Integration of Online and Offline Channels in Retail

Santiago Gallino, Toni Moreno
Tuck School of Business, Kellogg School of Management

January 2014
Introducing Personal Pickup

Buy online. Pick up at any Apple Store. We’ll get you set up.

Place your order.
Now there’s a whole new way to shop with Apple — no matter where you are. Make your purchase at the Apple Online Store or from the Apple Store app on your iPhone or iPod touch. Select “pick up” when you check out, then stop by your favorite Apple Retail Store to pick up your order in person.1

Pick up at any Apple Store.
You’ll receive a pickup notification when your order is ready. Just come into the Apple Retail Store, and we’ll have it waiting for you. You can be in and out right away. Or you can choose Personal Setup, which is included with every new Apple Product.

We’ll get you set up.
With Personal Setup, we’ll help you get your Apple product up and running before you leave.
Integration of Online and Offline Channels in Retail
Challenges of “Buy Online, Pick up at Store”

- Sharing inventory information across online-offline channels in real time
- Inventory record inaccuracy
- Increased complexity of store execution
- Impact of “Buy Online, Pick up at Store” (???)
Research Question

We want to understand the impact of the Store Pickup decision:

– on the Online business
– on the B&M stores
– on the overall sales performance for the Company
Empirical Setting and Data

Implementation of store pickup capabilities in a major retail chain with more than 80 stores in North America.
Integration of Online and Offline Channels in Retail

Data

• Online and B&M store level data

  • Online channel [unit of observation: DMA* - day pairs]
    – Sales (includes “store pickup” orders)
    – Number of unique visitors

  • Brick and mortar stores [unit of observation: store - day pairs]
    – Sales
    – Number of transactions
    – Traffic

• Six months of data before implementation and six months of data after implementation (October 2011)

* DMA: Designated Market Areas (Nielsen)
First Question: Impact

How does the **Store Pickup** decision impact the **Online** business?
How to answer these question?

Buy online pickup at store transactions are considered “online revenue”

We expect to find higher lift in areas that are closer to stores
Impact of Store Pickup on Online Sales

• Naïve approach: compare online sales before and after
• Idea: use situations in which store pickup is not available as a control group
Impact of Store Pickup on Online Sales

Compare lift in sales after implementation between DMAs that are close to a store and DMAs that are not.

48 DMAs have a B&M store within 50 miles, 162 DMAs do not. Buy online pickup at store transactions are considered online revenue.
Impact of Store Pickup on Online Sales

$$ \text{LogSales}_{it} = \beta_0 + \beta_1 \cdot \# \text{Visitors}_{it} + \beta_2 \cdot \text{Store}_i + \beta_3 \cdot \text{After}_t + \beta_4 \cdot \text{Store}_i \cdot \text{After}_t + \text{Controls} $$

<table>
<thead>
<tr>
<th></th>
<th>log(SALES)</th>
<th>log(SALES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STORE_AFTER</td>
<td>-0.16***</td>
<td>-0.07**</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>log(VISITORS)</td>
<td></td>
<td>1.41***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.07)</td>
</tr>
</tbody>
</table>

Fixed Effects: YES YES
Week: YES YES

$N = 10710$
$R^2 = 0.87$

Robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

After the implementation, online sales **decrease** in DMAs close to stores ... despite online traffic **increased** in those DMAs
How does the **Store Pickup** decision impact the B&M stores?
Impact of Store Pickup on B&M Sales

• Store pickup is not available at stores in Canada.
• Use Canada as control group and compare lift in sales after implementation between stores in the U.S. and Canada (differences in differences)
Impact of Store Pickup on B&M Sales

\[ \log(Sales_{it}) = \beta_0 + \beta_1 \cdot US_i + \beta_2 \cdot After_t + \beta_3 \cdot US_i \cdot After_t + \text{Controls} \]

<table>
<thead>
<tr>
<th></th>
<th>(\log(\text{TRAFFIC}))</th>
<th>(\log(\text{SALES}))</th>
<th>(\log(\text{SALES}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>US*AFTER</td>
<td>0.13***</td>
<td>0.14***</td>
<td>0.06*</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>(\log(\text{TRAFFIC}))</td>
<td></td>
<td></td>
<td>0.63***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.07)</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Macroeconomic Controls</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Time Effect</td>
<td>Week</td>
<td>Week</td>
<td>Week</td>
</tr>
<tr>
<td>(N)</td>
<td>4347</td>
<td>4497</td>
<td>4342</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.95</td>
<td>0.90</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

* \(p < 0.05\), ** \(p < 0.01\), *** \(p < 0.001\)

After implementation, store sales and store traffic increase more in the US than in Canada
Information on Inventory Availability

- Offering BOPS implies giving **reliable** product availability information
- Some customers may simply travel to a store to buy the product (ROPO, Research online, purchase offline)
Information on Inventory Availability

Proposed explanation: BOPS increases ROPO

A shock to the reliability of inventory information would reduce the cost of visiting the stores and would result in:

1. Increase in store visits to stores that share reliable inventory information
2. Increase in store sales in stores that share reliable inventory information
3. Decrease in online sales in DMAs that are close to stores

Additional hypotheses

1. Cart abandonment increases
2. Store traffic conversion increases
3. Online traffic conversion decreases
Cart Abandonment and Conversion

<table>
<thead>
<tr>
<th></th>
<th>ABAND</th>
<th>ABAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>STORE*AFTER</td>
<td>0.009**</td>
<td>0.009**</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Time Effects</td>
<td>Week</td>
<td>Month</td>
</tr>
<tr>
<td>$N$</td>
<td>10920</td>
<td>10920</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.48</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

- Cart abandonment does increase in the areas near stores after the project implementation
- We do find evidence for an increase of B&M conversion and a decrease in Online conversion
Cross Selling Effect
### Cross Selling Effect

<table>
<thead>
<tr>
<th></th>
<th>log(TRANS)</th>
<th>log(SALES)</th>
<th>log(SALES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(PICKUP_VISITS)</td>
<td>0.07*</td>
<td>0.06***</td>
<td>0.05***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>log(TRAFFIC)</td>
<td>0.35***</td>
<td></td>
<td>0.30***</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td></td>
<td>(0.07)</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Week</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>$N$</td>
<td>5088</td>
<td>5238</td>
<td>5083</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.92</td>
<td>0.78</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

- Additional visits to a store are correlated with more sales
How did the **Store Pickup** decision impact the overall sales performance of the Company?

-2% + 6% = +4%
What about those who use BOPS?

# of days to pick up the order

- 0: 8%
- 1: 18%
- 2: 16%
- 3: 14%
- 4: 12%
- 5: 10%
- 6: 8%
- 7: 6%
- 8: 4%
- 9: 2%
- 10: 1%
- 11: 1%
- 12: 1%
- More: 50%

50%
Conclusions

• Analysis of pre and post implementation period of a “buy online, pickup at the store” project
  – Online sales decrease after implementation, relative to a control group
  – Store sales increase, relative to a control group

• Showing reliable inventory availability online reduces the stockout risk faced by customers and increases ROPO, resulting in additional store sales and traffic

• Challenges of analyzing channels independently
Information and Fulfillment

• Online retailers benefit from centralized fulfillment, but can “suffer” from limited ability to deliver information

• Conjecture
  – Generalists Retailers with commodity products—working on the fulfillment dimension (Amazon drones/delivery stations)
Integration of Online and Offline Channels in Retail
Integration of Online and Offline Channels in Retail
Information and Fulfillment

• Online retailers benefit from centralized fulfillment, but can “suffer” from limited ability to deliver information

• Conjecture
  – Generalists Retailers with commodity products—working on the fulfillment dimension (Amazon drones/delivery stations)
  – Vertical Retailers with unique products—working on informational dimension (Showrooms)
Conclusions

Traditional B&M Retailer that had established an online presence has the opportunity to leverage the benefits of an Omni-channel presence.