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FIBRE SUBSTITUTION IN RETAIL DEMAND FOR APPAREL

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Previous studies of fibre substitution have been at the raw fibre level, using raw fibre prices and apparent consumption data. However, this is inappropriate when there are distortions in retail markets for apparel. Distortions, such as tariffs, make it is necessary to consider substitution at the retail level to study the effects on demand and the returns to fibre producers.

This study analyses the substitution between wool, cotton and synthetic fibres at the retail level, with emphasis on wool. The study uses household survey data collected in the United States and applies the Almost Ideal Demand System to consider substitution between the fibres across several end uses. It is found that there is a high level of competition between the fibres, with consumers substituting one fibre for another within an end use. As the US quota and tariff arrangements for wool are, on average, higher than for other apparel fibre, these results would help to explain the relatively low level of per capita consumption of woollen apparel in the United States despite the country's very high overall per capita consumption expenditure.

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Introduction

Demand for Australian wool is influenced by several factors, including policies affecting trade in textiles, and the price competition from alternative apparel fibres. In Australia, wool demand and prices are chiefly affected by the latter.

In purchasing apparel, consumers primarily consider such attributes as comfort, durability, function and style. These qualities are partly dependent on the processes of spinning, weaving and knitting, and partly on the physical characteristics of the raw fibres. if consumer preferences for apparel qualities are highly fibre-specific, the demand for apparel fibres will be considerably more elastic, as the consumer responds to changes in apparel prices by a change in fibre preference.

The effects of fibre competition on wool demand can be measured in the context of markets for raw fibres. However, where government policies affect the apparel trade (by, for example, systems of quotas and tariffs) measurements of price response at the retail level are a better indicator.

The investigation of price competition between fibres at the retail level has until recently been limited by lack of appropriate data. In this paper we study these effects by estimating retail price elasticities of demand for wool, cotton and synthetic fibres using survey data on household apparel consumption in the United States over the years 1974 to 1986. The analysis applies the Almost Ideal Demand System (AIDS) developed by Deaton and Muellbauer (1980)

Background

Consumption of wool fibres in major apparel end uses in the United States was approximately 141 kt in 1987. This accounted for nearly 25 per cent of total wool consumption in the eight countries which are the largest consumers of apparel wool. Yet per head consumption of apparel wool fibres was generally half that of the remaining seven countries, even though total expenditure per head was the second largest. This might suggest that either preferences among United States consumers were greatly at odds with the rest of the world, or possibly, that the relative prices between various fibres available in the United States were at variance with the rest of the world.

The relative fibre prices in the United States do differ from world relative fibre prices because US imports of wool and woollen apparel are subject to both bilateral quota restrictions and general tariffs. In addition, growth rates in wool quotas have been slower than for other fibres and tariff rates are generally higher for wool then they are for other natural fibres (on average about 20 per cent for wool and 6 per cent for cotton). These restrictions result in higher retail prices for wool apparel. It is an intention of this study to examine the effect of price changes at the retail level on the effect of demand for fibres, especially with regard to wool.

It is not possible to determine the exact amount of Australian wool that is imported into the United States in the form of apparel. However, it is clear, that because the United States is a large consumer of wool, any policies which affect their level of consumption will have large effects on the returns to wool producers. Any policies affecting wool consumption will be particularly important to Australia as it is the largest exporter of wool for apparel, accounting for nearly 56 per cent of virgin wool exports in 1988 (International Wool Secretariat 1988), most of this wool being used in clothing production.

Previous research

Numerous studies have been made of price competition between fibres. These have included studies of raw wool demand in Australia, and the demand for raw fibres by processors and by consumers. Most studies used data on raw fibre prices and apparent consumption.

The initial studies of raw fibre consumption by processors adopted a single static equation regression approach (Lewis 1972; Ward and King 1973). They found inelastic own price-elasticities for wool, cotton and synthetic fibres but could not detect significant cross-price effects. Veldhuizen and Richardson (1984) used a single equation partial adjustment approach. Their results suggested that the demand for wool is very inelastic but that relative prices of wool and synthetic fibres significantly affect wool demand. Dewbre, Vlastuin and Ridley (1986) used reduced form single equations, while a static demand system approach was adopted by Harris (1988). Ball, Beare and Harris (1989) extended this model to incorporate partial adjustment dynamics. While the own- and cross-price elasticities of demand for raw fibres were found to be less than unity in the studies using a systems approach, the estimates obtained were more elastic than those obtained in the studies cited previously. Again, significant substitution relationships were found between synthetic fibres and wool.

Raw fibre costs are only a small component of the total retail costs of apparel. Thus, the derived demand for raw fibres is expected to be less elastic than retail demand. A high degree of price competition between raw fibres would require extensive substitution between fibres in final consumption. Previous estimates of raw wool price elasticities suggest that retail substitution would only be moderate.

Data and Model Specification

The data used in the analysis were tabulated from a survey of household apparel consumption in the United States between 1974 and 1986. The survey, conducted and recorded by the Market Research Corporation of America and required participants to keep a diary of purchases, recording end use, price , sex of wearer and fibre content Fibre content was recorded by type and the percentage of the dominant fibre. Records consisted of individual household purchases of apparel, along with a household identifier and household demographic information. A more detailed discussion of the data is given by Dewbre, Thompson and Richardson (1986).

Unit records were constructed at the Australian Bureau of Agricultural and Resource Economics (ABARE) for each household. Unit records consisted of the number of purchases for each end use, average price and average percentages of fibre content. Sample weights were constructed from a comparison of the population and sample distribution of households by geographic location and income class in each year. The apparel records were averaged across all households in a given year, using the sample weights.

For the analysis in this paper data were reclassified by dominant fibre into three categories: wool, cotton and man-made fibres (synthetics). Supplementary information on typical garment weights, provided by the

International Wool Secretariat (personal communication), was used to compute prices per kilogram of apparel for each end use and fibre category.

Specification of the model

A demand system approach was adopted to gain additional efficiency through the imposition of symmetry and homogeneity restrictions on the parameters to be estimated. The model selected for the analysis was the Almost Ideal Demand System (AIDS) developed by Deaton and Muellbauer (1980). Estimation is performed in terms of value shares. The model may be written:

(1) $$w_{mn} = \alpha_{mn} + \gamma_{mn,mn} \ln(p_{mn}) + \beta_{mn} \ln(E/P)$$

where m denotes the number of end uses and n the number of fibre categories, and:

w is an m times n vector of value shares,
γ is a square matrix of coefficients of dimensions m times n,
p is an m times n vector of prices,
β is an m times n vector of coefficients,
E is total expenditure on the included apparel categories, and
P is a price index for the included apparel categories.

The specification assumes that the allocation of expenditure on alternative fibres would take into account complementary and substitution relationships between different end uses. Thus the allocation of expenditure between fibres in one end use is dependent on prices of fibres in other end uses. This general formulation may be expressed in terms of the following partitioned matrices:

(2) $$\begin{pmatrix} W_{1n} \\ W_{2n} \\ \vdots \\ W_{mn} \end{pmatrix} = \begin{pmatrix} A_{11} & \Delta_{12} & \Delta_{13} & \cdots & \Delta_{1n} \\ \Delta_{21} & A_{22} & \Delta_{23} & \cdots & \Delta_{2n} \\ \vdots & & \ddots & & \vdots \\ \Delta_{m1} & \cdots & \cdots & \cdots & A_{mn} \end{pmatrix} \begin{pmatrix} P_{1n} \\ P_{2n} \\ \vdots \\ P_{mn} \end{pmatrix} + \begin{pmatrix} \beta_{1n} \\ \beta_{2n} \\ \vdots \\ \beta_{mn} \end{pmatrix} \begin{pmatrix} \ln\frac{E}{P} \\ \ln\frac{E}{P} \\ \vdots \\ \ln\frac{E}{p} \end{pmatrix}$$

$$W_{ij} = \begin{pmatrix} W_{11} \\ W_{12} \\ \vdots \\ W_{1n} \end{pmatrix}$$

$$A_{11} = \begin{pmatrix} \gamma^1_{11} & \gamma^1_{12} & \cdots & \gamma^1_{1n} \\ \gamma^1_{21} & \gamma^1_{22} & \cdots & \gamma^1_{2n} \\ \vdots & & \ddots & \vdots \\ \gamma^1_{m1} & \cdots & \cdots & \gamma^1_{mn} \end{pmatrix}$$

$$\Delta_{ij}=\begin{pmatrix}\delta^i_{11} & \delta^i_{12} & \dots & \delta^i_{1n}\\ \delta^i_{21} & \delta^i_{22} & \dots & \delta^i_{2n}\\ \vdots & & \ddots & \vdots\\ \delta^i_{m1} & \dots & \dots & \delta^i_{mn}\end{pmatrix}$$

$$P_{ij}=\begin{pmatrix}\ln P_{i1}\\ \ln P_{i2}\\ \\ \ln P_{in}\end{pmatrix} \qquad \beta_{ij}=\begin{pmatrix}\beta_{i1}\\ \beta_{i2}\\ \\ \beta_{in}\end{pmatrix}$$

where i represents any of the m categories of end uses, and j any of the n fibre categories. The A_{ii} matrices can be considered as being demand systems for an individual end use's fibres (where there would be no interaction between one end use and any other end use), with the Δ_{ij} matrices representing the substitution possibilities across different end uses.

With the imposition of symmetry, homogeneity and adding up restrictions, the number of free price parameters within a linear system which allocates expenditures between end uses and fibres is given by:

$$(m^2n^2 - mn)/2$$

where m is the number of end uses and n is the number of fibres. The problems associated with estimating a large number of price parameters are magnified in using predominantly cross-sectional data, due to the lack of independent variation in prices. Variation in the prices paid for individual categories of apparel in a given year is presumably due to differences in the quality of apparel purchased. Thus further restrictions were needed in order to reduce the number of parameters to be estimated. The assumptions employed were as follows. First:

(i) $$A_{ii} = A_{jj}$$

This is equivalent to the pooling or stacking of data across end uses; i.e. the price parameters specific to an end use are assumed to be equivalent across end uses. This assumption attempts to increase the amount of relative price variation between alternative fibres by 'stacking' the data. However, the potential gains in estimation efficiency from this restriction are at the expense of an aggregation bias.

Second:

(ii) $$\begin{Bmatrix}\delta^{ij}_{KK}=\delta^{ij}_{LL}\\ \delta^{ij}_{KL}=0 \text{ , for } K\neq L\end{Bmatrix} \quad \text{for all } i,j.$$

Two assumptions underlie this restriction. The first is that the price relationships between end uses are the same across all end uses. Thus, wool fibres are either complements or substitutes across all end uses in the estimated model. The second assumption is that the allocation of expenditure to a fibre in one end use is directly influenced only by the price of the same fibre in other end uses. A change in the price of wool in one end use may influence the allocation of expenditure on wool in all other end uses, will not influence the allocation of cotton and synthetic fibre expenditures in other end uses. That is, complementarity or substitution between end uses is assumed to be fibre specific.

The specification of the estimated model is given by:

$$(3) \qquad W_{ij} = \alpha_i + \sum_n \gamma_{in} \ln(p_{in}) + \delta \cdot \left(\sum_{m \neq i} \ln(p_{mj}) \right) + \beta_{ij} \ln\left(\frac{E}{P}\right)$$

subject to the constraints:

Adding up $\quad \sum_{i=1}^{mn} \alpha_i = 1, \quad \sum_{i=1}^{m} \gamma_{ij} + (m-1)\cdot\delta = 0, \quad \sum_{i=1}^{mn} \beta_i = 0,$

Homogeneity $\quad \sum_{i=1}^{n} \gamma_{ij} + (m-1)\cdot\delta = 0,$

Symmetry $\quad \gamma_{ij} = \gamma_{ji}.$

It should be noted that this specification is very restrictive and requires strong assumptions about the underlying behaviour. However, the assumptions are required in order to exploit to the full the limited variation available in the small range of data.

Estimation and Results

The model was estimated using Seemingly Unrelated Regressions with data from 1974 to 1986. A Stone's price index was used as an approximation to the true AIDS price index. This avoids the need for simultaneous estimation, which is generally not recommended with this amount of data.

The restrictions necessary for estimation, together with the size of the data set, allowed only four end uses and three fibre types to be examined. The end uses selected were those with the highest expenditure shares on wool fibre, and a well correlated relationship between prices to complement the use of Stone's price index. The end uses selected for men were, jackets, coats, suits and knitwear, and for women they were skirts, jackets, suits (with pants) and knitwear.

The estimated elasticities from the model for men's apparel are presented in Tables 1a and 2a, and the corresponding women's estimates are in Tables 1b and 2b. Tables 1a and 1b give the elasticities of the fibres within each end use. Tables 2a and 2b report the elasticities of the fibres across the end uses, but it should be noted that the latter two tables can only be read across the rows, as there are no inter-fibre comparisons available because of the assumptions involved in estimating the model.

Below the elasticities are the t ratios, calculated using Monte Carlo simulations by perturbing the parameter estimates with a value taken from a distribution given by the variance-covariance matrix of the estimates. Nearly all the elasticities were found to be significantly different from zero, though caution should be exercised in interpreting these statistics, as an asymptotic framework supports them, and the number of observations is

TABLE 1a

Own- and Cross-price Elasticities from General Model: Men's Apparel

(Mean values 1974 - 1986)

Jackets

Demand for:	with respect to the price of: Wool	Cotton	Synthetic
Wool	-1.1455	0.1455	1.0724
	(-29.89)	(37.85)	(43.68)
Cotton	0.9039	-0.7285	-1.1075
	(33.45)	(-28.85)	(-13.20)
Synthetic	0.3553	-0.2067	-2.0746
	(39.45)	(-23.40)	(-23.85)

Coats

Demand for:	with respect to the price of: Wool	Cotton	Synthetic
Wool	-1.9567	1.4389	3.7565
	(-12.90)	(38.36)	(47.48)
Cotton	1.3473	-0.7381	-1.6518
	(39.41)	(-17.38)	(-20.67)
Synthetic	0.8204	-0.3652	-1.8395
	(50.37)	(-20.94)	(-21.06)

Suits

Demand for:	with respect to the price of: Wool	Cotton	Synthetic
Wool	-1.1072	0.3218	0.8179
	(-35.48)	(38.29)	(41.65)
Cotton	1.5355	-0.6691	-2.2747
	(28.19)	(-9.50)	(-18.28)
Synthetic	0.2310	-0.1433	-2.0088
	(29.77)	(-21.61)	(21.54)

Knitwear

Demand for:	with respect to the price of: Wool	Cotton	Synthetic
Wool	-1.5306	0.3012	0.5676
	(-20.32)	(35.64)	(18.42)
Cotton	0.8877	-1.1777	-1.9448
	(21.01)	(-7.97)	(-16.00)
Synthetic	0.2841	-0.0914	-0.8072
	(58.41)	(17.68)	(-18.06)

Figures in parentheses are t ratios

TABLE 1b

Own and Cross-price Elasticities from General Model: Women's Apparel

(Mean values 1974 - 1986)

Skirts

Demand for:	with respect to the price of: Wool	Cotton	Synthetic
Wool	-0.8224	0.613	-3.0381
	(6.12)	(6.19)	(11.42)
Cotton	0.2192	-1.2689	0.7953
	(6.39)	(16.43)	(4.89)
Synthetic	-0.3585	0.2431	-3.7153
	(11.55)	(4.57)	(21.02)

Jackets

Demand for:	with respect to the price of: Wool	Cotton	Synthetic
Wool	-0.7781	0.9011	-4.3564
	(4.11)	(6.33)	(11.18)
Cotton	0.4124	-1.4688	1.5345
	(6.48)	(10.68)	(5.17)
Synthetic	-0.6216	0.4668	-5.8299
	(11.30)	(5.04)	(17.21)

Pant-Suits

Demand for:	with respect to the price of: Wool	Cotton	Synthetic
Wool	-0.7791	0.3703	-5.3313
	(4.71)	(2.32)	(10.73)
Cotton	0.0794	-1.4593	-0.2483
	(5.35)	(28.41)	(3.11)
Synthetic	-0.1041	0.1525	-2.0424
	(10.27)	(5.97)	(21.28)

Knitwear

Demand for:	with respect to the price of: Wool	Cotton	Synthetic
Wool	-0.8794	0.4232	-2.1736
	(9.62)	(6.15)	(11.21)
Cotton	0.2302	-1.8173	0.3522
	(5.25)	(13.65)	(1.57)
Synthetic	-0.1604	0.16	-2.6341
	(10.40)	(6.01)	(18.38)

Figures in parentheses are t ratios

TABLE 2a

Elasticities Across End Uses
From General Model: Men's Apparel

(Mean Values 1974 - 1986)

Jacket fibre

Demand for: With respect to the prices of the fibre in:

	Suits	Coats	Knitwear
Wool	-0.51602	-0.4969	-0.5159
	(36.71)	(39.1)	(36.71)
Cotton	-0.0567	-0.05749	-0.0586
	(2.66)	(2.68)	(2.7)
Synthetics	-0.205	-0.0551	-0.2634
	(8.0)	(2.83)	(9.36)

Suit fibre

Demand for: With respect to the prices of the fibre in:

	Jackets	Coats	Knitwear
Wool	-0.3919	-0.3826	-0.3957
	(41.7)	(39.47)	([illegible].5.57)
Cotton	-0.1403	-0.1259	-[illegible].1342
	(3.63)	(3.33)	(3.52)
Synthetics	-0.1277	-0.0532	-0.23604
	(7.49)	(39.47)	(12.15)

Coat fibre

Demand for: With respect to the prices of the fibre in:

	Jackets	Suits	Knitwear
Wool	-1.8709	-1.9133	-1.9124
	(35.58)	(34.44)	(34.47)
Cotton	-0.1108	-0.0962	-0.1064
	(3.69)	-3.19	(3.56)
Synthetics	-0.0418	-0.0812	-0.1166
	(0.99)	*(1.75)*	*(2.3)*

Knitwear fibre

Demand for: With respect to the prices of the fibre in:

	Jackets	Suits	Coats
Wool	-0.4463	-0.4657	-0.3994
	(38.43)	(36.89)	(39.37)
Cotton	-0.1302	-0.1002	-0.1088
	(4.75)	(3.94)	(4.2)
Synthetics	0.1022	0.1341	0.0605
	(9.89)	(12.79)	(5.95)

Figures in parentheses are t ratios

TABLE 2b

Elasticities Across End Uses

From General Model: Women's Apparel

(Mean Values 1974 - 1986)

Skirt fibre

Demand for:	With respect to the prices of the fibre in:		
	Jackets	Suits	Knitwear
Wool	0.6835	0.6818	0.6721
	(11.47)	(11.33)	(11.22)
Cotton	-0.302	-0.3381	-0.3067
	(7.1)	(8.28)	(7.25)
Synthetic	0.8826	0.5278	0.679
	(14.16)	(9.46)	(11.69)

Jacket fibre

Demand for:	With respect to the prices of the fibre in:		
	Skirts	Suits	Knitwear
Wool	0.9727	0.9785	0.9586
	(11.27)	(11.31)	(11.18)
Cotton	-0.5717	-0.6128	-0.5643
	(7.34)	(8.08)	(7.21)
Synthetic	1.4463	0.9321	1.1967
	(14.27)	(8.61)	(12.06)

Suit-pants fibre

Demand for:	With respect to the prices of the fibre in:		
	Skirts	Jackets	Knitwear
Wool	0.7912	0.8116	0.7603
	(10.95)	(11.14)	(10.62)
Cotton	-0.1955	-0.1638	-0.1793
	(10.95)	(8.85)	(9.72)
Synthetic	0.3870	0.3551	0.4615
	(13.86)	(15.75)	(9.97)

Knitwear

Demand for:	With respect to the prices of the fibre in:		
	Skirts	Jackets	Suits
Wool	0.4623	0.4657	0.4644
	(11.28)	(11.73)	(11.32)
Cotton	-0.5103	-0.4504	-0.6786
	(9.58)	(8.12)	(11.87)
Synthetic	0.5371	0.5123	0.6565
	(16.73)	(15.98)	(19.97)

Figures in parentheses are t ratios

small.

The estimation of price elasticities for men's apparel yielded several interesting results. Within an end use, own-price responses for wool and synthetic were generally found to be elastic, with cotton generally being inelastic, both in absolute terms and relative to other fibres (the exception being knitwear). At the retail level, estimated cross-price elasticities indicated that the fibres were substitutes except in the case of cotton and synthetic, a result that is consistent with other studies. These estimates are indicative of a reasonably high level of price competition between fibres. The similar magnitudes of the elasticities between the different end uses is a result of the restriction that all the different end uses have the same price coefficients in the estimated model.

The complementarity result between cotton and synthetics is probably due to the high level of blending between cotton and synthetics in apparel production. As the model does not distinguish between apparel wear of different blends, it is highly likely that the price-induced substitution between apparel of different blends is occurring within the broad fibre categories used by the model, leading to results which show complementarity.

That the allocation of expenditure between fibres in one end use is dependent on relative prices of fibres in other end uses is evidenced in the elasticities between end uses in Table 2a. Nearly all the elasticities are negative, indicating complementarity between the same fibres in different end uses.

For women's apparel, again own-price elasticities within an end use were all negative, though wool was both absolutely and relatively inelastic, but cotton and synthetics elastic. Wool and synthetics generally appear as complements, the other combinations of fibres being substitutes.

The relationship between fibres across end uses for women's apparel are presented in Table 2b. The results are not as expected,only cotton garments showing evidence of a complementary relationship. Wool and synthetic garments, on the other hand, indicate that the fibre relationship across garments is one of substitution.

The inconsistencies of the women's estimated elasticities with a priori expectations suggests that the market for women's apparel is inherently more complex and could not be captured within the structure of this model due to its strong behavioural assumptions.

The plausibility of the men's apparel elasticity estimates was further examined by testing the behavioural assumptions underlying the demand system. First, homogeneity was tested individually across all the equations, using an F test between a system with no restrictions and a system with homogeneity imposed. This was rejected, at the 5 per cent level by only two equations, synthetic jackets and woollen knitwear, though neither is rejected at the 10 per cent level.

The assumption of symmetry, given homogeneity, was tested using a Wald test as indicated in Gallant and Jorgenson (1979). The chi-squared value observed was 305.3, clearly rejecting the assumption of symmetry. However, as symmetry is an important theoretical assumption in the specification, the model was not respecified. In fact, the rejection of symmetry is probably due to the use of Stone's index as an approximation to the true price index.

The use of Stone's index is required due to data limitations which prevent the use of estimation techniques that would allow the true price index to be included.

Comparing elasticities obtained from other studies is difficult as all other studies have used raw fibre prices and different sample periods. Elasticity estimates from two studies that used similar estimation techniques are shown in Table 3.

The study by Ball et al. (1989) used a dynamic translog approach in estimating cost minimisation production. As these are derived demands from retail level consumption the results may be compared with those of the present study. The own-price elasticities for wool and synthetics are much higher in the present study than in those of Ball et al., though the own-price elasticities for cotton are similar. Comparison of the cross-price elasticities was not as straightforward, though it appears that, on average, the elasticities from the model used here indicate a higher level of substitution at the retail level, than at the producer level.

Table 3
Long Run Fibre Demand Elasticities: Other Studies

US Study (Ball, Beare and Harris, 1989): (mean values 1960-87)

Demand for:	with respect to price of: Wool	Cotton	Polyester	Rayon
Wool	-0.70	0.31	0.41	-0.03
Cotton	0.34	-0.79	0.33	0.12
Poly.	0.31	0.22	-0.61	0.08
Rayon	-0.12	0.53	0.52	-0.93

18 OECD Countries (Dewbre, Vlastuin and Ridley 1986): (mean values 1970-83)

Demand for:	with respect to price of: Wool	Cotton	Synthetic
Wool	-0.23	0.09	0.14
Cotton	0.05	-0.24	0.17
Synthetic	0.16	0.06	-0.21

The cost of raw fibres constitutes only a small component of total apparel cost. Thus it is expected that, since raw fibre demand is derived from retail level demand, demand for raw fibres would be less elastic than demand at the retail level. For example, the cost of raw wool accounts for roughly 5 per cent of the total cost of an apparel item. Given the magnitudes of the estimated retail elasticities, it is expected that raw wool demand would be highly inelastic. This hypothesis is supported by the results obtained in the study by Ball et al.

The study by Dewbre, Vlastuin and Ridley (1986) was conducted using retail consumption data and raw fibre prices. However, the technique of estimation was that of a reduced form single equation. Their estimated long run retail elasticities were substantially lower than those obtained in this analysis.

As the own-price elasticities for men's apparel range between -0.5 and -2 at retail prices, and the price of raw fibres accounts for only a small component of the cost of an end use, an enormous increase in the raw fibre price would be needed to cause observable changes in retail level consumption. Thus it is to be expected that the study by Dewbre et al. using raw fibre prices and retail consumption would have very low elasticities.

Conclusions

Retail price competition between apparel fibres is derived from a complex pattern of consumer preferences. The assumptions required to estimate retail demands for apparel fibres from the available data yield an extremely restrictive model of consumer behaviour. Despite this limitation, the results provide an indication of the level of price induced substitution between apparel fibres.

The general model estimates for men's and women's apparel yielded a reasonable set of own-price elasticities. The cross-price elasticity estimates were generally much more consistent for men's apparel. This suggests that the market for women's apparel is inherently more complex and could not be captured within the structure of the model.

The own-price elasticity estimates for wool from the model used in this study are generally price elastic, and the magnitude of the cross-price elasticities indicates there is also a high level of competition between the fibres. However, fibre substitution is imperfect and fibre specific demands could be identified. An implication of this result is that the promotion of a fibre - for example, wool - may lead to increased consumption of that fibre.

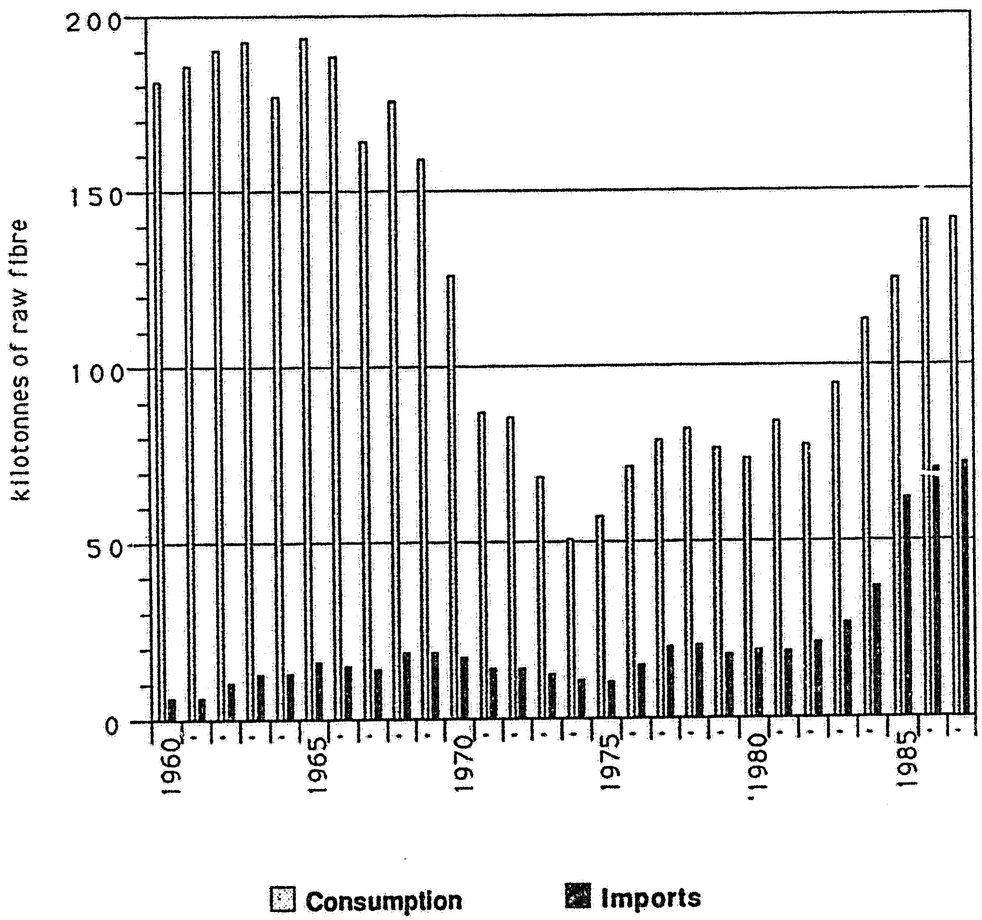
The apparel category definitions used in the analysis did not allow for changes in fibre blends within a given category, which would allow for a greater degree of substitution at the retail level. Hence, the level of retail fibre competition may be understated. Also, a larger range of 'fibres' among which to allocate expenditure would possibly have countered the complementary relationship between cotton and synthetics in men's apparel and may have yielded results in line with expectations for women's apparel.

When the retail elasticities obtained from this study are compared with elasticities obtained in studies of price competition between raw fibres, the retail elasticities are greater by an order of magnitude of ten. As raw fibre costs are generally less than 5 per cent of the retail price of apparel, this suggests that changes in fibre blends is a significant source of fibre competition.

As a high level of competition exists between different fibres, any distortion that caused relative prices of apparel made from different fibres to change would result in substantial changes in consumption patterns. This could then explain the observation that although US consumers have the second highest per capita consumption in the world, their per capita consumption of wool is low relative to the rest of the world. The changes in relative fibre prices brought about by the tariff structure in the United States would cause a shift away from wool consumption into other fibres.

Over recent years, the United States has imported more than 50 per cent of its apparel wool consumption (see Figure 1). Given that the tariffs on apparel wool average 20 per cent, and that the smallest own-price elasticity for wool in this analysis is -1.1, a substantial increase in demand could be expected from any easing of the tariff. Increases in demand could also be expected with any relaxation of the quota restrictions and subsequent price declines.

Figure 1
Wool in Apparel: Imports and Consumption in the United States



Source: Textile Economics Bureau

The results from the study also suggest that measures which affect the price of the final good (an end use) will have a larger effect on the demand for that end use's principal fibre than any measure levied directly against the raw fibre. That is, a tariff on woollen apparel will lead to a greater reduction in demand for wool than a tariff applied to raw wool used in production.

Given that nearly all Australian wool is used in apparel production, the various quota and tariff policies in the United States can be expected to have a detrimental effect on the returns to producers in Australia, through decreased demand for wool apparel.

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