

# Estimation of demand for unaddressed mail in the UK: entry and exit customer analysis using firm level data

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# Motivation and problem to analyse

Postal mail volumes in the UK exhibit different trends, e.g. letters or parcels. Diverse behaviour even within segments of traffic (PWC 2013).

Postal operators can inform their decisions if they understand better key drivers of demand for different types of mail, in particular how prices impact customer demand.

Good customers dataset for unaddressed mail in the UK since 2008 to 2013. Unaddressed mail is used for advertising and target zonal areas across the country.

We estimate a demand for volumes sent in the contract and/or number of contracts, taking into account the following:

Non-linear pricing rule: If <25,000 items sent then same price across zonal areas (A,B,C,D,E). But >25,000 items price is different in each zonal areas.

Macroeconomic conditions (using retail sales, and/or index production, and/or services output)

Seasonality (monthly dummy variables)

Identified when new zonal areas were introduced between June 2007 and May 2013 (with dummy variables)

# Demand for door to door and assumptions

Considered the demand equation:

$$\ln Y_{tj} = \varphi_j (\ln Y_{t-1j}, \ln P_{tj}, \ln X_{tj}, D_{tj}) + \varepsilon_j + u_{tj}$$

Y, items sent or number of contracts

P, average price

X, macroeconomic variables

D, dummy variables

$\varepsilon_j$ , heterogeneity term and  $u$ , error term

Different models were considered depending on  $\varphi_j$  the and taking into account the following options/assumptions:

- Endogeneity on prices or not
- Different macroeconomic variables
- Temporarily or permanent shocks in pricing zonal areas
- Heterogeneity on zonal areas  $j$  or not

The models were estimated using parametric and non-parametric techniques when  $\varphi_j$  was assumed linear and nonlinear respectively.

# Estimated models and price elasticities

## Parametric techniques

$$\ln Y_{tj} = \alpha + \beta \ln Y_{t-1j} + \gamma \ln P_{tj} + \delta' \ln X_{tj} + \lambda' D_{tj} + u_{tj}$$

Short term elasticity

$$\gamma$$

$$\ln Y_{tj} = \alpha + \beta \ln Y_{t-1j} + \sum_{l=1}^J \gamma_l (\ln P_{tl} \times 1 | (j=l)) + \delta' \ln X_{tj} + \lambda' D_{tj} + u_{tj}$$

Long term elasticity

$$\frac{\gamma}{1-\beta} \text{ and } \frac{\gamma_l}{1-\beta}$$

## Non-parametric techniques

$$\ln Y_{tj} = \alpha(\xi_{tj}) + \beta(\xi_{tj}) \ln Y_{t-1j} + \gamma(\xi_{tj}) \ln P_{tj} + \delta(\xi_{tj})' \ln X_{tj} + \lambda(\xi_{tj})' D_{tj} + u_{tj}$$

Short term elasticity

$$\frac{\partial \varphi_j}{\partial \ln P_{tj}}$$

Long term elasticity

$$\frac{\frac{\partial \varphi_j}{\partial \ln P_{tj}}}{1 - \frac{\partial \varphi_j}{\partial \ln Y_{t-1j}}}$$

# Empirical results

**Table 1. Estimated price elasticities for UK unaddressed mail**

Dependent variable	<i>Linear models</i>		<i>Non-linear model</i>	
	Estimated using parametric techniques		Estimated using non parametric techniques	
<b>Number of contracts</b>	<i>Pooling all zonal areas</i>		<i>Pooling all zonal areas</i>	
Zonal area prices	Short term	Long term	Short term	Long term
A	-0.38 to -0.71	-0.83 to -1.46	-0.56	-0.92
B	-0.33 to -0.65	-0.78 to -1.35	-0.43	-0.76
C	-0.31 to -0.63	-0.67 to -1.29	-0.79	-1.86
D	-0.29 to -0.60	-0.63 to -1.25	n.s.	n.s.
E	-0.29 to -0.60	-0.62 to -1.24	n.s.	n.s.
<b>Volumes sent</b>	<i>Pooling all zonal areas together</i>			
Zonal area prices			Models not estimated	
A	-0.69 to -0.92	-0.97 to -1.31		
B	-0.57 to -0.80	-0.81 to -1.14		
C	-0.53 to -0.75	-0.75 to -1.08		
D	-0.49 to -0.71	-0.68 to -1.01		
E	-0.47 to -0.69	-0.66 to -0.98		
<b>Number of contracts</b>	<i>Pooling individual zonal areas</i>			
Zonal area prices			Models not estimated	
A	-0.60 to -0.64	-0.94 to -1.03		
B to E	n.s.	n.s.		

Notes: \* Denotes statistically significant at 5% significance level. \*\* Denotes statistically significant at 10% significance level. n.s. denotes results not statistically significant. Figures in parenthesis are standard errors for price coefficients. Estimation period covers June 2007 to May 2013.

## Linear models

Including macroeconomic variables improved explanatory power of price elasticities using OLS estimation.

But not statistically significant prices when considering endogeneity based on (2SLS) or heterogeneity (panel fixed effects)

## Non-linear models

Price elasticities statistically significant for A,B and C zonal areas.

## Main results:

- 1) Short term price elasticities smaller than long term price elasticities; beta coefficient positive and lower than 1.
- 2) Price elasticities differ by pricing zonal areas, and zones A to B tend to be higher.

# Conclusions

1. Wide range of estimated long run price elasticities for unaddressed advertising mail in the UK (-0.6 to -1.5), mid value in absolute terms around unity.
2. Given the wide range, it is not clear to what extent the estimated price elasticities, on their own, can be used to inform revenue enhancement measure and responding to competitive pressures.
3. Need more analysis to narrow the range of estimates, either exploring further the choice of macroeconomic variables or adopting richer dynamic models.