quantity sold and profit made.

On-screen information for retailers comprised the wholesale price offered, the outside option wholesale price, the retail cost schedule given the accepted wholesale price, the number of retailers, the bid and ask price queues in the retail market (without buyer and seller labels), the profit made on each own trade, and, at the end of each period, the quantity sold and profit made.

On-screen information for consumers comprised the valuation schedule (multi-unit demand), the bid and ask price queues in the retail market (without buyer and seller labels), the profit made on each own trade, and, at the end of each period, the quantity sold and profit made.
On-screen information for the wholesaler comprised production cost, the outside option wholesale price, the number of retailers and, at the end of each period, the quantity sold and profit made.

On-screen information for retailers comprised the wholesale price offered, the outside option wholesale price, the retail cost schedule given the accepted wholesale price, the number of retailers, the bid and ask price queues in the retail market (without buyer and seller labels), the profit made on each own trade, and, at the end of each period, the quantity sold and profit made.

On-screen information for consumers comprised the valuation schedule (multi-unit demand), the bid and ask price queues in the retail market (without buyer and seller labels), the profit made on each own trade, and, at the end of each period, the quantity sold and profit made.
Observed Retail and Wholesale Prices by Treatment

![Graph showing observed retail and wholesale prices by treatment. The graph compares low, mid, and high treatment levels with lines indicating median prices over periods from 1 to 13. The x-axis represents periods, and the y-axis represents median prices.]
Table 2: Quartiles (25, 50, 75), correlations ($\rho$) and tests for retail price, paid wholesale price and consumer surplus share. P-Values are provided for two-tailed tests using session averages for periods 11-15 as units of analyses (N = 12, 12 and 13 for treatments LOW, MID and HIGH, respectively).

<table>
<thead>
<tr>
<th></th>
<th>LOW</th>
<th>MID</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail Price</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29,575</td>
<td>30,082</td>
<td>30,509</td>
<td></td>
</tr>
<tr>
<td>20,451</td>
<td>21,188</td>
<td>21,342</td>
<td></td>
</tr>
<tr>
<td>Paid Wholesale Price</td>
<td>28,760</td>
<td>29,465</td>
<td>30,175</td>
</tr>
<tr>
<td>21,342</td>
<td>22,381</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer Surplus %</td>
<td>0.34</td>
<td>0.28</td>
<td>0.20</td>
</tr>
<tr>
<td>0.42</td>
<td>0.53</td>
<td>0.34</td>
<td></td>
</tr>
</tbody>
</table>
In our experiment we find only partial support for the countervailing power hypothesis. Retail price is lower in treatment HIGH than in LOW (Hypothesis 1.b).
Testing Hyp. 1 and 2.

- In our experiment we find only partial support for the countervailing power hypothesis. Retail price is lower in treatment HIGH than in LOW (Hypothesis 1.b).

- However, the mere reduction in the number of retailers (treatment MID versus LOW) was insufficient to induce a significant reduction in wholesale price (Hypothesis 2.a) As we expected a-priori, the offered wholesale price was occasionally rejected such that fear of rejection could be a reasonable concern in wholesale pricing. Also, the offered wholesale price was substantially less than the theoretically predicted outside option value (21k vs 23k, 15k vs 17k).
Testing Hyp. 1 and 2.

- In our experiment we find only partial support for the countervailing power hypothesis. Retail price is lower in treatment HIGH than in LOW (Hypothesis 1.b).

- However, the mere reduction in the number of retailers (treatment MID versus LOW) was insufficient to induce a significant reduction in wholesale price (Hypothesis 2.a) As we expected a-priori, the offered wholesale price was occasionally rejected such that fear of rejection could be a reasonable concern in wholesale pricing. Also, the offered wholesale price was substantially less than the theoretically predicted outside option value (21k vs 23k, 15k vs 17k)

- Therefore, the countervailing power effect in its narrow sense failed (Hypothesis 1.a).
Testing Hyp. 1 and 2.

- In our experiment we find only partial support for the countervailing power hypothesis. Retail price is lower in treatment HIGH than in LOW (Hypothesis 1.b).
- However, the mere reduction in the number of retailers (treatment MID versus LOW) was insufficient to induce a significant reduction in wholesale price (Hypothesis 2.a). As we expected a-priori, the offered wholesale price was occasionally rejected such that fear of rejection could be a reasonable concern in wholesale pricing. Also, the offered wholesale price was substantially less than the theoretically predicted outside option value (21k vs 23k, 15k vs 17k).
- Therefore, the countervailing power effect in its narrow sense failed (Hypothesis 1.a).
- Only the additional increase in retailer power by a reduction of the outside option wholesale price implemented a significant reduction in wholesale price (Hypothesis 2.b).
Furthermore, as expected, the offered wholesale price was substantially less than the theoretically predicted outside option value. However, it was not significantly lower in MID than in LOW.
Furthermore, as expected, the offered wholesale price was substantially less than the theoretically predicted outside option value. However, it was not significantly lower in MID than in LOW.

We found a positive correlation between wholesale price and retail price (Hypothesis 3) but a pass-through rate of a wholesale price reduction of only about 10%.
Furthermore, as expected, the offered wholesale price was substantially less than the theoretically predicted outside option value. However, it was not significantly lower in MID than in LOW.

We found a positive correlation between wholesale price and retail price (Hypothesis 3) but a pass-through rate of a wholesale price reduction of only about 10%.

Comparing surplus share we find more collusion of retailers in the retail market when there are two retailers rather than four (Hypothesis 4). This is the classical concentration effect and it works against the countervailing power effect.
Higher retail concentration does not reduce the wholesale price unless the outside option of the retailer improves.
Conclusion

- Higher retail concentration does not reduce the wholesale price unless the outside option of the retailer improves.
- Even when a retailer obtains a lower wholesale price, only 10\% reduction passes on to consumers.
Conclusion

- Higher retail concentration does not reduce the wholesale price unless the outside option of the retailer improves.
- Even when a retailer obtains a lower wholesale price, only 10% reduction passes on to consumers.
- No support for Galbraith’s hypothesis in our experiment.