MODELLING QUANTITATIVE TRADE RESTRICTIONS: RATIONING IN THE ROTTERDAM MODEL**

BY

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1 INTRODUCTION

This paper develops a more general approach to the modelling of quantitative restrictions (QRs) on international trade than is commonly adopted. It allows for the possibility that, following the imposition of a quantity ceiling, price does not rise to the level required to clear excess demand (as is normally assumed) but that quantity rationing occurs. The paper develops methods of identifying this situation and of allowing for it in the estimation of demand functions. The implications for making welfare calculations are also briefly considered.

The estimation of the effects of a QR on imports requires the derivation of a model of demand in the presence of a binding constraint. If prices rise to clear the market, the QR does not cause any econometric difficulties, for the normal demand system can be estimated on observations from both the periods with and without policy. If, on the other hand, the price does not rise sufficiently there is rationing, and we show that by using the approach of Neary and Roberts (1980) some of the information from the constrained period can be used to estimate the parameters of the demand equations. Our approach differs from that of 'disequilibrium models' (Quandt (1982)) in which changes in regime are endogenous to the model. Here we use a priori information to identify when the trade policy was binding and so can concentrate upon testing

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for the presence of rationing during the period of constraint. Although we work solely on the demand side of the market, it is plain that even if prices rise sufficiently so that demand is not quantity-constrained, then supply must be rationed in the sense that at the new, higher, price suppliers would wish to offer more than the quantity permitted. Hence techniques of the type developed here must figure somewhere in the modelling of QRs.

Having developed the theoretical model we offer some illustrative results from the British footwear market during the 1970s and 1980s. Specifically, we study the demand for women's and children's leather footwear and analyse the voluntary export restraint on exports from Czechoslovakia, Poland and Romania. In this particular case there is a plausible explanation of why prices did not rise to clear demand during the period in which the import constraint was binding and thus why it was that demanders were rationed. Footwear is attractive for a case study of QRs for several reasons: it is typical of the labour-intensive goods in which comparative advantage has shifted away from industrial countries; the UK sector has experienced several trade shocks and policies; there is no significant government ownership through which covert support could be given; the sector is fairly competitive, at least at the production level; and the QRs are reasonably well documented and transparent. As Hamilton (1988) observes, footwear is to trade policy what the fruit fly is to genetics: of relatively little direct importance but a wonderful example for study.

2 THE MODEL OF DEMAND

In contrast to much previous work on QRs we place considerable emphasis upon estimating the parameters of economic behaviour. In addition, earlier studies tend to concentrate upon total imports under a quantity constraint, whilst here we examine the effects of discriminatory trade policy and so allow for spillovers not only between the constrained imports and domestic supplies but also between different sources of imports.

Assume, for now, that we are dealing with a single buyer in a competitive market. For the reasons enunciated in Winters and Brenton (1988), the Rotterdam system (Theil 1975) is the most attractive way of characterising this demand. For convenience we express it in matrix form.

\[ Y = Qb' + PC + E \] (1)

where

\[
\begin{align*}
Y & \text{ is } (T \times n) \quad \{w_t, \text{ d ln } q_i\} \\
Q & \text{ is } (T \times 1) \quad \{\text{d ln } Q_t\} \\
P & \text{ is } (T \times n) \quad \{\text{d ln } p_{it}\}
\end{align*}
\]

1 Further details are available in Winters and Brenton (1988) and Brenton and Winters (1990).