Chapter 9

Delivery Costs II

Back to Parametric Models

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1. INTRODUCTION

It is commonly accepted that the outdoor mail delivery process exhibits strong scale economies, even if models differ on the precise measurement of this phenomena. Engineering models based on analytical analyses of the delivery process estimate scale factors in excess of 4 or, equivalently, to a scale elasticity smaller than 0.25, so that an increase of 1% of the quantity of mail would imply a cost variation of only 0.25% (see Roy 1999 and Bernard et al 2002). Econometric models have also provided estimates of significant scale factors (around 2 or 3) (see Cazals et al 1997 and 2001). The econometric models are based on the estimation of a relation between the cost and the quantity of mail. Such a relation is usually estimated using micro data measured at the level of delivery offices. Then the cost function should incorporate variables describing the heterogeneity between offices. This diversity is introduced through observable explanatory variables and, if the sampling scheme permits, using unobservable heterogeneity components. One of the strongest conclusions of ten years of estimation of delivery cost models is that the more precise the treatment of heterogeneity between delivery offices, the lower the estimated scale elasticity. In particular the use of panel data and of individual unobservable effects leads to estimations of scale elasticity around 3 if the model also incorporates some observable heterogeneity components; the same argument applies when using a non-

parametric specification, which allows very different cost structures between "small" and "large" offices.

Using a new data set describing the cost of outdoor delivery for French offices in 2001 we estimate a very simple constant elasticity model where the cost is modeled as a function of the total traffic and of two heterogeneity components, the surface[1] and the population (measured by the 1999 census; hereafter referred to as population99). As we note below, this model is also equivalent to representing delivery cost as a function of the traffic, the population density and the traffic per capita. Section 2 presents the main result of such an elementary econometric model: The elasticity of the cost with respect to the traffic is estimated to be 0.28. Furthermore, if the sample is sub-divided according to the traffic it appears that the elasticity is almost zero for the very small offices (costs are essentially fixed) and jumps to 0.7 for very large offices.

The models presented in section 2 are more "descriptive" than "structural" because they do not incorporate technology choices or design of delivery offices, which introduce selection bias or endogeneity bias in the estimation. In this paper we carry out two steps in the direction of the specification of a more structural model. Actually, we consider two (partial) phenomena.

Section 3 presents the first one. We show that two technologies may be used for the delivery of packets: The packets may be delivered jointly with the rest of the mail or by specific motorized rounds. We consider a model which incorporates this choice as an endogenous selection mechanism.

Secondly, the model of section 4 shows that the surface of the office is an important explanatory variable. However the strategy of the design of the offices is conducted in order to reduce the cost. The decomposition of the territory into delivery offices defines units of observation with a surface depending on unknown heterogeneity components of the costs. Then the surface should be treated as endogenous: This is the goal of the last section of this paper. The model we present is not fully satisfactory because the process of construction or regrouping offices is not explicitly modeled and in particular the number of offices[2] is kept exogenous.

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[1] Surface: size of the geographical postal area covered by a delivery office (denoted for simplicity the surface in the paper).

[2] The sample size is also kept exogenous.