Sender-receiver-segment-based demand analysis for letters

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The aim of the presentation

To clarify why the demand of letters develops differently in different sender and receivers segments
GDP = Gross Domestic Product

Letter demand factors

\[ Q_t = Q_t \{ T_t, S_t, P_t, K_t, g_t(f_t(y_t)), N_t, L_t \} \]

where

Q = letter volume
T = trend
S = business cycle
P = letter price
K = price of competitive service,
g = substitution
N = population
L = letter service quality
Correlations between the segment based volumes of 1st and 2nd class letters and GDP in Finland 1991-2013

Letter demand has followed GDP quite closely during the whole examination period
The big change happened already in the middle of 1990’s
The relationship changed dramatically at the turn of the millennium

Correlations:
- GDP/B2C = +0.97
- GDP/B2B = -0.97
- GDP/C
  - 1991-1999 = +0.96
  - 1999-2+13 = -0.94
Conclusion on GDP of letter demand

Because letter demand in different sender and receiver segments totally differs each other the analysis must be made segment-oriented

\[ Q_{t}^{X2Y} = Q_{t}^{X2Y} \{T_{t}, S_{t}, P_{t}^{X2Y}, K_{t}^{X2Y}, g_{t}^{X2Y}(f_{t}(y_{t})), N_{t}, L_{t} \} \]
Prices
Real prices of letters and telecommunication services in Finland 1990-2013

Correlation between service prices and letter demand

<table>
<thead>
<tr>
<th></th>
<th>B2B</th>
<th>B2C</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter own price</td>
<td>-0.38</td>
<td>0.14</td>
<td>-0.17</td>
</tr>
<tr>
<td>Telecomm. service price</td>
<td>0.98</td>
<td>-0.94</td>
<td>0.56</td>
</tr>
</tbody>
</table>

Source: Ministry of Transport and Communications Finland, Price level of telecommunications charges
### Estimated letter’s own and gross price elasticity

<table>
<thead>
<tr>
<th>Time period</th>
<th>B2B Cross elasticity with telecommunication services (P/K)</th>
<th>B2C No cross elasticity (K)</th>
<th>C Cross elasticity with telecommunication services (P/K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991-2007</td>
<td>-0.37 (t = -6.10)</td>
<td>-1.38 (t = -3.47)</td>
<td>-0.004 (t = -0.05)</td>
</tr>
<tr>
<td>1991-2009</td>
<td>-0.37 (t = -8.29)</td>
<td>-0.93 (t = -2.18)</td>
<td>0.12 (t = 1.26)</td>
</tr>
<tr>
<td>1995-2013</td>
<td>-0.35 (t = -7.11)</td>
<td>-0.77 (t = -1.09)</td>
<td>0.04 (t = 0.27)</td>
</tr>
</tbody>
</table>

- **B2B own price and gross price elasticity (P/K)** has been very stable, although the prices of telecommunication services have been all the time on the decrease and therefore the proposition of business letter price to the telecommunication prices has increased.
- **B2C own price elasticity** is diminishing at the same time when the prices have been raised in recent years, after a couple of stable price decades.
- **Consumer letters do not have any price elasticity**, even if the proposition of consumer letter price to the phone service prices has also increased.
In average a consumer sends one letter or postcard per month, which means 0.8 € expenditure per month.

A household used 23 € on an average for mail services in 2013.

The average total communication costs of one household were 540 € in 2013.

Letters have only a 4% share of the total communication costs of households.

This all means that the letter expenses do not act a big role in the consumers’ total costs which implicates a low letter price elasticity.
Different price elasticity in B2B and B2C segments even though letter prices are the same, why?

It can be explained by two different phenomena

1. Selection criteria between different communication channels
2. Differences in the volumes
1. Selection factors of communication channels

- Significance order of the factors:
  1. reliable arrival of message
  2. data security
  3. ease of use
  4. price
  5. speed of communication

- If the sender can choose between many channels, price is not the most important selection criteria. This is the situation in C2C and B2B segments

- If the letter is in practice the only useful channel, the price gets much bigger significance. This has been the situation for a long time in B2C segment, now this is changing

2. Volumes and structure of B2B and B2C segments

- B2C segment is used for mass mailings
  ➔ letter price rises will realize as bigger total cost changes compared to the smaller mailing volumes
- On the other hand
  - the volume discounts should be bigger in the B2C segment
  - the share of cheaper D+2 service is bigger in B2C segment
  ➔ this all means cheaper average prices in B2C

One cannot say unambiguously that the volume or structural differences would explain the price elasticity differences of B2B and B2C segments
Conclusion on the effect of the price on letter demand

- Letter demand reacts very differently in regard to the prices in different segments, in spite of the fact that the prices in B2B and B2C segments are in principle the same.

- It seems that the significance of letter prices is diminishing.
Substitution
Correlation between letter volume and electronification of invoicing process is very strong

Addressed letter volumes in the Nordic countries

Role of letters in consumer invoicing

Source: Elkelä K; *Electronic consumer invoicing in Nordic countries, Russia and Australia*. Itella BI. Research series 10/2013.
The most important reasons to begin receive invoices electronically have been:

- surcharge for the paper invoice and offering of the electronic receiving as the only alternative
- in addition, to regard electronic invoice as handy and environment responsible

Source: Elkelä K; *Electronic consumer invoicing in Nordic countries, Russia and Australia*. Itella BI. Research series 10/2013.
The form of estimated demand model

\[ Q_{t}^{X2Y} = c \times T_{t}^{\infty} \times S_{t}^{\lambda} \times P_{t}^{\beta} \times K_{t}^{\beta} \times e^{\delta \times G_{t}^{X2Y}} \times N_{t}^{Y} \times L_{t}^{\phi} \times \varepsilon_{t}, \]

- Sender-receiver-segment based analysis

- Substitution factor is in an exponential form which means that it measures the stage of substitution at the annual level
Demand model including the substitution factor for C letters in Finland 1991-2013

Theoretical volume (actual + substitution volume) can be described by the demand function without the substitution factor

\[ q_t^C = 0.034 \cdot T_t^{0.92} \cdot S_t^{-0.13} \cdot \left( \frac{P_t^C}{K_t^C} \right)^{0.17} \cdot e^{-0.021 \cdot G_t^C} \cdot \varepsilon_t \]

Theoretical volume (actual + substitution volume) can be described by the demand function without the substitution factor.
Substitution factor is a combination of email use penetration and progress of invoicing process electronification

- The factor describes the development of theoretical number of electronic communication possibilities instead of paper letters
- Substitution is a complex phenomenon - how to find a good enough indicator to describe it - this is difficult but crucial!
Substitution degrees for 1st and 2nd class letters in Finland 1991-2013

- **B2C**: substitution process has been slow but is now accelerating
- **B2B**: different substitution periods
- **C2C**: straightforward substitution

The degree of substitution is a ratio between actual and theoretical letter volumes (realised + substituted)
Total impact of different factors to the 1\textsuperscript{st} and 2\textsuperscript{nd} class letter demand in Finland 2000-2013

<table>
<thead>
<tr>
<th>Factor</th>
<th>Impact</th>
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<tbody>
<tr>
<td>Economic activity</td>
<td>+20 %</td>
</tr>
<tr>
<td>Letter price</td>
<td>-11 %</td>
</tr>
<tr>
<td>Population</td>
<td>+4 %</td>
</tr>
<tr>
<td>Substitution</td>
<td>-31 %</td>
</tr>
<tr>
<td>Service quality</td>
<td>0 %</td>
</tr>
<tr>
<td>Actual volume</td>
<td>-18 %</td>
</tr>
</tbody>
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The own price and gross price elasticity

direct and indirect
Correlation between price elasticity and letter substitution
Correlation between letter substitution and price elasticity
Real B2C-letter and telecommunication prices

Telecommunication can not be used, because the message receiver, or consumer doesn't want to use it. Could this have something to do with the high letter price elasticity in B2C segment?

Source: Ministry of Transport and Communications Finland, Price level of telecommunications charges
Conclusion on correlation between price elasticity and substitution

- Letter substitution explains changes in the price elasticity better than price-, volume- and structural changes
- However, it is still too early to say what kind of mathematical equation there is between the transformation of price elasticity and the progression of substitution
Conclusions
Conclusions

- Substitution has been and will be in the near future the most important demand factor of letters
- Letter demand behaviors very differently in different sender and receiver segments
- It seems to be a correlation between letter price elasticity and substitution progress – elasticity is diminishing with the substitution progress
Thanks for your attention

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