IMPACT OF DEMOGRAPHIC CHANGE ON INDUSTRY STRUCTURE IN AUSTRALIA

A joint study by the Australian Bureau of Statistics, the Department of Employment and Industrial Relations, the Department of Environment, Housing and Community Development, the Department of Industry and Commerce and the Industries Assistance Commission

ESTIMATES OF THE ELASTICITY OF SUBSTITUTION BETWEEN IMPORTED AND DOMESTICALLY PRODUCED COMMODITIES AT THE FOUR DIGIT ASIC LEVEL

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SUMMARY

In this paper we present estimates of the elasticity of substitution between imported and domestically produced goods classified at the four digit ASIC level. Estimating equations are based on the CES expansion path. The data used are quarterly and span the period July 1968 to June 1975. The main data series, including the price and quarterly indexes for imports, are yet to be published as they have only recently been compiled by the IAC and the ABS.

Two approaches to modelling import demand are used. The first assumes that adjustment to the expected ratio of import to domestic prices occurs rapidly and the second is a partial adjustment formulation. In fitting the models it is assumed that in general an ordering lag of one and a half quarters is applicable for Australian imports and that the domestic ordering lag is half a quarter. The models include variables which enable various hypotheses about the effects of domestic pressure of demand, tariff quotas and quantitative restrictions on imports to be tested.

The estimating equations are fitted to the data using OLS methods. The results indicate that the ratio of the consumption of imported to domestically produced goods is sensitive to changes in the ratio of domestic to import prices for a wide range of commodities, with estimated elasticities of substitution clustering around two for many consumer goods, but typically somewhat lower in the case of intermediate inputs.

The interpretation of many of our results is robust under a switch from the rapid adjustment to the partial adjustment framework. Moreover, the results suggest that most of the response in the import ratio to a change in the relative prices of imported and domestic goods occurs within one year of the change in prices.

The results indicate that a variable reflecting pressure of demand for domestically produced goods has had a measurable effect on imports of a wide range of commodities.

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1. INTRODUCTION

Over the period 1968-69 to 1974-75, the share of imports in Australian sales of manufactured goods increased from roughly 20 to 25 per cent. This movement at the aggregate level disguises a considerable variation between industries in their sensitivity to import competition. In this paper we present estimates of the elasticity of substitution between imported and domestic manufactures, classified at the four digit ASIC level.[1] The data used in the study were assembled within the Australian Industries Assistance Commission (IAC) and form the first comprehensive data base on Australian trade flows. This work is reported in Marsden amd Milkovits (1977) and a summary is presented in Appendix 3.

The data are quarterly and span the period September 1968 to June 1975. This period is ideal for import demand estimation as it includes large movements in import and domestic prices and large movements in industrial activity. The 46 four digit ASIC codes for which comprehensive data are currently available represented approximately 35 per cent of Australian merchandise imports in 1973-74.

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1. The (4 digit) ASIC classification gives a relatively homogenous commodity grouping. For this reason, we would not expect large biases in our results due to errors of measurement in index construction since the bias is reduced as the commodity groupings become more homogeneous. Bias arising from a divergent coverage between the import price and quantity indexes is avoided by ensuring that the two indexes cover the same group of commodities. For a discussion see Orcutt (1950) and Kemp (1962).

One problem with our data is that domestic output is used as a proxy for domestic usage and the domestic output indexes contain exports. The results presented in this paper for those industries which export a significant proportion of their output can therefore be regarded as preliminary. These are identified in the paper.

The econometric models estimated in this paper are derived assuming a one and a half quarter ordering lag for imports and a half quarter ordering lag for domestically produced goods. These represent what we believe to be the average length of the ordering lags for most manufactured goods considered in this study. We appreciate that for some commodities the lags may be slightly longer or shorter; however because of the large number of four digit ASIC industry groupings considered in this study, individual modelling of ordering lags was infeasible given the time constraints placed on the project.

The ordering lag for imports chosen is based on discussions with some importers and officers of the IAC familiar with the behaviour of importing firms. Further support for the chosen lag was obtained from preliminary estimates of the models derived in this paper in which the pressure of demand proxy was lagged one, two and three quarters. In almost all cases, the proxy lagged two quarters produced the best fit.

Because of the nature of the proxy used, the proxy lagged two quarters corresponds to a one and a half quarter lag relative to the usual quarterly indexes. (The proxy is discussed in detail in Section 3.) We believe the half quarter ordering lag for domestically produced goods assumed in this paper is a reasonable guess of the average length of the ordering lag faced by users.

The paper is organised as follows : Section 2 is concerned with the restrictions and assumptions associated with the estimation of the basic functional form on which the estimating equations are based. Section 3 is concerned with the effect of domestic pressure of demand on imports and the construction of the price series used in the study. Sections 4 and 5 respectively contain the derivation of the rapid adjustment and partial adjustment models. This is followed in Section 6 by a discussion of the additional variables in the basic equations (quota dummies and seasonal dummies). The final (i.e., Seventh section) contains a discussion of the results and the conclusions. The appendices are concerned with the construction of the various data series.

2. SPECIFICATION

The elasticity of substitution between imports and domestically produced goods (ES) measures the responsiveness of imports to changes in their prices and the prices of domestic substitutes. The ES can be written :

$$\sigma_i = \frac{\partial \ln (x_{2i}/x_{1i})}{\partial \ln (P_{1i}/P_{2i})} , \qquad (2.1)$$

where : σ_i is the ES between imported and domestically produced goods of type i ;

x_{2i} is the quantity of imports of good i used ;

x_{1i} is the quantity of domestically produced good i used ;

P_{2i} is the price of imports of good i ;

and P_{1i} is the price of the domestically produced good i .

If it is assumed that utility and production functions possess the usual concavity properties which rule out corner solutions, the ES (σ_i) as defined in (2.1) is necessarily positive.

If it is assumed that the ES is constant, integration of (1.1) yields :

$$\ell n \left(x_{2i}/x_{1i} \right) = a + \sigma_i \ell n \left(P_{1i}/P_{2i} \right) \quad , \qquad (2.2)$$

where a is an arbitrary constant.

Equation (2.2), which is the logarithmic transform of the CES expansion path equation, forms the basis of our econometric estimating equation.[1]

Equation (2.2) has a long history in import demand studies : Tinbergen (1946), Chang (1948), Gregory (1971), Goodman (1973) and Richardson (1973). Because of the important policy implications of the estimates, various studies were initiated into the possible sources of bias involved in using equations of the form (1.2).[2] These involve problems associated with simultaneity in import-demand (Morgan and Corlett (1951)), and the types of restrictions imposed by the functional form (Morgan and Corlett (1951), Polak (1950), Morrissett (1953) and Richardson (1973)).

An important contribution in this area was made by Morrissett. He showed that (2.2) imposes the following restrictions on the data :

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1. In a situation in which the economic agent buying inputs or consumer goods is confronted by constant prices, the expansion path is the line joining points of equal marginal rate of substitution in an isoquant or indifference map.

2. Leamer and Stern (1970) devote a chapter of their book to this subject.

$$E_{11} - E_{21} = E_{22} - E_{12} \quad ; \qquad (2.3)$$

$$E_{1y} = E_{2y} \quad ; \qquad (2.4)$$

and $$E_{1i} = E_{2i} \; , \; (i = 3,\ldots,n) \quad ; \qquad (2.5)$$

where E_{ii} is the own price elasticity ;

$E_{ij}(i \neq j)$ is the cross price elasticity ;

and E_{iy} is the expenditure elasticity .

These restrictions are severe and can be expected to hold only approximately for any data set. Intuitively, restriction (2.4) (the income or expenditure elasticities of the two goods are the same) is probably the most likely to be violated, especially for consumer goods. If this assumption is violated, serial correlation in the residuals is a likely consequence in time series studies because changes in income over time would affect the numerator and the denominator of the dependent variable in (2.2) differently, leading to unexplained variation in the dependent variable which would finish up in the residuals of the estimated equation.

It is clear that since (2.2) can alternatively be derived from a CES production or utility function (which is homothetic), for global consistency, $E_{1y} = E_{2y} = 1$. Equation (2.2) therefore imposes less severe restrictions on the data than would demand functions derive from a CES system.

In deriving our estimating equations, we assume that an ordering lag of one and a half quarters is relevant for Australian imports and that the domestic ordering lag is one half a quarter. In addition, we make the small country assumption (the world price is not affected by Australian import demand); that is, the import price is assumed to be exogenous. Under these assumptions, all the explanatory variables which enter our estimating equations are predetermined. Given our belief that these assumptions approximate reality, we do not, therefore, expect simultaneity bias to be a problem.

3. PRESSURE OF DEMAND AND EXPECTED EFFECTIVE PRICES

It is widely recognized that during periods of excess domestic demand, import demand increases independently of prices and domestic activity. The usual explanation provided for this phenomenon is that under conditions of excess demand, producers have difficulty in meeting their orders at ruling prices. However, recognising the short term nature of this increased demand, producers are reluctant to increase prices, and prefer to ration their output by increasing their delivery lags, with the direct effect of increasing queue lengths. Thus the user pays two prices for the good: the quoted price and the imputed cost of queueing. In an attempt to minimise total cost, the customer may turn to imports. When this occurs, import demand is no longer fully explained by nominal prices and activity. We shall call this the "positive" pressure of demand effect. For a detailed discussion see Gregory (1971) and Leamer and Stern (1970, pp. 13-14).

It has also been suggested that when domestic output is less than normal, import demand is retarded because domestic producers offer rebates, prompt delivery and other non-price inducements which tend to reduce import demand. For further discussion see Ahluwalia and Hernandez-Cata (1975) and Parrish and Dillulo (1972). This shall be referred to as the "negative" pressure of demand effect. We shall test these hypotheses in the specification.

The manner in which the quoted price and the imputed cost of waiting interact in the determination of imports was investigated by Gregory (1971). He postulated that imports respond to effective prices, where the effective price is defined as the actual quoted price weighted by all the factors which affect the availability of a particular commodity, for example, waiting times (as quoted by suppliers) and trade credit restrictions.

Data on these non-price factors were unavailable; however, Gregory constructed proxies for the most important component, quoted waiting times. Gregory was unable to construct an effective price series for imports, and his regression equation included the ratio of domestic <u>effective</u> prices to <u>actual</u> import prices.[1] He found that all regressions based on the effective price concept were significant. Accepting the intuitive appeal of this approach, we also model the effect of domestic pressure of demand in imports using Gregory's concept of effective price.

We shall now discuss the implication of our ordering lag assumptions for the formation of the effective price series. Consider the case of an importer about to place an order for goods which will arrive in quarter (t). Because we assume a one and a half quarter ordering lag for imports, the importer places his

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1. Because Australia is a small country, importers can easily switch their demand to alternative sources. It is therefore unlikely that foreign pressure of demand will have a significant effect on Australian imports, except possibly at a time of global commodity bottlenecks.

order in period (t-3/2). At this time, the importer does not know the price of the domestically produced import-substitute, which will be ordered in period (t-½), one quarter in the future, but which will arrive at the same time as his ordered imports. Therefore the price component of his importing decision is based on the import price quoted to him in the import-ordering period (t-3/2) and the domestic price expected to prevail in the domestic good ordering period (t-½); that is, the importer must somehow guess what the price of the domestic substitute will be when subsequently ordered.

Therefore, in the models developed here, it is the expected domestic price which is weighted by the pressure of demand proxies. That is, the domestic price variable which enters the estimating equations derived in this paper is the expected effective domestic price in (t-½) as viewed in the import-ordering period (t-3/2).

Generally, we can postulate that the expected price of a good is some function of historic and current prices. Expected prices are usually estimated by taking a weighted average of historic prices; however, in periods when prices are rising quickly, importers may discount heavily the probability that prices pertaining in the immediate past will be maintained. That is, they will expect prices to rise even further. In this type of situation, a linear least squares sliding trend projection is probably a better guide to importers' expectations than a weighted average of past observations.

The calculation of the expected domestic price in the domestic-ordering period (t-½) as viewed from the import-ordering period (t-3/2) involves a one quarter sliding trend projection. In forming this projection, we assume that the quoted domestic price in period (t-½) is in fact the price paid in (t), when the goods arrive.

Therefore, prices observed in (t) reflect information which is known to the purchasers of the domestic good in period (t-½). This assumption avoids the problem of re-centreing the data on half quarters (by averaging) and then subjecting the price data to further smoothing in forming the projection. The one quarter linear least squares sliding trend projection model can be written[1] :

$$\hat{P}_{i1(t-\frac{1}{2})}(t-3/2) = \sum_{h=1}^{m} w_h \cdot P_{i1(t-h)} , \qquad (3.1)$$

with weights, $w_h = \{2(2m+1) - 6h/[m(m-1)]\}$,

where : $\hat{P}_{i1(t-1/2)}(t-3/2)$ is the expected domestic price in period (t-1/2) as viewed in the import-ordering period (t-3/2) ;

$P_{i1(t-h)}$ is the actual domestic price in period (t-h) ;

m is the number of observations used in forming the sliding trend projection.

There are two problems associated with formulating the expected price series according to (3.1). First, forming a sliding trend projection using the actual price can lead to negative prices if the data exhibit a sequence of rapidly falling prices; second, forming a projection would destroy any seasonality in the price data.

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1. This model was used by Powell and Gruen (1967) in their econometric study of beef supply. For a discussion of an extrapolative sliding trend projection model, see Powell (1974, pp. 132-135).

The following procedure was used to overcome these problems. First, the price series were decomposed into trend and seasonal components using regressions of the form :

$$\ell n P_{i1t} = \alpha' S_t + \beta t + \varepsilon_t \qquad (3.2)$$

where : S_t is a (4×1) seasonal dummy for period t ;

α' is a (1×4) vector of seasonal coefficients ;

t is time (and ε_t is an error term) .

Prices were then deseasonalised by computing

$$\ell n \bar{P}_{i1t} = \ell n P_{i1t} - \hat{\alpha}' S_t \qquad (3.3)$$

where $\hat{\alpha}'$ is the estimate of the vector of seasonal coefficients in (3.2) .

The expected price series was then computed (where exp. is the exponential function) as[1]

$$\hat{P}_{i1(t-\frac{1}{2})}(t-3/2) = \exp.\left[\sum_{h=1}^{m} w_h \cdot \ell n \bar{P}_{i1(t-h)} + \hat{\alpha}' S_t\right] , \qquad (3.4)$$

where the weights, w_h , are computed as in (3.1) . The models were estimated for expected price series formed using four quarter ($m = 4$) and three quarter ($m = 3$) linear sliding trend projections.

1. The first term on the right of (3.4) is the projected trend component of the expected price; the final term adds seasonal influence back in for the projected period $(t-\frac{1}{2})$. (As pointed out earlier, the difference between (t) and $(t-\frac{1}{2})$ is ignored.)

The pressure of demand proxy we have used to weight the expected prices is based on the disaggregated pressure of demand measures developed in Alaouze (1977). These measures are derived from a question from the Survey of Industrial Trends conducted jointly by the Bank of N.S.W. and the Associated Chambers of Manufactures of Australia (ACMA-BNSW). The proxy can be written :

$$W_t = \exp.(\theta_1 \overline{ZP}_t + \theta_2 \overline{ZN}_t) \quad , \qquad (3.5)$$

where[1] : W_t is the general pressure of demand proxy ;

$\overline{ZP}_t$ is the positive pressure of demand component of the general pressure of demand proxy ;

$\overline{ZN}_t$ is the negative pressure of demand component of the general pressure of demand proxy ;

θ_1 and θ_2 are parameters to be estimated. The expected sign of both parameters is positive.

The expected effective price can now be written :

$$\hat{\hat{P}}_{i1(t-\frac{1}{2})}(t-3/2) = \hat{P}_{i1(t-\frac{1}{2})}(t-3/2) \; . \; W_t \;', \qquad (3.6)$$

where : $\hat{\hat{P}}_{i1(t-\frac{1}{2})}(t-3/2)$ is the expected effective price of the domestic good in the domestic ordering period $(t-\frac{1}{2})$ as viewed from the import ordering period $(t-3/2)$.

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1. By construction, the positive pressure of demand component ($\overline{ZP}$) has a zero where the negative pressure component ($\overline{ZN}$) takes a non-zero value (and vice versa); that is, these two data vectors are orthogonal, and for simplicity can be unambiguously combined to give a general pressure of demand price weighting function as in (3.5) .

The positive and negative pressure of demand components of W_t are proxies for the effect of pressure of demand in the import-ordering period (t-3/2) on the level of imports in period (t) . They are constructed using a non-linear transformation of the proportion of firms in an industry which indicate that they are working at full capacity in answering a question in the survey. Since the survey is conducted in the last month of a quarter, the survey which corresponds closely to the import-ordering period is the one conducted in period (t-2) . For details, see Alaouze (1977).

The pressure of demand proxies are available disaggregated into eight industry classifications :

(1) Treatment of Non-Metal Minerals (cement, bricks, pottery, glass) ,

(2) Chemicals (paint, oils, pharmaceuticals) ,

(3) Engineering (machinery, iron and steel, electrical, industrial metals) ,

(4) Vehicle Construction and Repair (rail, bus, motor, ship, aircraft) ,

(5) Textiles (leather, clothing) ,

(6) Food (drink, tobacco) ,

(7) Paper (printing, cardboard) ,

(8) Miscellaneous (including manufactures of wood, rubber, plastics) .

Operationally, the use of these proxies in regressions using data aggregated at the ASIC level requires a concordance between each ASIC and the eight ACMA-BNSW industry groupings. This concordance can be found in Appendix 2.

4. THE RAPID ADJUSTMENT MODEL

The estimating equations for commodities for which adjust- rapid adjustment in the market share of imports to domestic goods can b derived directly from the log-transform of the CES expansion path equat

$$\ell n \left[x_{2i}/x_{1i}\right] = a_i + \sigma_i \, \ell n \left[P_{1i}/P_{2i}\right] , \qquad (4.1)$$

where, as before : x_{2i} is the quantity of imports of good of type i used ;

x_{1i} is the quantity of domestically good of type i used ;

P_{2i} is the price of imports of good i ;

P_{1i} is the price of the domestically produced good of type i .

However, because of the ordering lags we have assumed, the expansion path equation must be expressed in terms of the import-price quoted in (t-3/2) and assumed to pertain in (t) ; the expected effective domestic-price quoted to retailers in (t-½) and assumed to pertain in (t), as viewed in the import-ordering period (t-3/2) ; and the expected orders of the domestic good in (t-½) as viewed in (t-3/2). Substituting these variables into (4.1) yields the estimating equation :

$$\ell n \left\{\frac{x_{i2(t)}{}^{(t-3/2)}}{\hat{x}_{i1(t)}{}^{(t-3/2)}}\right\} = a_i + \sigma_i \ell n \left\{\frac{\hat{P}_{i1(t-\frac{1}{2})}{}^{(t-3/2)}}{P_{i2(t)}{}^{(t-3/2)}}\right\}$$

$$+ \sigma_i\theta_{1i}\overline{ZP}_{it} + \sigma_i\theta_{2i}\overline{ZN}_{it} + u_t \qquad (4.2)$$

where : $x_{i2(t)}{}^{(t-3/2)}$ is the amount of the imported good i ordered in (t-3/2) for consumption in t .

$\hat{x}_{i1(t)}{}^{(t-3/2)}$ is the expected order of the domestically produced good i in period (t-½) for consumption in period (t) as viewed in the import-ordering period (t-3/2) .

$P_{i2(t)}{}^{(t-3/2)}$ is the price of the imported good i in period (t) as quoted in period (t-3/2) .

$\hat{P}_{i1(t-\frac{1}{2})}{}^{(t-3/2)}$ is the price of the domestically produced good of type i expected to pertain in the domestic good ordering period (t-½) as viewed in the import-ordering period (t-3/2) .

$\overline{ZP}_{it}$ and $\overline{ZN}_{it}$ are the positive and negative pressure of demand proxies respectively .

Equation (4.2) can be interpreted as an expansion path for importers based on (locally) CES demand functions.

Alternatively, (4.2) can be derived from stated utility (Gregory 1971) and production functions (Alaouze 1976). This approach is tenuous if the importers are not the same economic agents as those who use the goods. However, it is also clear that the derived demand aspects of the decision to import must be reflected in equation (4.2) (or its underlying assumptions). The most important of these arises as a result of the long ordering lag for imports.

The demand equations for imports cleared in period (t) and the expected use of the domestic good in (t) as viewed in the import ordering period (t-3/2) are functions of the variables listed above and, where the goods are intermediate inputs, the expected output of using industries in (t) as viewed in (t-3/2). In the case of consumer goods, the additional variable is the expected income of consumers in (t), as viewed from the import ordering period (t-3/2).

If these expectations are not realised, unintended inventories of imports and domestically produced goods can occur, and the demand functions for these goods in the following period (t+1), should be adjusted for these. An unintended inventory is less likely to occur for the domestically produced good than for imports because of the much shorter ordering lag for domestically produced goods. (For a discussion, see Alaouze (1976)). In using an equation of the form (4.2) we assume that no unintended inventories occur.

Equation (4.2) was estimated for three different specifications of the expected use of domestic good series. The first specification is simply using the actual domestic output series for the expected-use series. This assumes that expectations are always fulfilled. In the second specification it is assumed that importers form their expectations of domestic-good consumption in period (t) simply by seasonally adjusting their deseasonalized consumption in the import-ordering period.[1] The last series is constructed from the ACMA-BNSW tendency survey data on expected output changes. We have called these formulations the Infallibility, Naiveté and Clairvoyance specifications respectively. The construction of these series is discussed in Appendix 1.[2]

5. A PARTIAL ADJUSTMENT FORMULATION

In the models developed above, the ratio of the quantity of imports ordered to the expected orders of the domestic good is explained in part by the ratio of the expected effective domestic price and the quoted import price. Once the price expectations are formed, it is assumed that the adjustment of the quantity ratio to this price ratio is instantaneous. Because the expected domestic price is formed using price observations from the previous three or four quarters, the maximum lag in these models is about one year.

For most goods imported into Australia through established commercial channels most of the adjustment in the quantity ratio probably occurs within one year. However, for goods not previously imported, and those which are manufactured from Australian design specifications, the adjustment of the quantity ratio to changes in the price ratio may take longer than one year.

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1. That is, the trend component of actual domestic usage in (t-3/2) is projected forward to (t-½) without any change. The correct seasonal for (t-½) (which is assumed equal to the seasonal for (t)), is then superimposed on this trend value.

2. The Clairvoyance series could not be constructed for eight of the forty six ASIC industry groupings. These are identified in Appendix 1.

We therefore hypothesize a model in which there is a partial adjustment towards a target import to domestic quantity ratio. The target ratio is determined by long-run price expectations with pressure of demand having only a short-run effect on the quantity ratio.

The target import-domestic quantity ratio can be written :

$$\ell n\, y^*_{it} = a_1 + \sigma^*_i\, \ell n\, \Pi_{it} \quad , \qquad (5.1)$$

$$= h\, (\Pi_{it}) \quad ,$$

where : σ^*_i is the long-run elasticity of substitution for good i ;

Π_{it} is the ratio of long-run price expectations for good i ;

y^*_{it} is the target import to domestic quantity ratio for good i .

In the adjustment from a current position to y^*_{it} , let $\tilde{y}_{it}$ be the planned position on the adjustment path at t as viewed from (t-3/2). The observed import to domestic quantity ratio is assumed equal to the planned ratio plus an adjustment for pressure of demand effects occurring in t :

$$\ell n\, y_{it} = \ell n\, \tilde{y}_{it} + \theta_{i1}\, \overline{ZP}_{it} + \theta_{i2}\, \overline{ZN}_{it} \quad , \qquad (5.2)$$

where : $\overline{ZP}_{it}$ is the positive pressure of demand proxy for good i ,

$\overline{ZN}_{it}$ is the negative pressure of demand proxy for good i ,

y_{it} is the actual quantity ratio of good i in (t) ,

$\tilde{y}_{it}$ is the quantity ratio which would have been observed in period (t) had adjustment towards y^*_t not been affected by pressure of demand ,

θ_{i1},θ_{i2} are parameters which are some function of the short-run elasticity of substitution.

We assume that there is a Koyck adjustment mechanism based on $\tilde{y}_{it}$:

$$\ell n\ \tilde{y}_{it} - \ell n\ y_{i(t-3/2)} = \lambda_i [h(\Pi_{it}) - \ell n\ y_{i(t-3/2)}] \quad . \qquad (5.3)$$

Substituting for $\ell n\ \tilde{y}_{it}$ from (5.2) and for $h(\Pi_{it})$ from (5.1) into (5.3) yields the estimating equation :

$$\ell n\ y_{it} = \lambda_i a_1 + \lambda_i \sigma_i^* \ell n\ \Pi_{it} + (1-\lambda_i)\ \ell n\ y_{i(t-3/2)} + \Theta_{i1} \overline{ZP}_{it} + \Theta_{i2} \overline{ZN}_{it} + u_{it} \quad , \qquad (5.4)$$

where

λ_i is the coefficient of adjustment for good i , and

$\lambda_i \sigma_i^*$ is the short-run (one period) elasticity of substitution ,

u_{it} is an error term with classical properties.

In constructing the ratio of long-run price expectations, we assume that the long-term expectations of the price of imports is determined at the time of ordering (t - 3/2) by a sliding trend projection based on the currently quoted price and import prices in the preceding two and three periods. This projection is into the ordering period itself. Therefore adjustment is based on the projected import-price in the ordering period rather than the quoted price.[1] The long-run domestic price components of the ratio of long-run price expectations is based on a one quarter projection from the import-ordering period (t-3/2) into the domestic good ordering period (t-1/2) using the preceding three and four price observations (centred on integer periods). The treatment of seasonality in forming these projections is the same as that outlined in the section on the expected effective price.

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1. The weights for the three and four period sliding trend projections into the import-ordering period itself were calculated from the general formula for the weights of a linear least-squares sliding-trend projection from t into $t + \ell$ (in this case, $\ell = 0$) :

$$W_\tau = \frac{2}{m(m+1)} \{2 - m - 3\ell + 3\ (m - 1 - \tau)(1 + 2\ell/[m-1])\} ,$$

where $\tau = 0, \ldots, m-1$, and m is the number of data periods on which projection is based.

This formula is based on Powell (1974, pp. 132-133).

6. ADDITIONAL VARIABLES - SEASONAL AND QUOTA DUMMIES

In addition to the basic variables which appear in the estimating equations derived in earlier sections, we have introduced dummy variables to account for seasonality and Government imposed quantitative and tariff quota restrictions (where appropriate).

Import Restrictions

Over the data period, certain commodities were subject to quantitative and tariff quota restrictions. Under certain conditions these can lead to biases in econometric estimates of import demand functions. In the case of quantitative restrictions (or import licensing), biased estimates would be obtained if importers did not allow the prices of the goods to reach equilibrium; that is, if importers did not take full advantage of the potential price rises which the restrictions on imports would permit. This situation is shown, in Fig. 6.1a . In this diagram, DD is the demand curve for imports, OQa is the quota level, PaS is the supply curve for imports, OP is the equilibrium price, and OP' is the observed non-equilibrium price. The distance P' P indicates the difference between the observed price and the equilibrium price for a level of quota OQa. The point X_1 represents the co-ordinates of the observed price and quantity, and as this point does not lie on the demand curve, biased estimates will be obtained if the curve is estimated without an additional variable to account for the dis-equilibrium effects of the quota. The bias is exacerbated if the non-price factors used to ration the imported good (for example increased waiting time for delivery and tight credit terms to customers)

Figure 6.1a

The Effect of Import Licensing on Econometric Estimation of Import Demand Functions

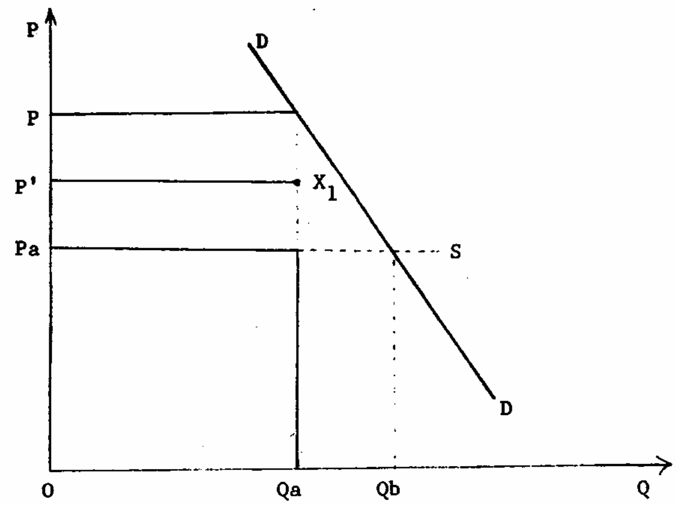
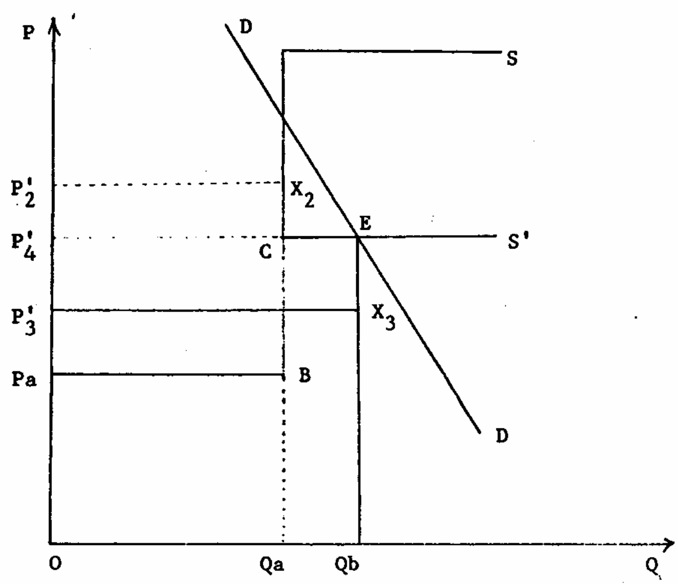


Figure 6.1b

The Effect of Tariff Quotas on Econometric Estimation of Import Demand Functions



cause a spill-over of demand into domestic substitutes, causing DD to shift to the right and therefore raising their prices. To test for these effects, we have incorporated dummy variables into the estimating equations for ASICs which have greater than ten per cent of their components (by value) affected by this type of quota. Since the dependent variable in our regressions is the log of the ratio of imports to the expected use of the domestic good, it is clear from Fig. 6.1a that the estimated coefficient of a dummy variable which takes a positive value in the affected period can be expected to have a negative sign if this hypothesis is correct.

Tariff quotas are two tier tariff structures which impose a penalty rate of duty if imports exceed a certain level. In analysing the effect of tariff quotas we consider two cases : the imposition of a penalty tariff high enough to prevent imports in excess of the quantity on which the lower rate of tariff is applicable, and a penalty tariff which permits imports in excess of the quantity on which the lower rate of duty operates.

In Fig. 6.1b, the first case is represented by the import supply schedule PaBCS. The step in this function represents the penalty rate of duty. Since the supply curve does not intersect the import demand curve (at the penalty rate of duty), imports in excess of the low tariff quota, OQa, are not observed. This case can be analysed in exactly the same manner as that of quantity quotas discussed above.

The second case is represented by the import supply schedule PaBCS'. This intersects the demand curve at E, leading to imports OQb. However the observed price is a weighted average of the price pertaining at the higher rate of duty P_4' and the price at the lower rate of duty Pa . The point X_3 represents the co-ordinates of the observed price and quantity, and as this does not lie on the demand curve, estimation without appropriate correction will lead to biases. To test for these effects, we have added a dummy variable to the estimating equations for ASICs which have greater than ten per cent of their components (by value) affected by this type of quota. Again we would expect the estimated coefficient of a positive dummy variable to have a negative sign if this hypothesis is correct.[1]

The structure of the dummy variable we have used reflects our assumption of a one and a half quarter ordering lag and takes the following form :

$$D_{it} = \begin{cases} 0 & \text{if no restriction is applicable in period } (t) \text{ ;} \\ 0 & \text{if the restriction in period } (t) \text{ was introduced in } (t-1) \text{ ;} \\ .5 & \text{if the restriction in period } (t) \text{ was introduced in } (t-2) \text{ ;} \\ 1 & \text{if the restriction in period } (t) \text{ was in effect at } (t-2) \text{ ;} \end{cases}$$

where D_{it} is the dummy variable for the restriction of imports of goods belonging to ASIC "i" in period (t). It is clear from the structure of the dummy variable that we are only measuring the <u>average</u> effect of the restriction. This was done because information relating to the intensity of the restrictions was not available. The ASIC groups for which dummy variables were used to account for import restrictions are listed in Table 6.1 .

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1. The trivial case where DD intersects the supply schedule to the left of Qa does not lead to any econometric problems.

Table 6.1* ASICS FOR WHICH THE ES WAS ESTIMATED USING DUMMY VARIABLES TO ACCOUNT FOR IMPORT RESTRICTIONS

ASIC	Description	Type of Restriction	Period of Restraint
2314	Man-made Fibres and Yarns	Tariff Quota	19/ 5/72 to June 74 3/12/74 to 28/ 2/77
2315	Man-made Fibres and Broadwoven Fabrics	Tariff Quota	9/12/74 to 28/ 2/77
2316	Cotton Yarns and Broadwoven Fabrics	Tariff Quota	3/12/74 to 28/ 2/78
2412	Cardigans and Pullovers	Import Licensing	19/12/67 to 14/ 8/71 8/ 9/71 to 31/ 8/72
		Tariff Quota	1/ 9/72 to 1/ 3/74
2425	Underwear, Nightwear, Shirts and Infants Clothing nec	Import Licensing	1/ 7/69 to 14/ 8/71 8/ 9/71 to 31/ 8/72 1/ 9/72 to 30/ 6/74 1/ 1/75 to 28/ 2/77
2426	Foundation Garments	Tariff Quota	9/12/74 to 31/12/78
3211	Motor Vehicles	Import Licensing	1/ 2/75 to 8/12/76
		Tariff Quota	1/ 1/75 to 8/12/76

* This table includes only those ASICs for which the proportion of value of output of the ASIC affected by quota restrictions is greater than 10 per cent.

Seasonal Dummies

After preliminary estimation, the residuals of the models derived in the paper were tested for fourth-order auto-correlation using the fourth-order Durbin-Watson (DW) statistic (Wallis 1972).[1] Seasonal dummies were added to regressions where this statistic indicated that fourth-order auto-correlation was present in the residuals. In addition, the residuals from the preliminary regressions were regressed against seasonal dummies. In cases where the coefficient of at least one seasonal dummy was significant, the models were re-estimated with seasonal dummies added. We found that in many cases where the fourth-order DW fell in the inconclusive range, the addition of seasonal dummies was warranted.

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1. The omission of seasonal dummies in cases where they are relevant explanatory variables leads to biased estimates of all parameters, as is the case when any relevant variable is omitted from an estimated equation. For a discussion, see Lovell (1963).

7. RESULTS

Preliminary Discussion

The two basic models developed in this paper (rapid adjustment and partial adjustment) were fitted for forty six groups of commodities classified at the four digit ASIC level. The rapid adjustment model was fitted for three different specifications of the expected use of the domestic substitute, and each of these was fitted for three and four period linear sliding trend price projections. The partial adjustment model was also fitted for three and four period price projections.[1]

Before these models were estimated, graphs of the data were inspected for aberrant behaviour which could be attributed to compositional changes rather than price movements. Serious deviations from the trend pattern were found in three cases : ASIC 2927 (Rolling, Drawing and Extruding of Aluminium), ASIC 3212 (Truck and Bus Bodies, Trailers and Caravans) and ASIC 3445 (Sporting Equipment). In these cases, vetting dummies of the (0, 1) type were used in the relevant quarters to account for the possibility that the observed movements in the data were due to compositional changes.

The dummy variables which were used to vet these data series are shown in Table 7.1.

Table 7.1 VETTING DUMMIES

ASIC	Dummy Variable No.	Structure
2927	1	1 in quarter 6, 0 elsewhere
3212	1	1 in quarter 27, 0 elsewhere
	2	1 in quarter 28, 0 elsewhere
3445	1	1 in quarter 27, 0 elsewhere
	2	1 in quarter 28, 0 elsewhere

1. The Clairvoyance model was not fitted for the eight ASICs listed in Appendix 3.

After the models were estimated, graphs of the predicted and actual values of the dependent variable were inspected for the occurrence of unusual patterns. In one case, ASIC 2192 (Beer), the models fitted over predicted the log of the ratio of imports to the expected use of the domestic good in seven consecutive quarters in the three period sliding trend projection models and in six consecutive quarters for the four period sliding trend projection models. As it is unlikely that such runs could occur by chance, and because the runs occurred at the start of the data, we believe that these results indicate a structural shift in the function. That is, that in the latter part of the period, imports of beer had captured a larger share of the domestic market independently of prices. To account for this, we re-estimated the equation for this ASIC with a dummy variable which took the value zero in the period of over prediction (mentioned above) and one for the remainder of the period.

As mentioned earlier, the only available data on the consumption of domestically produced goods are series of domestic output, and these contain exports. In cases where exports form a large part of domestic production, any estimates of the ES obtained using this data could be subject to serious bias. We have calculated the ratio of the value of exports to the total value of domestic production for the 46 ASIC groups which were estimated for the years 1968/69 and 1974/75. Of the ASICs estimated, nine have exports equal to or greater than ten per cent of domestic production in either of these two years, three ASICs have exports greater than five per cent of domestic production and less than ten per cent in at least one of these two years, and the remainder have exports of less than or equal to five per cent of domestic production in these two years. The ES estimates for those ASICs for which exports are greater than or equal to ten per cent of domestic production could be seriously biased, and although the results are reported, they are not commented upon extensively in the discussions. These nine ASICs are listed in Table 7.2 . The three for which exports lie between five and ten per cent are listed in Table 8.3 .

Table 7.2 ASICS FOR WHICH EXPORTS ARE GREATER THAN OR EQUAL TO TEN PER CENT OF DOMESTIC OUTPUT

ASIC	Description	Percentage of Domestic Output Exported 1968/69	1974/75
2131	Fruit Products	29%	20%
2151	Flour Mill Products	16%	26%
2182	Canned Fish	29%	25%
2312	Scoured and Carbonised Wool*	125%	160%
2313	Fibre Tops	56%	50%
2730	Petroleum Refining	10%	56%
2921	Copper Smelting and Refining	29%	55%
2928	Rolling Drawing and Extruding of Non-Ferrous Metals	10%	29%
3445	Sporting Equipment	15%	18%

* This anomaly occurs because exports are classified to the industry in which they were primarily produced whereas domestic output refers to production in establishments classified to the particular industry.

Table 7.3 ASICS FOR WHICH EXPORTS LIE BETWEEN FIVE AND TEN PER CENT OF DOMESTIC OUTPUT

ASIC	Description	Percentage of Domestic Output Exported 1968/69	1974/75
2316	Cotton Yarns and Broadwoven Fabrics	3	7
2315	Man-Made Fibres and Broadwoven Fabrics	7	6
2713	Synthetic Resins and Rubbers	4	8

The models discussed above were estimated using OLS, and altogether there were four or three pairs of equations for each ASIC, depending on whether or not the Clairvoyance series was calculated. The "best" pair of estimated equations for the rapid adjustment models were selected and these are presented in Table 7.8 . We attempted to select the pair of equations which have the most favourable combination of explanatory power, Durbin-Watson statistic and significance of parameters. This was a subjective procedure, and we would like to emphasise that in many cases there was very little difference between the Naiveté and Clairvoyance models. Generally, these two models performed better than the Infallibility model, and this is reflected in the tabulated results. It is evident from the results presented that the estimated parameters are not very sensitive to the number of observations used in forming the price projections. The three and four period price projection estimates of the partial adjustment model for each ASIC are presented in Table 7.9. Tables 7.8 and 7.9 are presented at the end of the Results section.

Because we have strong prior evidence for the expected signs of the estimated parameters we have used only one tail of the t distribution to test the significance of parameters in both the rapid adjustment and partial adjustment models. Furthermore, since the partial adjustment model was estimated using OLS, we could not calculate the t value for the long-run ES parameter (σ^*), because the coefficient of the price term in the partial adjustment model is the product of the coefficient of adjustment and the long-run ES, that is ($\lambda\sigma^*$).[1]

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1. It is possible however to calculate the asympototic variance of the long-run ES estimate if the covariance between λ and $\lambda\sigma^*$ is known (see Goldberger (1964, pp. 122-125)). Unfortunately the regression package we used does not provide the covariances of pairs of parameters.

The Elasticity of Substitution

Of the 37 ASICs for which the proportion of exports to domestic output was less than ten per cent, five had a negative ES in both the rapid ajustment and partial adjustment models : ASICs 2163 (Biscuits), 2181 (Confectionery, Chocolate and Cocoa Products), 2183 (Prepared Animal and Bird foods), 2210 (Tobacco Products), 2316 (Cotton Yarns and Broadwoven Fabrics). In the case of ASIC 2163, there is some evidence (from the basic data) of a seasonal change in the composition of imports.[1] This effect could also be manifest (for at least a part of the data period) in ASIC 2181. In the case of 2183, the level of imports is less than 1 per cent of domestic consumption and probably should not be compared with domestic consumption. In the case of tobacco (ASIC 2210), complementarity (of a sort) is enforced by law - and the ES is negative for complements. For ASIC 2316 we do not have an explanation for the negative sign. In any case, these five industries require further analysis which is beyond the scope of this paper. In our discussion, we shall concentrate on the estimates for the remaining 32 ASICs.

Estimates of the ES for the rapid adjustment models, together with their t statistics and DW statistics are presented in Table 7.4 . Estimates of the one period, three period and infinite period ES calculated from parameters estimated in the partial adjustment models for which the estimated coefficient of the lagged dependant variable had the

1. When a seasonal increase in the quantity imported is also associated with a shift in the overall composition of imports in favour of higher quality and consequently a higher unit value, a negative ES may result.

correct sign are also presented in Table 7.4.[1] As one period corresponds one and a half quarters, the three period estimates can be regarded as closely approximating estimates of the annual ES . We have also calculated (where possible) Durbin's h statistic as a rough guide to auto-correlation in the residuals of the partial adjustment model.[2]

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1. The formula for calculating these partial adjustment elasticities was obtained from Powell and Gruen (1967, p. 72).

2. The test for auto-correlation in the residuals using the h statistic is valid only for large samples. Johnson (1972, p. 313) suggests n=30 as a lower limit, and we have only 24 and 25 observations for the models fitted. In some cases, the h statistic is indeterminate because its calculation involves taking the square root of a negative number.

Table 7.4 ESTIMATES OF THE ELASTICITY OF SUBSTITUTION

ASIC	Abbreviated Description	Rapid Adjustment Model: Model	ES Estimate	DW	Partial Adjustment Model: 1 Period	3 Period	Infinite Period	Durbin h-Stat
✓2132	Vegetable Products	3N	0.9907* (3.455)	1.911	1.1340	1.2768	1.2786	0.5326
		4N	0.9219* (3.127)	2.054	1.0390	1.0884	1.0885	0.9513
✓2140 (3*)	Margarine, Oils and Fats n.e.c.	3C	1.215* (3.498)	1.481	1.0250	1.6365	1.7675	IND.
		4C	1.244* (3.578)	1.633	1.0080	1.5226	1.6054	IND.
✓2192	Beer	3C	2.029* (4.402)	1.904	1.8640	2.0637	2.0656	0.4285
		4C	2.264* (5.027)	2.055	2.3290	2.4163	2.4164	0.2286
2314 (3*) (4*)	Man-Made Fibres and Yarns	3	Wrong sign		0.1044	0.2427	0.4256	2.5952*
		4	Wrong sign		0.1870	0.4233	0.6934	1.9653*
✓2315 (3*) (4*)	Man-Made Fibre and Broadwoven Fabric	3I	2.376* (6.049)	1.154	1.1640	2.2027	2.6994	0.0029
		4I	2.384* (6.182)	1.212	1.1480	2.1383	2.5786	0.2043
✓2317	Worsted Yarns and Broad-woven Fabrics	3I	0.2303 (.6416)	1.276	0.1530	0.2229	0.2321	IND.
		4I	0.3520 (.9060)	1.318	0.2070	0.3136	0.3309	IND.
✓2318 (3*) (4*)	Woollen Yarns and Broad-woven Fabrics	3I	1.061* (2.397)	0.7278*	0.6834	1.3626	1.7764	0.9554
		4I	1.141* (2.449)	0.7112*	0.4723	0.9679	1.3116	1.4764
✓2331 (3*) (4*)	Textile Floor Coverings	3N	Wrong sign		0.7191	1.4121	1.8054	0.7191
		4I	0.0900 (.2008)	0.8606	0.7397	1.3834	1.6750	0.1842

The numbers in parentheses in column 4 are t values.
An asterisk and number in the ASIC column indicates that the coefficient of the lagged dependent variable is significant. An asterisk on the Durbin-Watson statistic (DW), and the Durbin h statistic indicates significant first-order auto-correlation. An asterisk on the ES estimate indicates significance at the five per cent level.

Table 7.4 (Cont'd)

ASIC	Abbreviated Description	Rapid Adjustment Model: Model	ES Estimate	DW	Partial Adjustment Model: 1 Period	3 Period	Infinite Period	Durbin h-Stat
2411 (3*)	Hosiery ✓	3I	0.7464* (2.028)	1.099	0.5068	0.7475	0.7814	1.6393
		4I	0.7356* (2.057)	1.256	0.4760	0.6494	0.6645	1.4760
2412	Cardigans ✓ and Pullovers	3C	1.719* (4.624)	2.355				
		4C	1.868* (4.943)	2.397				
2423 (3*) (4*)	Men's and ✓ Boys' Trousers and Shorts	3C	3.354* (6.671)	0.8802*	1.150	2.6174	4.3445	2.9629*
		4C	3.107* (6.527)	1.069	1.2300	2.6212	3.7869	1.5475
✓ 2424 (3*) (4*)	Men's and Boys' Suits and Coats Waterproof Clothing	3N	2.301* (9.350)	0.6556*	0.6403	1.4004	2.1258	1.4163
		4N	2.451* (9.605)	0.7461*	0.7011	1.5820	2.5719	0.3325
✓ 2425 (3*)	Underwear, Nightwear, Shirts and Infant's Clothing n.e.c.	3C	2.133* (4.187)	1.151	1.2510	3.1899	7.8977	2.6663*
		4C	2.074* (3.939)	1.200	1.1290	2.7854	5.9546	4.0248*
✓ 2426 (3*) (4*)	Foundation Garments	3	Wrong sign		0.4554	1.0446	1.7685	0.9454
		4	Wrong sign		0.4067	0.9585	1.7500	1.2389
✓ 2522 (3*) (4*)	Mattresses Excluding Rubber or Wire	3N	1.116* (2.820)	0.7807*	1.145	1.9769	2.2372	IND.
		4N	1.168* (2.962)	0.7679*	1.022	1.7064	1.8891	IND.
✓ 2611 (3*) (4*)	Pulp, Paper and Paper Board	3N	0.6724* (4.812)	1.440	0.5293	0.7698	0.8011	0.1070
		4N	0.6483* (4.510)	1.569	0.4169	0.8937	1.3049	IND.

The numbers in parentheses in column 4 are t values.
An asterisk and number in the ASIC column indicates that the coefficient of the lagged dependent variable is significant. An asterisk on the Durbin-Watson statistic (DW), and the Durbin h statistic indicates significant first-order auto-correlation. An asterisk on the ES estimate indicates significance at the five per cent level.

Table 7.4 (Cont'd)

ASIC	Abbreviated Description	Rapid Adjustment Model: Model	ES Estimate	DW	Partial Adjustment Model: 1 Period	3 Period	Infinite Period	Durbin h-Stat
2711	Chemical Fertilisers	3N	1.423* (4.740)	1.997	0.1477	0.2008	0.2054	IND.
		4N	1.649* (5.341)	2.098	0.1528	0.2047	0.2087	IND.
2713	Synthetic Resins and Rubbers	3C	1.712* (2.862)	1.217	1.340	1.763	1.7917	IND.
		4C	1.492* (2.309)	1.149	1.3350	1.6528	1.6658	IND.
2725	Soap and other Detergents	3N	1.263* (16.50)	1.603	1.218	1.2445	1.2445	8.7505*
		4N	1.290* (16.19)	1.687				
2821	Clay Bricks and Refractories	3C	1.256* (9.112)	0.7364*	1.346	1.414	1.4142	3.7925*
		4C	1.259* (9.596)	0.8603*				
2831	Cement	3N	0.7470* (1.818)	1.200	0.6469	0.7786	0.7827	IND.
		4N	0.6028 (1.515)	1.199	0.4317	0.4528	0.4529	IND.
2835	Asbestos Cement Products	3C	1.148* (6.879)	1.109*	1.1130	1.3128	1.3178	3.7828*
		4C	1.144* (6.651)	1.096*	1.0550	1.0694	1.0694	IND.
2914	Steel Pipes and Tubes	3N	1.513* (3.071)	1.833	1.068	1.2909	1.2982	IND.
		4N	1.388* (2.58)	1.751	0.9983	1.1455	1.1480	IND.
2927 (3*) (4*)	Rolling, Drawing and Extruding of Aluminium	3N	1.100* (4.619)	1.575	0.9558	1.4086	1.4720	0.4748
		4N	1.088* (4.302)	1.472	0.9205	1.3647	1.4291	0.1029

The numbers in parentheses in column 4 are t values.
An asterisk and number in the ASIC column indicates that the coefficient of the lagged dependent variable is significant. An asterisk on the Durbin-Watson statistic (DW), and the Durbin h statistic indicates significant first-order auto-correlation. An asterisk on the ES estimate indicates significance at the five per cent level.

Table 7.4 (Cont'd)

ASIC	Abbreviated Description	Rapid Adjustment Model: Model	ES Estimate	DW	Partial Adjustment Model: 1 Period	3 Period	Infinite Period	Durbin h-Stat
✓3211 (3*) (4*)	Motor Vehicles	3N	4.366* (5.123)	1.374	2.148	5.1833	10.2091	2.5160*
		4N	4.736* (5.504)	1.393	2.0530	4.8813	9.1570	2.0532*
✓3212	Truck and Bus Bodies; Trailers and Caravans	3N	0.8456* (3.579)	1.729	1.025	1.3997	1.4328	2.2987*
		4N	0.8264* (3.434)	1.719	0.8957	1.1500	1.1643	2.0532*
✓3322 (3*) (4*)	Refrigerators and Household Appliances	3C	2.145* (8.895)	1.594	0.4878	1.2285	2.8600	0.1127
		4C	2.174* (8.213)	1.605	0.4891	1.2372	2.9464	0.0189
✓3323 (3*) (4*)	Water Heating Systems	3C	1.506* (5.227)	1.408	0.4188	0.7942	0.9937	IND.
		4C	1.517* (4.732)	1.301	0.4055	0.7825	0.9799	IND.
3324	Electric and Telephone Cable, Wire and Strip	3C	0.7882* (11.05)	1.724				
		4C	0.7871* (10.950)	1.755				
✓3325 (3*) (4*)	Batteries	3N	0.8322* (2.585)	1.009*	0.6728	1.3640	1.8194	IND.
		4N	0.8783* (2.917)	1.035*	0.5519	1.1352	1.5468	IND.
✓3431	Flexible Plastic Sheeting and Products	3C	0.9885* (12.24)	1.771				
		4C	0.9798* (11.83)	1.825				
✓3432	Rigid Plastic Sheeting	3I	1.515* (4.388)	1.554	1.358	1.7637	1.7887	2.4142*
		4I	1.470* (4.263)	1.759	1.1820	1.4450	1.4546	IND.

The numbers in parentheses in column 4 are t values.
An asterisk and number in the ASIC column indicates that the coefficient of the lagged dependent variable is significant. An asterisk on the Durbin-Watson statistic (DW), and the Durbin h statistic indicates significant first-order auto-correlation. An asterisk on the ES estimate indicates significance at the five per cent level.

The estimates of the ES for the rapid adjustment models are of the right sign and are significant in twenty eight out of the thirty t ASICs shown in Table 7.4 , and the values of the significant estimates range between 4.366 (ASIC 3211) and 0.6483 (ASIC 2611), with nineteen greater than one. Of these, we regard the estimates of the ES obtained in the rapid adjustment models as biased if the lagged dependent variable is significant.[1] In these cases, we regard the infinite period elasticity obtained from the partial adjustment model as an unbiased estimate of the (long run) ES, and the three period elasticity as the approximate estimate for annual responses. An examination of Table 7.4 reveals that in general the omission of the lagged dependent variable has biased the rapid-adjustment model ES estimates downwards in cases where the lagged dependent variable is significant in the partial adjustment model. This conclusion is supported by the fact that the lagged dependent variable in the partial adjustment model is significant in the three cases where the ES estimate obtained from the rapid adjustment models has the wrong sign; the ES estimates for these ASICs (2314, 2331, 2426) have the correct sign in the partial adjustment models.

As we would expect, the DW statistic is generally low in the rapid adjustment models for those ASICs for which the lagged

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1. We have a problem in identifying those ASICs for which the lagged dependent variable is significant because we have no accurate way of determining whether auto-correlation is present in the partial adjustment models.

   It is therefore possible that we have not detected a significant lagged dependent variable in all cases where one is present. It is for this reason that the ES estimates for all partial adjustment equations in which the lagged dependent variable has the correct sign are included in Table 7.4 .

dependent variable is significant.[1]

There are nine ASICs for which the Durbin h statistic indicates that significant auto-correlation is present in the residuals in at least one of the estimated pair of equations for each ASIC. If auto-correlation is in fact present in the residuals of these equations, the estimates of the parameters are inconsistent.

Auto-correlation in the residuals (where it is not expected) is usually an indication of specification error; that is, important variables have been omitted from the estimating equations or the data do not satisfy the restrictions imposed by the functional form. Given that the CES expansion path equation imposes severe restrictions on the data, (see the Introduction) we regard the latter explanation as more plausible. It is also possible that some auto-correlation was introduced by the operations performed on the data prior to estimation.

The Pressure of Demand

In estimating the models, the positive pressure of demand variable was always included; however the negative pressure of demand variable was retained only if it had the correct sign and its inclusion raised the $\bar{R}^2$. In the discussion of the results from now on, the value referred to is the estimate from the partial adjustment models if the lagged dependent variable is significant and has a positive estimated coefficient; the rapid adjustment model otherwise.

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1. There are three ASICs for which the DW statistics (for the rapid adjustment models) are close to or below the lower bound of the tabulated significance points for the DW statistic and for which the lagged dependant variable is not significant in the corresponding partial adjustment models (ASICs 2821, 2831, 2835). We attempted to re-estimate these using the Cochrane-Orcutt transformation. Little improvement in the DW was observed in one case, and in two cases it actually fell, indicating the auto-correlation in the residuals is not of the first-order Markov type.

Of the thirty two ASICs, the coefficient of the positive pressure of demand variable has the right sign and is significant in fourteen cases, has the right sign and is not significant in eleven cases, and has the wrong sign and is not significant in seven cases. The coefficient of the negative pressure of demand variable has the right sign and is significant in five cases. The ASICs for which the coefficients of the positive and negative pressure of demand are significant are presented in Table 7.5 and Table 7.6 respectively.

These results indicate that the positive pressure of demand has had a measurable effect on imports of a wide range of commodities, the majority of which are in the synthetic textiles, and clothing industries. These are industries which have traditionally received a high level of protection in the form of import licensing and tariff quotas. The spill-over effect into imports for these industries during periods of positive domestic pressure of demand is of potential policy relevance.

The Quota Dummies

Quota dummies were included in the estimation of the ES for all the ASICs shown in Table 6.1 . However, in the case of ASIC 2316, the estimated ES has the wrong sign and this ASIC is not discussed in this section. The remaining ASICs together with the estimates of the coefficients of their quota dummy variables are shown in Table 7.7 .

In two cases the estimated parameter had the wrong sign : the coefficient of the first quota dummy variable for ASIC 2314 and the coefficient of the quota dummy variable for ASIC 2426. The former of these was also significant, and we believe that this was due to the high multicollinearity between the quota dummy and the positive

Table 7.5 ASICS FOR WHICH THE ESTIMATED COEFFICIENT OF THE POSITIVE PRESSURE OF DEMAND VARIABLE IS SIGNIFICANT

ASIC	Description	ASIC	Description
2132	Vegetable Products	2426	Foundation Garments
2192	Beer	2713	Synthetic Resins and Rubbers
2314	Man-Made Fibres and Yarns	2725	Soaps and Other Detergents
2318	Woollen Yarns and Broadwoven Fabrics	2927	Rolling, Drawing and Extruding of Aluminium
2331	Textile Floor Coverings	3212	Truck and Bus Bodies, Trailers and Caravans
2411	Hosiery	3431	Flexible Plastic Sheeting and Products
2424	Men's and Boys' Suits and Coats; Waterproof Clothing	3432	Rigid Plastic Sheeting

Table 7.6 ASICS FOR WHICH THE ESTIMATED COEFFICIENT OF THE NEGATIVE PRESSURE OF DEMAND VARIABLE IS SIGNIFICANT

ASIC	Description	ASIC	Description
2132	Vegetable Products	2927	Rolling, Drawing and Extruding of Aluminium
2140	Margarine, Oils and Fats n.e.c.	3322	Refrigerators and Household Appliances
2725	Soaps and Other Detergents		

pressure of demand proxy; in the latter case the estimated parameter was not significant. The equations for these two ASICs were re-estimated without these two quota dummy variables.

In two cases the estimated parameters have the correct sign and are significant : the import licensing and tariff quota dummy variables for ASIC 2412, and the combined tariff quota and import-licensing dummy variable for ASIC 3211. The remaining estimates have the expected signs but are not significant. Interestingly, the two ASICs for which the estimated parameters are significant are very homogeneous, indicating that the restrictions probably applied to most of the components of the ASICs. In the remaining cases, the ASICs are not as homogeneous, indicating that the proportion of the ASICs covered by the quotas was probably small. This would seem to account for the results observed.

Table 7.7 THE ESTIMATED COEFFICIENTS OF THE QUOTA DUMMY VARIABLES*

ASIC	Description	Type of Restriction	Period of Restraint	Estimated Coefficient
2314	Man-Made Fibres and Yarns	Tariff Quota	19/ 5/72 to June '74	wrong sign
		Tariff Quota	3/12/74 to 28/ 2/77	-0.1171 (-.7811)
2315	Man-Made Fibres and Broadwoven Fabrics	Tariff Quota	9/12/74 to 28/ 2/77	-0.0210 (-.1768)
2412	Cardigans and Pullovers	Import Licensing	19/12/67 to 14/ 8/71	-0.8656*
			8/ 9/71 to 31/ 8/72	(-3.516)
		Tariff Quota	1/ 9/72 to 1/ 3/74	-0.9323* (-5.663)
2425	Underwear, Nightwear Shirts and Infants' Clothing n.e.c.	Import Licensing	1/ 7/69 to 31/ 8/72	-0.1191 (-.5566)
		Import Licensing	1/ 9/72 to 30/ 6/74	-0.3051
		Import Licensing	1/ 1/75 to 28/ 2/77	(-1.625)
2426	Foundation Garments	Tariff Quota	9/12/74 to 31/12/78	wrong sign
3211	Motor Vehicles	Import Licensing	1/ 2/75 to 8/12/76	-1.303*
		Tariff Quota	1/ 1/75 to 8/12/76	(-4.340)

* Four period price projection estimates.

Conclusions

From the results presented above, we can conclude that the ratio of the consumption of imports to domestically produced goods is sensitive to changes in the ratio of domestic to import prices for a wide range of Australian commodities. We have also found that for many commodities, positive domestic pressure of demand increases the level of imports and that, for a much smaller number of commodities, imports are retarded by negative domestic pressure of demand.

The effect of tariff and quantitative quotas on the level of imports was detected in only two cases. We believe the poor performance of the dummy variables for tariff quotas and import-licensing is due to the fact that these import restrictions only apply to a small number of the components of the ASICs. Further work in this area should be attempted at a more disaggregated level than the four digit ASIC.

There is evidence that auto-correlation may be present in the residuals of some of our estimated equations. One possible explanation is that the data do not satisfy the restrictions imposed by the CES expansion equation. To test this hypothesis, import demand equations for the ASICs with suspected auto-correlation in the residuals should be estimated using a less restrictive functional form than the CES expansion path equation.

It is also possible that various sorts of moving average errors were introduced by the various operations the data were subjected to prior to estimation.

Table 7.8 SUMMARY OF THE RESULTS FOR THE RAPID ADJUSTMENT MODELS

ASIC	Description	Price Proj.	Best Model	σ	$(\sigma\theta_1)$	$(\sigma\theta_2)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
				Estimated Parameters													
2131	Fruit Products	3	N	0.4955 (1.384)	0.7184* (2.172)	1.092* (1.998)					0.8861* (5.100)	1.156* (6.830)	-1.276* (-7.383)	0.7005* (4.531)	.9134	1.779	1.843
		4	N	0.4777 (1.289)	0.7211* (2.095)	1.003* (1.748)					0.8600* (4.637)	1.126* (6.203)	-1.304* (-7.063)	0.7129* (4.417)	.9118	1.801	1.647
2132	Vegetable Products	3	N	0.9907* (3.455)	0.7881* (3.643)	1.276* (3.063)					2.866* (2.276)	-0.1859 (-1.467)	-0.4470* (-3.371)	0.3045* (2.639)	.8184	1.911	1.746
		4	N	0.9219* (3.127)	0.7835* (3.589)	1.387* (3.208)					0.3247* (2.484)	-0.1468 (-1.113)	-0.4120* (-3.012)	0.2797* (2.379)	.8233	2.054	1.719
2140	Margarine and Oils and Fats n.e.c.	3	C	1.215* (3.498)	1.061 (.446)	1.200* (2.138)								0.1984 (1.393)	.2850	1.481	1.183
		4	C	1.244* (3.578)	0.0794 (.3377)	1.378* (2.378)								0.2222 (1.539)	.3047	1.633	1.178
2151	Flour Mill Products	3	I	1.474* (4.040)	0.5307 (.9401)	0.6411 (.5238)								-0.3280 (-1.264)	.4099	1.468	1.065
		4	I	1.436* (3.949)	0.5508 (.9801)	0.2911 (.2337)								-0.3589 (-1.389)	.4265	1.499	1.126
2163	Biscuits	3	N	-1.440* (-4.386)	0.0290 (.1892)									-0.0252 (-.6121)	.4188	1.306	1.631
		4	N	-1.455* (-4.424)	0.0320 (.2065)									-0.0322 (.7576)	.4338	1.272	1.726
2181	Confectionery, Chocolate Cocoa Products	3	I	-0.1606 (-.5524)	0.0229 (.1236)	0.0795 (.1858)								0.0418 (.4777)	.0912	1.980	1.705
		4	I	-0.1420 (-.4585)	0.0197 (.1032)	0.1107 (.2402)								0.0458 (.505)	.0983	1.957	1.693
2182	Canned Fish and Other Seafoods	3	N	0.7390 (1.458)	0.8481* (4.141)						0.4287* (3.264)	0.5692* (4.373)	0.3518* (2.649)	-0.3155* (-3.142)	.6338	1.463	1.972
		4	N	0.5893 (1.089)	0.8831* (4.118)						0.4444* (3.123)	0.5832* (4.117)	0.3723* (2.577)	-0.3309* (-2.132)	.5987	1.515	1.870

Definition of Symbols : σ is the elasticity of substitution; $\sigma\theta_1$ and $\sigma\theta_2$ are the coefficients of the positive and negative pressure of demand variables; η_1 is the coefficient of the quota dummy variable; η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic; * indicates significance at the 5 per cent level.

Table 7.8 (Cont'd)

ASIC	Description	Price Proj.	Best Model	Estimated Parameters: σ	$(\sigma\theta_1)$	$(\sigma\theta_2)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
2183	Prepared Animal and Birdfoods	3	C	-0.7685* (-2.661)	1.157* (2.191)	1.369 (1.297)								-0.2443 (-.9540)	.3897	1.616	1.379
		4	C	-0.8516* (-2.658)	1.116* (2.073)	1.632 (1.428)								-0.2697 (-1.027)	.3868	1.689	1.374
2192	Beer	3	C	2.029* (4.402)	0.5206* (3.679)			0.4805* (5.036)			0.3367* (3.598)	0.3709* (4.009)	0.0875 (.8993)	-0.1590 (-1.753)	.8726	1.904	1.654
		4	C	2.264* (5.027)	0.5588* (4.174)			0.4963* (5.561)			0.4150* (4.381)	0.4531* (4.857)	0.1494 (1.615)	-0.2793* (-2.691)	.8807	2.055	2.064
2210	Tobacco Products	3	N	-1.885* (-2.961)	0.2686 (1.543)									0.1672* (3.790)	.4126	.6613	1.878
		4	N	-1.997* (-3.399)	0.2610 (1.615)									0.1694* (3.918)	.4653	.6053	2.104
2312	Scoured and Carbonised Wool	3	I	0.7086* (2.125)	0.1204* (1.760)									0.5237* (7.125)	.2027	1.076	1.283
		4	I	0.6523* (2.143)	0.0958 (1.447)									0.5564* (7.69)	.2019	1.133	1.320
2313	Wool and Man-made Fibre Tops	3	I	0.0799 (.1537)	0.2875* (2.460)									-0.2038 (-1.701)	.1533	1.917	1.517
		4	I	0.1686 (.3252)	0.3013* (2.591)									-0.2248 (-1.832)	.1726	1.970	1.465
2314	Man-Made Fibres and Yarns	3	N	-0.4580 (-.9486)	0.0901 (1.657)		0.0173 (.0701)							0.2140 (1.934)	.1564	0.5098	1.135
		4	N	-0.8311 (-1.627)	0.0289 (.5269)		0.0769 (.3193)							0.1571 (1.321)	.1320	1.013	0.9559
2315	Man-Made Fibre & Broadwoven Fabrics	3	I	2.376* (6.049)	0.0626 (1.536)		0.1986 (1.112)				0.1067 (1.158)	0.1154 (1.209)	0.4171* (4.481)	0.0865 (1.177)	.7947	1.154	1.979
		4	I	2.384* (6.182)	0.0463 (1.177)		0.1647 (0.9562)				0.0492 (0.5301)	0.0577 (0.601)	0.363* (3.889)	0.1438 (1.841)	.7940	1.212	2.022

Definition of Symbols : σ is the elasticity of substitution; $\sigma\theta_1$ and $\sigma\theta_2$ are the coefficients of *the positive and negative pressure of demand variables;* η_1 *is the coefficient of the quota dummy variable;* η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are coefficients of the vetting dummy variables; α_1 , α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic; * indicates significance at the 5 per cent level.

Table 7.8 (Cont'd)

ASIC	Description	Price Proj.	Best Model	Estimated Parameters: σ	$(\sigma\theta_1)$	$(\sigma\theta_2)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
2316	Cotton Yarns and Broadwoven Fabrics	3	I	-0.2412 (-.5094)	0.0971* (6.173)		-0.1552* (-2.211)				0.0085 (.2426)	0.0951* (2.555)	0.2190* (6.253)	-0.1327* (-3.220)	.8260	2.562	2.173
		4	I	-0.5083 (-1.110)	0.1012 (6.369)		-0.1422* (-1.952)				0.0033 (.0901)	0.0969* (2.446)	0.2135* (5.821)	-0.2135* (-5.821)	.8288	2.640	2.269
2317	Worsted Yarns and Broadwoven Fabrics	3	I	0.2303 (.6416)	-0.0080 (-.1575)						-0.4471* (-3.076)	-0.1430 (.9922)	0.4390* (3.080)	-0.1784 (-1.439)	.5930	1.276	1.804
		4	I	0.3520 (.9060)	-0.0068 (-.1250)						-0.4001* (2.581)	-0.1042 (.6856)	0.4739* (3.185)	-0.2419 (-1.700)	.6025	1.318	1.857
2318	Woollen Yarns and Broadwoven Fabrics	3	I	1.061* (2.397)	0.1544* (3.024)						-0.1613 (-1.224)	0.4543* (3.356)	0.5813* (4.478)	-0.4045* (-3.257)	.7051	.7278	1.736
		4	I	1.141* (2.449)	0.1640* (3.231)						-0.1467 (-1.037)	0.4732* (3.214)	0.5877* (4.333)	-0.4350* (-2.962)	.7027	.7112	1.696
2331	Textile Floor Coverings	3	N	-0.0303 (-.0595)	0.1357* (2.521)	0.9093* (3.164)					-0.0930 (-.8887)	1.880 (1.828)	0.1867 (1.844)	-0.1782 (-2.019)	.5726	.8015	1.283
		4	N	0.0900 (.2008)	0.1423* (3.022)	0.9015* (3.676)					-0.0192 (-.2073)	0.2643* (2.889)	0.2580* (2.870)	-0.2606* (-3.246)	.6929	.8606	1.346
2411	Hosiery	3	I	0.7464* (2.028)	0.2139 (1.451)	0.3193 (.3865)								-0.7849* (-4.699)	.3468	1.099	1.207
		4	I	0.7356* (2.057)	0.2309 (1.615)	0.3350 (.422)								-0.8253* (-5.087)	.3955	1.256	1.226
2412	Cardigans and Pullovers	3	C	1.719* (4.624)	-0.0786 (-1.091)	0.2010 (.4375)	-0.0929* (-3.751)	-0.9580* (-5.680)			-0.3357* (-2.365)	0.1136 (.8511)	1.303* (9.715)	0.2520 (.8197)	.9455	2.355	1.478
		4	C	1.868* (4.943)	-0.0591 (-.8512)	0.2418 (.5381)	-0.8656* (-3.516)	-0.9323* (-5.663)			-0.2809 (-2.018)	0.1897 (1.394)	1.363* (10.15)	0.0824 (.2577)	.9490	2.397	1.381
2423	Men's and Boy's Trousers and Shorts	3	C	3.354* (6.671)	-0.0235 (-.2436)									0.0876 (.6623)	.6660	.8802	1.981
		4	C	3.107* (6.527)	-0.1736 (-.1939)									0.1850 (1.442)	.6643	1.069	2.025

Definition of Symbols : σ is the elasticity of substitution; $\sigma\theta_1$ and $\sigma\theta_2$ are the coefficients of the positive and negative pressure of demand variables; η_1 is the coefficient of the first quota dummy; η_2 is the coefficient of the second quota dummy; γ_1 and γ_2 are coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic; * indicates significance at the 5 per cent level.

Table 7.8 (Cont'd)

ASIC	Description	Price Proj.	Best Model	Estimated Parameters σ	$(\sigma\theta_1)$	$(\sigma\theta_2)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
2424	Men's and Boy's Suits and Coats; Waterproof Clothing	3	N	2.301*	0.1342*						-0.3986*	-0.2733	0.7666*	-0.2136	.8721	.6556	1.497
				(9.350)	(1.757)						(-2.166)	(1.471)	4.178	(1.197)			
		4	N	2.451*	0.1302*						-0.3211	-0.1908	0.8486*	-0.3737	.8820	.7461	1.643
				(9.605)	(1.770)						(-1.732)	(-1.021)	(4.598)	(-1.854)			
2425	Underwear, Nightwear Shirts and Infants Clothing n.e.c.	3	C	2.133*	0.0389		-0.3548	-0.5682						-0.2252	.4987	1.151	1.406
				(4.187)	(.4242)		(-1.568)	(-2.956)						(-1.264)			
		4	C	2.074	0.0403		-0.4004	-0.6161						-0.1647	.5133	1.200	1.339
				(3.939)	(.4409)		(-1.727)	(-3.033)						(-.8174)			
2426	Foundation Garments	3	N	-0.6646	0.1938*									0.3145*	.3280	1.502	1.651
				(-1.243)	(2.852)									(2.087)			
		4	N	-0.6394	0.1928									0.3242	.3706	1.458	1.643
				(-1.049)	(2.761)									(1.846)			
2522	Mattresses excluding Rubber or Wire	3	N	1.116*	-0.0577									-0.7278*	.2089	.7807	1.544
				(2.820)	(-.5946)									(-5.177)			
		4	N	1.168*	-0.0567									-0.7375*	.2359	.7679	1.611
				(2.962)	(-.5841)									(-5.182)			
2611	Pulp and Paper and Paperboard	3	N	0.5855*	0.0972*	0.5550*					0.0044	0.0483	0.1604*	-0.0207	.7409	1.440	2.140
				(4.964)	(5.026)	(3.742)					(.075)	(.8543)	(2.792)	(-.4386)			
		4	N	0.5502*	0.0461*	0.6379*					-0.0241	0.0431	0.1534*	0.0147	.6856	1.569	1.807
				(4.095)	(2.728)	(3.814)					(-.3556)	(.6547)	(2.294)	(.2608)			
2711	Chemical Fertilisers	3	N	1.423*	-0.0986									-0.4205*	.6692	1.997	1.568
				(4.740)	(-.8596)									(-4.193)			
		4	N	1.649*	0.0004									-0.3969*	.7135	2.098	1.585
				(5.341)	(.0035)									(-4.032)			
2713	Synthetic resins & Synthetic Rubbers	3	C	1.712*	0.1090*						0.4618*	0.0921	-0.1170	-0.2655*	.4939	1.217	1.289
				(2.862)	(2.22)						(3.190)	(.6266)	(-.7976)	(-2.542)			
		4	C	1.492*	0.1105*						0.4913*	0.1247	-0.0893	-0.2982*	.4390	1.149	1.252
				(2.309)	(2.033)						(3.019)	(.7478)	(-.5385)	(-2.422)			

Definition of Symbols : σ is the elasticity of substitution; $\sigma\theta_1$ and $\sigma\theta_2$ are the coefficients of the positive and negative pressure of demand variables; η_1 is the coefficient of the first quota dummy; η_2 is the coefficient of the second quota dummy; γ_1 and γ_2 are coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic; * indicates significance at the 5 per cent level.

Table 7.8 (Cont'd)

ASIC	Description	Price Proj.	Best Model	σ	$(\sigma\theta_1)$	$(\sigma\theta_2)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
				Estimated Parameters													
2725	Soap and other Detergents	3	N	1.263* (16.50)	0.1370* (3.857)	0.6923* (2.367)					0.1850* (2.972)	0.1053 (1.685)	0.1796* (2.893)	0.0678 (.7675)	.9607	1.603	1.879
		4	N	1.290* (16.19)	0.1375* (3.876)	0.8620* (2.637)					0.2123* (3.249)	0.1318* (2.065)	2.030* (3.190)	0.0845 (.9439)	.9628	1.687	2.056
2730	Petroleum Refining	3	C	0.3017* (3.560)	0.1029* (2.329)									0.1456* (5.348)	.3155	2.187	2.584
		4	C	0.3059* (3.550)	0.1047* (2.318)									0.1497* (5.277)	.3239	2.174	2.625
2821	Clay Bricks and Refractories	3	C	1.256* (9.112)	-0.0971 (-.7975)									0.6139* (5.925)	.7738	.7364	1.853
		4	C	1.259* (9.596)	-0.1088 (-.9393)									0.6530* (6.480)	.7983	.8603	2.040
2831	Cement	3	N	0.7470* (1.818)	-0.0415 (-.4086)	0.9598 (1.480)								0.0471 (.2176)	.0653	1.200	2.049
		4	N	0.6028 (1.515)	0.0581 (-.5799)	1.164* (1.795)								0.0172 (.0807)	.0693	1.199	2.253
2835	Asbestos Cement Products	3	C	1.148* (6.879)	-0.0704 (-.488)									-0.1103 (-.9134)	.6668	1.109	1.371
		4	C	1.144* (6.651)	-0.0663 (-.4458)									-0.1082 (.8494)	.6603	1.096	1.348
2914	Steel Pipes and Tubes	3	N	1.513* (3.071)	-0.1005 (1.466)									-0.2744 (-.4819)	.2389	1.833	2.142
		4	N	1.388* (2.58)	-0.0814 (-1.134)									0.2869 (-.462)	.1741	1.751	2.187
2921	Smelting & Refining of Copper	3	N	1.609* (6.508)	-0.0798 (-1.007)									-0.2015 (-1.889)	.6346	1.140	2.023
		4	N	1.715* (6.572)	-0.1268 (-1.546)									-0.1610 (-1.436)	.6494	1.268	1.964

Definition of Symbols : σ is the elasticity of substitution; $\sigma\theta_1$ and $\sigma\theta_2$ are the coefficients of the positive and negative pressure of demand variables; η_1 is the coefficient of the quota dummy variable; η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are coefficients of the vetting dummy variables; α_1 , α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic; * indicates significance at the 5 per cent level.

Table 7.8 (Cont'd)

ASIC	Description	Price Proj.	Best Model	σ	(σθ$_1$)	(σθ$_2$)	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
				Estimated Parameters													
2927	Rolling, Drawing and Extruding of Aluminium	3	N	1.100* (4.619)	0.1926* (3.283)	0.5721* (2.320)			1.026* (5.580)					0.0468 (.6702)	.8296	1.575	1.490
		4	N	1.088* (4.302)	0.1961* (3.246)	0.5071* (2.2)			1.036* (5.436)					0.0503 (.6988)	.8201	1.472	1.400
2928	Rolling, Drawing and Extruding of Non-Ferrous Metals n.e.c.	3	N	1.229* (7.797)	0.1595* (1.986)									0.3188* (3.075)	.7597	.8371	1.344
		4	N	1.211* (7.716)	0.1357* (1.736)									0.3507* (3.340)	.7617	.9074	1.431
3211	Motor Vehicles	3	N	4.366* (5.123)	0.1565* (2.515)		-0.6304* (-1.743)							0.2891* (3.951)	.7184	1.374	1.548
		4	N	4.736* (5.504)	0.1471* (2.459)		-0.7444* (-2.101)							0.3263* (4.462)	.7438	1.393	1.669
3212	Truck and Bus Bodies, Trailers, Caravans	3	N	0.8456* (3.579)	0.0787* (2.543)				1.190* (6.922)	1.067* (6.282)				-0.0991* (-2.582)	.8199	1.729	1.842
		4	N	0.8264* (3.434)	0.0823* (2.595)				1.201* (6.851)	1.072* (6.182)				-0.1052* (-2.614)	.8206	1.719	1.898
3322	Refrigerators and Household Appliances	3	C	2.145* (8.895)	0.951* (2.132)	0.6812* (1.709)								0.2646* (3.768)	.8504	1.594	1.284
		4	C	2.174* (8.213)	0.0911* (1.945)	0.7534* (1.792)								0.2670* (3.4)	.8321	1.605	1.284
3323	Water Heating Systems	3	C	1.506* (5.227)	0.1004 (1.205)									-0.0896 (-.4457)	.5140	1.408	1.586
		4	C	1.517* (4.732)	0.1063 (1.253)									-0.0844 (-.3695)	.4717	1.301	1.578
3324	Electric and Telephone Cable Wire and Strip	3	C	0.7882* (11.05)	-0.0545 (-1.215)									-0.1815* (-3.605)	.8393	1.724	1.543
		4	C	0.7871* (10.950)	-0.0584 (-1.289)									-0.1788* (-3.438)	.8430	1.755	1.492

Definition of Symbols : σ is the elasticity of substitution; σθ_1 and σθ_2 are the coefficients of the positive and negative pressure of demand variables; η_1 is the coefficient of the quota dummy variable; η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are coefficients of the vetting dummy variables; α_1 , α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic; * indicates significance at the 5 per cent level.

Table 7.8 (Cont'd)

ASIC	Description	Price Proj.	Best Model	Estimated Parameters: σ	(σθ₁)	(σθ₂)	η₁	η₂	γ₁	γ₂	α₁	α₂	α₃	c	$\bar{R}^2$	DW	D4
3325	Batteries	3	N	0.8322* (2.585)	0.0308 (.6621)									-0.1502 (-1.692)	.2541	1.009	1.463
		4	N	0.8783* (2.917)	0.0332 (.7077)									0.1693 (-1.787)	.2679	1.035	1.542
3431	Flexible Plastic Sheeting and Products	3	C	0.9885* (12.24)	0.0615* (3.109)									-0.1892* (-7.581)	.8618	1.771	1.797
		4	C	0.9798* (11.83)	0.0642* (3.176)									-0.1953* (7.474)	.8582	1.825	1.775
3432	Rigid Plastic Sheeting	3	I	1.515* (4.388)	0.0364 (1.233)									0.1977* (2.797)	.4347	1.554	1.701
		4	I	1.470* (4.263)	0.0314 (1.106)									0.222* (3.142)	.4265	1.759	1.846
3445	Sporting Equipment	3	N	1.301* (4.869)	0.1132* (2.545)				0.7453* (3.173)	1.154* (4.752)	0.3363* (2.400)	0.4113* (3.224)	0.1454 (1.13)	-0.1247 (-1.261)	.8261	0.7754	1.556
		4	N	1.227* (4.481)	0.1137* (2.569)				0.7272* (3.083)	1.084* (4.392)	0.3032* (2.119)	0.3645* (2.746)	0.0949 (.7030)	-0.0578 (-.5162)	.8037	0.6644	1.716

Definition of Symbols : σ is the elasticity of substitution; $\sigma\theta_1$ and $\sigma\theta_2$ are the coefficients of the positive and negative pressure of demand variables; η_1 is the coefficient of the quota dummy variable; η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic; * indicates significance at the 5 per cent level.

Table 7.9 RESULTS - PARTIAL ADJUSTMENT MODEL

ASIC	Description	Price Proj.	$(\lambda\sigma^*)$	θ_1	θ_2	$(1-\lambda)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
			Estimated Parameters														
2131	Fruit Products	3	0.3172	0.6327*	0.9106*	0.3881*					1.203*	1.045*	-1.500*	0.2877	.9448	1.890	1.801
			(1.136)	(2.452)	(2.049)	(2.487)					(6.406)	(7.773)	(-9.253)	(1.371)			
		4	0.3029	0.6390*	0.7291	0.3916*					1.148*	0.9838*	-1.563*	0.3123	.9490	2.031	1.514
			(1.106)	(2.490)	(1.664)	(2.584)					(6.159)	(7.211)	(-9.697)	(1.525)			
2132	Vegetable Products	3	1.134*	0.6929*	1.233*	0.1131					0.2564*	-0.2461	-0.4519*	0.3355*	.8477	2.151	1.248
			(4.288)	(3.507)	(2.830)	(.8017)					(2.131)	(-1.630)	(-3.187)	(3.184)			
		4	1.039*	0.6810*	1.496*	0.0455					0.3085*	-0.1649	-0.3890*	0.3086*	.8371	2.258	1.412
			(3.596)	(3.267)	(3.155)	(.2981)					(2.329)	(.9834)	(-2.480)	(2.731)			
2140	Margarine Oils & Fats n.e.c.	3	1.025*	0.1615	1.179*	0.4201*								0.2134	.3479	2.223	1.462
			(2.655)	(.6930)	(1.910)	(1.934)								(1.397)			
		4	1.008*	0.1529	1.236*	0.3721								0.2088	.3016	2.287	1.606
			(2.360)	(.6241)	(1.794)	(1.554)								(1.261)			
2151	Flour Mill Products	3	1.316*	-0.1951	1.714	0.5058*					0.6712*	0.3763	0.1358	-0.1864	.6149	1.736	1.475
			(3.361)	(-.3115)	(1.638)	(2.552)					(2.475)	(1.279)	(.4937)	(.6239)			
		4	1.196*	-0.4227	1.732	0.5054*					0.6291	0.3616	0.1312	-0.1401	.5342	1.594	1.366
			(2.149)	(-.6103)	(1.382)	(2.143)					(2.004)	(1.071)	(.4157)	(-.4158)			
2163	Biscuits	3	-1.457*	0.0648		-0.1455								-0.0319	.4545	1.345	1.783
			(-3.615)	(.4309)		(-.5385)								(-.7801)			
		4	-1.370*	0.0747		-0.2528								-0.0298	.3967	1.340	1.687
			(-3.092)	(.4599)		(-.9024)								(-.6615)			
2181	Confectionery	3	-0.1626	0.1415		0.3674					-0.0171	-0.1142	0.2243*	-0.0154	.2770	1.912	2.862
			(-.6437)	(.8303)		(1.1013)					(-.1871)	(-1.159)	(2.231)	(-.2048)			
		4	-0.1163	0.1685		0.4181					-0.0022	0.0954	0.2411*	-0.0339	.2694	1.965	2.854
			(-.4327)	(.9221)		(1.081)					(-.0223)	(-.8810)	(2.145)	(-.3874)			
2182	Canned Fish and Other Seafoods	3	0.7656	0.9860*		-0.3728					0.3223*	0.5212*	0.3855*	-0.2644*	.4652	1.234	2.192
			(1.083)	(2.286)		(-.8299)					(1.817)	(2.882)	(2.302)	(-2.214)			
		4	0.9175	1.024*		-0.4163					0.3341*	0.5346*	0.4128*	-0.2853*	.4586	1.260	2.140
			(1.280)	(2.336)		(-.9195)					(1.816)	(2.865)	(2.343)	(-2.210)			
2183	Prepared Animal and Bird foods	3	-0.3764	0.8240*		0.5776*								-0.2220	.5672	2.133	1.097
			(-1.411)	(1.819)		(3.163)								(-1.071)			
		4	-0.4249	0.8449*		0.5781*								-0.2702	.5600	2.195	1.109
			(-1.403)	(1.811)		(3.032)								(-1.135)			

Definition of Symbols : $\lambda\sigma^*$ is the coefficient of the price term; θ_1 and θ_2 are the coefficients of the positive and negative pressure of demand variables; $1-\lambda$ is the coefficient of the lagged dependent variable; η_1 is the coefficient of the quota dummy variable; η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are the coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is the R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic; * above an estimated parameter indicates significance at the 5 per cent level.

Table 7.9 (Cont'd)

ASIC	Description	Price Proj.	($\lambda\sigma^*$)	θ_1	θ_2	$(1-\lambda)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
			Estimated Parameters														
2192	Beer	3	1.864*	0.4287*		0.0976		0.4143*			0.3239*	0.3582*	0.0900	-0.1381	.8737	1.913	1.669
			(3.757)	(2.505)		(0.5665)		(2.973)			(3.576)	(3.942)	(.9088)	(-1.564)			
		4	2.329*	0.4584*		0.0362		0.4589*			0.3860*	0.4305*	0.1404	-0.2706*	.8963	2.059	2.335
			(4.735)	(3.005)		(.2287)		(3.725)			(4.537)	(5.035)	(1.574)	(-2.857)			
2210	Tobacco Products	3	-0.6077	-0.0434		0.8476*								0.0510	.7982	2.178	1.431
			(1.382)	(-.4011)		(6.327)								(1.649)			
		4	-0.6898	-0.0498		0.8280*								0.5547	.7926	2.156	1.473
			(-1.549)	(-.4532)		(6.075)								(1.700)			
2312	Scoured and Carbonised Wool	3	0.5839*	0.0771		0.4458*								0.3094*	.2657	2.012	1.609
			(1.729)	(1.114)		(2.037)								(2.477)			
		4	0.6418	0.0818		0.3015								0.4039	.2048	1.883	1.661
			(1.678)	(1.192)		(1.288)								(2.909)			
2313	Wool and Man Made Fibre-Tops	3	-0.0033	0.2483*		0.1871								-0.1817	.1303	2.189	1.602
			(-.006)	(1.983)		(.5829)								(-1.349)			
		4	-0.1006	0.2585*		0.1511								-0.2148	.1443	2.241	1.559
			(-.162)	(2.039)		(.4679)								(-1.552)			
2314	Man Made Fibres and Yarns	3	0.1044	0.0548*		0.7547*	-0.1327							0.1105	.7276	1.522	1.399
			(0.2544)	(1.713)		(4.251)	(-.8681)							(1.715)			
		4	0.1870	0.0592*		0.7303*	-0.1171							0.1442*	.7147	1.596	1.493
			(.4574)	(1.897)		(4.141)	(-.7811)							(2.188)			
2315	Man Made Fibre and Broadwoven Fabrics	3	1.164*	0.0286		0.5688*	-0.0131				0.0656	0.2021*	0.4700*	0.0662	.9254	2.001	2.017
			(3.720)	(1.146)		(5.729)	(-.1146)				(1.171)	(3.416)	(8.268)	(-1.279)			
		4	1.148*	0.0266		0.5548*	-0.0210				0.0498	0.1861*	0.4567*	0.0419	.9110	2.071	1.909
			(3.513)	(1.022)		(5.178)	(-.1768)				(.8154)	(2.822)	(7.266)	(.6699)			
2316	Cotton Yarns and Broadwoven Fabrics	3	-0.2632	0.1041*		-0.9677	-0.1558*				0.0079	0.0855	0.2087*	-0.1308*	.8174	2.540	2.055
			(-.4969)	(4.563)		(-.4671)	(-2.216)				(.2191)	(2.015)	(5.037)	(-3.049)			
		4	-0.0346	0.0961*		-0.0566	-0.1716*				0.0036	0.0784*	0.2076	-0.1109*	.8058	2.402	2.022
			(-.0575)	(3.870)		(-.2569)	(-2.352)				(.0907)	(1.737)	(4.816)	(-2.191)			
2317	Worsted Yarns and Broadwoven Fabrics	3	0.1530	0.0161		0.3407					-0.4565*	-0.0039	0.6026*	-0.1945	.5992	1.601	1.872
			(.4263)	(.2725)		(1.130)					(-3.166)	(-.021)	(2.965)	(-1.571)			
		4	0.2070	0.0264		0.3745					-0.4102*	0.0571	0.6606*	-0.2556	.6093	1.731	1.976
			(.5623)	(.4435)		(1.224)					(-2.677)	(.2879)	(3.121)	(-1.792)			

Definition of Symbols : $\lambda\sigma^*$ is the coefficient of the price term; θ_1 and θ_2 are the coefficients of the positive and negative pressure of demand variables; $1-\lambda$ is the coefficient of the lagged dependent variable; η_1 is the coefficient of the quota dummy variable; η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are the coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is the R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 if the fourth-order Durbin-Watson statistic;

* above an estimated parameter indicates significance at the 5 per cent level.

Table 7.9 (Cont'd)

ASIC	Description	Price Proj.	Estimated Parameters														
			$(\lambda\sigma^*)$	θ_1	θ_2	$(1-\lambda)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
2318	Woollen Yarns and Broadwoven Fabrics	3	0.6834* (1.922)	0.0985* (2.348)		0.6153* (3.754)					-0.0967 (-.9424)	0.7624* (5.762)	0.8090* (6.944)	-0.5078* (-5.120)	.8263	1.781	2.318
		4	0.4723 (1.091)	0.0986* (2.216)		0.6399* (3.547)					-0.1252 (-1.096)	0.7383* (5.207)	0.8005* (6.437)	-0.4541* (-3.755)	.8080	1.718	2.356
2331	Textile Floor Coverings	3	0.7191 (1.575)	0.0639 (1.349)	0.8797* (4.367)	0.6017 (5.400)					-0.0406 (-.5505)	0.2881* (3.909)	0.2626* (3.675)	-0.1776* (-2.834)	.8457	1.357	1.054
		4	0.7397* (2.297)	0.0778* (2.318)	0.8655* (6.420)	0.5584* (7.491)					0.0237 (.4642)	0.3581* (6.928)	0.3253* (6.574)	-0.2581* (-5.732)	.9325	1.930	1.137
2411	Hosiery	3	0.5068 (1.511)	0.2192* (1.840)		0.3514* (2.025)								-0.5946* (-3.778)	.4520	1.674	1.147
		4	0.4760 (1.444)	0.2519* (2.146)		0.2837 (1.565)								-0.6749* (-4.027)	.4552	1.723	1.175
2412	Cardigans and Pullovers	3	1.798* (3.765)	-0.1399 (-1.660)	0.9321* (1.793)	-0.0273 (-.1360)	-1.129 (-3.370)	-1.112* (-4.250)			-0.3358* (-2.105)	0.0964 (.3746)	1.379* (5.854)	0.4882 (1.141)	.9364	2.207	1.735
		4	2.236* (5.570)	-0.2022* (-2.861)	1.259* (2.923)	-0.1389 (-.8346)	-1.130* (-4.242)	-1.211* (-5 701)			-0.3082* (-2.373)	0.097 (.4637)	1.345* (6.942)	0.3700 (1.064)	.9595	2.571	1.905
2423	Men's and Boys' Trousers and Shorts	3	1.150 (1.565)	0.0263 (.3378)		0.7353* (3.925)								0.02826 (.2767)	.8123	1.585	1.286
		4	1.230* (1.732)	0.0101 (.1378)		0.6752 (3.808)								0.0888 (.9020)	.8223	1.687	1.553
2424	Men's and Boys' Suits and Coats; Waterproof Clothing	3	0.6403* (1.829)	0.0809 (1.609)		0.6988* (5.454)					-0.3991* (-3.326)	-0.0477 (-.3752)	1.090* (8.265)	-0.1206 (-1.034)	.9474	1.565	1.703
		4	0.7011* (2.270)	0.0797* (1.828)		0.7274* (6.433)					-0.3178* (-2.925)	0.0372 (.3173)	1.194* (9.988)	-0.2735* (-2.345)	.9605	2.113	2.094
2425	Underwear, Night-wear, Shirts and Infants Clothing n.e.c.	3	1.251* (2.891)	0.1145 (1.636)		0.8416* (4.783)	-0.0534 (-.2887)	-0.2642 (-1.563)						-0.1867* (-1.418)	.7541	2.507	1.024
		4	1.129* (2.336)	0.1055 (1.391)		0.8104* (4.125)	-0.1191 (-.5566)	-0.3051 (-1.625)						-0.1124 (.7256)	.7304	2.446	1.243
2426	Foundation Garments	3	0.4554 (.9823)	0.1259* (2.549)		0.7425* (5.323)								0.2737* (2.396)	.6849	2.271	2.120
		4	0.4607 (.9831)	0.1273* (2.528)		0.7676* (5.416)								0.2537 (2.024)	.6821	2.364	2.260

Definition of Symbols : $\lambda\sigma^*$ is the coefficient of the price term; θ_1 and θ_2 are the coefficients of the positive and negative pressure of demand variables; $1-\lambda$ is the coefficient of the lagged dependent variable; η_1 is the coefficient of the first quota dummy variable; η_2 is the coefficient of the second quota dummy variable; γ_1 and γ_2 are the coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is the R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic;

* above an estimated parameter indicates significance at the 5 per cent level.

Table 7.9 (Cont'd)

ASIC	Description	Price Proj.	Estimated Parameters ($\lambda\sigma^*$)	θ_1	θ_2	$(1-\lambda)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
2522	Mattresses, excluding Rubber or Wire	3	1.145* (2.837)	0.0328 (.3229)		0.4882* (2.080)								-0.3754 (-1.634)	.2478	1.543	1.760
		4	1.022* (2.408)	0.0288 (.2667)		0.4590* (1.713)								-0.4179 (-1.586)	.1752	1.541	1.627
2611	Pulp, Paper and Paperboard	3	0.5293* (3.755)	0.0289 (1.452)	0.4456* (2.512)	0.3393* (1.870)					0.0832 (1.206)	0.1314 (2.031)	0.1635* (2.513)	-0.0665 (-1.248)	.6967	2.018	1.707
		4	0.4169* (2.088)	0.0183 (.6832)	0.1940 (.7597	0.6805* (2.686)					0.0921 (.9061)	0.1484 (1.556)	2.508* (2.656)	-0.1082 (-1.286)	.5802	2.031	1.586
2711	Chemical Fertilizers	3	0.1477 (.3654)	-0.3082* (-2.425)		0.2809 (1.323)								-0.4576* (-3.431)	.5095	2.208	1.861
		4	0.1528 (.3370)	-0.3133* (-2.459)		0.2679 (1.075)								-0.4661* (-3.133)	.4928	2.138	1.738
2713	Synthetic Resins and Rubbers	3	1.340* (2.342)	0.0927* (2.227)		0.2521 (.8294)					0.2444* (1.948)	0.1096 (.8301)	0.0325 (.2476)	-0.2684* (-2.472)	.2977	1.594	1.404
		4	1.335* (2.245)	0.0844* (2.019)		0.1986 (.6096)					0.2559* (1.897)	0.1328 (.9253)	0.0488 (.3447)	-0.2907* (-2.356)	.2848	1.633	1.360
2725	Soap and other Detergents	3	1.218* (6.335)	0.1601* (2.214)	0.3515 (.6212)	0.0213 (.1086)					0.0776 (.6455)	0.0163 (.1412)	0.1087 (.9479)	0.0595 (.3541)	.8754	2.685	2.273
		4	1.586* (6.802)	0.1197* (1.737)	1.091* (1.746)	-0.3907 (-1.732)					0.2728* (2.197)	0.1272 (1.140)	0.2007 (1.815)	0.1037 (.6283)	.8884	2.727	2.286
2730	Petroleum Refining	3	0.3069* (4.350)	0.1274* (3.650)		0.1690 (.6629)								0.1175* (2.826)	.4901	1.816	2.174
		4	0.3134* (4.353)	0.1319* (3.712)		0.1586 (.5792)								0.1199* (2.623)	.5048	1.768	2.216
2821	Clay Bricks and Refractories	3	1.346* (7.388)	-0.0589 (-.4465)		-0.0482 (-.3342)								0.6194* (4.589)	.7442	.9495	1.904
		4	1.484* (6.647)	-0.0979 (-.6845)		-0.1431 (-.8733)								0.7193* (4.728)	.7100	1.105	2.055
2831	Cement	3	0.6469 (1.487)	0.0354 (.3286)		0.1735 (.6444)								-0.1141 (-.5506)	-.0202	1.422	1.821
		4	0.4317 (.9234)	0.0148 (.1325)		0.0467 (.1687)								-0.2460 (-1.099)	-.0928	1.142	1.961

Definition of Symbols : $\lambda\sigma^*$ is the coefficient of the price term; θ_1 and θ_2 are the coefficients of the positive and negative pressure of demand variables; $1-\lambda$ is the coefficient of the lagged dependent variable; η_1 is the coefficient of the quota dummy variable; η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are the coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is the R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic;

* above an estimated parameter indicates significance at the 5 per cent level.

Table 7.9 (Cont'd)

ASIC	Description	Price Proj.	Estimated Parameters: $(\lambda\sigma^*)$	θ_1	θ_2	$(1-\lambda)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
2835	Asbestos Cement Products	3	1.113* (6.209)	0.0020 (.0130)		0.1554 (.9392)								-0.1396 (-1.077)	.6249	1.150	1.356
		4	1.055* (4.352)	0.0250 (.1330)		0.0135 (.0641)								-0.1179 (- .7176)	.4490	1.503	1.553
2914	Steel Pipes and Tubes	3	1.068 (1.620)	-0.0757 (.8345)		0.1773 (.6581)								-0.2313* (-2.111)	.0313	1.922	2.335
		4	0.9983 (1.203)	-0.0691 (-.6223)		0.1304 (.4205)								-0.2535 (-1.881)	-0.0427	1.796	2.341
2921	Smelting and Refining of Copper	3	1.598* (4.433)	-0.1093 (-1.386)		0.0208 (.0694)								-0.2131 (-1.738)	.6382	1.513	1.753
		4	1.588* (4.126)	-0.1145 (-1.377)		0.0192 (.0589)								-0.2007 (-1.493)	.6211	1.523	1.729
2927	Rolling, Drawing and Extruding of Aluminium	3	0.9558* (3.725)	0.1396* (2.143)	0.4946* (1.867)	0.3507* (2.996)			1.150* (5.952)					-0.0217 (-.2798)	.8415	2.154	1.630
		4	0.9205* (3.340)	0.1390* (2.037)	0.4407 (1.604)	0.3559* (2.967)			1.300 (5.684)					-0.0221 (.2751)	.8320	2.034	1.476
2928	Rolling, Drawing and Extruding of Non-Ferrous Metals	3	0.8662* (3.332)	0.1599* (1.865)		0.3508* (1.948)								0.2000 (1.605)	.7548	1.403	1.448
		4	0.7471* (2.348)	0.1833* (1.909)		0.3657 (1.623)								0.2519 (1.700)	.6812	1.496	1.487
3211	Motor Vehicles	3	2.148* (2.620)	0.0706 (1.443)		0.7896* (4.922)	-1.345* (4.560)							0.1354* (2.114)	.8589	1.399	1.614
		4	2.053* (2.319)	0.0692 (1.384)		0.7758* (4.456)	-1.303* (-4.340)							0.1508* (2.172)	.8549	1.564	1.890
3212	Truck and Bus Bodies, Trailers and Caravans	3	1.025* (4.241)	0.0919* (3.234)		0.2846 (1.612)			1.182* (6.441)	0.6085* (2.555)				-0.1013* (-2.563)	.8628	1.568	2.054
		4	0.8957* (3.143)	0.0981* (3.011)		0.2307 (1.109)			1.180* (5.628)	0.7272* (2.620)				-0.1130* (-2.426)	.8295	1.653	1.851
3322	Refrigerators and Household Appliances	3	0.4878* (2.282)	0.0105 (.4945)	0.4131* (2.170)	0.8298* (9.997)					-0.0718 (-1.243)	0.2048* (3.425)	0.1406* (2.493)	0.0546 (1.036)	.9706	2.041	2.298
		4	0.4891* (2.233)	0.0089 (.4037)	0.4153* (2.097)	0.8340* (9.782)					-0.0699 (-1.12)	0.2059* (3.177)	0.1451* (2.403)	0.0498 (.8091)	.9676	2.007	2.361

Definition of Symbols : $\lambda\sigma^*$ is the coefficient of the price term; θ_1 and θ_2 are the coefficients of the positive and negative pressure of demand variables; $1-\lambda$ is the coefficient of the lagged dependent variable; η_1 is the coefficient of the quota dummy variable; η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are the coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is the R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic;

* above an estimated parameter indicates significance at the 5 per cent level.

ASIC	Description	Price Proj.	($\lambda\sigma^*$)	θ_1	θ_2	$(1-\lambda)$	η_1	η_2	γ_1	γ_2	α_1	α_2	α_3	c	$\bar{R}^2$	DW	D4
			Estimated Parameters														
3323	Water Heating Systems	3	0.4118 (.6755)	0.0768 (.8968)		0.5856* (1.929)								-0.2302 (-1.068)	.5040	1.827	1.196
		4	0.4055 (.6072)	0.0759 (.8664)		0.5862* (1.834)								-0.2339 (-.9370)	.4657	1.711	1.180
3324	Electric and Telephone Cable, Wire and Strip	3	0.8184* (8.991)	-0.1035* (-1.866)		-0.0388 (-.3468)								-0.1635* (-2.590)	.7829	2.232	1.975
		4	0.8644* (8.835)	-0.1441* (-2.549)		-0.2671* (-2.205)								-0.1223 (-1.919)	.7848	1.869	2.365
3325	Batteries	3	0.6728* (2.402)	0.0169 (.3888)		0.6302* (2.550)								-0.1380 (-1.669)	.3505	1.784	1.254
		4	0.5519 (1.705)	0.0214 (.4618)		0.6432* (2.384)								-0.1063 (-1.114)	.2866	1.793	1.331
3431	Flexible Plastic Sheeting and Products	3	0.9108* (4.884)	0.0127 (.2888)		-0.1630 (-.8250)								-0.2064* (-3.200)	.4887	2.515	1.670
		4	1.042* (5.041)	0.0090 (.2086)		-0.4023* (-1.893)								-0.2517* (-3.810)	.5133	2.035	1.746
3432	Rigid Plastic Sheeting	3	1.358* (3.220)	0.0204 (.6421)		0.2408 (1.243)								1.250 (1.476)	.4555	1.760	1.819
		4	1.182* (2.131)	0.0147 (.4151)		0.1874 (.7625)								0.1888 (1.812)	.2605	1.815	1.675
3445	Sporting Equipment	3	0.5138* (1.912)	0.1207* (3.788)		0.5499* (3.695)			0.3509 (1.778)	0.5723* (2.857)	0.6033* (5.637)	0.4390* (4.913)	0.2290* (2.393)	-0.2411* (-3.460)	.9155	1.918	1.581
		4	0.4717 (1.616)	0.1216* (3.677)		0.5374* (3.288)			0.3715 (1.781)	0.5794* (2.742)	0.5803* (4.856)	0.4095* (4.199)	0.1869 (1.871)	-0.1953* (-2.379)	.8968	1.856	1.584

Definition of Symbols : $\lambda\sigma^*$ is the coefficient of the price term; θ_1 and θ_2 are the coefficients of the positive and negative pressure of demand variables; $1-\lambda$ is the coefficient of the lagged dependent variable; η_1 is the coefficient of the quota dummy variable; η_2 is the coefficient of the dummy variable for a shift in the function; γ_1 and γ_2 are the coefficients of the vetting dummy variables; α_1, α_2 and α_3 are the coefficients of the seasonal dummy variables; c is the constant; $\bar{R}^2$ is the R^2 adjusted for degrees of freedom; DW is the Durbin-Watson statistic; D4 is the fourth-order Durbin-Watson statistic; * above an estimated parameter indicates significance at the 5 per cent level.

APPENDIX 1

The Expected Use of the Domestic Good Series

Three proxies were used to represent the expected use of the domestic good in period (t) as viewed by importers in the import-ordering period (t - 3/2). We have termed these proxies the Infallibility, Clairvoyance, and Naiveté models. Because the only available domestic quantity data are output series, in constructing these proxies it is assumed that the output of a supplying industry is equal to the demand of all using industries and consumers.[1]

The first proxy is simply the actual use of the domestic good in (t), that is :

$$\hat{x}_{i1(t-1/2)}(t - 3/2) = x_{i1t} , \qquad (A1.1)$$

where x_{i1t} is the actual use of domestically-produced good i in period (t). We have termed this the Infallibility specification.

The Clairvoyance proxy is constructed from the question in the ACMA-BNSW survey concerning output changes anticipated by manufacturers one quarter into the future. In the survey, all questions concerned with changes require only "up" or "down" or "the same" as an answer. This information is converted into index form by subtracting the number of "downs" from the "ups" and dividing by the total number of responses. When converted to percentage change form, this measure is called a diffusion index (DI).

1. This assumption is not valid for intermediate inputs which enter final demand or for goods which are exported. Inspection of the 1968-69 input-output table indicates that final usage of intermediate inputs is generally trivial and can be ignored. The problem of exported goods cannot be overcome with the existing data base.

The main use of this index in the past has been to provide a preliminary estimate or a forecast of changes in published output indexes. It has been shown that the best correlation between a DI and a conventional economic index is obtained when the DI is correlated with the percentage change in the conventional index.[1]

In constructing the expected domestic use series, it is assumed that the expected change in output of the supplying industry (as measured by the DI) mirrors the expected change in the aggregate demand for a good of all using industries and consumers. This assumption is tantamount to assuming that when suppliers were asked about their expected output (in the survey), they would have used information, then current, to estimate how current conditions would affect the demand for their product, and that their expectations are similar to those of the industries and consumers they supply.

Because the DI reflects expected percentage change, it can be used to construct expected output series (using the corresponding DI for each ASIC). However, since the question from which the diffusion indexes are calculated is worded so as to exclude seasonality, an adjustment for seasonality is necessary. Another problem which must be considered is that the diffusion index is calculated from a question which requires a one quarter forecast; however, the import-ordering period (t - 3/2) and the using period (t) are separated by one and a half quarters. We assume that the diffusion index for a one quarter change

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1. See : Theil (1961), Chapter 4, and Central Statistical Office (1965).

into the future is a reasonable guide to a one and a half quarter change. In addition we assumed that the output information on which the respondents base their answers is the total output for period (t - 2). The expected use of the domestic good series were obtained from the results of regressions of the type :

$$\frac{x_{i1t} - x_{i1(t-2)}}{x_{i1(t-2)}} = \alpha_i' S_t + \beta DI_{i(t-2)} + \varepsilon_t \quad , \qquad \text{(A1.2)}$$

where

x_{i1t} is the index of the output of good i in period (t) ,

$x_{i1(t-2)}$ is the index of the output of good i in period (t - 2) ,

$DI_{i(t-2)}$ is the diffusion index reflecting the expected output change of the ACMA-BNSW industry group to which good i can be allocated ,

α_i' is a (1 × 4) vector of seasonal coefficients for good i ,

S_t is a (4 × 1) seasonal dummy for period t ,

ε_t is an error term .

The expected use series was derived using the estimates of the coefficients of (A1.2) :

$$\hat{x}_{i1t}(t - 3/2) = (1 + \hat{\beta}\, DI_{i(t-2)} + \hat{\alpha}'\, S_t)\, x_{i1(t-2)} \quad . \qquad \text{(A1.3)}$$

The expected sign of β, the coefficient of the diffusion index in (A1.2) is positive. However, in eight of the forty-six ASICs for which equation (A1.2) was fitted (using the concordance in Appendix 2), $\hat{\beta}$, the estimate of β, had a negative sign. In these cases the Clairvoyance series was not constructed. These eight ASICs are : 2120, 2132, 2163, 2182, 2193, 2312, 2921 and 3325.

The Naivété series was constructed by simply adjusting the deseasonalised output in period $(t - 3/2)$ for seasonality in (t). It was assumed that the output in (t) could be explained by the simple time-series model :

$$x_{ilt} = \exp(\alpha_i' S_t + \beta t + \varepsilon_t) \quad , \qquad \text{(A1.4)}$$

where

α_i' is a (1×4) vector of seasonal coefficients for good i ,

S_t is a (4×1) seasonal dummy for period (t) ,

t is time ,

ε_t is an error term .

Seasonal coefficients were obtained from regressions of the form :

$$\ln x_{ilt} = \alpha_i' S_t + \beta t + \varepsilon_t \quad . \qquad \text{(A 1.5)}$$

The seasonal component of (A1.4) was calculated from estimates of the seasonal coefficients in (A1.5) :

$$\hat{d}_{it} = \exp(\hat{\alpha}_i' S_t) \quad , \tag{A1.6}$$

where $\hat{d}_t$ is an estimate of the seasonal component of (A1.4). This was used to obtain estimates of deseasonalised output in (t) :

$$x^D_{i1t} = x_{i1t} / \hat{d}_{it} \quad , \tag{A1.7}$$

where x^D_{i1t} is the estimate of deseasonalised output of domestic good i in (t) . Deseasonalised output in (t - 3/2) was then calculated :

$$x^D_{i(t-3/2)} = 1/2 \; (x^D_{i(t-1)} + x^D_{i(t-2)}) \quad . \tag{A1.8}$$

The expected use of the domestic good in (t) as viewed in t - 3/2 was obtained by adjusting (A1.8) for seasonality in (t) :

$$\hat{x}_{i1t}(t - 3/2) = x^D_{i(t-3/2)} \cdot \hat{d}_t \quad . \tag{A1.9}$$

APPENDIX 2

CONCORDANCE OF ACMA INDUSTRY GROUPS AND ASIC CLASSES[a]

ACMA industry group	ASIC class
1 Treatment of non-metallic minerals (cement, bricks, pottery, glass)	2821 2835
2 Chemicals	2711 2713 2725 2730
3 Engineering (machinery, iron and steel, industrial metal, electrical)	2914 2927 2928 3324
4 Vehicles construction and repair (rail, bus, motor, ship, aircraft)	3211
5 Textiles (leather, clothing)	2312 2313 2314 2315 2316 2317 2318 2331 2412 2423 2424 2425 2426
6 Food (drinks, tobacco)	2131 2132 2140 2151 2181 2183 2192 2210
7 Paper (printing, cardboard)	2611
8 Miscellaneous (mfrs. of wood, rubber, plastics)	2523 3322 3323 3325 3431 3445

a Selected industries. Details of the ASIC classification may be found in : Australian Standard Industry Classification, Preliminary Edition, Volume 1, Australian Bureau of Census and Statistics, Canberra, Australia, 1969.

APPENDIX 3

The Data Base

Over the past year, there has been a major effort by the IAC to assemble the data required for a detailed study of Australian trade flows. The key variables are quarterly price and quantity indexes for the seven year period 1968-69 to 1974-75 for imports and domestic production classified by 4 digit ASIC codes. Other data in the study include dummy variables for the effects of tariff and quantitative restrictions on imports (these are discussed in the text) and measures of expected output and pressure of demand from the ACMA-BNSW Survey of Industrial Trends. The pressure of demand measure is discussed in detail in Alaouze (1977).

P_2 : Indexes of the Price of Imports

Import price indexes were constructed by forming quarterly unit value indexes for each tariff item in an ASIC class. Fisher indexes were then constructed from the ratio of unit values over two consecutive periods using value weights and aggregating over all the tariff items in an ASIC class for which data was available. The value of imports for each tariff item used in constructing these indexes are on an fob plus duty basis, the costs of insurance and freight (cif) are not included. These were omitted because the cif values were not available at the tariff item level and the more aggregated data which was available was judged to be unreliable. For details, see Marsden and Milkovits (1977).

Indexes constructed on a cif basis exhibit similar movements to those constructed on an fob basis in response to exchange rate movements, however the movements diverge in the event of tariff changes. The period for which this study was conducted includes a large across the board tariff cut (twenty five five per cent in December 1972). The values of indexes constructed on a cif and fob basis were simulated for a twenty five per cent tariff cut and it was found that for the ASICs in this study the difference between the fob and cif indexes was less than or equal to half of one per cent. For all practical purposes, the fob indexes can be regarded as approximately the same as cif indexes.

x_2 : Indexes of the Quantity of Merchandise Imports

These indexes were derived concurrently with the import price indexes and, similarly, are chained indexes based on the Fisher formula. The coverage of tariff items in the quantity indexes is the same as that for the import price indexes discussed above, the indexes were constructed using value weights based on fob plus duty. For details see Marsden and Milkovits (1977).

P_1 : Domestic Price Indexes

These unpublished indexes were constructed by the Australian Bureau of Statistics (ABS) and are essentially indexes of wholesale prices of Australian goods classified at the four digit ASIC level. The indexes are base weighted by the 1971-72 value of sales and transfers. They are available in monthly form and the quarterly indexes used in this study are the arithmetic averages of the monthly data.

x_1 : Indexes of Domestic Production

There are no official statistics on the use of manufactured goods monthly or quarterly by industry. Consequently we have used indexes of domestic output in the study. The quantity indexes were estimated by combining the ABS monthly production data on selected commodities using weights based on the value of sales and transfers in 1972-73. The quarterly indexes are simple arithmetic averages of the monthly indexes.

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