AN ANALYSIS OF CHANGES IN U.S. WOOL CONSUMPTION

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Wool consumption trends in the United States have given rise to considerable concern in Australia. During the last ten years U.S. per caput wool consumption has declined from around 4 pounds to approximately 3 pounds. Most of this decline has been in the apparel wool field in which Australia is particularly interested. While there has been some reduction in total fibre consumption per caput, the share of apparel wool has fallen from 7.3 per cent of the total in 1950 to 5.3 per cent in 1960.

In this paper an attempt is made to examine the particular end uses where wool has lost ground and, where possible, the reasons for such losses. This is followed by a discussion of some implications of our findings for wool research and promotion. Two sets of data will be used to study U.S. trends and the presumed reasons for the decline in U.S. wool consumption. The first set consists of the estimates of end use of the major textile fibres, published annually since 1949 by *Textile Organon*, a publication of the Textile Economics Bureau Inc. These estimates show gross fibre consumption for more than 120 different end uses. They are made on the basis of information supplied by mills, trade associations, man-made fibre producers, production data obtained from the U.S. Census Bureau and end-use studies undertaken by the National Cotton Council. A comparison of the estimate of aggregate U.S. ' wool consumption ' from *Textile Organon*, with U.S. wool consumption (viz. mill consumption plus imports minus exports) as obtainable from normal statistical sources, shows considerable discrepancies, the *Textile Organon* estimates being, on the average, about 25 per cent higher. The reasons for this are twofold. Firstly, non-virgin wool is included in the *Textile Organon* estimates of ' wool consumption ', since they are compiled at the garment-cutting level where it is often not possible, or perhaps too laborious, to ascertain the proportion of virgin and re-used wool in a garment. Secondly, there is a certain element of double counting, since wool waste at the garment cutting stage may be used for carpet manufacture (where it would be counted again) and waste from the production of carpets could be counted again when it is used for felts.

There are also considerable year-to-year differences in the gap between the figures based on mill consumption and the end-use estimates. The

*This is an abbreviated version of a more detailed study. Copies of the original paper are available on request from the authors.

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Any errors of analysis or interpretation remaining are the sole responsibility of the writers.

reason for these differences is probably to be found in stock movements which are often of considerable magnitude. Thus end-use estimates correspond more nearly to consumption in terms of sales to the ultimate consumer, while the mill consumption plus net imports figures represent more nearly ' production ' or sales to wholesalers. No direct check on the reliability of the end-use estimates is then available, even though discrepancies from existing statistics can be readily explained. While some misgivings have been expressed regarding the methods used and the reliability of the *Textile Organon* estimates, textile authorities generally use them as the best currently available. These estimates have been relied on here to pin-point the particular end-uses where wool has lost ground and to indicate which fibres have replaced wool.

To ascertain *why* wool has lost ground we rely on our second set of data—a series of eleven consumer surveys undertaken by the United States Department of Agriculture. These surveys cover most of the end uses which are of concern in this study ; in particular they provide information on the reasons given by consumers for fibre preferences. These data have been obtained for most items of men's, women's and children's clothing, household furnishings and fabrics in motor cars.[1] The surveys were undertaken between 1948 and 1959. In most of the surveys between 1500 and 2500 consumers were interviewed in nation-wide samples designed to be representative of the relevant consuming groups.

' *Substitution* ' *or* ' *Fashion* ' ?

The quantity of wool used can change either because the proportion of wool used in a particular class of garment changes or because consumers' purchases of clothing, furnishings and other goods change in such a way as to affect the amount of wool bought. Thus, for instance, if consumers change from using light-weight woollen suits to wool-dacron mixtures, or to suits made from rayon, we will regard the decline in wool consumption as being the result of the ' *substitution* ' of other fibres for wool. On the other hand if women switch from wearing suits (which contain mostly wool) to skirts and sweaters (which contain proportionately less) we will call the resultant decline in wool consumption the effect of ' *fashion* '. ' Fashion ' is used very broadly in this sense. It includes trends towards more casual wear and other changes in clothing

1. In chronological order the studies are : (all published by the United States Department of Agriculture), " Men's Preferences among Selected Clothing Items ", *Miscellaneous Publication No.* 706 (December 1949) ; " Mothers' Opinions of Fibres in Selected Items of Children's Clothing ", *Agriculture Information Bulletin No.* 65 (October 1951) ; " Women's Attitudes toward Wool and other Fibres ", *Market Research Report No.* 153 (February 1957) ; " Fabrics and Fibres for Passenger Cars ; Automobile Manufacturers' views 1955—compared with—1950 ", *Market Research Report No.* 152 (April 1957) ; " Teenage Girls discuss their wardrobes and their attitudes toward cotton and other fibres ", *Market Research Report No.* 155 (1957) ; " Homemakers appraise cotton, wool and other fibres in Household Furnishings ", *Market Research Report No.* 279, (November 1958) ; " Men's Preferences for Cotton, Wool and other fibres in selected clothing items ", *Market Research Report No.* 244 (1958) ; " Consumers' Concepts of Fabric ", *Market Research Report No.* 338 (July 1959) ; " Mothers' Opinions of Fibres in Children's Clothing ", *Market Research Report No.* 429, (September 1960) ; " Consumer Appraisal of Imported Wool Fabric in Clothing ", *A.M.S.* 300 (February 1959) ; " Selected Data on Women's Attitudes toward cotton and other fibres in clothing ", *A.M.S.* 378 (Preliminary Release), (June, 1960).

habits brought about by external circumstances such as central heating and air conditioning. It also includes changes in the sales volume of fabrics resulting from the competition of plastics (e.g. vinyl in motor car upholstery).

The distinction between ' fashion ' and ' substitution ' may seem a rather academic one. The main justification for it is that it may enable us to obtain a better picture of the reasons for changes in wool consumption and this should help us to counter unfavourable trends.

Table I gives the change in ' wool consumption ' (as defined in *Textile Organon*) between 1949 and 1958 for broad groups of end uses.[2] For each group the change in wool consumption is split into a ' fashion ' and a ' substitution ' effect, to indicate whether a drop in wool consumption over the period has been the result of inter-fibre competition and, approximately, the extent of the loss resulting from such competition.[3] Total ' wool consumption ' (i.e. virgin wool and re-used wool) declined by over 140 million pounds between 1949 and 1958—approximately 21 per cent. As shown in table I the broad trends of clothing consumption, which have been labelled the ' fashion ' effect, have not been responsible for this decline. In fact the ' fashion ' effect would have produced a

2. 1958 figures were used because the basis of end-use classification was changed somewhat for 1959. Wool consumption was particularly low in 1958 ; probably largely because of general economic conditions (total per caput fibre consumption being also lower than in any year between 1949 and 1960). *Our basic argument is not affected by the need to use 1958 figures.* Where later, more fragmentary figures are available, they confirm the trends shown in the 1949-1958 comparisons.

3. ' Approximately ' is used above because the exact loss which has resulted from inter-fibre substitution is not measurable. Since ' substitution ' depends on changing proportions of wool being used in the various end uses, we can find two possible estimates of the loss resulting from ' substitution ', depending on whether we multiply the change in the proportion of wool used by the base-year or the end-year quantities. We are, in fact, confronted with the usual index number problem. Using the notation given in table I, let p be the proportion of wool in each end use, q the quantity of all fibres in each end use and the suffixes 0 and 1 denote 1949 and 1958 respectively. The total change in wool consumption in each end use can then be denoted by $p_1q_1-p_0q_0$. There are two ways of breaking up this change into a ' fashion ' and a ' substitution ' effect :

i. $p_1q_1-p_0q_0 = p_0(q_1-q_0) + q_1(p_1-p_0)$
ii. $p_1q_1-p_0q_0 = p_1(q_1-q_0) + q_0(p_1-p_0)$

It seemed preferable to combine and average these two equations. In the remaining sections of this paper the ' substitution ' effect will therefore be represented by $(p_1-p_0) \cdot (q_1 + q_0)/2$ and the ' fashion ' effect by $(q_1-q_0) \cdot (p_1 + p_0)/2$.

As it happened, the ' substitution ' effect for all wool by equation (i) was 145.0 million lbs. and by equation (ii) 144.0 million lbs. For individual groups, however, the differences (given in table I) were considerably greater.

A further difficulty is that the size of the substitution effect will depend on the ' fineness ' of the end-use subdivision. Thus if there are no subdivisions everything is substitution effect. On the other hand if we regard regular weight wool-dacron suits as a different commodity (i.e. end use) from regular weight woollen suits everything becomes fashion effect in our terminology.

The basic problem here is one familiar to economists—namely what constitutes a commodity. Definitions which are theoretically correct—i.e. in terms of elasticities—are of little value in practice. Practical usage has its inconsistencies. While recognising this limitation we will proceed to ignore it and use the actual end-use subdivision which was devised by the statisticians and textile technologists who compiled the end-use figures for *Textile Organon*.

slight increase in total wool consumption.[4] In other words the actual decline over this period was the result of the ' substitution ' of other fibres for wool. True synthetics and, to a much lesser extent, cotton have replaced wool. These fibres have also replaced rayon in many end uses. In fact for all non-carpet uses considered, the losses suffered by rayon as a result of substitution equal those of wool.

Other fibres have gained at wool's expense in all major fields of end use. Proportionately, the losses from ' substitution ' have been greatest in Home Furnishings (blankets and draperies), Industrial Uses (car upholstery etc.) and Girls' and Children's Wear. ' Substitution ' losses have been smallest in Carpets (but the estimate here is of less value because of the large ' error term '), Men's and Boys' Wear and Women's and Misses' Wear.

The distinction between a ' substitution ' and a ' fashion ' effect also enables us to obtain a more accurate picture of the current state of competition between wool and other fibres than is available in the absence of such distinctions. Thus some observers have argued that wool is currently regaining some ground in the United States, because (according to the most recent statistics) wool has increased its proportion of total fibre consumption from 7.1 per cent in 1958 to 8.1 per cent in 1959 and 1960. (For apparel wool the relevant percentages are : 1958—4.8 per cent ; 1959—5.2 per cent ; 1960—5.3 per cent.)

However, an examination of changes in the total ' substitution ' effect present a different picture. For 27 major end uses (which accounted for over 90 per cent of total ' wool consumption ' in 1958) the aggregate ' substitution ' effect was —137.1 million pounds for the period 1949-1958 and —140.9 million pounds for 1949-1959.[5] In other words the ' substitution ' of other fibres for wool seems to have continued unabated in 1959 (i.e. the year of the largest relative gain in ' wool consumption '). Wool's proportion of total fibre consumption has continued to decline in such important end uses as sweaters, men's slacks and lightweight suits, blankets, women's and children's coats, etc.

The main reason why wool accounted for a larger proportion of total fibre consumption in 1959 than in 1958 would appear to be ' fashion '.

4. This does not mean that the changes in the pattern of consumers' purchases of clothing, furnishings etc. have not had an adverse effect on U.S. wool consumption. Between 1949 and 1958 consumption of all fibres increased by 14.9% ; i.e. if there had been no ' fashion ' and ' substitution ' changes, wool consumption would have risen pari passu with total fibre consumption. In the absence of ' substitution ' of other fibres for wool, changes in the relative popularity of different fibre end-uses meant that ' wool consumption ' would have risen by less than $\frac{1}{4}$ per cent. Actually total ' wool consumption ' declined by more than 20 per cent. *This* decline was the result of the ' substitution ' of other fibres for wool.

For *all non-carpet end uses* ' wool consumption ' was 516.6 million lbs. in 1949. If ' wool consumption ' had risen proportionately as rapidly as other fibres ' wool consumption ' would have risen to 583.2 million lbs. in 1958 ; i.e. an increase of 66.6 million lbs. If wool had maintained its proportion of the market in each end-use ' wool-consumption ' would have increased by 27.4 million lbs. (i.e. from 516.6 million lbs.). In other words those end uses where wool accounted for a large share of the market expanded their sales less rapidly than end uses such as home furnishings where wool is of relatively less importance. Actual consumption in 1958 was estimated at 412.3 million lbs. Of the total ' decline ' of 170.9 million lbs. (i.e. 583.2 minus 412.3), approximately 39.2 million lbs. or 23 per cent was the result of the adverse changes in the pattern of consumers' purchases and the remainder the result of the ' substitution ' of other fibres for wool.

5. Information on a comparable basis is not available for the other end uses.

TABLE I.

*The Effect of Substitution on U.S. Wool Consumption**

(All figures in millions of lbs. weight.)

Major End-Use Group	'Wool Consumption'		Change 1949-1958	Result of		Effect of 'Substitution' on Consumption of		
	1949	1958		'Fashion'	'Substitution'	Cotton	Rayon	Synthetics
Column No. I	II	III	IV	V	VI	VII	VIII	IX
Sub-Total ; All Apparel Wool	351.7	323.8	−27.9	+34.4	−62.3 (15.1)	+116.3	−156.1	+102.5
(a) Men's & Boys' Wear	171.7	155.7	−16.0	+10.3	−26.3 (8.2)	+44.2	−60.1	+42.5
(b) Women's & Misses' Wear	150.4	142.7	− 7.7	+17.5	−25.2 (5.5)	+69.7	−98.0	+53.7
(c) Girls' & Children's Wear	29.6	25.4	− 4.2	+ 6.6	−10.8 (1.4)	+ 2.4	+ 2.0	+ 6.3
Sub-total ; Other Non-carpet Wools	164.9	88.5	−76.4	− 7.0	−69.3 (2.0)	−14.0	+24.9	+58.6
(a) Home Furnishings	32.1	11.0	−21.1	+ 9.2	−30.3 (6.3)	−43.5	+41.2	+32.6
(b) Other Consumer Products	63.0	49.8	−13.2	− 1.2	−12.0 (0.2)	+21.3	−26.5	+17.3
(c) Industrial	69.8	27.7	−42.1	−15.0	−27.0 (4.0)	+ 8.2	+10.2	+ 8.7
Sub-total ; All Non-carpet Wools	516.6	412.3	−104.3	+27.4	−131.6 (17.1)	+102.3	−131.2	+161.1
Carpets	158.2	119.4	−38.8	−25.9	−12.9 (16.6)	−77.4	+58.7	+31.6
Grand Total All Wool	674.8	531.7	−143.1	+ 1.5	−144.5 (0.5)	+24.9	−72.5	+192.7

Source : Textile Organon ; January 1960 and 1961 (latest figures used).

Explanatory Note :

Let p = proportion of wool in each end use ; q = the quantity of all fibres in each end use and the suffixes 0 and 1 denote 1949 and 1958 respectively.

Then column II = $\Sigma p_0 q_0$; column III = $\Sigma p_1 q_1$; column IV = $\Sigma p_1 q_1 - \Sigma p_0 q_0$; column V = $\Sigma(p_1 + p_0)(q_1 - q_0)/2$; column VI = $\Sigma(q_1 + q_0)(p_1 - p_0)/2$. The figures in brackets (column VI) give the ranges of the substitution effect—i.e. $\Sigma q_1(p_1 - p_0) - \Sigma(q_1 + q_0)(p_1 - p_0)/2$ or $\Sigma q_0(p_1 - p_0) - \Sigma(q_1 + q_0)(p_1 - p_0)/2$ respectively (plus and minus signs have been omitted).

Columns VII, VIII and IX use the same methods as column VI to obtain the effect of substitution on consumption of cotton, rayon and synthetics respectively. Hence : column IV = column V + column VI (any differences are the result of rounding off), and column VI + Column VII + Column VIII + Column IX = 0 (any differences are the result of rounding off).

*The figures are based on 34 out of a total of 127 end uses listed in *Textile Organon*. The 34 end uses chosen were those where " wool " consumption exceeded 2 million lbs. in either 1949 or 1958. These end uses accounted for 99% of total wool consumption in 1949 and 98½% in 1958.

TABLE II.

Change in Wool Consumption in Selected End Uses

Item	'Wool' as % of all fibres 1949	'Wool' use 1949	Change in 'Wool' use 1949-1959	Change due to :		Other fibre change due to 'substitution'			Presumed reasons for :			Sources for Cols. VIII, IX and X*
				'Fashion'	'Substitution'	Cotton	Rayon	Synth.	Dissatisfaction with wool	Satisfaction with other fibres	Preferring Wool	
Column No. 1	II	III	IV	V	VI		VII		VIII	IX	X	XI
	%	Million lbs.										
1. Sweaters (men's, women's and children's)	77.0	36.1	− 6.9	+28.8	−35.7	+ 2.5	− 1.8	+35.1	(In Women's sweaters) : Irritating, shrinks, not washable, too warm, bulky, not mothproof.	*Orlon, nylon* : washes easily, quickly, soft, holds shape, doesn't sag or stretch, not irritating.	Warm, heavy, has body, durable, stays new looking, has attractive rich smart appearance.	M.R.R. No. 153. Tables 28 and 29.
2. Car upholstery (and sidewalling etc.)	47.2	38.5	−36.8	− 3.2	−33.6	+16.3	+ 9.5	+ 7.8	*Upholstery, sidewalls, head lining* : styling not sufficiently creative, designs and textures outdated ; better dyeing and wearing qualities needed ; not soil and moisture resistant. Not cool.	*Cotton, rayon, nylon (and vinyl)* : better appearance, soil resistant, permanent colours, durable, easy to handle in tailoring, moisture resistant. *Upholstery only* : cool, smooth appealing texture. *Sidewalls only* : integration with body cloth.	*Head lining only* : good appearance.	M.R.R. No. 152. pp. 23-26, 30-31, 35-36, 51-53.
3. Blankets	30.8	24.4	−16.4	+ 7.2	−23.6	−22.1	+30.6	+15.1	Irritating, doesn't hold shape, shrinks, stretches, not washable, wool fuzz comes off, gets linty, not mothproof.	*Cotton* : washes easily, less expensive, non irritating, not too warm, soft, feels good. *Wool-rayon* : washes, dries well, holds shape, non irritating, less expensive, not too warm.	Warm, without being heavy, durable, looks nice, good appearance.	M.R.R. No. 279. Tables 79 and 81.
4. Men's Slacks	37.5	23.5	− 0.4	+22.5	−22.9	+38.4	−29.9	+14.4	*Men's slacks* : too warm, irritating, not washable, shrinks.	*Cotton* : cool, washable. *Dacron* : cool, washable, wrinkle resistant, lightweight.	Holds shape, keeps press longer, dressier, can be worn all year.	M.R.R. No. 244. Tables 57 and 62.
									Boys' school pants : not available.	*Cotton* : washable, durable, good appearance.	Not available.	M.R.R. No. 429. Pp. 11-15.

Notes : Let p = proportion of wool in each end use ; q = the quantity of all fibres in each end use and the suffixes 0 and 1 denote 1949 and 1959 respectively.
The column II = p_0 ; column III = p_0q_0 ; column IV = $p_1q_1-p_0q_0$; column V = $(p_1 + p_0)(q_1-q_0)/2$; column VI $(q_1 + q_0)(p_1-p_0)/2$.
Column VIII uses the same method as column VI to work out the effect of substitution on cotton (C), rayon (R), and synthetics (S). Hence C + R + S + W = 0, where W = column VI.
*M.R.R.—Market Research Report A.M.S.—Agricultural Marketing Service.

Table II (*Continued*).

Item	'Wool' as % of all fibres 1949	'Wool' use 1949	Change in 'Wool' use 1949-1959	Change due to :		Other fibre change due to substitution :			Presumed reasons for :			Sources for Cols. VIII, IX, and X.*
				'Fashion'	'Substitution'	Cotton	Rayon	Synth.	Dissatisfaction with wool	Satisfaction with other fibres	Preferring wool	
Column No. 1	II	III	IV	V	VI		VII		VIII	IX	X	XI
	%	Million lbs.										
5. Woven Carpets	97.4	158.2	−36.5	−13.8	−22.7	+1.4	+ 8.4	+12.9	*Living room floor* coverings : not mothproof, not soil resistant, doesn't clean easily, irritating, too warm, too expensive.	*Nylon :* easy to clean, mothproof, washable, inexpensive, soil resistant.	Wears well, nap doesn't wear off, colour fast, satisfactory past or present experience, gives warmth, looks dressy, rich.	M.R.R. No.279. Tables 37, 38, 46 and 48.
6. Tufted Carpets	—	—	+48.5	+22.2	+26.3	−88.7	+45.6	+16.8	*Master bedroom floor coverings :* not soil resistant, doesn't clean easily, extra nap fuzz comes off, not mothproof.	*Cotton* : washable, inexpensive, mothproof, variety of pretty colours. *Nylon* : easy to clean, soil resistant, washable, mothproof, not irritating, good texture.	Wears well, nap doesn't wear off, gives warmth, pleasant to walk on, soft, looks dressy, rich.	
7. Draperies	5.3	7.7	− 7.2	+ 4.8	−12.0	−35.0	+20.6	+26.4	*Living room draperies :* Not available.	*Cotton :* washes easily, can be laundered at home, durable. *Dacron, nylon :* washes easily, quickly, durable, looks nice, soil resistant. *Rayon :* durable, hangs well.	Not available.	M.R.R. No. 279. Table 17.
8. Unit priced dresses (street and formal wear)	5.3	8.5	+15.3	+ 2.8	+12.5	+28.7	−55.5	+14.3	*Between seasons dresses :* Not available. *Knit dresses :* Not available.	*Cotton :* easily washed, ironed, launders well, cool, absorbent, versatile. *Orlon :* washable, feels soft, non irritating, holds shape, doesn't stretch.	Warm, heavy, lightweight, holds shape, feels soft, dressy, feminine. Warm, heavy, durable, stands up well, dry-cleans well.	A.M.S. 378. Preliminary Release. Tables 5 and 6.

Notes : Let p = proportion of wool in each end use ; q = the quantity of all fibres in each end use and the suffixes 0 and 1 denote 1949 and 1959 respectively.
The column II = p_0 : column III = p_0q_0 ; column IV = $p_1q_1 - p_0q_0$; column V = $(p_1 + p_0)(q_1 - q_0)/2$; column VI $(q_1 + q_0)(p_1 + p_0)/2$.
Column VIII uses the same method as column VI to work out the effect of substitution on cotton (C), rayon (R), and synthetics (S). Hence C + R + S + W = 0, where W = column VI.

*M.R.R.—Market Research Report A.M.S.—Agricultural Marketing Service.

In other words this larger proportion would seem to be mainly the result of improved sales of garments which contain relatively more wool. Such changes in the ' fashion ' effect probably occur fairly regularly during the business cycle. Proportionately more garments made from wool are ' big ticket items ', e.g. men's and women's suits, overcoats, whose purchase is more likely to be postponed during periods of lower incomes than ' small ticket items ', e.g. underwear, blouses, socks. Hence in periods of recovery the ' fashion ' effect will give an unduly favourable impression of ' wool consumption ' and vice versa. Hence our study does not support the complacent view that the substitution of synthetics and cotton for wool has been reversed or even halted after 1958.

Important Areas of Inter-Fibre Competition

In this section it is proposed to examine those end uses where inter-fibre competition has been particularly marked—more specifically those areas where wool has lost more than 10 million pounds through the ' substitution ' of other fibres for wool (or vice versa). Eight types of garments or end uses are discussed in detail in this section.[6] Most of the information presented is summarised in table II. For each end use the change in wool consumption is split into a ' fashion ' and a ' substitution ' effect. This is followed by a column showing which fibres have gained at wool's expense and, approximately the extent of such gains. Lastly, reasons are given which may account for wool's loss of popularity in the individual cases. These were extracted from the U.S. Department of Agriculture surveys.

Sweaters. Synthetics—especially orlon—have largely supplanted wool as the predominant fibre for sweaters in the United States between 1952 and 1959. Taking men's, women's and children's sweaters as a single ' product ' this represents the largest individual loss sustained by wool in its competition with other fibres. Wool's loss of its share of the market was particularly great for women's sweaters (1949—76 per cent ; 1959—17 per cent), but large losses also occurred for children's and men's sweaters. In a survey in 1955 a sample of 2,425 U.S. women were interviewed to ascertain their attitudes toward wool and other fibres for sweaters. The leading appeal named by women of orlon or nylon for sweaters was the washability of these fibres. Other good points mentioned were softness and (for orlon) ability to hold shape—in that order. Wool's major drawbacks in the eyes of these consumers were difficulty of cleaning and laundering ; it was regarded as irritating next to the skin, and too warm.

Good qualities mentioned relatively more frequently for woollen sweaters than those made from rival fibres were : ' warmth ', ' stays new-looking ', ' attractive appearance '. Comparatively less dissatisfaction was recorded with orlon sweaters than woollen ones (orlon—21 per cent of persons interviewed ; wool 40 per cent). However, even

6. This is part of an examination of all end uses where wool consumption exceeded two million lbs. in 1949 or 1958. There were a total of 34 such end uses which accounted for 98½-99 per cent of all wool consumption. The tabular information regarding the whole 34 end uses is given in the Appendix.

more dissatisfaction was recorded for nylon (54 per cent) and cashmere (69 per cent). The main disadvantages of nylon and, to a lesser extent, orlon were that they sag, get knotty and are too cool. Cashmere's major drawback was its price.

Car upholstery, as defined by *Textile Organon* includes sidewalls, headlining, convertible tops as well as seat upholstery. Wool accounted for less than 2.5 per cent of the market in 1959, compared with almost half the fibre used ten years earlier.

Most of this decline had taken place by 1955 when the U.S. Department of Agriculture studied the market for fabrics and fibres for motor cars. Their study supplemented one undertaken five years earlier. ' The radical decline in wool's position as a preferred material (by executives of motor car manufacturing corporations) may be attributed to its continued high cost and to the creative styling achieved with synthetics, especially nylon, and blends of synthetics and natural fibres.'[7] Almost half of the 34 executives interviewed felt that ' there was nothing that could be done to wool which would increase its use because of its high cost and out-of-date appearance '.[8]

In motor car sidewall material, wool has been supplanted primarily by vinyl with cotton backing, probably because of its greater soil resistance, cleanability and substantially lower cost. Most executives (23 out of 32) considered that further laboratory work would not help to increase the use of wool as a sidewall fabric. Wool was regarded as too costly and not as attractive and popular as synthetics.[9]

7. *Market Research Report No.* 152, p. 23.

8. *Loc. cit.*, p. 52. " Of the group who made suggestions for improvements in wool, the majority stressed the point that wool would have to be developed to the point where it could compete in appearance with the modern styles and designs achieved by synthetics. Another group (11 of the 34 executives) stated that means would have to be found for reducing the cost of wool before it would gain acceptance as an automotive upholstery material. Others indicated that a luster or sheen has to be achieved with wool and that it needs improved dyeing and wear qualities and greater soil resistance. The following comments illustrate executives' opinions :

' Improve the ability of wool to take colour and get decorative patterns. Unfortunately we don't use wool as much as we used to, although we tried it and the patterns aren't anywhere near as sharp as synthetics. We can't get a change of pace with wool because it has no luster. Synthetics give much better wear for a lower price.

Wool will stay put for the quality look in very expensive cars but will go no further in other lines. Wool is out for lower priced cars except as a novelty or change of pace by no means in quantity. Laboratories should work on moisture resistance, increased coolness, cleanability, luster, strength, along with reducing its cost.

Wool people should meet the specifications of the manufacturers. For example, in vinyl we get very fine contemporary designs. The wool people should be in with synthetics manufacturers and work closely with them to develop wool as a backing or blending material. They can't fight synthetics alone ; they are too popular and cheaper.

Wool does not lend itself to piece dyed fabrics or synthetics. The wool people will not invest in looms that produce the patterns presently in vogue. Wool broadcloth is a terrific fabric but it's too expensive ' ".

9. " The executives who did suggest specific improvements for wool mentioned the need for longer wear, lower cost, greater soil resistance and modern textures and designs similar to those now popular with synthetics.

' Wool's cost must be brought down before it can be considered for sidewalling. Wool also should take on more of the synthetics' qualities such as cleanability, durability and better, more contemporary appearance '.

' A considerable reduction in price '.

' Develop a new nylon-wool combination which will wear well and look stylish ' ". P. 53, *loc. cit.*

According to *Textile Organon* wool's share of the *blankets* fibre market declined from 30 per cent in 1949 to less than 7 per cent in 1959. Most of this substitution has taken place since 1953. While the end-use figures for this item correspond with production figures for blankets made from different fibres (as published by the U.S. Census Bureau), they are at variance with a consumer survey undertaken by the U.S. Department of Agriculture in 1957. According to this survey ' wool was mentioned by almost one-half of the owners as the fibre content of the last blanket acquired, regardless of type ; another 13 per cent had wool blends '.[10] However, a warning is issued at an earlier stage in the report that ' the findings are presented as summaries of the statements made by respondents and are subject to any errors in their beliefs and attitudes. Perhaps more importantly, identification of fabrics and mixtures must definitely be considered as that of the respondents. Since no actual inventory was undertaken, it is possible that some fabrics referred to singly were, in fact, mixtures of several fibres, the predominant one being the only one volunteered. For other fabrics, the respondent's identification may have been completely in error '.[11]

It is, therefore, doubtful how reliable respondents' views of the advantages and drawbacks of different fibres for blankets are. However, for what they are worth, reasons for preferring wool and wool blends were ' warmth ', ' warmth without weight ', ' looks nice and comes in a variety of colours '. 20 per cent said that such blankets were ' durable and wore well '. Cotton was preferred by some consumers because it ' doesn't scratch or irritate the skin ', was ' easy to clean ' and ' relatively inexpensive '. Comparatively few respondents said that they used nylon blankets ; many of those who did, preferred them because of their ' warmth and lightweight ' ; they were also said to have ' desirable laundering characteristics ' (i.e. wash easily and dry quickly). " The small number of homemakers who had some criticism to make of their favoured fibre was largely concentrated among those selecting wool. Altogether 13 per cent of the group preferring wool expressed negative comments as compared with 6 per cent of those choosing cotton, 9 per cent for nylon and even less for other fibres and mixtures . . . The main complaints against wool were that it ' doesn't hold its shape—stretches or shrinks ', it ' scratches or irritates the skin ' and the ' wool comes off, gets linty or fuzzy ' ".[12]

Wool's share of total fibre consumption for men's *separate slacks and trousers* fell from 37 per cent in 1949 to 16 per cent in 1959. As a result of the trend towards lighter, more casual clothing, total fibre use in separate slacks more than doubled over this period. While wool and rayon consumption remained relatively static, cotton consumption increased sevenfold and synthetics—starting from a much smaller base—more than fiftyfold. According to a survey undertaken in 1956 men preferred cotton to wool in summer slacks because they were cool and washable. Dacron slacks were also favoured for these reasons and, additionally, because they were more wrinkle resistant. While wool had an advantage over all other fibres in holding shape, keeping a press, being dressier and able to be worn the whole year, proportionately more dissatisfaction

10. *Market Research Report No.* 279, p. 27.
11. *Loc. cit.*, p. 4.
12. *Loc. cit.*, p. 31.

was expressed with wool in summer slacks than with any other fibre.[13] The reasons, in order of importance, were ' too warm ', ' sticky, scratchy, stings ' and ' not washable, shrinks '.

Included in this item are boys' school pants. Here mothers expressed a strong preference for cotton during a 1958 survey. Good laundering characteristics, durability and appearance were the main reasons.

Traditionally woollen *carpets* have been woven, but a new process of " needling " or tufting the pile on to a backing has gained increasing popularity in recent years. Since tufted carpets have usually contained little wool, this change has affected wool use adversely.

In *woven carpets*—made almost wholly from wool in 1949—inroads have been made by other fibres. By 1952 wool's share of total fibre use had dropped below 75 per cent (from 97.5 per cent in 1949). However, since then wool has regained some ground ; its share of the market fluctuating between 77 and 87 per cent in recent years. Wool carpets gave rise to less dissatisfaction than those made from cotton.[14] The major reason for preferring cotton carpets would appear to be that they were cheaper ; whilst some consumers interviewed in 1957 preferred nylon carpets because they were easier to clean and were mothproof.

The major competition to wool in the carpet field has come from *tufted carpets* where sales have increased more than tenfold between 1949 and 1959, whilst the volume of woven carpet sales has declined by ten per cent. Tufted carpets are cheaper to produce because they are not woven in the traditional manner. Cotton was practically the only fibre used until 1952-1953. From then on it was being replaced rapidly by rayon which accounted for 60 per cent of the market in 1956. Since then rayon has been replaced partially by wool and synthetics. In 1959 rayon accounted for about two-fifths of all fibres used in the tufting of carpets, wool one-fifth, cotton a quarter and synthetics the remainder. According to U.K. sources tufted carpets made entirely from rayon did not wear so well and some people also criticised their appearance ; hence the present trend in the United Kingdom is to manufacture such carpets half of rayon and half of wool, but the ratio varies among manufacturers.[15]

Although wool did not account for an important share of the market in *draperies, upholstery and slip covers* in 1949, it has since lost almost 95 per cent of its market in this field. According to a 1957 survey, most homemakers owned and preferred cotton and cotton mixtures in living room draperies with rayon next in ownership and preference. Draperies made from wool were not mentioned separately. Plastic and fibreglass were also important materials in this field. The reasons for the popularity of the different fibres were mainly concerned with laundering qualities and durability.

Street and formal wear dresses (called ' unit priced dresses ' in the *Textile Organon* statistics) is the other important item apart from tufted carpets where wool has steadily gained a larger share of the market each year since 1953. (1949—5.3 per cent ; 1959—12.4 per cent.) This

13. The percentage of consumers who expressed dissatisfaction with their preferred fibre for summer slacks was as follows : wool 13%, dacron 12%, cotton and rayon 11%, cotton 10%, rayon 10%, wool and rayon 10%, other wool mixtures 7%, other cotton mixtures 5%.
14. *Market Research Report No.* 279. Table 47.
15. *Financial Times*, 12th January 1960.

may be the result of the growing popularity of fully fashioned knitted dresses where wool probably accounts for more than half the market. Improved machinery for fully-fashioned knit garments has probably assisted this trend. In a survey in 1959 consumers were asked their reasons for preferring wool or orlon for such dresses ; wool was preferred because of its warmth and durability, whilst orlon was preferred because it ' can be laundered ' and ' feels soft ', ' doesn't itch '. The main gains in this field have been at the expense of rayon, with wool obtaining about a quarter of rayon's loss and cotton more than half. For between-season dresses, wool was second in fibre preference to cotton and rayon third (1959 survey—the relative percentages being cotton 18 per cent, wool 13 per cent, rayon 11 per cent, silk 9 per cent ; the remaining preferences were split between mixtures, dacron, linen and others). For such dresses wool scored more highly than cotton for its warmth, weight, ability to hold shape, softness and good appearance. Cotton was preferred because of its better laundering qualities.

Some Possible Inferences for Research and Promotion Expenditure

Trends in wool consumption in the United States are important, partly because the U.S. is a large market for wool—in spite of the decline in per capita consumption it remains the largest single national market. But of greater importance is the likelihood that trends in the United States may be repeated elsewhere. Basically there are two reasons why such a development might be expected. (a) U.S. consumers have had longer experience with some of the newer synthetic fibres which have taken part of wool's share of the market. But consumers in most western European countries (and in Australia) are increasingly being offered the same fibre alternatives which the U.S. consumer has enjoyed during the last seven or eight years. While end-use estimates are not available for other countries, it appears that wool is losing ground in Australia (and possibly elsewhere) in many of the same end uses where it has lost ground in the United States. Obvious examples are women's sweaters, car upholstery and men's slacks. (b) U.S. consumers enjoy higher per capita incomes than those in most other countries. Wool consumption trends in other countries may parallel those of the United States as consumers in other countries become equally affluent and as able to afford washing machines, heated motor cars and airconditioning. Although Japanese wool consumption has grown rapidly in recent years, about two-thirds of world wool consumption still takes place in the higher income areas of North America, Western Europe and Oceania.

This is not to deny that there are special features in the United States which are likely to affect wool consumption. The tariff on imported apparel-type wool which, at present prices, adds between 15 and 25 per cent to the landed price of such wool is an obvious example. However, price is only one of the factors influencing inter-fibre competition. It seems likely that the trend away from wool in the United States has been largely the result of non-price factors. Whilst inter-fibre competition in other high-income areas may differ somewhat from the U.S. pattern, broad trends of fibre consumption in Western Europe for instance could easily parallel U.S. developments—unless wool producers engage in a determined, positive and imaginative counterstrategy.

The design of a counter strategy for the wool industry calls for a profound knowledge of textile technology and fashion trends which we cannot claim to possess. Our comments here are based on the con-

clusions which our analysis, plus a cursory reading of the technical literature, suggests to us ; they may need to be modified in the light of what is technically (and financially) possible in the laboratory, the textile mill, in market research and in advertising.

While wool has been replaced by other fibres in a large number of end uses, it is evident that this displacement has not been uniform. Our data (cf. table II and the appendix) suggest that it has been particularly marked in certain fields and that it is usually possible to find perfectly plausible reasons for such displacement. This conclusion would seem to have important implications for a promotion policy on behalf of wool. It is generally realised now that wool promotion in the past has been largely ineffective because it has concentrated on promoting wool as a fibre rather than particular woollen garments or other articles made from wool. But the corollary which is sometimes drawn from this, namely that what is required is simply much more advertising of woollen products is unlikely—at least by itself—to counter existing trends. While the promotion of synthetics has probably raised their sales, permanent gains seem to have been achieved mainly in those areas where synthetics have been able to offer consumers certain qualities and choices not previously available to them. Where performance has not warranted wool's displacement by synthetics—e.g. in regular weight suits where the manufacturers of dacron engaged in an aggressive advertising campaign—little worthwhile benefit has accrued to the sponsors of such campaigns. The unsuccessful attempt to establish a market for ardil, a U.K. synthetic substitute for wool, is another example that aggressive advertising cannot guarantee success in the competition between fibres. As a result promotion of synthetics in recent years has concentrated on informing consumers of the useful, new qualities which their products have to offer. Such promotion, at least by implication, usually draws attention to certain grounds for dissatisfaction or to disadvantages of products made from traditional fibres. It is doubtful how effectively this type of activity can be countered merely by stressing the virtues of traditional fibres. As Gutman and Fead have pointed out : ' Wool has been known and used as a raw material for several thousand years. Many of its properties are well known and it has penetrated to most of the end uses for which it is adapted. People are familiar with it . . . '.[16]

The elements for a more effective strategy for wool would seem to us then to consist of :

(a) Obtaining much more adequate information on the end uses for wool in major consuming countries than is at present available (except in the U.S.). Unless careful statistical estimates are made of those fields where wool is actually being used and how its consumption compares with rival fibres, large sums can be wasted on promotion. Such information is necessary not only to ascertain where wool is threatened (or gaining) but also to obtain data on the success of any counter-measures which may be undertaken. In other words it is probably necessary to undertake end use studies—of the type currently conducted in the U.S. by synthetics and cotton interests—in other major wool consuming re-

16. " Competition between Fibres " by G. O. Gutman and M. Fead, A.N.U., Wool Seminar (roneod), p. 17.
On the other hand it may be true of the United States—especially of younger age groups—that they are less familiar with wool than with synthetics. For these groups informational advertising is probably of value.

gions.[17] It is significant that even manufacturers of synthetics—who presumably have much more adequate notions of the end uses of their products simply from examining their order books—have found it worth while to spend substantial sums on statistical estimation of this kind. Again those responsible for the effective promotion of cotton in the United States have found it essential to engage in this type of study.

(b) Follow up these end-use studies by properly planned and designed surveys of consumers and retail outlets. The function of such surveys would be to ascertain consumers' views of the strengths and weaknesses of wool and of competing fibres in the individual end uses. Information on what consumers consider to be the good qualities of wool (and the weaknesses of competing fibres) is required partly for designing more effective advertising campaigns. However, it was suggested above that the mere stressing of such good qualities of wool—relative to its rivals—is unlikely to be sufficient *by itself.* This brings us to the most important element of a counter strategy for wool :

(c) *Launch and promote products which meet the consumers' criticism of wool and the good points of synthetics.* The qualities needed in such ' new ' products will obviously vary in the different end uses. However, the following would seem to be the major weaknesses of wool mentioned by U.S. consumers :

(i) *Warmth.*

Warmth is, of course, one of the major attractions of woollen fabrics. It is noticeable that in those end uses where warmth is obviously of major importance—such as men's regular-weight suits and overcoats—wool has usually held its own or even gained slightly at the expense of other fibres. However, the advent of heated motor cars and air-conditioning has reduced the necessity for warm clothing for many affluent consumers. Hence the need to provide consumers with the alternative of more lightweight materials made from wool. We understand that the main limitations on making lightweight articles from wool is fibre strength. In the spinning process a thick sliver of wool is gradually drawn and twisted until it reaches the desired diameter. The finer the thread the longer the process of drawing and the greater the number of breakages. Breakages will probably be more serious and costly for fibres such as wool which are relatively weaker.

There seem to be two possibilities of overcoming this problem. The first, and the better from a long run point of view, is research to provide an economic method of raising fibre strength (whilst not affecting other ' good ' properties such as handle). But this is obviously a long-term solution which is unlikely to produce much practical benefit in the near future. In the meantime launching and promoting certain types of blends may be the second-best alternative.

Our attitude to the promotion of blends seems to be based largely on emotional considerations rather than a careful consideration of the issues involved. A proper perspective on these issues is perhaps best obtained by examining why synthetics manufacturers are willing to carry

17. Shortages of funds and trained staff will probably limit the volume of work along these lines which can be undertaken. Priorities should be given to products where (a) inter-fibre competition is particularly marked, (b) special promotional activities are undertaken. Priority should also be given to countries where changes in wool consumption (upward or downward) are likely to be greatest.

out costly research on the properties of blends, and then proceed to launch and promote certain types of ' mixed ' fabrics. For them too, blends constitute a second-best alternative. But synthetic producers realise that, given the present state of their technical knowledge, they can most easily overcome some of the disadvantages of their fibres, such as lack of warmth and handle, by the use of a minimum quantity of competing natural fibres such as wool. In the absence of such blends consumers would prefer garments made from rival fibres like wool. Hence the promotion of blends enables synthetic manufacturers to increase the demand for their product.

The wool industry is confronted with a similar situation. Wool at present has some disadvantages such as lack of strength. According to some authorities the addition of small percentages of synthetic fibre to wool exerts a marked effect on the strength of the yarn. Replacing 20 per cent of the wool with synthetics leads to a substantial increase in the fineness of the yarn which can be produced. The tensile strength of a fabric made from an 80/20 wool-nylon mixture may be increased by 50 per cent over an all-wool fabric and its durability by 100 per cent or more.[18] If this information is correct, it would seem a better policy for wool interests to launch and promote 80/20 blends which overcome some of the problems which beset pure wool products than allow 50/50 blends—or even pure synthetic fabrics—to capture a large share of the market by default. Whilst both wool and synthetics interests therefore have an incentive to promote blends they will ordinarily promote blends in very different proportions.[19] While such a policy may not be easy to apply in practice (or to defend in front of an audience of woolgrowers) the criterion as to whether a blend should or should not be promoted is very simple : will it or will it not increase the overall demand for wool in this particular field of end use ?

(ii) *Ease of washing.*

The easy care characteristics of cotton and synthetic fibres have been a major factor affecting wool consumption in a number of important end uses such as sweaters, slacks, men's socks and blankets. Important progress has been made by research workers in overcoming this disadvantage of wool. However, it still remains necessary to convince the consuming public that duly treated woollen garments can be washed with impunity. To build up a desirable ' image ' of wool every effort should be made to ensure that, in the type of garments where easy care characteristics are of importance, all woollen fabrics are treated by one of the available processes to improve washability. Synthetics manufacturers achieve some control over the quality of the products made from their fibres by denying any promotion assistance to textile mills whose products do not conform to their rigid quality standards,[20] A similar

18. " The Influence of Man-Made Fibres on Wool ", by A. Johnson, *Textile Manufacturer*, Vol. 81, No. 970 (October 1955), pp. 514-515.

19. There may be occasions when wool and synthetics producers have a common interest in the promotion of a blend. For instance in the U.S. men's socks market it seems possible that synthetic/wool blends have taken away some share of the market from cotton. In this type of situation—which is probably rather rare—wool producers may gain from making common cause with synthetics.

20. " Wool Consumption Trends in Western Europe and the United States ", *Wool Economic Research Report No.* 3 ; January 1961, Bureau of Agricultural Economics, Canberra, Australia, p. 32.

policy would seem advisable for wool. In other words wool interests should encourage the adoption of new wash-and-wear treatments in certain fields by generous assistance with promotion campaigns for manufacturers who adopt these treatments, whilst refusing any assistance to those who market untreated goods.

(iii) *Irritability.*

A large proportion of U.S. consumers surveyed mentioned irritability as an important drawback of fabrics made from wool and contrasted such fabrics unfavourably with the soft feel of fabrics made from rival fibres or sometimes wool mixtures. This is another area where further research work is likely to supply the most satisfactory long-run solution. In the meantime other short term expedients may be useful. It is understood that irritability is largely the result of the inclusion of coarser wools (or re-used wool) in fabrics. The launching and promotion of special fabrics made of fine wool, which are guaranteed to be soft and have a comfortable feel would probably have a beneficial effect on wool's competitive position in such end uses as men's separate coats, sports shirts, lightweight suits, men's and women's sweaters, knit dresses, skirts, and blankets.

(d) Our suggestions so far have a defensive ring about them. In other words we have largely concentrated on measures designed to counter the threat of synthetics. Such an approach flows naturally from an examination of the past and the displacement of wool by other fibres which has taken place. But there is no reason why the same techniques cannot be used to find new uses for wool, or to encourage the more rapid growth of wool consumption in those end uses where it has been gaining a gradually larger share of the market. Tufted carpets and fully fashioned knitwear are perhaps the most important examples here. In both cases wool's gains have tended to be relatively slow whilst manufacturers gradually discovered for themselves the benefits of wool in these comparatively new fields.

The elements of an effective counter-strategy for wool which have been listed above are not meant to be exhaustive. For instance no comment was made on the need for technical liaison, that is ensuring that research techniques are fully applied commercially and in case they are not, ascertaining the possible ' snags ' to their adoption. These omissions are justified here because our findings have little bearing on such facets of a research-cum-promotion policy for wool.

Finally we must justify another omission—the absence of any reference to methods of countering the decline in wool consumption which has been the result of our ' fashion ' effect. This is because little is definitely known regarding the reasons for the changes described by our ' fashion ' effect and whether these can be influenced in any way. A cursory glance at the data shows that the ' fashion ' effect has had adverse consequences for wool consumption in such important end uses as men's and women's suits and coats, woven carpets and car upholstery. It seems to us that it would probably be more difficult to counter such trends than those resulting from the substitution of other fibres for wool. Promotion in the form of advertising can probably contribute most in this direction. However, no direct evidence on this point is available. Manufacturers of synthetic

fibres have probably taken more advantage of whatever possibilities exist in the field of channelling consumer spending into those areas where their fibres show themselves to greatest advantage.[21] But we have no new information to offer on this subject.

21. e.g. " The Manufacturers of synthetics fibres are said to make full use of the established channels of fashion by sponsoring the creation by Paris fashion houses of models in fabrics made from their fibres ". *Wool Economic Research Report No.* 3, *op. cit.*, p. 18.

APPENDIX

Changes in Wool Consumption in Major End Uses

A. *Men's and Boys' Wear, Selected Items.*

Item	'Wool' as % of all fibres 1949	'Wool' use 1949	Change in 'Wool' use 1949-1958	Change due to :		Other fibre change due to substitution		
				'Fashion'	'Substitution'	Cotton	Rayon	Synth.
Column No. I	II	III	IV	V	VI		VII	
	%	Million lbs.						
1. Suits, Regular-weight.	91.2	49.6	−10.8 (− 6.7)	−11.2 (− 8.2)	+ 0.3 (+ 1.5)	—	− 1.1	+ 0.8
2. Outdoor Jackets & Uniforms	32.3	23.8	+ 6.6 (+10.9)	O (+ 4.3)	+ 6.6 (+ 6.6)	− 2.9	− 6.1	+ 2.5
3. Slacks	37.5	23.5	− 5.3 (− 0.4)	+12.4 (+22.5)	−17.7 (−22.9)	+28.3	−21.6	+11.0
4. Overcoats	92.0	20.6	− 4.9 (n.a.)	− 5.6	+ 0.7	+ 0.2	− 0.9	—
5. Sweaters	81.9	14.5	− 0.1 (+ 2.6)	+ 7.8 (+11.8)	− 7.9 (− 9.2)	+ 1.7	− 1.2	+ 7.5
6. Separate Coats	80.3	9.8	+ 3.3 (n.a.)	+ 3.6	− 0.3	—	—	+ 0.3
7. Socks	9.8	8.5	+ 0.4 (+ 1.8)	− 0.9 (− 0.3)	+ 1.3 (+ 2.1)	− 5.0	− 7.4	+11.1
8. Sports shirts	7.1	6.2	− 1.0 (− 1.3)	+ 3.0 (+ 3.5)	− 4.0 (− 4.8)	+ 17.7	− 15.7	+2.0
9. Suits, Lightweight	50.5	4.7	− 0.1 (+ 0.4)	+ 0.8 (+ 1.8)	− 0.9 (− 1.4)	+ 0.1	− 3.6	+ 4.4
10. Robes, Smoking Jackets & Neckties.	30.3	4.9	− 1.3 (n.a.)	+ 0.3	− 1.6	+ 3.1	− 2.1	+ 0.6
11. Business shirts.	3.7	3.3	− 1.8 (− 2.3)	− 0.4 (− 0.3)	− 1.3 (− 2.0)	+ 0.8	− 0.7	+ 1.3
12. Underwear—knitted	2.7	2.3	− 1.0 (n.a.)	+ 0.5	− 1.5	+ 0.2	+ 0.3	+ 1.0

B. *Women's, Misses' and Juniors' Wear, Selected Items.*

Item	'Wool' as % of all fibres 1949	'Wool' use 1949	Change in 'Wool' use 1949-1958	Change due to :		Other fibre change due to substitution		
				'Fashion'	'Substitution'	Cotton	Rayon	Synth.
Column No. I	II	III	IV	V	VI		VII	
	%	Million lbs.						
1. Coats	94.3	74.8	−14.0 (−13.6)	− 5.0 (− 1.0)	− 9.0 (−12.6)	+ 0.8	+ 3.1	+ 5.2
2. Suits	76.7	27.0	−15.2 (−12.8)	−11.8 (− 9.8)	− 3.4 (− 3.0)	+ 0.4	+ 0.9	+ 2.1
3. Sweaters	75.7	16.2	− 5.7 (− 6.9)	+12.8 (+15.4)	−18.5 (−22.3)	+ 0.7	− 0.4	+18.2
4. Skirts	36.9	14.0	+14.0 (+24.0)	+14.5 (+21.3)	− 0.5 (+ 2.7)	+10.0	−11.7	+ 2.3
5. Unit priced dresses (for street & formal wear).	5.3	8.5	+11.4 (+15.3)	+ 1.3 (+ 2.8)	+10.1 (+12.5)	+27.2	−46.9	+ 9.6
6. Lounge-wear (bath beach robes etc.).	10.6	3.5	− 2.6 (n.a.)	− 1.3	− 1.3	− 1.8	+ 1.3	+ 1.8
7. Slacks & slack suits & jackets	23.8	2.9	+ 4.8 (+ 5.9)	+ 5.4 (+ 6.6)	− 0.6 (− 0.7)	+ 6.3	− 6.0	+ 0.3
8. Blouses & shirts	4.6	2.3	+ 0.7 (− 0.1)	+ 1.4 (+ 1.5)	− 0.7 (− 1.6)	+23.9	−33.0	+ 9.8
9. Nightwear knitted	9.5	1.2	− 1.1 (− 1.1)	+ 0.2 (+ 0.3)	− 1.3 (− 1.4)	+ 2.2	− 5.3	+ 4.4

C. *Girls', Children's and Infants' Wear, Selected Items.*

Item	'Wool' as % of all fibres 1949	'Wool' use 1949	Change in 'Wool' use 1949-1958	Change due to :		Other fibre change due to substitution		
				'Fashion'	'Substitution'	Cotton	Rayon	Synth.
Column No. I	II	III	IV	V	VI		VII	
	%	Million lbs.						
1. Coats & Jackets	70.9	18.5	− 1.9 (− 0.1)	+ 2.2 (+ 5.5)	− 4.1 (− 5.6)	+ 1.8	+ 1.4	+ 0.9
2. Sweaters	69.2	5.4	− 2.9 (− 2.6)	+ 1.0 (+ 1.6)	− 3.9 (− 4.2)	− 1.1	+ 0.1	+ 4.9
3. Suits & Skirts	48.4	3.0	+ 0.7 (+ 1.2)	+ 2.0 (+ 2.9)	− 1.3 (− 1.7)	+ 1.2	− 0.1	+ 0.2
4. Other outerwear	4.3	2.7	− 0.1 (n.a.)	+ 1.4	− 1.5	+ 0.5	+ 0.6	+ 0.3

D. *Home Furnishings, Selected Items.*

Item	'Wool' as % of all fibres 1949	'Wool' use 1949	Change in 'Wool' use 1949-1958	Change due to :		Other fibre change due to substitution		
				'Fashion'	'Substitution'	Cotton	Rayon	Synth.
Column No. I	II	III	IV	V	VI		VII	
	%	Million lbs.						
1. Blankets & blanketing	30.8	24.4	−13.8 (−16.4)	+ 5.4 (+ 7.2)	−19.2 (−23.6)	−18.2	+24.3	+13.1
2. Draperies & upholstery & slip covers	5.3	7.7	− 7.3 (− 7.2)	+ 3.8 (+ 4.8)	−11.1 (−12.0)	−25.3	+16.9	+19.5

E. *Other Consumer Type Products, Selected Items.*

Item	'Wool' as % of all fibres 1949	'Wool' use 1949	Change in 'Wool' use 1949-1958	Change due to :		Other fibre change due to substitution		
				'Fashion'	'Substitution'	Cotton	Rayon	Synth.
Column No. I	II	III	IV	V	VI		VII	
	%	Million lbs.						
1. Retail piece goods	11.5	27.0	− 8.4 (− 7.8)	− 1.6 (− 1.4)	− 6.8 (− 6.4)	+12.6	−11.1	+ 5.3
2. Apparel linings	16.2	25.4	— (+ 4.4)	+ 3.7 (+10.1)	− 3.7 (− 5.7)	+ 8.9	−15.3	+ 10.2
3. Handwork yarns	39.4	10.6	− 4.8 (n.a.)	− 3.3	− 1.5	− 0.2	− 0.1	+ 1.8

F. *Industrial Uses, Selected Items.*

Item	'Wool' as % of all fibres 1949	'Wool' use 1949	Change in 'Wool' use 1949-1958	Change due to :		Other fibre change due to substitution		
				'Fashion'	'Substitution'	Cotton	Rayon	Synth.
Column No. I	II	III	IV	V	VI		VII	
	%	Million lbs.						
1. Transportation, upholstery	47.2	38.5	−37.1 (−36.8)	− 5.4 (− 3.2)	−31.7 (−33.6)	+16.0	+10.2	+ 5.5
2. Felts	57.1	31.3	− 5.0 (− 1.2)	− 9.6 (− 6.0)	+ 4.6 (+ 4.8)	− 7.8	—	+ 3.2

G. *Carpets.*

Item	'Wool' as % of all fibres 1949	'Wool' use 1949	Change in 'Wool' use 1949-1958	Change due to :		Other fibre change due to substitution		
				'Fashion'	'Substitution'	Cotton	Rayon	Synth.
Column No. I	II	III	IV	V	VI		VII	
	%	Million lbs.						
1. Woven face yarns	97.4	158.2	−66.0 (−36.5)	−38.2 (−13.8)	−27.8 (−22.7)	+ 1.6	+ 8.7	+17.5
2. Tufted face yarns	—	—	+27.2 (+48.5)	+12.3 (+22.2)	+14.9 (+26.3)	−79.0	+50.0	+14.1

Notes : Let p = proportion of wool in each end use ; q = the quantity of all fibres in each end use and the suffixes 0 and 1 denote 1949 and 1958 respectively. Then column II = p_0 ; column III = p_0q_0 ; column IV = $p_1q_1-p_0q_0$; column V = $(p_1 + p_0)(q_1-q_0)/2$; column VI $(q_1 + q_0)(p_1-p_0)/2$.

Column VII uses the same method as column VI to work out the effect of substitution of cotton (C), rayon (R) and synthetics (S). Hence C + R + S + W = 0, where W = column VI.

Figures in brackets in columns IV, V and VI give the change for the period 1949-1959 where it is available.