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Manufacturing trade: The changing demand for apparel in New Zealand and import protection

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Manufacturing trade

The changing demand for apparel in New Zealand and import protection

NZ Trade Consortium working paper no 40

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The New Zealand Trade Consortium

in association with the

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Preface

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Abstract

New Zealand import protection was been reduced from amongst the highest in the developed world in the 1980's to about the OECD average in 1999. At that point, Government stopped further reductions that had been planned. That policy has left import protection on apparel goods (clothing and footwear) at high levels and restricted imports from many important trading partners, particularly in Asia. Future import protection in apparel goods may need to be revisited as New Zealand continues negotiations on free trade agreements with China and other countries. The consumer gains that could be made from further reductions in apparel tariffs and anti-dumping duties will be influenced by recent market changes in New Zealand. Markets have changed a great deal over the last few decades in response to a range of demand and supply side factors. This paper reports on consumer demand elasticities estimated over the last twenty years for apparel items purchased by New Zealand households that would be useful in evaluating further reductions in import protection. The Rotterdam model parameter estimates indicate that the demand for particular apparel items has been very price-elastic with significant cross-price elasticities. This would imply that the overall consumer gains from reductions in import protection for apparel might be less than in the past.

JEL codes

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1. Introduction

The standard textbook explanation for continuing protection against imports of clothing and footwear products, apparel, in higher income countries is largely couched in distributional terms. The (almost Rawlsian) argument goes that apparel is produced at home by lower income workers and demanded by all consumers. So, while there are efficiency gains to be made from unilateral free trade in these goods, the balance of distributional effects means that lower income workers benefit from continuing tariffs, quotas and anti-dumping actions, more than lower income consumers lose. Infant industry and regional development arguments are also used.

The story has been generally accepted in New Zealand and has led historically to widespread import protection against apparel imports, particularly from Asia. The protection afforded the apparel sector in New Zealand took the form of import selection often with specific tariffs applied, and by anti-dumping duties. The level and type of protection over a long period of time in New Zealand¹ induced structural changes that strongly influenced consumer choice – and in interesting ways. For example, the ad valorem equivalent tariff on expensive shoes was often lower than on cheaper shoes, with obvious distributional consequences. It created an incentive in New Zealand to produce less expensive shoes – that is where New Zealand's comparative disadvantage was strongest.

Gibson and Lattimore (1991) provided evidence that cast doubt on the producer and worker benefits of import protection up to 1981 by showing that small regional economies and more labour intensive firms were not the major beneficiaries of the import protection policy. Deardorff and Lattimore (1999) reinforced these conclusions by showing that the import substitution sector (including apparel) of the New Zealand economy tended to employ relatively higher qualified (skilled) workers than the exportable sector. Accordingly, by Stolper-Samuelson, lower waged workers would benefit from trade liberalisation rather than import protection.

Over the last 25 years import protection for the apparel and all other import competing sectors has been significantly reduced in New Zealand but it has been most gradual in the case of apparel, WTO (2003) and Lattimore (2003).² In fact, the studies just cited demonstrate that apparel is one of the few areas where there are still significant tariffs in New Zealand: a pattern that mirrors that of many other developed countries. Not surprisingly, there is also evidence that tariff reductions in New Zealand have been

¹ Anti-dumping legislation from 1908 and an import selection policy (import licensing plus tariffs) from 1938.

² While average levels of import protection are significantly lower than they were, there are very distinct tariff peaks. The WTO reported recently that the highest New Zealand tariff currently in force is a specific apparel tariff of 136 percent, WTO (2003).

accompanied by increasing anti-dumping actions and levies, Garcia and Baker (2005).

Import protection of the apparel industries by New Zealand and many other higher income countries has disadvantaged the growth prospects, through trade, of the developing countries with a comparative advantage in those commodities. More recently, there have been a number of important world market developments that are increasing import pressure. The entry of China into the WTO world trading system and New Zealand's desire to negotiate a free trade agreement with that country, and others, means that further adjustments will need to be evaluated in the future.

The demand side of the welfare cost argument has received much less attention in New Zealand because there has never been a complete demand system model estimated for consumption goods including apparel. Previous studies in New Zealand, e.g. Micheline (1999), estimated a one-stage demand system with apparel (or clothing) as one of the aggregate goods, and the focus in this study was primarily on the substitution possibilities between apparel as a whole and other items of household expenditure.

This paper is an attempt to expand the availability of demand parameters using more recent data to see whether there are grounds for believing that the structural changes that occurred primarily during the last two decades are having effects that would influence the size of the consumer benefits from further trade liberalisation in apparel items. The paper provides estimates of price elasticities of demand for apparel disaggregated into eight subgroups.

To this end, a Rotterdam apparel demand system is estimated for this paper using time series data from the household economic survey, 1981 to 2004. Besides allowing adding up of the subgroup demand equations (1) to the group demand equations (2), an advantage of the Rotterdam model of consumer demand is that the matrix of substitution effects can be easily required to be negative semi definite during estimation. In a study of effects of mergers of companies producing close substitutes (brands), Capps et al. (2003) found the Rotterdam model to be more likely to accommodate the restrictions implied by demand theory – these restrictions being required for the demand system to be consistent with utility maximizing behaviour. The Rotterdam model is of course flexible enough to also allow complementarity between goods as can happen in the case of product types (e.g. Theil and Clements, 1987). Another advantage of the Rotterdam model over the equally flexible models like the AIDS is that the variables appear in their first differences. Typically, this makes the variables in a regression stationary, in order to allow the standard asymptotic tests of hypotheses.

2. A Rotterdam Model of Apparel Expenditures

The New Zealand Household Expenditure Survey (HES) reports total consumer spending classified into seven groups: (A) food, (B) housing, (C) household operation, (D) apparel, (E) transport, (F) other goods, and (G) other services. Each of these groups is classified further into subgroups. For example, the main subgroups of apparel are: (1) men's clothing, (2) women's clothing, (3) children's clothing, (4) other clothing (e.g. infants), (5) clothing supplies & services, (6) men's footwear, (7) women's footwear, and (8) children's footwear.

Weak separability of consumer preferences in apparel allows estimation of elasticities of demand within this group (e.g. men's clothing with respect to price of women's footwear) *conditional* on the budget allocated to this group. However, if we need to estimate elasticities of demand for any of the apparel subgroups with respect to price of a subgroup belonging to any of the other groups (e.g. men's clothing with respect to price of a food subgroup like *eating out*), then a two-stage budget model can be used if consumer preferences were weakly separable in apparel and the other groups.

Demand for any of the apparel subgroups conditional on budget allocated to that group (group D) can be estimated by using an absolute price version of the Rotterdam model (as reformulated by Theil and Clements (1987) in order to incorporate Working's (1943) non-linear specification of the Engel curves). A further inclusion of an intercept in each of the equations in the Rotterdam model allows trend-like changes in tastes over time:

$$s_{iD} \Delta \ln \frac{x_i}{X_D} = \tau_i + \alpha_{iD} \Delta \ln X_D + \sum_{j \in D} \gamma_{ij} \Delta \ln p_j, i \in D \quad (1)$$

where: p_i , x_i and $s_{iD} (= p_i x_i / \sum_{j \in D} p_j x_j)$ represent price, quantity demanded

per capita, and budget share respectively of the i th commodity in group D, and $\Delta \ln X_D = \sum_{j \in D} s_{jD} \Delta \ln x_j$ is the Divisia aggregate quantity index of

group D in the percentage change form.

The variable X_D itself, implied by this aggregation, is a measure of the total quantity of apparel expressed as a composite commodity. The coefficient α_{iD} measures the difference between marginal and average budget share of good i in group D, while the price coefficients γ_{ij} represent the substitution effects conditional on the budget allocated to this group. The adding up, symmetry and homogeneity restrictions of consumer demand theory are satisfied when the coefficients are such that $\sum_{i \in D} \tau_i = 0$, $\sum_{i \in D} \alpha_{iD} = 0$, $\gamma_{ij} = \gamma_{ji}$

and $\sum_{j \in D} \gamma_{ij} = 0$. Concavity requires the additional restriction that the matrix of the γ_{ij} coefficients be negative semi-definite.

Elasticities of demand for goods in group D with respect to the overall consumption expenditure (rather than the group D expenditure) requires estimation of the demand system at the next higher level of aggregation, i.e. a demand system for the expenditure groups, $g = A, \dots, G$. If consumer preferences are weakly separable in these groups, the absolute price version of the Rotterdam model at this level of aggregation is:

$$s_g \Delta \ln \frac{X^g}{X} = \tau_g + \alpha_g \Delta \ln X + \sum_{h=A}^G \gamma_{gh} \Delta \ln p_h^*, \quad g = A, \dots, G \quad (2)$$

where s_g = average budget share of group g in total expenditure on consumption, $\Delta \ln X = \sum_{h=A}^G s_h \Delta \ln X_h$ is the Divisia aggregate of consumption in the percentage change form, and $\Delta \ln p_h^* = \sum_{j \in h} \beta_{jh} \Delta \ln p_j$ is the *Frisch* price index of group h with $\beta_{jh} = \alpha_{jh} + s_{jh}$ being the marginal budget share of good j in group h . Trends in consumption at the group level are represented by the parameters τ_g satisfying the restriction $\sum \tau_g = 0$. Differences between marginal and average budget shares of group g is given by α_g such that $\sum \alpha_g = 0$. The group demands are also subject to the restrictions $\sum_h \gamma_{gh} = 0$, with the matrix of γ_{gh} values being symmetric and negative semi-definite.

The elasticities of demand for goods in group D with respect to the overall consumption budget (y) are given by:

$$\varepsilon_{iy} = (\alpha_{iD} + s_{iD})(\alpha_D + s_D)/(s_{iD}s_D), \quad i \in D \quad (3)$$

The compensated price elasticities of demand for goods in D, allowing real group expenditure allocation to change owing to price changes relative to the other groups but still holding real total expenditure the same, are:

$$E_{ij}^* = (\gamma_{ij} / s_{iD}) + (\gamma_{DD} \beta_{iD} \beta_{jD}) / s_{iD}s_D \text{ for all } i, j \in D$$

$$\text{or } (\gamma_{Dh} \beta_{iD} \beta_{jh}) / s_{iD}s_D \text{ for all } i \in D \text{ and } j \in h \neq D \quad (4)$$

The overall price elasticities of demand for goods in D including both income and substitution effects are:

$$E_{ij} = E_{ij}^* - s_{jh}s_h\varepsilon_{iy}, \text{ for all } i \in D \text{ and } j \in h = A, \dots, G \quad (5)$$

Note that the group demand system (2) can be estimated only if the Frisch price indices were available. This requires prior estimation of all α_{jh} values, i.e. estimation of conditional demand systems for each of the consumption groups.

3. Data

An eight-commodity classification of apparel along with the classifications used for all the other consumption groups are laid out in Table 1.

Table 1: Consumption groups and sub-groups

Groups	Subgroups
Food	Fruits & vegetables, meat, poultry, fish, farm products, fats & oils, cereals & cereal products, sweet products, spreads, beverages & other foodstuffs, meals away from home, & ready to eat food.
Housing	Rental housing & owner occupied housing.
Household operations	Fuel & power, home appliances, household equipment & utensils, furniture & furnishings, floor coverings, household textiles, household supplies, & household services.
Apparel	Men's clothing, women's clothing, children's clothing, clothing not elsewhere classified, clothing supplies & services, men's footwear, women's footwear, and children's footwear.
Transport	Public, private, overseas transport.
Other goods and services	Tobacco, alcohol, medical, toiletries & cosmetics, personal goods, leisure & recreational goods, recreational vehicles, health services, & personal services

Data on weekly expenditure per household, average household size and prices were obtained from Statistics NZ. The household economic survey (HES) was used for expenditure data from 1981-2004, while the corresponding data on prices came from the consumer price index (CPI) series. The HES surveys approximately 3,000 private households in NZ. Data were collected annually until 1998 when the survey switched to once every three years.³ The HES is subject to sampling and some non-sampling error. Non-sampling error arises in a variety of ways including through the exclusion of people not living in private permanent dwellings, the omission of some purchases by respondents (e.g. alcoholic drinks and confectionery) and the exclusion of expenditure by children under 15 years.

There are two breaks in the HES data. The first is between 1989 and 1990 when the system used to weight the survey to the total population was changed. Statistics New Zealand introduced integrated weighting to the HES in the 2000/01 survey. It has revised the series back to 1990. Integrated weighting is a method of applying linear weights, which are consistent at an individual and household level, to calibrate estimates from a survey with independent population benchmarks. Prior to the introduction of integrated weighting it was known that the HES persistently underestimated the total number of people and households in NZ.⁴ The average expenditure per household tends to be less affected by this than total expenditure, as it depends on the extent to which under-represented groups have different income or expenditure levels or patterns to the rest of the population. As we have used average expenditure per household, we have minimised this concern. The second break occurs in the movement to a three yearly cycle of surveys. Statistics NZ switched from a March year to a June year survey with the 2001 survey. This is not a substantial problem because it can be allowed for in the corresponding price data. Standard INFOS series were used for price data. Where necessary these were weighted together using the weights from the CPI.

Weekly consumption expenditures per household on all the groups listed in Table 1, and the overall and subgroup shares of the apparel items are shown in Table 2. These data indicate a decline in the overall share of apparel over time to about half of its initial share during the two decades 1981-2004. The share of women's clothing in the household apparel budget itself remained fairly steady at about 33%. During the same time period, the share of men's clothing fell slightly to 18% and that of children's clothing increased slightly to 13%, while the share of other clothing (which includes

³ Since there is a three year gap between the observations in 1998 and 2001, and those between 2001 to 2004, the 2001 and 2004 expenditure values (E) were expressed in terms of their annual equivalents as: $E_t^* = E_{t-3} + (E_t - E_{t-3})/3$. The corresponding price indices (P) were annualised assuming constant annual growth according to: $P_t^* = (1+g)P_{t-3}$ where $g = (P_t/P_{t-3})^{1/3} - 1$.

⁴ Further detail is available in the information paper *The introduction of integrated weighting to the 2000/2001 Household Economic Survey* released by Statistics NZ on 18 June 2001, and available on their website www.stats.govt.nz.

infant's) increased sharply from 4.5% to 14%. All the footwear shares fell over the period. Prices of women's clothing increased the fastest of all, with clothing prices mostly rising faster than the footwear prices.

Table 2: Weekly consumption expenditures on all groups per household and overall and subgroup share of apparels

Year	Exp	aprl	mcl	wcl	ccl	ocl	cls	mfr	wfr	cfr
1981	210.65	0.083	0.206	0.334	0.114	0.045	0.083	0.060	0.100	0.057
1982	237.70	0.078	0.202	0.358	0.118	0.045	0.084	0.048	0.094	0.051
1983	263.60	0.074	0.203	0.349	0.113	0.047	0.087	0.051	0.092	0.059
1984	288.41	0.069	0.210	0.338	0.121	0.037	0.107	0.056	0.091	0.040
1985	315.17	0.069	0.206	0.366	0.121	0.033	0.102	0.048	0.086	0.039
1986	348.70	0.065	0.219	0.339	0.118	0.045	0.102	0.058	0.083	0.036
1987	384.03	0.067	0.205	0.329	0.120	0.053	0.102	0.067	0.089	0.035
1988	435.83	0.062	0.217	0.355	0.096	0.075	0.106	0.050	0.069	0.031
1989	470.57	0.054	0.213	0.326	0.079	0.147	0.101	0.048	0.058	0.029
1990	529.27	0.050	0.193	0.380	0.074	0.135	0.086	0.049	0.059	0.024
1991	526.51	0.050	0.173	0.357	0.096	0.136	0.107	0.040	0.062	0.029
1992	499.80	0.047	0.203	0.318	0.076	0.186	0.085	0.042	0.059	0.030
1993	513.60	0.051	0.198	0.340	0.095	0.153	0.084	0.042	0.061	0.027
1994	497.00	0.052	0.188	0.363	0.086	0.160	0.074	0.047	0.055	0.027
1995	539.20	0.047	0.167	0.267	0.092	0.259	0.072	0.052	0.056	0.036
1996	584.00	0.046	0.174	0.348	0.089	0.196	0.052	0.041	0.063	0.037
1997	578.20	0.040	0.176	0.343	0.086	0.193	0.064	0.047	0.060	0.030
1998	610.80	0.041	0.197	0.325	0.124	0.153	0.056	0.048	0.060	0.036
2001	618.38	0.040	0.188	0.337	0.135	0.141	0.053	0.050	0.062	0.034
2004	642.52	0.040	0.186	0.338	0.133	0.150	0.047	0.049	0.066	0.031

Notes: Exp Weekly consumption expenditures on all groups per household, aprl Share of all apparel items in total consumption spending, mcl Share of men's clothing in apparel spending, wcl Share of women's clothing in apparel spending, ccl Share of children's clothing in apparel spending, ocl Share of other clothing in apparel spending, cls Share of clothing supplies & services in apparel spending, mfr Share of men's footwear in apparel spending, wfr Share of women's footwear in apparel spending, cfr Share of children's footwear in apparel spending.

4. Estimation and Results

Six conditional demand systems corresponding to the six groups in Table 1, using appropriate versions of equation (1), were estimated allowing for first order serial correlation as the data were time series.⁵ Assuming normally distributed additive errors in these equations, the method of estimation was maximum likelihood as formulated by Whistler, White, Wong and Bates (2001) in their econometric program, SHAZAM. The resulting coefficient estimates (with asymptotic t-ratios within parentheses) for the apparel group

⁵ A singular equation system like ours, where the dependent variables add up to one of the explanatory variables, requires the autocorrelation coefficients to be the same in all equations (Berndt and Savin, 1975). The estimated serial correlation coefficients were significantly negative in all the conditional demand systems. It may be noted that with first differenced data serial correlation coefficient equals $-0.5(1-\rho)$ where ρ is the serial correlation coefficient in the levels data. Unless $\rho = 1$, serial correlation in differenced data is always negative. The dependent variables in (1) are share-weighted first differences.

are reported in Tables 3 and 4. Since the asymptotic t-ratios are approximately standard normal, these ratios can be compared with the 5% two-sided critical values of ± 1.96 . Coefficients that are significantly different from zero by this criterion are indicated by an asterisk.

Diagnostic tests indicate that the estimated model fits the data very well. Overall goodness of fit is tested by comparing the log likelihood value of the estimated model with that of a model without real expenditure and prices to explain demands. The likelihood ratio test statistic is Chi-square with 35 degrees of freedom. The value of the test statistic is 136.63 with a p-value approximately equal to 0 indicating that the explanatory are all jointly significant. A system measure of goodness of fit (Berndt, 1991, p.468) defined as $R^2 = 1 - |E'E| / |Y'Y|$, where E is the matrix of residuals in all the estimated equations, and Y is the matrix of deviations of the dependent variables from their respective means, gave a measure of $R^2 = 0.97$. The model was estimated allowing errors to be autocorrelated to the first order. Further autocorrelation was not indicated by autocorrelation tests of residuals (by t -tests in regressions of residuals on their order one lags, both including and excluding the other model regressors) in each equation at the 5% level of significance. These results were further supported by non-parametric runs tests in each case. The Breusch-Pagan test of heteroscedasticity was carried out in each equation allowing error variance to depend on all the regressors. White tests of heteroscedasticity were also carried out in each equation allowing error variance to depend on all the squared regressors (levels and cross-products of regressors were excluded to preserve degrees of freedom). No heteroscedasticity was detected at the 5% level of significance by either of these tests.

The coefficients representing trend (τ_i) and the difference between marginal and average budget shares ($\alpha_i = \text{marginal share} - \text{average share}$) are shown in Table 3.

The trend coefficients represent the effect on demands by time related factors other than real total expenditure and relative prices. No clear trends are indicated for any of the apparel subgroups at the 5% level of significance. The excess marginal share coefficients that are significant at the 5% or 10% level suggest that a household devotes an increasing share of its extra spending on apparel to children's clothing and women's footwear while a decreasing share goes to men's and other clothing (including infant's).

Table 3: Trend and Excess Marginal Share Coefficients in a Rotterdam Model of Apparel for New Zealand, 1980-2004

	Trend	Excess of marginal over average expenditure share
Men's clothing	-0.0015 (-0.55)	-0.1143# (-1.69)
Women's clothing	0.0036 (0.69)	0.1596 (1.37)
Children's clothing	0.0030 (1.54)	0.1041* (2.05)
Other clothing	0.0009 (0.17)	-0.2024# (-1.80)
Clothing supplies & services	-0.0032# (-1.79)	-0.0336 (-0.71)
Men's footwear	0.0003 (0.42)	0.0158 (0.68)
Women's footwear	-0.0008 (-0.77)	0.0524# (1.84)
Children's footwear	-0.0022# (-1.84)	0.0184 (0.60)

Note: * and # indicate that the coefficient is significantly different from 0 at the 5% and 10% level respectively.

The estimated price coefficients for the apparel group are reported in Table 4 as an upper triangular matrix as it is symmetric. These coefficients represent the own and cross price substitution effects. All the own price substitution effects are non-positive as required theoretically. The cross price effects that are positive at the 5% level of significance indicate product pairs that are likely to be Hicksian substitutes. Men's clothing seems to be a substitute for other clothing and men's footwear, while children's clothing appears to be a substitute for other clothing and clothing supplies & services. A household may also see women's footwear as a substitute for other clothing, clothing supplies & services and men's footwear. The product pairs that are likely to be Hicksian complements are: (men's footwear, other clothing), (men's footwear, clothing supplies & services),

(children's footwear, children's clothing) and (children's footwear, women's footwear).

Table 4: Price Coefficients of a Rotterdam Model of Apparel for New Zealand, 1980-2004

	Men's clothing	Women's clothing	Children's Clothing	Other clothing	Clothing supplies	Men's Footwear	Women's footwear	Children's footwear
Men's clothing	-0.5789* (-3.07)	0.1485 (0.98)	-0.1151 (-1.27)	0.3695* (2.17)	0.0824 (1.62)	0.1655* (3.75)	-0.0844 (-1.28)	0.0126 (0.22)
Women's clothing		-0.4324# (-1.94)	0.1134 (1.10)	0.0546 (0.24)	0.0460 (0.72)	-0.0482 (-1.08)	-0.0043 (-0.07)	0.1224# (1.74)
Children's clothing			-0.2531* (-2.77)	0.2137* (2.01)	0.0901* (2.71)	0.0278 (0.93)	0.0180 (0.42)	-0.0948* (-2.41)
Other clothing				-0.6786* (-2.43)	-0.1275# (-1.94)	-0.1314* (-3.41)	0.1903* (3.32)	0.1093# (1.71)
Clothing supplies					-0.1134* (-3.57)	-0.0442* (-3.00)	0.0592* (2.78)	0.0073 (0.33)
Men's footwear						-0.0663* (-4.13)	0.0806* (4.35)	0.0163 (0.82)
Women's footwear							-0.1993* (-6.63)	-0.0600* (-2.75)
Children's footwear								-0.1131* (-3.76)

Notes: * and # indicate that the coefficient is significantly different from 0 at the 5% and 10% level respectively.

Given the marginal budget share estimates from the six conditional demand systems, Frisch price indices can be calculated for each of the six consumption groups. A demand system for the six groups can then be estimated using equations (2). Estimates of this system, reported in Table 5, did not indicate any clear trend in demand for apparel at the 5% level of significance. The estimated budget share differential for apparel is negative (at the 5% level of significance), which implies expenditure-inelastic demand for this group as a whole. As shown in Table 6, the apparel expenditure elasticity estimate of 0.26 at the observed budget share in 2004 is significantly short of 1. Lluch, Powell and Williams (1972) reported estimates mostly below 1 for the developed countries (including 0.45 for Australia), and a comparison of their estimates across countries suggests that the elasticity decreases with an increase in total consumption spending per capita. For New Zealand, Giles and Hampton (1985) reported an estimate 1.12 in 1981-82, while Michelini (1999) reported an average estimate of 1.11 during 1983-92. At the much higher consumption expenditure per capita of today, this elasticity is now likely to be well within the 0-1 interval as our estimate seems to suggest.

Table 5: Estimated coefficients in a Rotterdam Model of consumption for New Zealand, 1980-2004

	Trend	Marginal less average share	Food	Housing	Housing Operation	Apparel	Transport	Other
Food	0.0005 (0.76)	-0.1059* (-6.58)	-0.0203 (-1.16)	0.0167* (3.41)	0.0316# (1.66)	0.0027 (0.14)	-0.0130 (-1.09)	-0.0177 (-1.13)
Housing	0.0031# (1.78)	0.1170* (2.38)		-0.1201* (-7.85)	0.0171* (1.97)	0.0099* (2.34)	0.0592* (4.65)	0.0172* (2.71)
Housing Operation	-0.0009 (-0.79)	-0.0607* (-2.22)			-0.1087* (-3.12)	0.0475* (2.70)	-0.0251 (-1.23)	0.0377# (1.71)
Apparel	-0.0009 (-1.59)	-0.0292* (-2.16)				-0.0878* (-3.75)	0.0220# (1.65)	0.0057 (0.28)
Transport	-0.0008 (-0.54)	0.1162* (2.76)					-0.0540* (-1.96)	0.0109 (0.65)
Other	-0.0010 (-1.17)	-0.0375# (-1.84)						-0.0537# (-1.88)

Notes: * and # indicate that the coefficient is significantly different from 0 at the 5% and 10% level respectively. Numbers in parentheses are *t*-ratios.

According to the estimated price coefficients in the group demand system, also shown in Table 5, apparel appears to be a significant substitute for housing, housing operation and transport at the 5% level. In contrast to the other groups, the demand for apparel was estimated to be highly price elastic with an own price elasticity of about -2.22 (Table 6). Since these elasticity estimates used Frisch price indices, for comparability with other studies typically estimating a demand system just at the group level using average share-weighted price indices, we re-estimated the own price elasticity of apparel with respect to a Divisia apparel price index that uses average budget shares of the various apparel items as the weights.⁶ An even higher estimate was obtained, -2.31 with standard error 0.58. Using similarly aggregated prices, Michelini (1999) reported a somewhat smaller estimate of -2.09 .

⁶ Note that Divisia price indices can replace the Frisch price indices in the Rotterdam model only under the restriction of homothetic weak separability.

Table 6: Elasticities of Group Demand in a Rotterdam Model of Consumption for New Zealand

Calculated at share values in 2004

	Own Frisch-Price Elasticity	Expenditure Elasticity
Food	-0.106# (-1.16)	0.447*# (5.31)
Housing	-0.415*# (-7.85)	1.404*# (8.27)
Housing Operation	-0.705* (-3.12)	0.607*# (3.42)
Apparel	-2.221*# (-3.75)	0.262# (0.77)
Transport	-0.275*# (-1.96)	1.591*# (7.43)
Other	-0.416# (-1.88)	0.710*# (4.51)

Notes: * indicates that the elasticity differs significantly from 0 at the 5% level. # indicates that the elasticity (or its absolute value) differs significantly from 1 at the 5% or 10% level.

The expenditure and price elasticities of demand for the apparel subgroups evaluated at the observed budget shares in the year 2004 and using the formulae (3) – (5) are presented in Table 7.

The estimated expenditure elasticities are all less than 1, and only those of women's and children's clothing, and women's and men's footwear, differ significantly from zero at the 5% level, but they are all significantly less than 1 at the 5% level. It is likely that a decreasing share of extra consumption expenditures is devoted to each of the apparel subgroups. Compared to women's and children's clothing, demand for men's clothing increases very little when total expenditure increases, other things remaining the same.

Table 7: Elasticities of demand for apparel subgroups in New Zealand at the share values in 2004

Asymptotic t-ratios within parentheses

With respect to price of	Elasticity of demand for							
	Men's clothing	Women's clothing	Children's clothing	Other clothing	Clothing supplies	Men's Footwear	Women's footwear	Children's footwear
Men's	-3.179*	0.203	-1.152#	2.520*	1.699	3.151*	-1.573	0.149
Clothing	(-3.11)	(0.47)	(-1.67)	(2.27)	(1.52)	(3.39)	(-1.48)	(0.08)
Women's	0.373	-2.911*	-1.124	0.752	0.654	-2.446*	-2.059*	2.172
Clothing	(0.47)	(-3.01)	(1.39)	(0.46)	(0.46)	(-2.88)	(-2.22)	(1.04)
Children's	-0.823#	-0.442	-2.844*	1.610*	1.755*	-0.133	-0.676	-3.890*
Clothing	(-1.67)	(-1.39)	(-4.10)	(2.21)	(2.11)	(-0.21)	(-0.95)	(-2.93)
Other	2.033*	0.331	1.812*	-4.566*	-2.666#	-2.520*	3.102*	3.700#
Clothing	(2.27)	(0.46)	(2.20)	(-2.50)	(-1.92)	(-3.02)	(3.11)	(1.78)
Clothing	0.432	0.091	0.622*	-0.839#	-2.410*	-0.939*	0.845*	0.185
Supplies	(1.52)	(0.45)	(2.11)	(-1.92)	(-3.49)	(-2.87)	(2.24)	(0.25)
Men's	0.835*	-0.356*	-0.049	-0.826*	-0.977*	-1.539*	0.965*	0.293
footwear	(3.39)	(-2.88)	(-0.21)	(-3.02)	(-2.87)	(-4.92)	(3.20)	(0.45)
Women's	-0.555	-0.400*	-0.334	1.361*	1.177*	1.290*	-3.505*	-2.349*
footwear	(-1.48)	(-2.22)	(-0.95)	(3.12)	(2.25)	(3.20)	(-6.78)	(-2.87)
Children's	0.025	0.200	-0.909*	0.768#	0.122	0.186	-1.111*	-3.812*
footwear	(0.08)	(1.04)	(-2.93)	(1.78)	(0.25)	(0.45)	(-2.87)	(-3.71)
With respect to	0.101	0.386*	0.468*	-0.092	0.076	0.347*	0.472*	0.417
Expenditure	(1.05)	(4.28)	(4.66)	(-0.47)	(0.29)	(2.82)	(4.14)	(1.61)

Notes: * and # indicate that the coefficient is significantly different from 0 at the 5% and 10% level respectively. Numbers in parentheses are *t*-ratios.

In contrast to the expenditure elasticities, demands for all the apparel subgroups appear to be highly own-price elastic. The estimated elasticities are above 2 or 3 (in absolute value) for most of the apparel groups. The lowest estimate occurs for men's footwear, but even in this case, a 1% fall in price may increase demand by about 1.5%. Given the large own price elasticity of demand for the apparel group reported previously, reductions in relative apparel prices caused by major import policy changes since 1984 would have led to significant reallocation of the total consumption budget in favour of apparel. A large own price elasticity of demand for an individual apparel item is partly due to this expenditure substitution. As we do not disaggregate the apparel subgroups down to the brand level, increases in substitutability due to brand proliferation cannot be captured directly by our elasticity estimates, but even a product type as a whole may become more attractive relative to other product types when it is enhanced by the availability of several brands. The large price elasticities reported in this paper, can to some extent, be attributed to this phenomenon.

The size and significance of the estimates suggest that the demand for footwear of all types responds strongly to changes in many other apparel prices. For example, a 1% rise in the prices of children's clothing and women's footwear is likely to reduce demand for children's footwear by

about 3.9% and 2.3% respectively. Similarly, a 1% increase in the prices of women's clothing and children's footwear might lower demand for women's footwear by about 2.1% and 1.1% respectively. Interestingly, the demand for men's footwear appears to be encouraged by an increase in the prices of men's clothing and women's footwear. As for clothing, demand appears to be less sensitive to other prices than footwear. Demand for women's clothing in particular is not influenced much by the other prices.

The elasticities reported in table 7 include only those with respect to the apparel prices, but demand for any of the apparel subgroups can also respond to changes in the prices of goods belonging to any of the other groups. For instance, the elasticities of demand for women's clothing – which has the largest share of the apparel budget – with respect to all the non-apparel prices, calculated using appropriate versions of formulae (4) and (5) and the budget shares in 2004, are shown in table 8.

Table 8: Elasticities of Demand for Women's Clothing with respect to Non-Apparel Prices in New Zealand at Share Values in 2004

Asymptotic t-ratios within parentheses

	With respect to price of:		
Rental housing	0.031*	Cereals & cereal products	-0.011*
	(2.15)		(-2.86)
Owner-occupied housing	0.226*	Sweets & other foods	0.001
	(4.17)		(0.23)
Fuel & power	0.277*	Eating out	0.038*
	(3.63)		(3.50)
Home appliances & utensils	0.330*	Public transport	0.029*
	(2.96)		(3.17)
Furniture & furnishings	0.297*	Overseas travel	0.265*
	(2.96)		(3.26)
Floor coverings	0.143*	Private transport	0.450*
	(2.22)		(3.88)
Household textiles	0.086*	Tobacco	-0.006
	(2.04)		(-0.79)
Household supplies	-0.042	Alcohol	0.035*
	(-0.71)		(2.56)
Household services	0.619*	Medical	0.012*
	(3.36)		(2.86)
Fruits & vegetables	-0.002	Toiletries & cosmetics	0.006
	(-0.51)		(0.84)
Meat	0.008	Personal goods	0.004
	(1.58)		(0.40)
Poultry	-0.002	Leisure & recreation	0.086*
	(-1.44)		(3.23)
Fish	≈ 0	Health services	0.022#
	(0.10)		(1.87)
Farm products, fats & oils	-0.005	Personal services	0.004
	(-1.25)		(0.89)

Notes: * and # indicate that the coefficient is significantly different from 0 at the 5% and 10% level respectively.

An increase in a non-apparel price can influence the demand for women's clothing by lowering real income and/or by influencing the allocation of that income to the apparel group as a whole as this group becomes relatively cheaper. Most of these price effects are small in magnitude. Only two out of the 28 elasticities in table 8 have an absolute value of 0.4 or more – an elasticity of 0.62 to the price of household services and 0.45 to the price of private transport. The housing operation and transport groups, to which these items belong, appeared to be substitutes for the apparel group as indicated by the group demand estimates reported in Table 5. Thus, an increase in the prices of housing or transport can induce extra demand for women's clothing by increasing the budget share of the relatively cheaper apparel group.

5. Conclusions

As one might expect, apparel (clothing and footwear) appears to be a necessity at both the aggregate and subgroup levels, with low expenditure or income elasticities of demand. The demand for men's clothing is particularly inelastic with respect to a change in total consumer spending. However, changes in prices are likely to have a much greater effect on demand. At an aggregate as well as at a subgroup level, the demand for clothing and footwear is more price elastic than earlier estimates would indicate.

The larger price elasticities at the sub-group level are most likely due to expenditure substitution at the group level allowed by our two-stage choice system, and to the sub-groups with a greater range of available brands becoming an attractive alternative outlet of expenditures at the sub-group level. A greater availability of quality substitutes at reasonable prices became possible owing to rapidly growing imports of apparel as well as to the niche domestic suppliers who have survived two decades of tariff reductions⁷. Imports of apparel have been rising not just owing to the lowering or removal of tariffs, which has been a world-wide trend, but also due to lower production costs in a highly competitive world market for clothing and footwear. This process may also have been aided further by the development of giant shopping malls and the proliferation of highly competitive clothing and footwear outlets and brands.

Lower levels of import protection would, in general, result in gains in consumer surpluses. However, given the substitution possibilities identified here, the particular pattern of tariff reductions across the various product

⁷ It has been estimated that there are 2 to 3 times the number of types of shoes available at retail than was true 20 years ago in New Zealand, Mark Dowson, marketing manager, Dowson's Shoes, New Zealand, pers comm.

types would be an important influence on total consumer gains. An important aspect of reductions in import protection for apparel items is likely to be the policy treatment of anti-dumping duties. These duties can be readily applied on an ad hoc basis and given the cross price elasticities estimated here could significantly influence net gains from reductions in import protection.

The gains in consumer surplus arising from further reductions in import protection will be less than they would have been in the past, to the extent that the demand functions are now more price elastic. In other words, New Zealand consumers as a whole are now less vulnerable to price rises that would result from tariff increases or anti-dumping actions.

Our model takes no account of the increased variety of goods in the market. To the extent that further trade liberalisation would result in greater product variety, the gains from trade would be enhanced. However, Broda and Weinstein (2004) argue that the gains from variety are related to the inelasticity of substitution effects. These results point to increasing substitution possibilities and, accordingly, lower gains from increased variety.

There is room for important future research on the distributional question already mentioned. It is likely that there is a conjunction between New Zealand's pattern of comparative advantage and the demand propensities across income groups. Lower income groups in New Zealand are likely to have the largest relative consumption of apparel products where New Zealand's comparative disadvantage is greatest. Conversely, it is possible that New Zealand has a comparative advantage in apparel items which higher income consumers demand relatively more. The exploration of this question would be an interesting extension to the estimates provided here.

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