

Khaled, Mohammed; Lattimore, Ralph

**Working Paper**

## New Zealand's love affair with houses and cars

NZ Trade Consortium Working Paper, No. 41

**Provided in Cooperation with:**

New Zealand Institute of Economic Research (NZIER), Wellington

*Suggested Citation:* Khaled, Mohammed; Lattimore, Ralph (2005) : New Zealand's love affair with houses and cars, NZ Trade Consortium Working Paper, No. 41, New Zealand Institute of Economic Research (NZIER), Wellington

This Version is available at:

<http://hdl.handle.net/10419/66099>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# **New Zealand's love affair with houses and cars**

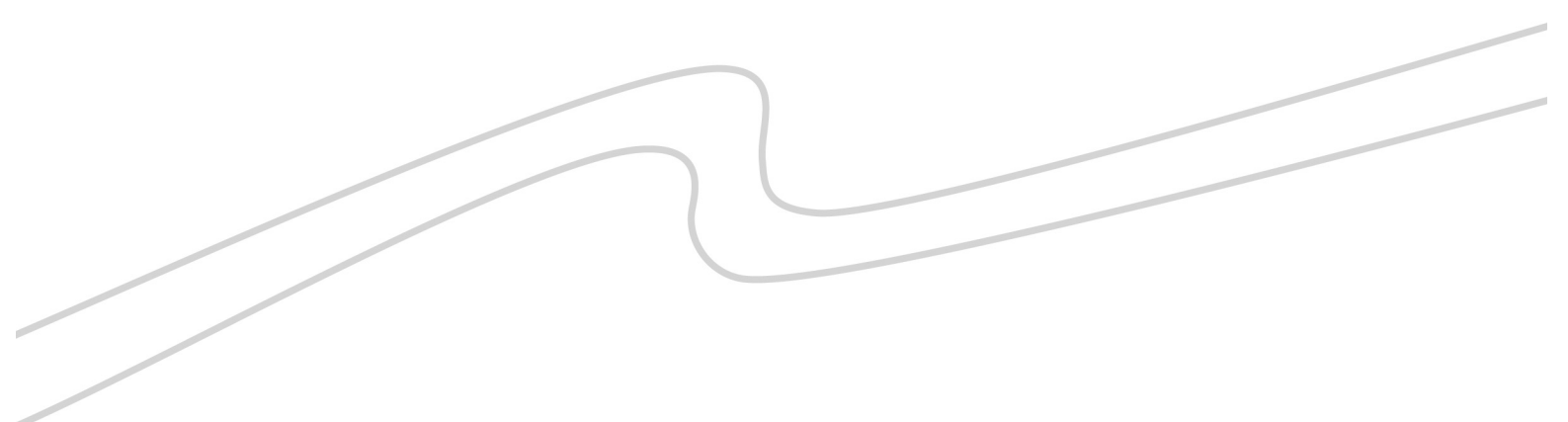
NZ Trade Consortium working paper no 41

December 2005

**The New Zealand Trade Consortium**

**in association with the**

**New Zealand Institute of Economic Research (Inc)**





## **Preface**

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice to clients in the public and private sectors, throughout New Zealand and Australia, and further afield.

NZIER is also known for its long-established *Quarterly Survey of Business Opinion* and *Quarterly Predictions*.

Our aim is to be the premier centre of applied economic research in New Zealand. We pride ourselves on our reputation for independence and delivering quality analysis in the right form, and at the right time, for our clients. We ensure quality through teamwork on individual projects, critical review at internal seminars, and by peer review at various stages through a project by a senior staff member otherwise not involved in the project.

NZIER was established in 1958.

## **Authorship**

This report has been prepared by:

Mohammed Khaled, Senior Lecturer, School of Economics and Finance, Victoria University of Wellington, PO Box 600 Wellington, New Zealand; email: Mohammed.Khaled@vuw.ac.nz

and

Ralph Lattimore, Consulting economist, Hope, New Zealand and honorary fellow, Victoria University of Wellington; email: Ralph.Lattimore@xtra.co.nz

8 Halswell St, Thorndon  
P O Box 3479, Wellington  
Tel: +64 4 472 1880  
Fax: +64 4 472 1211  
econ@nzier.org.nz  
www.nzier.org.nz

NZIER's standard terms of engagement for contract research can be found at [www.nzier.org.nz](http://www.nzier.org.nz).

While NZIER will use all reasonable endeavours in undertaking contract research and producing reports to ensure the information is as accurate as practicable, the Institute, its contributors, employees, and Board shall not be liable (whether in contract, tort (including negligence), equity or on any other basis) for any loss or damage sustained by any person relying on such work whatever the cause of such loss or damage.

## Contents

1. Introduction.....	1
2. A Rotterdam Model of housing expenditures .....	2
3. Data.....	4
4. Estimation and Results.....	8
5. Summary and Conclusions .....	13
6. References .....	15

## Tables

Table 1: Consumption groups and sub-groups.....	5
Table 2: Shares and Prices of Housing Consumption in New Zealand.....	7
Table 3: Estimated Coefficients in a Rotterdam Model of Consumption for New Zealand Price.....	8
Table 4: Elasticities of Group Demand in a Rotterdam Model of Consumption for New Zealand.....	10
Table 5: Estimated Coefficients in a Conditional.....	10
Table 6: Elasticities of Demand for Own Housing in New Zealand at Share Values in 2004.....	11
Table 7: Elasticities of Demand for Own Housing in New Zealand at Share Values in 2004.....	12

# 1. Introduction

Twice in the last decade there have been surges in the demand for property in New Zealand – what could be described as speculative bubbles. An important part of these demands has been that for owner occupied housing. This has occurred in a generally buoyant economic environment since the early 1990's as the economy finally recovered from the reform shock of the period 1985- 91. In both cases, the central bank has raised interest rates in attempts to stem this exuberance<sup>1</sup>. The housing market itself has been examined in two recent papers, Grimes and Aitken (2004) and Rosborough (2005). They explore drivers within the housing market at the national and regional levels. An earlier household demand system study by Michelini (1999) excluded housing (other than housing operations) essentially because of its capital nature and the lumpy transactions involved.

A notable feature of the period has been an apparent drift away from owner occupied housing towards rental accommodation. This has been characterised as an affordability issue in the face of rapidly rising house prices. However, there have also been changes in government housing policy with a move away from state provision towards rental house subsidies for qualifying people (means tested portable housing supplements). This policy change is likely to have driven rents upwards and caused some substitution away from rental accommodation.

More generally, there may have been a number of expenditure switches by households occurring over the last decade, so it is interesting to explore consumer expenditure patterns generally in an attempt to uncover any changes in demand parameters and preferences that may have occurred recently. This paper addresses this last issue with particular reference to the household demand for housing using household expenditure data (HES) up to 2004.

As supply of housing, even that in the fairly long run, is essentially fixed (Grimes and Aitken, 2004), housing prices and the allocation of the existing stock are determined initially by demand conditions. Good estimates of housing demand elasticities will therefore be very useful in understanding variations in housing demands.

Housing presents an interesting case because housing represents both a consumption good and a capital good. The purchase of houses for both own use and for rent can, accordingly, be thought of as having two income

---

<sup>1</sup> Aside from the microeconomic issues explored here, there is, of course, an important macroeconomic issue. At least the last two real exchange rate spikes (1997 and the current one) coincided with property price bubbles. The booms have been funded by large increases in the use of foreign savings, and associated large current account deficits and increases in foreign debt. This is part of a general issue concerned with real exchange rate overshooting, for example, see Joumard and Reisen (1992).

streams – an explicit or implicit rental stream and a stream of capital gains. The capital gains portion is attractive in New Zealand because, where the owner is not seen to be a property trader, it is not subject to income tax.

## 2. A Rotterdam Model of housing 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 housing are: (1) rent, (2) mortgage payments, (3) local authority rates, (4) property maintenance goods and (5) property maintenance services, where the last four subgroups correspond to owner occupied housing.

Weak separability of consumer preferences in housing allows estimation of elasticities of demand within this group (e.g. own housing with respect to price of rental housing) *conditional* on the budget allocated to this group. However, if we need to estimate elasticities of demand for any of the housing subgroups with respect to price of a subgroup belonging to any of the other groups (e.g. own housing with respect to price of a transport subgroup like overseas travel), then a two-stage budget model can be used if consumer preferences were weakly separable in housing and the other groups.

Demand for any of the housing subgroups conditional on the budget allocated to that group (group  $B$ ) 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:

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

where  $p_i$ ,  $x_i$  and  $s_{iB} (= p_i x_i / \sum_{j \in B} p_j x_j)$  represent price, quantity demanded per capita, and budget share respectively of the  $i$ th commodity in group  $B$ , and  $\Delta \ln X_B = \sum_{j \in B} s_{jB} \Delta \ln x_j$  is the Divisia aggregate quantity index of group  $B$  in the percentage change form. The variable  $X_B$  itself, implied by this aggregation, is a measure of the total quantity of housing expressed as a composite commodity. The coefficient  $\alpha_{iB}$  measures the difference between marginal and average budget share of good  $i$  in group  $B$ , while the price

coefficients  $\gamma_{ij}$  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  $\sum_{i \in B} \tau_i = 0$ ,  $\sum_{i \in B} \alpha_{iB} = 0$ ,  $\gamma_{ij} = \gamma_{ji}$  and  $\sum_{j \in B} \gamma_{ij} = 0$ . Concavity requires the additional restriction that the matrix of the  $\gamma_{ij}$  coefficients be negative semi-definite.

Elasticities of demand for goods in group  $B$  with respect to the overall consumption expenditure (rather than the group  $B$  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  $\tau_g$  satisfying the restriction  $\sum \tau_g = 0$ . Differences between marginal and average budget shares of group  $g$  is given by  $\alpha_g$  such that  $\sum \alpha_g = 0$ . The group demands are also subject to the restrictions  $\sum_h \gamma_{gh} = 0$ , with the matrix of  $\gamma_{gh}$  values being symmetric and negative semi-definite.

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

$$\varepsilon_{iy} = (\alpha_{iB} + s_{iB})(\alpha_B + s_B) / (s_{iB} s_B), \quad i \in B \quad (3)$$

The compensated price elasticities of demand for goods in  $B$ , 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:

$$E_{ij}^* = (\gamma_{ij} / s_{iB}) + (\gamma_{BB} \beta_{iB} \beta_{jB}) / s_{iB} s_B \quad \text{for all } i, j \in B$$

$$E_{ij}^* = (\gamma_{Bh} \beta_{iB} \beta_{jh}) / s_{iB} s_B \quad \text{for all } i \in B \text{ and } j \in h \neq B$$



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

$$E_{ij} = E_{ij}^* - s_{jh}s_h\varepsilon_{iy}, \text{ for all } i \in B \text{ and } j \in h = A, \dots, G \quad (4)$$

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

### 3. Data

A two-subgroup – rental and owner-occupied – classification of housing along with the classifications used for all the other consumption groups are given in table 1.

---

**Table 1: Consumption groups and sub-groups**

<b>Groups</b>	<b>Subgroups</b>
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.<sup>2</sup> The HES is subject to sampling and some non-sampling errors. 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.

---

<sup>2</sup> Since there is a three year gap between the observations in 1998, 2001 and 2004, the 2001 and 2004 expenditures were expressed in terms of their annual equivalents by linear interpolation such that the adjusted 2001 and 2004 expenditures follow consecutively from 1998. The price indices for 2001 and 2004 were similarly adjusted using their annual growth rates.

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.<sup>3</sup> 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.

Since an appropriate counterpart of the rental price for owner-occupied housing is not available directly from the CPI, we calculated the user cost of

own housing ( $c$ ) as  $c = (i + \delta - \frac{\dot{p}_{hr}}{p_{hr}})p_h$  where  $i$  = nominal mortgage

interest rate,  $\delta$  = rate of physical depreciation of house,  $p_h$  = nominal price of house (with  $p_h = p_{hr}p$  which is real house price times the consumer price index), and  $\dot{p}_{hr}/p_{hr}$  = rate of gain *expected* on the real capital value of house (physical appreciation as it were). The latter can be obtained as the rate of nominal capital gain net of any general inflation,  $\dot{p}_{hr}/p_{hr} = \dot{p}_h/p_h - \dot{p}/p$ . The CPI first mortgage rate index, along with a first mortgage interest rate of 10% in 1997, was used to calculate the  $i$  series. Assuming a house lifetime of 50 years (consistent with the main durability requirements of the NZ building code, DBH, 2005) implies  $\delta = 2\%$ . A 1981-2004 series of observed rates of nominal capital gains were derived from the median urban house price observations. These rates less the rates of CPI inflation yield the real rates of capital gains. Assuming that the expected rate of capital gains is determined by the rates experienced in the recent past, we measured  $\dot{p}_{hr}/p_{hr}$  by a series of the historic three-year moving averages of the observed real rates of capital gains. Finally, treating the user cost values ( $c$ ) as the price variable for mortgage and maintenance expenses, an overall price index of owner-used housing was obtained by incorporating the local authority rates index as the price variable

<sup>3</sup> 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](http://www.stats.govt.nz).

corresponding to the payments to local authorities by the method of Divisia aggregation.

The housing price indices derived as above and the share of rental housing with its price index are shown in Table 2. The share of rental housing in the total household expenditure on housing remained fairly steady at about 18% during 1981-1991 before rising to about 26% in 2004. House rents increased rapidly after 1985 accompanying the increasing privatization or marketisation of social housing and rents thereof. In contrast, the price of owner-occupied housing services behaved cyclically, declining during 1982-84, then increasing until 1988, declining again until 1997 before increasing back until 2001. Since then, the user price of own housing has declined yet again to a new lower level in 2004. A major factor underlying the differential growth in the rental and owner-use price indices is that the latter is moderated by the inclusion of expected capital gains. Owners of rental properties are unlikely to have directly passed on capital gains to tenants as rental discounts, though expected capital gains in rental properties will tend to increase the supply of tenancies available. Capital gains in the early 80's were associated with high inflation and interest rate controls. Gains rose in the mid 90's (with lower inflation coupled with high immigration) only to be cut off by higher interest rates. They have begun rising again after 2000 (with higher immigration).

---

**Table 2: Shares and Prices of Housing Consumption in New Zealand**

1981 -2004

Year	Rental Housing Share	Rental Price Index	Owner-user Price Index
1981	0.183	1.000	1.000
1982	0.168	1.162	1.059
1983	0.191	1.330	0.873
1984	0.181	1.381	0.591
1985	0.177	1.563	0.873
1986	0.200	2.096	1.462
1987	0.193	2.406	1.746
1988	0.184	2.868	2.159
1989	0.181	3.228	1.936
1990	0.169	3.406	1.819
1991	0.182	3.579	1.719
1992	0.209	3.589	1.713
1993	0.200	3.650	1.715
1994	0.225	3.893	1.318
1995	0.218	4.376	1.225
1996	0.219	4.736	1.184
1997	0.245	4.924	1.083
1998	0.253	5.122	1.511
2001	0.256	4.944	2.189
2004	0.259	4.944	1.526

---

## 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.<sup>4</sup> 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. Given the marginal budget share estimates from the six conditional demand systems, Frisch price indices were calculated for each of the six consumption groups. A demand system for the six groups was then estimated using equation (2). Estimates of this system (with t-ratios in parentheses) are reported in table 3. Since the asymptotic t-ratios are approximately standard normal, these ratios can be compared with the 5% two-sided critical values of  $\pm 1.96$ . Coefficients significantly different from zero by this criterion are indicated by an asterisk.

**Table 3: Estimated Coefficients in a Rotterdam Model of Consumption for New Zealand Price**

1981 – 2004

	Trend	Marginal less av. 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.

<sup>4</sup> The estimated serial correlation coefficients were significantly negative in all the conditional demand systems and in the group demand system. It may be noted that with first differenced data serial correlation coefficient equals  $-0.5(1-\rho)$  where  $\rho$  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.

The estimated model appears to fit the data very well. 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  $R^2 = 98.6\%$ . 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.

According to the estimates in Table 3, the only trend coefficient that is significant at the 10% level indicates a change in tastes over time in favour of housing. Correspondingly, overall demand would have shifted away from the other groups, but there is no clear trend in demand for any of the other groups in particular, even at the 10% level of significance. The estimated budget share differential for housing (0.117) implies an expenditure elasticity estimate of about 1.4 (shown in Table 4) for this group as a whole at the share values in 2004. This value is significantly above 1 at the 5% level, indicating expenditure-elastic demand for the housing aggregate. The large impact of real consumption expenditures on housing demand is consistent with the direction of results found by Rosborough (2005) though she does not estimate parameters exactly equivalent to ours.

The expenditure elasticity for housing (1.4) is nearly double that found in our earlier study using HES data up till 2001, Khaled et al (2004). This is likely to be because the earlier study excluded the capital gains motive for house ownership. The only other product group with a significant expenditure elasticity greater than one (about 1.6) is the transport group (which includes public and private transport and overseas travel). At the subgroup level, the total expenditure elasticities are estimated to be about 1.25 for public transport and 1.36 for private transport with standard errors of 0.23 and 0.13 respectively at the 2004 budget shares. In the case of private transport (with a 2004 transport budget share of about 72%), the expenditure elasticity is significantly above 1 at the 5% level. The price coefficients estimated in the group demand system, shown previously in Table 3, indicate that housing is a substitute for all the other groups, the transport group appearing to be the strongest of them all.

**Table 4: 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 coefficient estimates (with asymptotic t-ratios within parentheses) for the housing subgroups, conditional on the budget allocated to the group as a whole, are reported in Table 5. Diagnostic tests indicate that the estimated conditional housing demand model fits the data adequately, with  $R^2 = 92.8\%$ . The model estimated allowed first order autocorrelation of errors. Absence of any further autocorrelation was confirmed by autocorrelation tests of residuals (by  $t$ -test in a regression of residuals on their order one lags, and by a non-parametric runs test) at the 5% level of significance. No heteroscedasticity was detected at the 5% level of significance by either the Breusch-Pagan or the White test.

**Table 5: Estimated Coefficients in a Conditional Rotterdam Model of Housing Demand in New Zealand**

1981 -2004

	Trend	Surplus of Marginal Over average share	Rental housing	Own housing
Rental housing	0.0063* (2.44)	-0.0974* (-2.90)	-0.0927* (-3.27)	0.0927* (3.27)
Own housing	-0.0063* (-2.44)	0.0974* (2.90)		-0.0927* (-3.27)

Note: \* indicates that the elasticity differs significantly from 0 at the 5% level.

Within the housing group itself, there has been a trend away from owner occupied to rental housing. The trend coefficients represent the effect on demands by time related factors other than real expenditure and relative prices.

The expenditure and price elasticities of demand for owner-occupied and rental housing evaluated at the observed budget shares in the year 2004 and using the formulae (3) – (4) are presented in Tables 6 and 7 respectively.

**Table 6: Elasticities of Demand for Own Housing in New Zealand at Share Values in 2004**

Asymptotic t-ratios within parentheses

		With respect to price of:	
Own housing	-0.860* (-47.98)	Women's clothing	-0.002 (-0.44)
Rental housing	-0.070* (-2.26)	Children's clothing	0.001 (0.42)
Fuel & power	-0.050* (-19.86)	Other clothing	-0.011* (-2.62)
Home appliances & utensils	-0.036* (-10.77)	Clothing supplies, services	-0.002 (-1.34)
Furniture & furnishings	-0.022* (-7.54)	Men's footwear	-0.001 (-0.64)
Floor coverings	-0.001 (-0.27)	Women's footwear	0.000 (0.40)
Household textiles	-0.008* (-5.26)	Children's footwear	0.000 (-0.03)
Household supplies	-0.019* (-8.17)	Public transport	-0.007* (-3.81)
Household services	-0.042* (-9.13)	Overseas travel	0.009 (0.58)
Fruits & vegetables	-0.038* (-13.92)	Private transport	-0.083* (-5.76)
Meat	-0.022* (-7.27)	Tobacco	-0.021* (-8.49)
Poultry	-0.010* (-11.08)	Alcohol	-0.030* (-8.10)
Fish	-0.005* (-6.24)	Medical	-0.010* (-9.49)
Farm products, fats & oils	-0.030* (-11.30)	Toiletries & cosmetics	-0.012* (-5.18)
Cereals & cereal products	-0.039* (-15.96)	Personal goods	-0.014* (-4.61)
Sweets & other foods	-0.059* (-12.91)	Leisure & recreation	-0.009# (-1.72)
Eating out	-0.036* (-8.46)	Health services	-0.033* (-8.99)
Men's clothing	-0.009* (-3.36)	Personal services	-0.010* (-6.25)
		With respect to total expenditure	
		1.589* (24.94)	

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



**Table 7: Elasticities of Demand for Own Housing in New Zealand at Share Values in 2004**

Asymptotic t-ratios within parentheses

		With respect to price of:	
Own housing	-0.048 (-0.96)	Women's clothing	-0.001 (-0.44)
Rental housing	-0.465* (-3.36)	Children's clothing	0.000 (0.41)
Fuel & power	-0.028* (-4.77)	Other clothing	-0.006* (-2.31)
Home appliances & utensils	-0.020* (-4.47)	Clothing supplies, services	-0.001 (-1.29)
Furniture & furnishings	-0.012* (-4.12)	Men's footwear	0.000 (-0.64)
Floor coverings	0.000 (-0.27)	Women's footwear	0.000 (0.40)
Household textiles	-0.004* (-3.59)	Children's footwear	0.000 (-0.03)
Household supplies	-0.011* (-4.21)	Public transport	-0.004* (-3.01)
Household services	-0.023* (-4.33)	Overseas travel	0.005 (0.58)
Fruits & vegetables	-0.021* (-4.63)	Private transport	-0.046* (-3.74)
Meat	-0.012* (-4.07)	Tobacco	-0.012* (-4.25)
Poultry	-0.005* (-4.49)	Alcohol	-0.016* (-4.20)
Fish	-0.003* (-3.86)	Medical	-0.005* (-4.36)
Farm products, fats & oils	-0.017* (-4.51)	Toiletries & cosmetics	-0.007* (-3.56)
Cereals & cereal products	-0.021* (-4.70)	Personal goods	-0.007* (-3.36)
Sweets & other foods	-0.032* (-4.59)	Leisure & recreation	-0.005 (-1.62)
Eating out	-0.020* (-4.25)	Health services	-0.018* (-4.31)
Men's clothing	-0.005* (-2.78)	Personal services	-0.005* (-3.86)
		With respect to total expenditure	
		0.877*	(4.82)

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

The estimated expenditure elasticity of owner occupied housing is well above 1 at the 5% level of significance. Owner occupied housing appears to be a luxury with an expenditure elasticity of about 1.6, indicating that an increasing share of extra consumption expenditures is devoted to this type of housing. With a much smaller expenditure elasticity of around 0.9, rental housing appears to be a necessity as expected, with demand declining less than proportionately to total consumption expenditures.

The own price elasticity estimates indicate that demands for both types of housing are inelastic, rental housing being particularly so. Other things remaining the same, a 10% increase in rents would lower demand for rental housing by about 5% only. As a result, the rapid rise in rental prices seen in recent times would have led to an increase in rental housing expenses as well as a large loss of consumer surplus. Demand for own housing, on the other hand, is relatively much more responsive to its price, with a 10% price-hike reducing demand by about 9%. However, even this elasticity is on the lower side of 1 at the 5% level of significance. With cross-price elasticities of about  $-0.05$  and  $-0.07$  respectively, rental and owner-used housing may also be responsive to a small extent to each other's prices. However, the cross effect on demand for rental housing is not significant at the 5% level, and the two goods are net substitutes as shown by the significant positive cross-price coefficient (around  $+0.1$ ) in Table 5.

An increase in a non-housing price can also influence demand for housing by lowering total real income and/or by influencing the allocation of that income to the housing group as a whole as this group becomes relatively cheaper. Most such cross price elasticities are negative and rather small in magnitude, indicating that demands for housing of either variety are not influenced much by the prices of other goods and services. To a small extent, the demand for housing appears to be depressed by an increase in private transport prices.

## 5. Summary and Conclusions

New Zealand households appear to view housing and transport (cars) as luxury goods. The expenditure (or income) elasticities are significantly greater than one. In the case of housing this only appears to be the case if potential capital gains are included in housing costs. The expenditure elasticities for all other major product groupings appear to be less than one, food and apparel having the lowest expenditure elasticities, as expected.

The trend coefficients estimated in this Rotterdam model also point to changes in consumer preferences in favour of housing consumption (and investment) at the expense of all other major groupings. This change is aside from demand response that the model can attribute to changes in real income and relative price shifts. Furthermore, housing and transport are the only two groups where the marginal budget share is greater than the average share. This indicates that the shares of these products are growing with total expenditures, other things remaining the same.

There are a number of possible explanations for these time and expenditure related trends. New Zealand consumers, of all the major ethnic groups, do appear to place a higher priority on housing than at least some other populations like the French or Americans. This may be related to a strong

sense of place. New Zealanders also seem to have a “love affair” with cars (as reflected by the very large number of makes and models that are consumed) but the motivation is probably quite different. Nonetheless, demand for private transport rises strongly with total consumption spending, having an elasticity well in excess of 1 to this factor.

Furthermore, New Zealand households are getting smaller, as they are in many countries. This is associated with the breakdown in extended families and with the number of younger people who are increasingly having smaller families or living alone. Average household size may continue to decline for some decades in New Zealand because some of the fastest growing ethnic groups in society (perhaps including Pacific Peoples) still have a propensity to live as extended families, but this pattern is likely to slowly change. The aging population is also likely to cause reductions in household size given the differential life expectancies of women and men.

The trend in favour of the housing group over time may partly reflect increases in the demand for apartments by students (and particularly foreign students in recent years). There was a veritable explosion in tertiary enrolments from the mid 1980’s and enrolments by foreign students from the late 1990’s.

A trend in favour of rental housing may have been aided further by a growing preference for maintaining mobility in an environment of non-permanent jobs arising from the major economic reforms that began in the mid 1980’s. Again, the aging population may have also played a part. It has been hypothesized that changes in means testing people for retirement care in the mid 1990’s has led to increases in the formation of family trusts. Whether this has resulted in increases in reported rent payments in the HES is a moot point.

Around 75 percent of the New Zealand housing stock was built before the first oil shock in 1973/74. Even allowing for renovations to these older houses, it is likely that the vast majority of New Zealand homes are not technically advanced (by standards prevailing in higher income countries) – particularly in the area of efficient heating etc. Given the strong response of demand for housing services to income, we can expect increasing demand for house modifications or replacement as consumer incomes increase.

It is also clear that shocks to housing demand can initiate house price bubbles. With a high expenditure elasticity of demand and generally tax free capital gains on housing, a rise in immigration that will be associated with a shift in housing demand – owing to the capital gains motive, injection of new spending power etc – can induce a significant short term burst in housing activity.

The price response characteristics of owner occupied and rental housing are also, not surprisingly, somewhat different. The demand for both housing types are price inelastic but the demand for rental housing is only half as elastic as it is for owner occupied housing (-0.5 compared to -0.9, approximately). The two types of housing are net substitutes as reflected by a cross price substitution coefficient of around 0.1.

The model does not identify strong substitution or complementary effects between the two types of housing demand and the other goods at a disaggregated level. There is a hint that overseas travel may be a substitute for both rental and owner occupied housing but the parameter is not significant even at the 10 percent level.

## 6. References

Adams, P. D., C-F. Chung and A. A. Powell (1988), "Australian Estimates of Working's Model Under Additive Preferences", *Working Paper No. 0-61, Impact Research Centre, The University of Melbourne*.

Berndt, E.R. (1991), *The Practice of Econometrics: Classic and Contemporary* (Reading, MA.: Addison-Wesley).

Berndt, Ernst R. and N. Eugene Savin (1975), "Estimation and Hypothesis Testing in Singular Equation Systems with Autoregressive Disturbances", *Econometrica*, 43 (5-6), 937-957.

Chatterjee, Srikanta, Claudio Micheleni and Ranjan Ray (1994), "Expenditure Patterns and Aggregate consumer Behaviour; Some Experiments with Australian and New Zealand Data, *Economic Record*, 70, 278-291.

DBH (2005), Building Code, section B2, *Department of Building and Housing*, Wellington.

Gibson, J. and G. Scobie (2002), "Are We Growing Faster than We Think? An Estimate of 'CPI bias' for New Zealand", *Paper presented at the New Zealand Association of Economists conference*, Wellington, New Zealand.

Giles, David and Peter Hampton (1985), "An Engel Curve Analysis of Household Expenditure in New Zealand", *Economic Record*, 61, 450-462.

Grimes, Arthur and Andrew Aitken (2004), "What's the Beef with House Prices? Economic Shocks and Local Housing Markets". *Motu Working Paper 04-08*.

Joumard, Isabelle and Helmut Reisen (1992), "Real Exchange Rate Overshooting and Persistent Trade Effects: The Case of New Zealand". *The World Economy* 15 (3).

Keller, W. J. and J. Van Driel (1985), "Differential Consumer Demand Systems", *European Economic Review*, 27, 375-390.

Mohammed Khaled, Vhari McWha and Ralph Lattimore (2004), "Fragmenting Food Markets: Some NZ Evidence from a Two-Stage Budget Model". *Agrarwirtschaft* (German Journal of Agricultural Economics) 53 (8).

Michelini, Claudio (1999), "New Zealand Household Consumption Patterns, 1983-92: An Application of the Almost Ideal Demand System", *N.Z. Economic Papers*, 33 (2), 15-26.

Michelini, Claudio and Srikanta Chatterjee (1997), "Demographic Variables in Demand Systems: An Analysis of New Zealand Household Expenditures, 1984-92", *N.Z. Economic Papers*, 31 (2), 153-173.

*NZ Department of Statistics* (1980), "Application of Engel Curves to NZ Household Expenditures and the Estimation of Simple Equivalence Scales", New Zealand Department of Statistics, Wellington.

Rosborough, Lauren (2005), "New Zealand House Prices: Foundations and Fallacies". *NZ Association of Economists Meetings*, Christchurch.

Theil, Henri and K. W. Clements (1987), *Applied Demand Analysis: Results from System-Wide Approaches*, Cambridge, Mass.: Ballinger Publishing Company.

Whistler, D., White, Kenneth, Wong S. D. and Bates D., (2001), *SHAZAM User's Reference Manual Version 9.0*, Vancouver, B.C.: Northwest Econometrics Ltd.

Wong, A. Y-T. and C. J. McDermott (1990), "Consumption of Durables, Non-durables and Services in New Zealand: A Systemwide Analysis", *N.Z. Economic Papers*, 24 (2), 115-127.

Working, H. (1943), "Statistical Laws of Family Expenditure", *Journal of the American Statistical Association*, 38, 43-56.