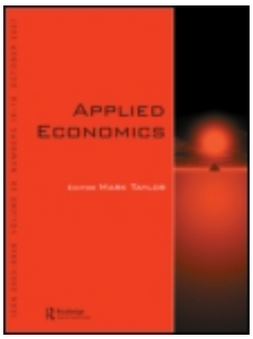

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The effects of changes in household demographics and employment on consumer demand patterns

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This study examines to what extent changes in consumer demand patterns over the last two decades in the Netherlands can be attributed to changes in household demographics, employment and total expenditures. The dominating changes in consumer demand are decreasing budget shares of *food & beverages* and *clothing & footwear* and increasing budget shares of *housing* and *services*. The changes in households' composition – away from the traditional one-earner family with children – together with the increase in household total expenditures account for about one-third of the decrease in the budget share of *food & beverages*, half of the increase in the budget shares of *services* and only a minor part of the increase in *housing*. Once controlled for budget effects, the quadrupling of the proportion of employed women with young children accounts for about one-third of the increase in the budget shares of *personal & health care* – including childcare – and *food away, holidays & entertainment*.

I. Introduction

Household expenditures patterns are important determinants of the structure of an economy. The major changes over the last decades in household expenditures towards services related commodities is often argued to be the result of changes in household composition away from the traditional household of a one-earner family with two or three children and towards more singles and two-earner households with fewer children.[1] The main objective of this study is to gain insights in the determinants of the changes in consumer demand over the last two decades and we significantly contribute to the literature by examining in detail to what extent changes in relative expenditures on major commodity groupings can be attributed to changes in households' employment, demographic composition and total expenditures. The empirical analysis employs household budget data from the Netherlands.

During the last decades several studies have examined consumer demand or household expenditures patterns in the Netherlands. The influential work of Barten (1969) discusses in detail the estimation of systems of consumer demand equations and uses aggregate time series data to estimate price and budget elasticities. To gain insights in the elasticities of demand Van Imhoff (1984) uses a combination of a cross-section data set and aggregated time series and, building on the work of Blundell *et al*. (1993),

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[1] See e.g. the seminal work on the service economy of Fuchs (1968) and Schettkat and Yocarini (2004) for an overview.

Kalwij *et al*. (1998) uses Dutch household-level budget data over the period 1980–1991. This latter study shows that – compared to the early 1980s – in the early 1990s households spent relatively more on services-related commodities such as holidays and food in restaurants and relatively less on basic goods such as food and clothing. We extend on these studies by providing a very detailed description of the changes between 1979 and 1998 in consumer demand patterns in the Netherlands for up to 20 major and 38 minor commodity grouping. In line with previous studies our analysis shows that the dominating changes in consumer demand are decreasing budget shares of *food & beverages* and *clothing & footwear* and increasing budget shares of *housing* and *services*. Kalwij and Machin (2005)[2] provides a detailed comparison of the changes in consumer demand patterns in Germany, France, Spain, Netherlands, United Kingdom and United States and show that similar changes are observed in these countries.

Many empirical studies identify the significant importance of household demographics, employment and total expenditures on demand patterns. For instance, the studies aforementioned do this for the Netherlands and studies such as Soberon-Ferrer and Dardis (1991) and Machado and Cardoso (2003) examine more specifically the effects of female employment on expenditures on services related commodities. For instance, Machado and Cardoso (2003), using Portuguese data, conclude that households with an employed wife have higher budget shares of services related commodities such as childcare, food away from home and domestic services. These empirical studies do not, however, explicitly examine to what extent changes in consumer demand patterns can be attributed to changes in households' employment, demographic composition and total expenditures and this is where our study contributes to the literature.[3] Our study quantifies the impact of the changes in households' composition and the increase in average household total expenditures on consumer demand patterns. Our analysis shows that changes in households' composition – away from the traditional one-earner family with children – together with the increase in household total expenditures account for about one-third of the decrease in the budget share of *food & beverages*, half of the increase in the budget shares of *services* and a minor part of the increase in *housing*. Once controlled for budget effects, the quadrupling of the proportion of employed women with young children accounts for about one-third of the increase in relative expenditures on *personal & health care* – including childcare – and *food away, holidays & entertainment*. The results furthermore show that the major trends in demand patterns are for a large part explained by the time effects.

The outline of this article is as follows. Section II describes the data and the major trends in household composition and consumer demand patterns. Section III presents the empirical results. The empirical framework adopted is based on estimating reduced form quadratic Engel curves for several commodity groupings. As examined in the Dutch studies discussed earlier, consumer demand will respond to relative price changes. Data limitations prevent us from identifying price responses and such responses are considered part of the time effects. Section IV summarizes the main results.

II. The Major Trends in Household Composition and Expenditures Patterns

The data available for this study are taken from the Dutch budget survey (*budgetonderzoek*), which has been held by Statistics Netherlands on a yearly basis since 1978. For this study the 1979, 1989 and 1998 waves are available. Each wave consists of about 2000 households. The descriptive statistics throughout this study are weighted sample statistics.[4]

During 1 year all households keep a daily record of all expenses above a certain threshold amount per item, except when being on holidays. Expenditures during holidays are recorded in a separate diary. The threshold amount for the daily records was 25 Dutch Guilders (€11) in 1979 and 1989 and fl35 (€16) in 1998. For a limited period of the year all expenses

[2] Kalwij and Machin (2005) is a forthcoming book chapter and is output of an EU funded research project of a collaboration of researchers from six countries where the main objective was to make a cross-country comparison of household expenditures patterns by making use of household level budget surveys. Parks and Barten (1973) and Selvanathan and Selvanathan (1993) examine cross-country differences in consumption patterns using aggregate data.

[3] Results of a first attempt to use this approach can be found in Kalwij and Machin (2005). These first results were conditioned by cross-country comparability issues. We extend on these first results in several directions using the Dutch data. To mention a few, housing consumption is included, female employment when having young children is explicitly examined, and a quadratic Engel curve is used, hereby explicitly allowing for the endogeneity of total expenditures, household employment variables and homeownership.

[4] Unit nonresponse is over 70%. This requires a weighting of the final sample to derive a representative picture of household expenditures of the Dutch population (CBS, 1992).

Table 1. Changes in household composition over time

Cells: % households		Years	1979	1989	1998	1979–1998
Types						%-point
1 Single	Age < 65	No job	5.2	7.0	7.9	2.7
2		One job	5.8	11.6	13.5	7.7
3 Single	Age = 65		9.1	8.7	10.9	1.9
4 Couple	Age < 65	No job	3.5	5.9	5.4	1.9
5		One job	9.0	4.5	6.2	−2.8
6		Two jobs	4.6	8.6	11.0	6.4
7 Couple	Age = 65		7.8	9.0	8.3	0.5
8 Other			4.0	0.7	0.6	−3.4
9 Single	With Children	No job	3.1	2.5	2.9	−0.3
10		One job	0.5	1.7	3.3	2.8
11 Couple	Youngest child < 6	No job	0.5	0.6	0.5	0.0
12		One job	14.0	10.4	7.9	−6.1
13		Two jobs	1.7	4.8	6.1	4.4
14	Youngest child = 6	No job	5.5	3.5	1.2	−4.3
15		One job	19.0	11.2	7.9	−11.1
16		Two jobs	5.6	8.8	5.9	0.3
17 Other	With Children		1.2	0.4	0.6	−0.6
All			100.0	100.0	100.0	
Number of observations			1884	1872	1904	

Note: The age is of the head of the household.

are recorded from which yearly expenses are deduced on commodities with a price below the threshold amount. This period equalled one month in 1979 but was reduced to half a month in 1989 and further reduced to 7 or 8 days in 1998. This period has become rather short and, consequently, zero expenditure may occur more frequently in later years. We return to this issue below.

The survey contains information on income, family composition and background information on all members of the household (age, education, etc.). All expenditures are directly observed except the rental value of the house for homeowners and this is imputed by Statistic Netherlands.[5] We trim the data to avoid outliers affecting the empirical results. This causes a 5% reduction of the sample. The resulting sample consists of 1884 households in 1979, 1872 households in 1989 and 1904 households in 1998.

In the Dutch Budget Survey the starting point for calculating household income is gross household income, which includes gross labour income of all household members, gross income from other activities, asset income, rent subsidies, child allowances, social security benefits, pension income, other monetary transfers such as inheritance, scholarships and alimony. To arrive at net household income, social security contributions and labour and income tax are deducted from gross household income. In addition mandatory health insurance contributions are deducted from net income[6] and the rental value of the house is added. Interest payments are not reported on in the survey in every year and are therefore not included as an income component. Consequently, savings cannot be deduced from the difference between income and expenditures.

Household demographics, employment, income and total expenditures

During the last decades Dutch society has undergone significant changes concerning household composition and employment. The total number of households increased by 40%. The major changes are a strong growth of single-person households, childless couples and two-earner couples with children (Table 1). Consequently, the share of traditional households of single-earner couples with children has fallen sharply from 33% 1979 to less than 16% in 1998 (Types 12 and 15, Table 1). Though their share fell, the absolute number of households with children remained virtually unchanged as the increasing number of single parents made up for the decline in couples with children. The share of working singles has increased (Type 2, Table 1) and the number of

[5] See Kalwij and Salverda (2004) for a detailed description of how the Statistics Netherlands imputes rents.
[6] Basic health premiums are mandatory and especially in case of public health insurance largely paid for by the employer. The privately insured often get the basic premium reimbursed by their employer. See Kalwij and Salverda (2004) for more details.

Table 2. Household size, number of children, homeownership and educational attainment

	Years			
	1979	1989	1998	1979–1998
Absolute change				
Average household size (in persons)	2.87	2.51	2.30	−0.57
Average number of children	1.05	0.82	0.68	−0.37
Average number of adults	1.82	1.69	1.62	−0.20
Panel A				
%-point change				
Distribution of the number of children				
Cells: % of households				
No children	49.6	56.2	63.8	14.8
One child	16.5	16.5	13.5	−3.0
Two children	21.6	19.2	15.7	−5.9
Three children	8.2	6.2	5.7	−2.5
Four or more children	4.7	2.0	1.3	−3.4
All	100	100	100	
% Couples (two adults or more)	75.8	68.4	61.5	−14.2
Average number of children	1.29	1.09	0.93	−0.36
% Couples with children	61.8	57.9	48.9	−12.9
Distribution of the number of children (%)				
One child	31.0	35.8	34.0	3.0
Two children	43.6	45.4	44.6	1.0
Three children	16.8	14.5	17.2	0.4
Four or more children	8.6	4.3	4.3	−4.4
Average number of children	2.09	1.88	1.91	−0.18
Panel B				
%-point change				
% of households that own a house	41.7	45.5	50.0	8.3
Educational attainment of the head of household (%)				
Level 1	70.0	35.5	28.5	−41.5
Level 2	19.1	40.0	43.7	24.6
Level 3	10.9	24.6	27.7	16.8
Partner present in the household (%)	75.6	67.9	60.4	−15.2
Educational attainment of the partner, if present (%)				
Level 1	78.3	50.1	39.0	−39.3
Level 2	15.0	34.6	40.2	25.2
Level 3	6.7	15.3	20.8	14.1

two-earner households has strongly increased from 1979 (12%) to 1998 (23%, Types 6, 13 and 16, Table 1). The share of couples with children decreased over the last two decades and couples that have children have slightly fewer children (Panel A, Table 2). Table 2 furthermore shows 14.2%-point decrease in the number of couples or, alternatively, a 59% increase in the number of single person households. The average number of children per household decreases by 35% (top Table 2) and this is not only due to an increase in the number of singles but also due to more childless couples.

Panel B of Table 2 reports on the educational attainment of the head of the household and partner (if present) and homeownership. Education Level 1 is at most junior secondary education, Level 2 is senior secondary education and Level 3 is higher vocational education or a university degree. Educational attainment has increased for both the head of household and the possible partner. Homeownership has increased by some 20% (8.3%-points).

Table 3, Panels A and B, shows that total (real) expenditures (+15%) and household income (+24%) increased substantially between 1979 and 1998. The fact that households have become smaller on average (Table 2) implies a stronger increase in the expenditures per person than per household. The distribution of household income and household expenditures has changed somewhat over the years 1979, 1989 and 1998. In particular there has been a larger increase in expenditures at the bottom percentiles than at the top percentiles. However, the inequality measures suggest

Table 3. Household income and the distribution of household total expenditures in the Netherlands in the years 1979, 1989 and 1998

	1979	1989	1998	% Change 1979–1998
Number of observations	1884	1872	1904	
Consumer price index	100.0	123.2	153.8	53.8
Panel A: distribution of household total expenditure				
Mean	42 286	44 807	48 559	14.8
Percentiles				
1%	11 398	13 110	16 070	41.0
5%	15 949	16 272	19 099	19.7
10%	19 571	20 063	22 240	13.6
25%	27 250	27 645	29 389	7.9
50%	39 113	40 467	44 913	14.8
75%	52 874	56 235	61 861	17.0
90%	69 889	75 808	78 508	12.3
95%	81 803	89 238	93 084	13.8
99%	102 139	115 662	120 106	17.6
Inequality measure, P90/P10	3.57	3.78	3.53	−1.1
Theil inequality index	0.11	0.13	0.12	3.4
Panel B: distribution of household income				
Mean	51 152	56 075	63 355	23.9
Percentiles				
1%	15 773	13 916	15 790	0.1
5%	19 474	17 816	21 681	11.3
10%	23 924	22 425	25 041	4.7
25%	32 262	30 555	35 205	9.1
50%	45 991	49 949	56 651	23.2
75%	63 756	72 054	83 198	30.5
90%	85 965	97 627	109 829	27.8
95%	101 733	118 865	126 542	24.4
99%	141 561	181 085	177 022	25.1
Inequality measure, P90/P10	3.59	4.35	4.39	22.1
Theil inequality index	0.12	0.16	0.15	23.9

Note: All amounts are in 1998 Dutch guilders.

that expenditures inequality remained relatively stable. Household income inequality, however, has increased between 1979 and 1998, mainly due to the somewhat stronger increase in the higher deciles of the income distribution.[7]

The commodity classification and price indices

When constructing the different aggregated commodities the emphasis is put on services – following the comparative work of Kalwij and Machin (2005). Table 4 lists the consumer commodities we distinguish and reports the average budget shares for the years 1979, 1989 and 1998. We distinguish 20 major categories and within these, for descriptive purposes only, several minor categories including specifications of expenditures on durables. The 20 categories distinguish between (physical) *goods*, *housing* and *services*.[8] *Housing* is treated separately throughout the empirical analysis for two reasons. Strong increases in the budget share of *housing* together with the high share in the overall budget raise particular interest in the evolution of the households' relative expenditures on *housing* and its determinants. In national accounts *services* includes *housing* and following this definition may yield a rather confusing interpretation of the evolution of relative expenditures on *services* since this would be dominated by the relative expenditures on *housing*.

The budget share is defined as the expenditures on a certain commodity divided by total household expenditures. Table 4 shows that the dominating changes in consumer demand patterns in the Netherlands from 1979 to 1998 are decreasing shares of expenditures on goods such as *food* and *clothing* and increasing shares of expenditures on *housing* and *services*.[9] The declines

[7] Interest payments, which are presumably increasing with income, are not taken into account.
[8] Note that Kalwij and Machin (2005) exclude housing from the final analysis.
[9] Kalwij and Salverda (2004) presents a detailed (and favourable) comparison of our budget data with National Accounts data.

Table 4. The budget shares of major and minor commodity categories

	1979	1989	1998	Change 1979–1998
All goods and services, in 1998 Dutch guilders	42 286	44 807	48 559	
Cells: % of the budget				%-point
Gross household income	**167.1**	**157.4**	**153.3**	**−13.8**
Net income	**127.9**	**126.2**	**131.6**	**3.7**
All goods and services	**100.0**	**100.0**	**100.0**	**0.0**
1. Food and nonalcoholic beverages	**19.9**	**16.2**	**12.5**	**−7.5**
a. Food	17.1	14.0	10.6	−6.5
b. Nonalcoholic beverages	2.8	2.3	1.9	−0.9
2. Alcoholic beverages and tobacco	**3.7**	**2.8**	**2.4**	**−1.3**
a. Alcoholic beverages	2.0	1.6	1.4	−0.6
b. Tobacco	1.7	1.1	1.0	−0.7
3. Clothing and footwear	**9.6**	**7.8**	**6.4**	**−3.2**
a. Clothing and footwear	8.9	7.2	5.9	−3.0
b. Accessories	0.7	0.6	0.5	−0.2
4. Private transport goods	**6.6**	**6.8**	**6.2**	**−0.4**
a. Durables: cars, bikes & motors	4.5	4.4	3.2	−1.3
b. Fuel	2.1	2.5	3.0	0.9
5. Furnishing and appliances	**7.2**	**6.0**	**5.5**	**−1.6**
a. Durables: furniture & furnishing	4.7	3.8	3.7	−1.0
b. Appliances, nondurables	1.4	1.3	1.0	−0.4
Appliances, durables	1.0	0.9	0.8	−0.3
6. Entertainment goods	**5.9**	**6.5**	**6.0**	**0.1**
a. Books, newspapers	2.2	2.8	1.8	−0.4
Durable: computer	0.0	0.0	0.8	0.8
b. Cd's & tapes	0.5	0.7	0.7	0.2
Durables: audio and video equipment	1.5	1.2	1.1	−0.4
c. Toys and hobbies, nondurables	1.0	1.1	1.0	0.0
Durables: instruments & pets	0.2	0.1	0.1	−0.1
d. Holiday goods: sport-goods, rental of equipment	0.2	0.3	0.2	0.0
Durables: boat, caravan & tents	0.4	0.3	0.3	0.0
7. Personal Goods	**0.9**	**1.3**	**1.3**	**0.4**
Nondurables	0.9	1.3	1.3	0.4
Durables: hairdryer, electric shaver	0.0	0.0	0.0	0.0
8. Home energy	**7.5**	**5.8**	**5.4**	**−2.0**
9. Food and beverages away from home	**2.4**	**3.8**	**3.6**	**1.2**
10. Holiday services	**4.8**	**4.4**	**4.8**	**0.0**
a. Package tours and travel insurance	1.5	1.3	2.0	0.5
b. Holidays in other countries	2.3	2.3	1.8	−0.5
c. Holidays in the home country	1.0	0.8	1.0	0.0
11. Housing	**20.8**	**25.9**	**29.5**	**8.7**
a. Rent and home related service charges	8.6	12.0	15.1	6.5
b. Imputed rent for homeowners	8.2	10.3	11.1	2.9
c. House repairs	4.0	3.5	3.2	−0.8
12. Household services	**0.9**	**1.0**	**1.4**	**0.5**
a. Domestic help	0.5	0.6	0.8	0.2
b. Childcare and babysitting	0.0	0.1	0.4	0.4
c. Laundry services	0.1	0.1	0.1	−0.1
d. Repairs	0.2	0.2	0.1	−0.1
13. Health goods and services	**1.2**	**1.8**	**1.4**	**0.1**
a. Payment to doctors	0.5	1.2	0.6	0.1
b. Drugs and other medical goods	0.7	1.0	0.7	0.0
14. Personal services	**0.7**	**0.7**	**0.7**	**0.0**
15. Public transport services	**0.8**	**1.3**	**1.1**	**0.3**
16. Private transport services	**2.6**	**2.8**	**3.9**	**1.3**
a. Repairs	0.2	0.3	1.3	1.1
b. Car insurance, road-tax, license fees	2.2	2.3	2.4	0.2
c. Driving lessons	0.2	0.2	0.2	0.0
17. Communication services	**2.0**	**2.1**	**2.5**	**0.5**
18. Education and training services	**0.6**	**0.3**	**1.0**	**0.4**

(*continued*)

Table 4. Continued

	1979	1989	1998	Change 1979–1998
19. Entertainment services	**1.2**	**1.7**	**2.5**	**1.3**
20. Miscellaneous services	**0.7**	**1.0**	**1.9**	**1.2**
a. Financial and insurance services	0.3	0.5	0.4	0.1
b. Contributions	0.4	0.6	1.1	0.7
c. Other services such as passport fees	0.0	0.0	0.4	0.4
Goods (1–8)	**61.3**	**53.2**	**45.7**	**−15.6**
Housing (11)	**20.8**	**25.9**	**29.5**	**8.7**
Services (9, 10, 12–20)	**17.9**	**20.9**	**24.8**	**6.9**
All	**100**	**100**	**100**	

Note: Major commodity categories are in bold.

in the budget shares of *food & nonalcoholic beverages* and *clothing & footwear* equal 7.5 and 3.2%-points respectively. The aggregate of other goods decreased by 4.8%-points; for a large part because of home energy consumption. By contrast, the budget shares of *housing* and *services* increased by 8.7 and 6.9%-points, respectively. Kalwij and Machin (2005) report similar changes in Germany, France, Spain, United Kingdom and United States.

For completeness we present price information obtained from the published tables of Statistics Netherlands. At a detailed level, the minor category level (Table 4), no satisfactory price information could be obtained for all three years. For this reason Table 5 reports only on price indices for the major categories, setting 1979 equal to 100. Table 5 shows that *housing* has experienced the largest relative price increase (+38.7%), the price of *services* changed in line with the overall price index (hence a relative increase close to 0) and the relative price of *goods* decreased (−13.4%).

Zero expenditure on a certain commodity can be observed, especially on item level. One reason for zero expenditure is that the expenditures took place outside the observation period, hence infrequency of purchase, or that a household does not consume that commodity. For instance, one may use public transport infrequently and therefore record zero expenditures during the diary period, while a nonsmoker would indeed purchase no tobacco and therefore records zero expenditures on this commodity. Given the data at hand, it is not possible to distinguish infrequency of purchase from no purchase ever. This study essentially takes a reduced form approach in the empirical analysis (next section) and treats zeros as real zero expenditures. However, infrequency of purchase does invoke a measurement error problem and in the estimation procedure the issue of measurement error is taken into account by employing an Instrumental Variables estimator. Furthermore, we emphasise the empirical results based on a higher level of aggregation at which the occurrence of zero-expenditures is much less frequent (virtually absent) and thus avoids potential zero-expenditures problems.

Table 5. The overall price index increased by 53.8%

Consumer price indexes	1979	1989	1998
1. Food & nonalcoholic beverages	100.0	90.9	84.0
2. Alcoholic beverages & tobacco	100.0	106.4	115.0
3. Clothing & footwear	100.0	87.5	70.1
4. Private transport goods	100.0	113.2	101.6
5. Furnishing & appliances	100.0	94.2	82.2
6. Entertainment goods	100.0	94.9	81.0
7. Personal goods	100.0	96.1	87.5
8. Home energy	100.0	88.0	96.4
9. Food & beverages away from home	100.0	108.9	113.8
10. Holiday services	100.0	100.4	94.0
11. Housing	100.0	116.9	138.7
12. Household services	100.0	112.1	114.3
13. Health goods & services	100.0	101.4	102.4
14. Personal services	100.0	96.1	87.5
15. Public transport services	100.0	118.4	126.7
16. Private transport services	100.0	97.3	105.0
17. Communication services	100.0	85.7	88.5
18. Education & training services	100.0	107.6	113.5
19. Entertainment services	100.0	94.9	90.1
20. Miscellaneous services	100.0	91.8	90.0
Goods (1–8)	100.0	94.2	86.6
Housing (11)	100.0	116.9	138.7
Services (9, 10, 12–20)	100.0	100.3	100.8
All	100.0	100.0	100.0

Source: Statistics Netherlands.
Notes: We report on the relative price indices of *goods, services* and *housing* within the group of all commodities.

III. Empirical Analysis

The empirical framework follows earlier studies such as Barten (1969) and is based on estimating Engel

curves for several commodity groupings. The empirical approach we take is considered a reduced form approach.[10] We estimate quadratic Engel curves and decompose the changes in the budget shares over time in changes due to changes in households' employment, demographic composition and total expenditures. We refer to Deaton and Muellbauer (1980) for an overview on Engel curve estimation and the relationship with consumer behaviour and to Banks *et al*. (1997) for estimation using quadratic Engel curves. We take a conditional approach to model household employment (Browning and Meghir, 1991).[11]

The statistical model and empirical specification

A system of reduced form quadratic Engel curves is estimated where the budget shares of the 20 major commodity groupings of Table 4 are as follows related to the logarithm of household total expenditures and demographic and employment variables:

$$S^t_{j,h} = \alpha^t_j + \gamma^d_j z^{d,t}_h + \gamma^e_j z^{e,t}_h + \gamma^h_j z^{h,t}_h + \beta_{1,j}\ln(x^t_h) + \beta_{2,j}(\ln(x^t_h))^2 + \varepsilon^t_{j,h}, \quad h \in \{1,\ldots,H_t\},\ t \in \{1,\ldots,T\},\ j \in \{1,\ldots,J\}, \quad (1)$$

where $s^t_{j,h}$ is the budget share of commodity j of household h in time period t, $z^{d,t}_h$, $z^{e,t}_h$ and $z^{h,t}_h$ are vectors containing, respectively, demographic, employment and homeownership variables, x^t_h is household total expenditures, α^t_j, γ^d_j, γ^e_j, γ^h_j, $\beta_{1,j}$ and $\beta_{2,j}$ are the parameters of interest of the budget share equation for commodity k and $\varepsilon^t_{j,h}$ is an idiosyncratic error term. We have H_t households in year t, 20 commodities ($J=20$) and 3 years of observations ($T=3$). Prices are not included in the specification of Equation 1 because three years of price information is insufficient to identify price effects.[12]

The explanatory variables are the following. To examine the effects of changes in household composition we include the logarithm of the number of adults, the logarithm of one plus the number of children under 6 years of age, the logarithm of one plus the number of children over 5 and age squared of the head of household. To examine the effects of changes in household employment we include dummy variables for one-earner and two-earner households. A dummy variable equal to 1 is included if all adults are employed and a child under 6 years of age is present in the household, 0 otherwise. This variable is basically a dummy variable for employed women with young children. This variable captures a possible increase in the demand for services such as childcare, as suggested by Machado and Cardoso (2003). An additional control is homeownership to control for the fixed costs of owning a house.

Equation 1 is estimated using Instrumental Variables to take into account possible measurement errors in total expenditures and endogeneity of the employment variables and homeownership. We have ten additional instruments and six endogenous variables. The additional instruments are: educational attainment of the head of household and the partner (if present) and age (and squared) of the partner (if present), widow status and gender of the head of household and log-household income (and squared). The variables treated as endogenous are: one-earner and two-earner households, log-household total expenditures (and squared), female employment times the presence of a child under six and homeownership.

Empirical results

The Engel curve estimates for the 20 major categories as listed in Table 4 and relevant test statistics, are reported in the Table A1 in the Appendix.[13] To facilitate the discussion of the empirical results we present a decomposition of the changes in the budget shares over the years 1979–1998 in time effects, changes in household demographics, employment, the budget and homeownership. These decomposition results are in detail reported in Table A2 in the Appendix. To further facilitate the discussion we restrict our discussion to the decompositions in Table 6 that are based on more aggregate commodity groupings.[14] At the top of Table 6 the observed dominant compositional changes over the observation period are reported, as discussed in Section II. The major change in the household composition is a shift away from the traditional one-earner family with children. We observe a 59% increase in single person households, couples having 28% fewer children, a doubling of the proportion of two-earner families from 12 to 23% and a quadrupling of the proportion of employed women with young children

[10] We wish to emphasize that we include durables and zero-expenditures in the analysis to provide a complete picture of consumer demand changes in the Netherlands.
[11] The absence of information on wage rates and hours of work prevent us from modelling leisure or labour supply as a commodity (see, e.g. Folkertsma, 1995).
[12] Note that prices are the same for all households, hence we need time variation for the identification of price effects.
[13] Pooled estimation results. Estimating this equation by year does not alter the main conclusions of this study.
[14] Furthermore, at this high level of aggregation there are very few zero expenditures reported.

Table 6. A decomposition of the %-point changes in the budget shares over the period 1979–1998

Effects	Budget share 1979 (in%)	Time 1979–1998	Demographics 28% fewer children (for couples) 59% more singles	Budget 15% real increase	Employment increase in two-earners 12 to 23%	Employed women with children < 6 2.2 to 9.4%	Homeownership 20% increase	Total
Panel A								
Goods (1–8)	61.3	**−11.9 (0.59)**	**−1.76 (0.20)**	−0.52 (0.39)	0.74 (0.47)	**−1.84 (0.58)**	−0.26 (0.31)	**−15.5 (1.09)**
Services (9, 10, 12–20)	17.9	**3.66 (0.34)**	**0.73 (0.12)**	**1.39 (0.23)**	**−1.45 (0.27)**	**3.34 (0.33)**	**−0.44 (0.18)**	**7.23 (0.63)**
Housing (11)	20.8	**8.22 (0.31)**	**1.03 (0.11)**	**−0.87 (0.21)**	**0.72 (0.25)**	**−1.50 (0.30)**	**0.70 (0.16)**	**8.30 (0.57)**
All	100.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panel B								
Food & beverages (1, 2)	23.6	**−5.36 (0.26)**	**−1.95 (0.09)**	**−1.28 (0.18)**	0.16 (0.21)	−0.38 (0.26)	−0.13 (0.14)	**−8.95 (0.49)**
Clothing & footwear (3)	9.6	**−3.34 (0.19)**	**−0.35 (0.07)**	0.08 (0.12)	0.28 (0.15)	0.04 (0.19)	0.02 (0.10)	**−3.27 (0.35)**
Transport & communication (4, 15, 16, 17)	12.0	**1.85 (0.38)**	**0.48 (0.13)**	**1.06 (0.25)**	−0.68 (0.31)	−0.52 (0.38)	−0.35 (0.20)	**1.85 (0.71)**
Furnishing & appliances (5, 6, 20)	13.8	**−1.09 (0.33)**	**0.28 (0.11)**	0.39 (0.23)	0.16 (0.26)	0.16 (0.32)	0.00 (0.17)	−0.11 (0.61)
Personal care & health care (7, 12, 13, 14, 18)	4.3	**0.35 (0.15)**	**0.27 (0.05)**	**0.74 (0.11)**	−0.09 (0.12)	**0.64 (0.15)**	**−0.40 (0.08)**	**1.51 (0.29)**
Home energy (8)	7.5	**−1.23 (0.09)**	**−0.18 (0.03)**	**−0.56 (0.02)**	**0.21 (0.07)**	**−0.28 (0.08)**	0.05 (0.04)	**−2.00 (0.15)**
Food away, holidays & entertainment (9, 10, 19)	8.4	**0.61 (0.26)**	**0.42 (0.09)**	**0.43 (0.18)**	**−0.75 (0.21)**	**1.85 (0.26)**	0.12 (0.14)	**2.67 (0.49)**
Housing (11)	20.8	**8.22 (0.31)**	**1.03 (0.11)**	**−0.87 (0.21)**	**0.72 (0.25)**	**−1.50 (0.30)**	**0.70 (0.16)**	**8.30 (0.57)**
All	100.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Significant effects are in bold. The decomposition at a lower level of aggregation is in the Appendix Table A2.

from 2.2 to 9.4%. Furthermore, average household real total expenditures – the budget – has increased by 15% and homeownership by 20%.

At the top of Table 6, Panel A, we summarize the decomposition results for the highly aggregated commodity groupings *goods*, *services* and *housing*. The last column shows, as discussed before, that the major changes in household demand patterns are 15%-point decrease in *goods* and a 7%-point increase in *services* and a 8%-point increase in *housing*. Changes in demographics – a 28% decrease in the number of children of couples and a 59% increase in one-person households – increased the demand for *services* by 0.7%-point and *housing* by 1%-point and, consequently, a decrease of 1.8%-points in *goods*. Examining this trend in *services* in more detail shows that most of this increase is due to increases in *holiday services* and *household services* (see Appendix, Table A2). The increase in household total expenditures accounts for a 1.4%-point increase in *services* – which can be considered a luxury commodity. The change in household employment – a doubling of the proportion of two-earner families – is basically a fixed-cost effect of an additional worker since budget effects are controlled for. This increase yields a 1.5%-point decrease of *services*, while the relatively spending on *goods* and *housing* increased both by 0.7%-points. The quadrupling of employed women with young children accounts for a 3.3%-point increase in *services* and the more detailed commodities (Table A2) show this is mainly due to a 1.1%-point increase in *holiday services*, a 0.5%-point increase in *household services* (childcare included), a 0.5%-point increases in *public transport services* and 0.3%-point increases *entertainment services*. The 20% increase in homeownership mainly resulted in a 0.7%-point increase in the relative expenditures on housing.

Panel B of Table 6 examines a different commodity grouping to provide a clearer picture on a different level of aggregation than Panel A. These eight commodity groupings are in line with the conventionally chosen ones in this literature. The most striking features of Table 6, Panel B, are the 9.0%-points decrease in the budget share of *food and beverages*, the 3.2%-points decrease in the budget share of *clothing and footwear*, the 2.7%-points increase in the budget share of *food away, holidays and entertainment* and, as already discussed earlier, the 8.3%-points increase in *housing*. This latter observation, together with the large budget share of *housing*, underlines the importance of including housing consumption in the analysis. The budget share of *personal care and health care* increases with 1.5%-points.

Time effects dominate most of these trends. Although, as discussed earlier, data limitations prevent estimation of price-effects, the observed decrease in the relative price of food and the strong increase in the price of housing are in line with the corresponding estimated time effects under the assumption of price inelastic demand. In support of this assumption Kalwij *et al.* (1998) report that *clothing & footwear* and *housing* are inelastic commodities. The commodity *food & beverages*, however, is reported to be highly elastic and this shows that these time effects need to be interpreted with great caution since different time and price effects may be present. The budget effects show that the necessary commodities are *food & beverages, home energy* and *housing* (conditional on ownership). The luxury commodities are *personal care & health care*, *food away, holidays & entertainment* and *transport & communication*. These findings are, to the extent they can be compared, in line with Kalwij *et al.* (1998) who use Dutch budget survey data from 1980 to 1991.

The budget share of *food & beverages* decreases with 9%-points and 2%-points of this decrease is explained by demographic changes and 1.3%-points by the budget increase. The remaining effects are insignificant. The budget share of *clothing and footwear* decreases with 3%-points and virtually all of this decrease is explained by the time-effect and only a 0.4%-point decrease is attributed to demographic changes. The budget share of *transport & communication* increases with 1.9%-points; the increase in the budget accounts for a 1.1%-point increase and the increase in the number of two-earner families results in a 0.7%-point decrease. The budget share of *furnishing & appliances* decreases slightly with 0.1%-points. The budget share of *personal care & health care* increases slightly with 1.5%-points, half of this is explained by an increase in the budget (a luxury commodity) and the other half is explained by the quadrupling of the proportion of employed women with young children from 2.2 to 9.4%. The budget share of *home energy* decreases with 2%-points. This is mainly a time effect but also the 15% increase in the budget and more employed women with young children attributed significantly to a reduction in this share. The budget share of *food away, holidays & entertainment* increases with 2.7%-points. Changes in demographics account for 0.4%-point of this increase and 0.4%-points of this increase is due to an increase

in the total expenditures. Most of this increase – 1.9%-points – is attributed to the increase proportion of employed mothers with young children. As discussed earlier, the budget share of *housing* increases with 8%-points. This is the most dominant feature of the change in the demand patterns in the Netherlands. The time effect captures almost all of this increase, 8.2%-points and this may be largely be a price effect (see Table 5 and Kalwij *et al*., 1998). We can of course not formally test this latter claim since we do not estimate price effects. Demographic changes, mainly the increase in single person households, have also somewhat contributed to the increase in housing consumption.

IV. Summary of Results and Concluding Remarks

This study provides a detailed picture of changes in household expenditure patterns in the Netherlands over the last two decades and examines to what extent changes in consumer demand patterns can be attributed to changes in household demographics, employment and total expenditures. The data employed are the 1979, 1989 and 1998 cross-sections of the Dutch Budget Survey data. Descriptive statistics show that the dominating changes in consumer demand over this period are decreasing budget shares of *food & beverages* (−7.5%-points) and *clothing & footwear* (−3.2%-points) and increasing budget shares of *housing* (+8.7%-points) and *services* (+6.9%-points).

The major changes during the last two-decades in households' composition – demographics and employment – is a shift away from the traditional one-earner family with children. We observe a strong increase in the proportion of single-person households, couples having fewer children, a doubling of the proportion of two-earner families and, related to this, a quadrupling of the proportion of employed women with young children. Furthermore, average household (real) total expenditures increased by 15%. The empirical results show that these changes in households' composition – away from the traditional one-earner family with children – together with the increase in total expenditures account for about one-third of the decrease in the budget share of *food & beverages*, half of the increase in the budget shares of *services* and a minor part of the increase in *housing*. Once controlled for budget effects, the quadrupling of the proportion of employment women with young children from 2.2 to 9.4% accounts for about one-third of the increase in relative expenditures on *personal & health care* – including childcare – and *food away, holidays & entertainment*. The results furthermore show that the major trends in consumer demand patterns can only partially be attributed to these compositional changes and that the time effects dominate these trends. This indicates the importance of price responses that – due to data limitations – could not be identified in this study and estimating price responses is left for future research.

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Appendix

Table A1. Estimation results

Commodity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Covariate	Cell: parameter estimate																			
Year = 1989	2.17	−0.73	−2.06	1.07	−1.47	0.17	0.32	−1.46	0.99	−1.01	4.78	−0.34	0.58	0.01	0.38	0.29	0.05	−0.22	0.45	0.39
Year = 1998	−4.44	−0.92	−3.34	−0.04	−2.00	−0.22	0.33	−1.23	0.78	−1.38	8.22	−0.22	−0.09	−0.09	0.11	1.37	0.41	0.43	1.20	1.13
ln (adults)	8.41	0.73	0.23	0.59	−0.32	−0.73	−0.25	0.34	0.17	−0.39	−7.32	−1.08	−0.13	−0.12	−0.30	1.63	−0.95	−0.31	−0.11	−0.09
ln (kids < 6)	3.81	1.63	0.65	3.93	2.35	−3.50	1.68	2.90	−5.09	−8.96	11.11	−1.06	−1.32	0.06	−3.18	−1.96	0.41	−0.90	−1.80	−0.77
ln (kids > 0)	4.99	−0.48	1.75	−2.64	−0.78	0.07	−0.01	0.76	−0.78	−1.65	−0.86	−0.44	−0.25	−0.10	−0.09	−0.26	−0.22	0.59	0.36	−0.33
ln (expenditures)	−8.92	9.06	9.00	−47.71	−9.34	3.05	2.73	−25.66	−3.91	17.01	41.26	−6.29	7.76	2.69	−6.03	21.15	−8.04	1.49	−3.81	4.50
ln (expenditures)^2	0.02	−0.48	−0.40	2.56	0.52	−0.12	−0.11	1.02	0.12	−0.61	−2.25	0.36	−0.28	−0.11	0.35	−1.03	0.41	0.00	0.21	−0.18
One-earner	−1.35	−0.22	−2.91	6.05	−3.30	1.94	−0.95	−1.34	0.41	2.60	−5.35	1.09	0.76	−0.32	1.24	1.08	−0.37	−0.42	0.73	0.63
Two-earner	−0.35	0.28	−0.36	3.85	0.32	0.64	0.29	0.64	−2.26	−1.33	1.42	0.75	−0.82	−0.05	−0.62	−1.04	−0.22	−0.97	−0.02	−0.14
Full employment *x* presence kids < 6	0.54	−8.02	0.72	−21.30	−7.12	7.69	−2.86	−5.55	7.67	22.17	−29.25	9.25	4.21	0.08	8.79	2.93	−0.54	1.87	6.15	2.56
Homeowner	−2.28	0.67	0.25	−2.22	0.31	0.01	−0.50	0.57	3.72	−1.01	8.45	−1.12	−1.31	−0.18	−2.89	2.72	−1.82	−1.69	−1.30	−0.37
Constant	95.75	−42.37	−41.21	224.3	47.22	−8.15	−15.36	161.25	37.34	−102.4	−165.7	27.82	−47.51	−15.49	28.89	−106.5	42.17	−11.97	19.29	−27.32
Cell: SE																				
Year = 1989	0.20	0.11	0.17	0.32	0.22	0.18	0.05	0.08	0.13	0.19	0.27	0.07	0.08	0.04	0.07	0.10	0.05	0.05	0.05	0.07
Year = 1998	0.23	0.13	0.19	0.36	0.25	0.21	0.05	0.09	0.14	0.21	0.31	0.08	0.09	0.05	0.07	0.11	0.06	0.06	0.06	0.07
ln (adults)	0.55	0.30	0.46	0.86	0.59	0.49	0.13	0.20	0.34	0.51	0.74	0.20	0.21	0.11	0.18	0.26	0.13	0.15	0.15	0.18
ln (kids < 6)	1.40	0.77	1.18	2.19	1.52	1.26	0.33	0.52	0.87	1.31	1.88	0.50	0.55	0.28	0.45	0.67	0.34	0.37	0.37	0.45
ln (kids > 0)	0.23	0.13	0.19	0.35	0.25	0.20	0.05	0.08	0.14	0.21	0.31	0.08	0.09	0.05	0.07	0.11	0.05	0.06	0.06	0.07
ln (expenditures)	5.45	3.00	4.60	8.50	5.89	4.88	1.28	2.03	3.36	5.09	7.32	1.93	2.12	1.10	1.76	2.60	1.31	1.45	1.44	1.76
ln (expenditures)^2	0.25	0.14	0.21	0.39	0.27	0.23	0.06	0.09	0.16	0.24	0.34	0.09	0.10	0.05	0.08	0.12	0.06	0.07	0.07	0.08
One-earner	1.35	0.74	1.13	2.10	1.46	1.21	0.32	0.50	0.83	1.26	1.81	0.48	0.52	0.27	0.44	0.64	0.32	0.36	0.36	0.43
Two-earner	1.15	0.63	0.97	1.79	1.24	1.03	0.27	0.43	0.71	1.07	1.54	0.41	0.45	0.23	0.37	0.55	0.28	0.31	0.30	0.37
Full employment *x* presence kids < 6	4.38	2.42	3.70	6.84	4.74	3.93	1.03	1.63	2.71	4.09	5.89	1.56	1.71	0.88	1.42	2.09	1.06	1.16	1.16	1.42
Homeowner	1.44	0.79	1.21	2.24	1.55	1.29	0.34	0.54	0.89	1.34	1.93	0.51	0.56	0.29	0.47	0.69	0.35	0.38	0.38	0.46
Constant	30.32	16.72	25.58	47.29	32.81	27.18	7.10	11.30	18.71	28.32	40.73	10.76	11.82	6.10	9.81	14.47	7.30	8.06	8.00	9.79
R-squared	0.45	0.07	0.12	0.20	0.06	0.05	0.10	0.51	0.11	0.08	0.41	0.16	0.04	0.03	0.08	0.13	0.21	0.13	0.17	0.10
Sargan test, $\chi^2(4)$	29.4	75.3	139.2	15.3	13.6	60.0	26.0	18.1	75.3	24.9	18.7	35.7	17.5	53.2	51.5	31.1	32.3	29.4	35.7	2.8
Exogeneity test, $F(6, 5640)$	10.2	6.6	14.7	31.9	7.0	14.0	4.4	8.3	21.7	17.9	21.1	9.1	6.4	4.1	23.1	11.9	13.0	11.5	11.3	2.8

Notes: Age effects are not reported, commodity numbers 1–20 correspond with the numbers in Table 4.

Table A2. A decomposition of the %-point changes in the budget shares over the period 1979–1998

Effects	Budget share 1979 (in%)	Time 1979–1998	Demographics 28% fewer children (for couples) 59% more singles	Budget 15% real increase	Employment increase in two-earners 12 to 23%	Employed women with children < 6 2.2 to 9.4%	Homeownership 20% increase	Total
1. Food & nonalcoholic beverages	19.9	−4.44 (0.23)	−1.94 (0.08)	−1.14 (0.16)	0.11 (0.18)	0.03 (0.22)	−0.19 (0.12)	−7.57 (0.43)
2. Alcoholic beverages & tobacco	3.7	−0.92 (0.13)	0.00 (0.04)	−0.14 (0.08)	0.05 (0.10)	−0.41 (0.12)	0.06 (0.07)	−1.37 (0.23)
3. Clothing & footwear	9.6	−3.34 (0.19)	−0.35 (0.07)	0.08 (0.12)	0.28 (0.15)	0.04 (0.19)	0.02 (0.10)	−3.27 (0.35)
4. Private transport goods	6.6	−0.04 (0.36)	0.42 (0.12)	0.89 (0.23)	−0.29 (0.29)	−1.09 (0.35)	−0.18 (0.19)	−0.29 (0.66)
5. Furnishing & appliances	7.2	−2.00 (0.25)	0.18 (0.08)	0.23 (0.17)	0.39 (0.20)	−0.37 (0.24)	0.03 (0.13)	−1.54 (0.46)
6. Entertainment goods	5.9	−0.22 (0.21)	0.08 (0.07)	0.06 (0.14)	−0.15 (0.16)	0.39 (0.20)	0.00 (0.11)	0.16 (0.38)
7. Personal goods	0.9	0.33 (0.05)	0.03 (0.02)	0.06 (0.03)	0.13 (0.04)	−0.15 (0.05)	−0.04 (0.03)	0.36 (0.10)
8. Home energy	7.5	−1.23 (0.09)	−0.18 (0.03)	−0.56 (0.02)	0.21 (0.07)	−0.28 (0.08)	0.05 (0.04)	−2.00 (0.15)
9. Food & beverages away from home	2.4	0.78 (0.14)	0.13 (0.05)	−0.18 (0.10)	−0.26 (0.11)	0.39 (0.14)	0.31 (0.07)	1.18 (0.26)
10. Holiday services	4.8	−1.38 (0.21)	0.34 (0.07)	0.53 (0.15)	−0.41 (0.17)	1.14 (0.21)	−0.08 (0.11)	0.14 (0.40)
11. Housing	20.8	8.22 (0.31)	1.03 (0.11)	−0.87 (0.21)	0.72 (0.25)	−1.50 (0.30)	0.70 (0.16)	8.30 (0.57)
12. Household services	0.9	−0.22 (0.08)	0.21 (0.03)	0.19 (0.05)	−0.05 (0.06)	0.47 (0.08)	−0.09 (0.04)	0.52 (0.15)
13. Health goods & services	1.2	−0.09 (0.09)	0.06 (0.03)	0.24 (0.08)	−0.16 (0.07)	0.22 (0.09)	−0.11 (0.05)	0.15 (0.17)
14. Personal services	0.7	−0.09 (0.05)	0.03 (0.02)	0.04 (0.03)	0.03 (0.04)	0.00 (0.05)	−0.02 (0.02)	0.01 (0.09)
15. Public transport services	0.8	0.11 (0.07)	0.05 (0.03)	0.18 (0.05)	−0.19 (0.06)	0.45 (0.07)	−0.24 (0.04	0.36 (0.14)
16. Private transport services	2.6	1.37 (0.11)	−0.15 (0.04)	−0.09 (0.05)	−0.22 (0.09)	0.15 (0.11)	0.23 (0.06)	1.29 (0.19)
17. Communication services	2.0	0.41 (0.06)	0.16 (0.02)	0.09 (0.04)	0.02 (0.04)	−0.03 (0.05)	−0.15 (0.03)	0.49 (0.10)
18. Education & training services	0.6	0.43 (0.06)	−0.07 (0.02)	0.20 (0.04)	−0.05 (0.05)	0.10 (0.06)	−0.14 (0.03)	0.47 (0.11)
19. Entertainment services	1.2	1.20 (0.06)	−0.05 (0.02)	0.07 (0.04)	−0.08 (0.05)	0.32 (0.06)	−0.11 (0.03)	1.35 (0.11)
20. Miscellaneous services	0.7	1.13 (0.07)	0.02 (0.03)	0.11 (0.05)	−0.08 (0.06)	0.13 (0.07)	−0.03 (0.04)	1.27 (0.14)
Goods (1–8)	61.3	−11.9 (0.59)	−1.76 (0.20)	−0.52 (0.39)	0.74 (0.47)	−1.84 (0.58)	−0.26 (0.31)	−15.5 (1.09)
Housing (11)	17.9	3.66 (0.34)	0.73 (0.12)	1.39 (0.23)	−1.45 (0.27)	3.34 (0.33)	−0.44 (0.18)	7.23 (0.63)
Services (9, 10, 12–20)	20.8	8.22 (0.31)	1.03 (0.11)	−0.87 (0.21)	0.72 (0.25)	−1.50 (0.30)	0.70 (0.16)	8.30 (0.57)
All	100.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00