Scanner Data on Durable Goods: Market Dynamics and Hedonic Time Dummy Price Indexes

Discussion paper 04011

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Explanation of symbols

.	= data not available
*	= provisional figure
x	= publication prohibited (confidential figure)
–	= nil or less than half of unit concerned
–	= (between two figures) inclusive
0 (0,0)	= less than half of unit concerned
blank	= not applicable
2003–2004	= 2003 to 2004 inclusive
2003/2004	= average of 2003 up to and including 2004
2003/’04	= crop year, financial year, school year etc. beginning in 2003 and ending in 2004

Due to rounding, some totals may not correspond with the sum of the separate figures.

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Statistics Netherlands

SCANNER DATA ON DURABLE GOODS: MARKET DYNAMICS AND HEDONIC TIME DUMMY PRICE INDEXES

Summary: The treatment of durable goods and particularly the way quality adjustments are dealt with, is an important issue in the compilation of a consumer price index. This paper has two aims: first, to describe the consumer market for durables in the Netherlands and, second, to investigate the potential of hedonic regression for quality adjustments. To this end we utilize scanner data on televisions, refrigerators, washing machines and personal computers that represent the total population of sales. It is shown that the markets for these durables have a dynamic character: each period many new models appear and many obsolete models disappear. The market dynamics have implications for statistical agencies: samples should be updated regularly to remain representative, thus increasing the number of quality adjustments. This is where hedonics might help. We not only estimate hedonic models but estimate as well hedonic price indexes, using the time dummy variable method. To assess the various indexes and the official Dutch CPI, we take the so-called generalised Törnqvist index as our reference or benchmark index. Using a decomposition thereof, we show that for televisions, refrigerators and washing machines the matched-model Törnqvist index is a good approximation of the reference index, despite the dynamic market structure. Due to the high expenditure share of new and disappearing computer models the matched-model Törnqvist for PCs exhibits an increasing difference with respect to the reference index.

Keywords: consumer price index, hedonic regression, scanner data.

1. Introduction

In 1996 the Boskin Commission published their report (Boskin et al., 1996) which criticised the way the Bureau of Labor Statistics compiled the US Consumer Price Index (CPI). This criticism was directed to several aspects of the CPI, among which the way quality changes were handled was one of the most important. According to the Boskin Commission the US CPI overestimated inflation by 0,6 percentage points on an annual basis, due to insufficient corrections in case of quality changes. These findings were reason for the Dutch Advisory Committee on Price Statistics to encourage Statistics Netherlands in starting a research project to improve the Dutch CPI. This project started late 2000. Topics in this research were an annual revision of the base year, the introduction of a geometric average or a CES price index and the application of hedonic techniques when correcting for quality changes. See De Haan (2004) for an overview of the current state of affairs in this research project.

Hedonic regression is advocated in the new manual on the CPI (ILO, 2004) and it is the main subject in this paper. To perform research into this area Statistics Netherlands has bought scanner data for televisions, refrigerators, washing machines and personal computers from market research company GfK-Benelux. Practically, these data cover the population of sales during the period 1999-2001. Average prices (unit values) and quantities are available at a detailed level. For each durable an extensive list of technical characteristics is known as well. This enables us to develop hedonic models based on the population of sales and to calculate all kinds of population-based hedonic indexes. The presence of quantities makes it possible to compare hedonic indexes calculated with different types of weights. The importance of weighting has been stressed in recent years by Silver (2002) and Diewert (2003).

The quantities also give insight in the way sales are distributed over the year and in the relative importance of brands and models. It gives as well an indication on the length of the lifetime of a specific model of a durable and the pace by which substitution takes place. For a statistical office this information gives insight in the frequency at which samples have to be updated.

Section 2 starts with a description of the consumer market for the four durables that are discussed in this paper. Section 3 describes the development and estimation of hedonic models. An important aspect is the stability of the model parameters. Both weighted and unweighted estimation procedures are applied. In this section computers are not included as they are dealt with extensively in Van Mulligen (2003). The results will be used in section 4 to estimate various hedonic time dummy indexes based on different types of weights. The central question is whether hedonic quality adjustments are necessary or a matched-model approach suffices. To answer this question we use a 'generalised' Törnqvist index as a benchmark index. This time dummy index coincides with the Törnqvist index in case all items of two consecutive periods can be matched. A decomposition of this index is used to evaluate whether for televisions, refrigerators, washing machines and PCs the conditions are satisfied under which a matched-model Törnqvist index approximates the generalised version. Section 5 concludes.

2. Household durables, 1999-2001

2.1 The data

The scanner data refer to 18 bimonthly periods covering the years 1999-2001, except for PCs for which monthly data are available. The data set contains, per type of outlet, for each model sold unit values, quantities and a large set of characteristics. For the most important outlet types the data cover the whole population; all outlets belonging to those types are included. For the remaining outlet types the data are based on a sample and GfK subsequently raised the sample data to obtain population estimates. This means that the unit values and quantities reflect the population of sales in the Netherlands during the years 1999-2001.

The data received were subjected to a (limited) number of plausibility and consistency checks. It appeared that not all prices were presented in the same currency; some prices in Dutch guilders had to be converted to euros. A limited number of records were deleted because prices were highly implausible. Inconsistencies between characteristics were corrected where possible, sometimes using information from catalogues and the Internet. Generally spoken, the data were of good quality.

2.2 Market of durables 1999-2001

During the three years 1999-2001 a huge number of durables has been sold as is shown in table 1. According to GfK, two outlet types mainly sell PCs for business purposes. In our analysis, we classified all sales of those two types as business sales. They count for 62% of total sales. In the following we restrict ourselves to private sales only.

Table 1. Number of durables sold during 1999-2001

Type of durable	1999	2000	2001	1999-2001
Televisions	997 310	1 046 023	965 254	3 008 587
Refrigerators	547 909	569 770	565 752	1 638 431
- freestanding	382 207	401 596	402 225	1 186 028
- built in	165 702	168 174	163 527	497 403
Washing machines	458 100	490 285	504 466	1 452 851
Computers	1 039 052	1 011 953	919 634	2 970 639
- business use	668 116	606 104	570 038	1 844 258
- private use	370 936	405 849	649 596	1 126 381

Figure 1 shows the bimonthly sales during 1999-2001. A bit surprisingly, all durables exhibit a clear seasonal pattern. Televisions, computers (private sales only) and washing machines display a comparable pattern. All three have a top in their sales towards the end of the year. Mid 2000 shows an exception for televisions with an extra top halfway the year. This can be attributed to the European Championships Football, which were organised in Belgium and the Netherlands that year and the Olympic Games of September. Traditionally, big sport events stimulate the sales of televisions. For refrigerators the yearly peak is around August.

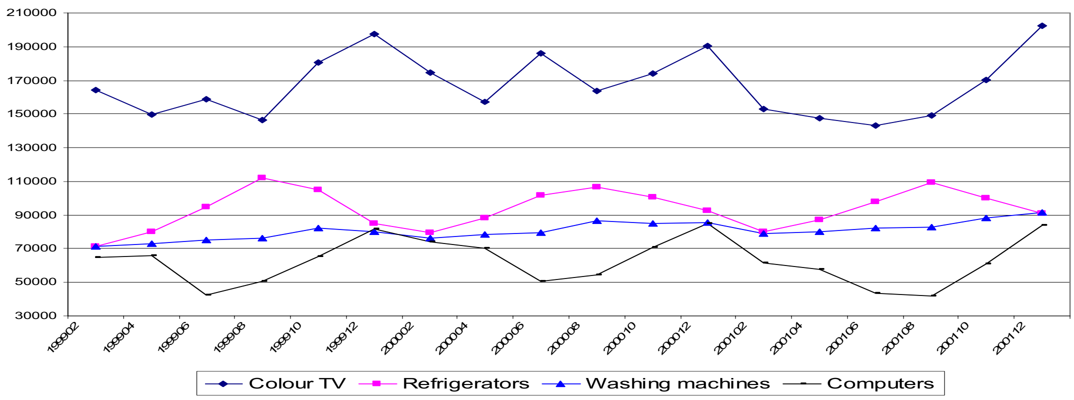

Figure 1. Durables, quantities sold during 1999-2001

As mentioned above, sales information is available for a number of outlet types. Table 2 shows their relative importance. For televisions, refrigerators and washing machines chain stores and buying combinations are the most important outlet types. For televisions, independents also have a considerable market share. For refrigerators a separate type of outlet, kitchen retail, does exist. In most cases these outlets can be classified as chain stores. The majority of computer sales is realised in specialised stores. Note that freestanding and built-in refrigerators have different distributions. Built-in refrigerators are typically sold in kitchen retail stores, whereas the market share of this outlet type is negligible with regard to freestanding refrigerators.

Table 2. Relative importance of types of outlets by durable, based on units sold

Type of outlet	Televisions	Refrigerators			Washing machines	Computers
		Freestanding	Built-in	Total		
Buying [a)]	28.8%	31.8%	6.6%	24.4%	35.2%	3.7%
Chain stores	49.3%	55.9%	2.0%	39.9%	52.7%	23.7%
Depmoh[b)]	3.3%	3.0%	0.0%	2.1%	3.5%	4.9%
Independents	16.3%	7.8%	1.3%	5.8%	8.6%	5.4%
Kitchen retail	-	1.5%	90.1%	27.7%	-	-
Photo retail	2.3%	-	-	-	-	9.3%
Computer stores	-	-	-	-	-	53.0%
Total sales	100%	100%	100%	100%	100%	100%

[a)] Buying: Buying combinations
[b)] Depmoh: Department stores and mail order houses

Table 3 shows the number of brands available and the market share of the ten most important ones. A surprisingly large number of brands is active in the market of durables. However, based on expenditures most of these are unimportant or even negligible. The market of durables is dominated by a relatively small number of brands.

Table 3. Number of brands and relative importance of top10, based on expenditures

Type of durable	Total number of brands	Market share of top10 of brands
Televisions	77	94%
Refrigerators	74	78%
Washing machines	45	90%
Computers	33	95% [a)]

[a)] Included is brand 'clone' having 26% of the market

An aspect which is important for price index statisticians is the life cycle of an item. Price indexes are preferably compiled by comparing identical items (compare like with like). When items disappear from the market, a comparison is made between the 'old' disappearing item and a newly selected one. In most cases it will be necessary to adjust the price difference between the two for a difference in quality. These quality adjustments contain a serious risk for biases as is indicated by Boskin et al. (1996). So, the longer items are available (with significant sales) the easier the life for the price statistician. Figures 2 and 3 provide an indication of the period items[1] are available on

[1] An item is defined in this paper as a durable-model, normally identified with a model number, sold in a specific type of outlet.

the market. Figure 2 shows which part of the 199902[2] population of items is still sold in period *t*. Figure 3 compares consecutive periods. For televisions, refrigerators and washing machines these are bimonthly periods, for computers the comparison is made on monthly data.

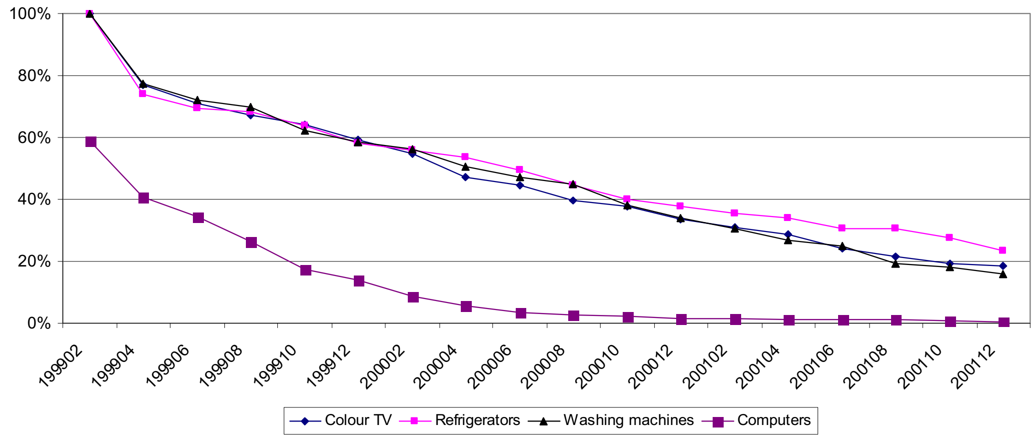

Figure 2. Number of items sold in both 199902 and t as percentage of number of items sold in 199902 (for computers 199901 and t)

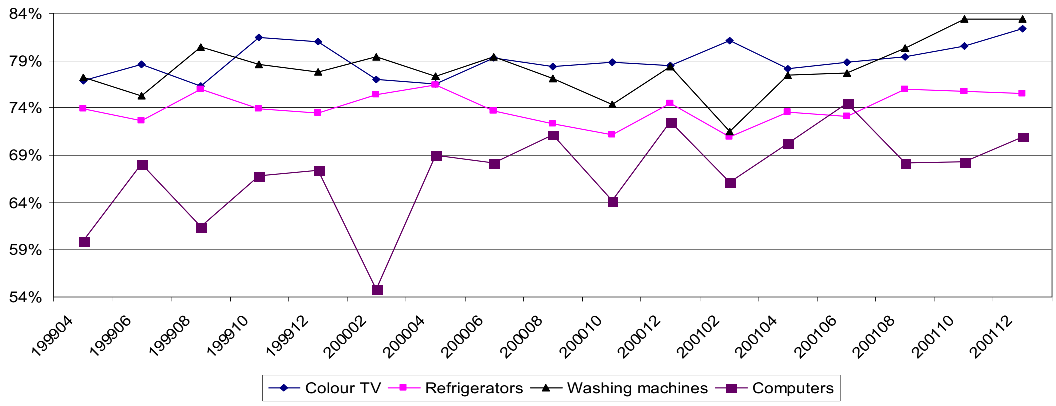

Figure 3. Number of items sold in both t-1 and t as percentage of number of items of t-1 (bimonthly for televisions, refrigerators and washing machines, monthly for computers)

For televisions, refrigerators and washing machines the match is fairly stable. In each period between 74% and 80% of the items of the previous period is still available. For refrigerators, the fraction of matched items is on average a bit lower than for televisions and washing machines. So, each period between 20% and 25% of the items disappear. After three years only 20% of the items sold in 199902 are still available. For computers the average lifetime is much shorter. Each month nearly 33% of the items of the

[2] In this paper periods are defined by JJJJMM, where JJJJ relates to the year and MM to the month. For bimonthly periods MM relates to the second month.

previous month disappear. In a year time less than 10% of the initial population has remained. In fact, it is surprising that three computer models sold in 199902 are still on the market in 200112. These figures make clear that the CPI samples will have to be updated regularly to remain representative for the market as a whole. Appendix 1 illustrates whether Statistics Netherlands has been successful in maintaining representative samples.

Note that figures 2 and 3 may slightly overestimate the true attrition rates. For example, in figure 3 it is assumed that an item has disappeared from the market in period *t* when the sales in that period have dropped to zero. It does happen, however, that in period *t+1* (or later) the item is sold again. We have considered these sales as the introduction of a new item.

Combining the information about sales and life cycles does change the picture a bit. For all durables the total number of items can be divided in a relatively small number that remains on the market for a long time, the major sellers, and a majority of items having a short lifetime and modest sales. As illustration, table 4 shows the number of months with positive sales for refrigerators and computers. Note that there may be months with zero sales in between, so the total period for which an item is on the market is longer in most cases. For refrigerators, the table shows that only 6.2% of all items stay on the market more than 2.5 years, but these items are responsible for 37.3% of total expenditures. On the other hand, almost half of the items (46.1%) is on the market less than six months, but these count for only 5.4% of total expenditures. For computers, the average lifetime is clearly shorter, 79% of the items stay on the market less than half a year, but only one third of total expenditures is realised by them. Slightly over 5% of the items has a lifetime longer than one year, but these computers are responsible for 30% of total expenditures.

Table 4. Length of sales period for refrigerators and computers

No of months with positive sales	Share of items		Part of total expenditures	
	Refrigerators	Computers	Refrigerators	Computers
1 – 6	46.1%	79.0%	5.4%	34.4%
7 – 12	19.6%	15.8%	9.8%	35.1%
13 – 18	11.8%	4.4%	10.0%	21.6%
19 – 24	9.6%	0.7%	18.1%	7.3%
25 – 30	6.8%	0.2%	19.5%	1.5%
31 – 36	6.2%	0.0%	37.3%	0.2%

Table 4 also may give a slightly distorted picture as items with sales only in the first or the last period of 1999-2001 actually can be sold much longer. In our table such an item is treated as an item with a very short lifetime. So, the presented information on lifetime and percentages of matched items has to be handled with some care. Nevertheless, it provides useful insight in the dynamic structure of the market of durables.

Figure 4 shows that over the three-year period the sales-weighted average prices (unit values) increase considerably. Refrigerators, washing machines and computers (private use) exhibit an increase of around 10%, whereas for televisions the increase is nearly twice as high (19%). However, this increase has nothing to do with inflation but is determined by an increase in quality of the durables involved. Quality adjusted price indexes decline substantially, as will be shown in section 4.

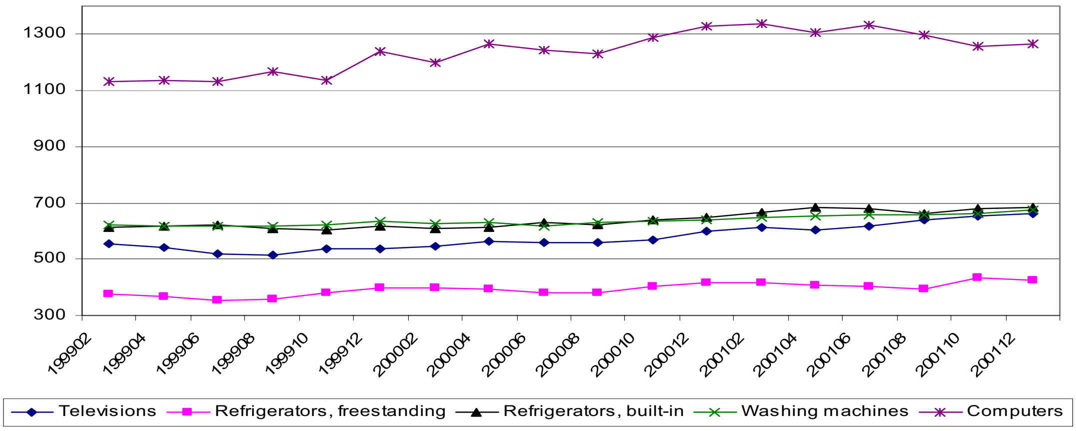

Figure 4 . Durables, unit values (€) during 1999-2001

3. Hedonic models

3.1 Introduction

A hedonic function describes the relation between the price of an item and a number of performance characteristics. Well-known functional specifications are the linear model, the semi-logarithmic (log-linear) model and the doublelog model. In the latter model not only the logarithm of the price but also the logarithm of the continuous explanatory variables is taken. The linear hedonic model can be expressed as

$$p_i^t = \alpha^t + \sum_{k=1}^{K} \beta_k^t X_{ik} + \sum_{j=1}^{J} \gamma_j^t D_{ij} + \varepsilon_i^t \qquad (1)$$

where p_i^t denotes the price of item *i* (*i=1,..,n*) in period *t*, X_{ik} its *k*-th quantitative characteristic (*k=1,..,K*), D_{ij} its j-th qualitative characteristic (i.e. a dummy variable, *j=1,..,J*), β_k^t and γ_j^t the corresponding parameters and ε_i^t an independently distributed error term with expected value of 0 and constant variance σ^2. Note that the parameters are modelled time-dependent as there is no a priori reason to assume they are constant over time.

Research on hedonic modelling for computers, based on the GfK-data, has been done by Van Mulligen (2003). The reader is referred to his chapter 4 for a detailed explanation of the models used. We will use his findings in our section 4 where we apply his log-linear model to calculate time dummy indexes for PCs. Dummy variables for brand name and outlet type are included as explanatory variables in the hedonic models for computers. The estimated hedonic models for televisions, refrigerators and washing machines also include dummies for brand name and type of outlet.

We deleted built-in refrigerators from our database as expenditures on those goods are defined as gross capital formation by households in the system of National Accounts and in the Dutch CPI as well.

A subsequent data reduction has been carried out by deleting brands and items with a negligible market share. There are many brands having hardly any sales as was shown in table 3. Moreover, many items are available very temporarily, sometimes only one or two months as was illustrated in table 4. To avoid disturbances due to incidental sales these transactions have been excluded from our analysis. Silver (2002), who discusses the use of weights in hedonic regressions, advises to delete so-called influential outliers, i.e. items with a small weight that have a large effect on the hedonic coefficients. Similar advice is given by Deltas and Zacharias (2004) who concluded to a bias in a high-frequency matched-model index due to models that survive for only a very small number of periods. During the process of estimating the hedonic models we encountered items with extreme (positive or negative) residuals. Further investigation learned that quite often these durables were of a specific design. Since we had no characteristics available relating to design features we deleted these items to prevent missing variable bias. In a few cases the extreme residuals related to very expensive or very cheap items. The most extreme cases have been deleted as well. Nevertheless, an impressive amount of data was left for our analysis. Table 5 gives an impression.

Table 5. Number of observations (unit values per item per period)

Type of durable	No of observations	% of total expenditures
Televisions	24 403	97.8%
Refrigerators	18 808	95.8%
Washing machines	18 478	96.4%

We tested which of the three above-mentioned functional forms fitted best to the available data. The following test has been used, based on Box-Cox transformations (Lim and McKenzie, 2002).

For example, under the null hypothesis

H_0: the linear and the log-linear model are empirically equivalent

the statistic $l = \frac{n}{2}\left|\ln\left(\frac{RSS_{lin} / \bar{y}^2}{RSS_{\log lin}}\right)\right|$, where $\bar{y}^2 = \exp\left(\frac{1}{n}\sum_{i=1}^{n} \ln p_i^t\right)$ and RSS denotes the residual sum of squares, has a $\chi^2_{(1)}$ distribution.

This statistic has been used to evaluate all three possible combinations. The factor $\bar{y}^2$ is needed to compare the residuals of the linear model with those of the logarithmic models. It should be omitted when testing the log-linear versus the doublelog model. In performing these tests no weights were used in the regression (Ordinary Least Squares, OLS). Regressions for periods 199902, 200008 and 200112 indicated that the log-linear and the doublelog model fitted significantly better to the data than the linear model did. Of these two, the log-linear form performed slightly better. The difference was marginal in most cases, which is probably due to the fact that nearly all explanatory variables are dummies. We have chosen the log-linear form in our subsequent analysis for its simpler interpretation and wide use in other empirical studies.

3.2 Hedonic regressions (OLS)

3.2.1 Results

For televisions, refrigerators and washing machines OLS-regressions have been run on the data of each of the 18 bimonthly periods. The explanatory variables used are listed in appendices 2-4. Table 6 contains some summarising statistics: the goodness of fit (*adjusted* R^2), the standard error of the estimate (*SEE*), the number of items and the number of explanatory variables (including the intercept). The average, minimum and maximum value are based on their values for the 18 bimonthly regressions separately. Consequently, the standard deviation in table 6 gives an impression of the stability of the indicator over the three-year period.

Table 6. Summary results of OLS-regression on 18 bimonthly periods

Type of durable		Average	St. Deviation	Minimum	Maximum
Televisions	Adjusted R^2	0.963	0.004	0.957	0.973
	SEE	0.144	0.013	0.117	0.159
	No of items	1356	121	1095	1485
	No of variables	63	3	57	66
Refrigerators	Adjusted R^2	0.886	0.024	0.851	0.930
	SEE	0.180	0.028	0.130	0.219
	No of items	1045	132	762	1268
	No of variables	66	3	62	70
Washing machines	Adjusted R^2	0.877	0.022	0.847	0.932
	SEE	0.131	0.011	0.098	0.144
	No of items	898	74	757	998
	No of variables	48	2	44	52

Figure 5 depicts the adjusted R^2 for all periods. Generally spoken, the goodness of fit decreases over time. The reason for this is not clear. Possibly, certain characteristics with an increasing influence on the price are missing in the GfK-database. The figure also shows that the fit is significantly better for televisions than for the other two durables. A summary of the regression results including the average value of the coefficients and their standard errors taken over all time periods is given in appendices 6-8. For confidentiality reasons, brand names are anonymised. Detailed results (apart from brand names) are available from the author.

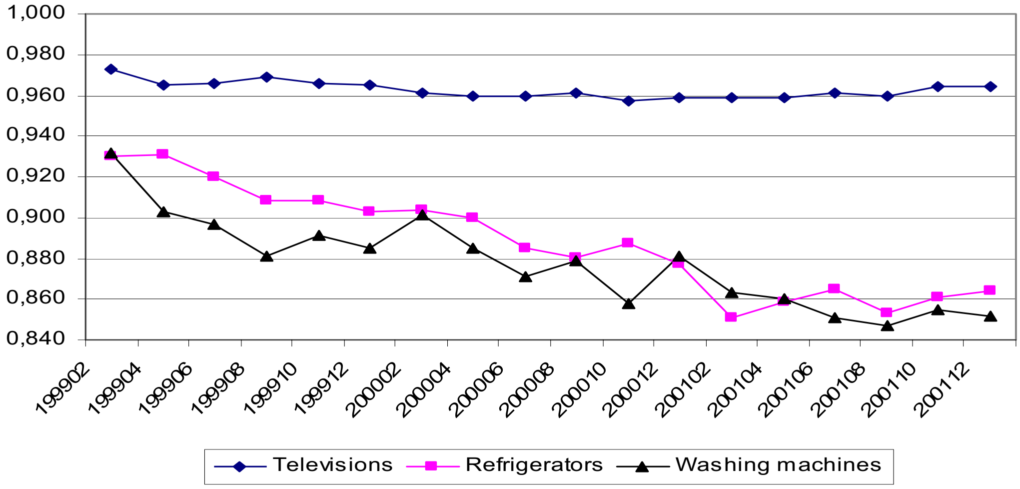

Figure 5. Development of adjusted R^2 (OLS)

For televisions 29 technical characteristics are incorporated into the hedonic model. The coefficients of 10 of these differ significantly from zero at the 5%-level in all 18 periods and their signs are according to a priori expectations. Based on the (average) value of the coefficients the availability of a DVD-player is the most important price-increasing characteristic. This feature, however, is only available from 200103 onwards. Characteristics having a major price-increasing influence during the whole period are a flat screen and a 100Hz frequency. The absence of teletext or stereo sound lowers the price, other things being equal.

For washing machines the coefficients of 4 out of the 15 technical characteristics differ significantly from zero in all 18 periods. Here as well, their signs are in accordance with a priori expectations. The availability of a separate spin-dryer has the largest (negative) coefficient.

For refrigerators the coefficients of 6 out of 20 technical characteristics are significantly different from zero in all 18 periods and their signs accord with a priori expectations. Having three doors raises the price sharply but only very few refrigerators have this feature. Fridge-freezers are on average 39% more expensive than refrigerators, with or without a freezing compartment.

In addition to the technical characteristics the brand name appears to be an important factor in explaining the price of a durable. The tables in the appendices 6-8 indicate that many brand names have significant coefficients. The effect of the brand name on the price of a durable is illustrated in table 7 that shows the price differences between a certain brand name and the brand name of the base item (benchmark item) in the regression model. For each durable the ten brands with the highest market share are listed. Because the brand of the base model always belongs to this top10, the table contains nine brands only.

Table 7. Top10 of brands; price level compared with base-brand [a)]

Televisions		Refrigerators		Washing machines	
Brand	Price diff.	Brand	Price diff.	Brand	Price diff.
Brand08	+283%	Brand01	- 2%	Brand07	-10%
Brand21	+9%	Brand08	- 14%	Brand11	-1%
Brand27	+7%	Brand10	+ 1%	Brand12	-8%
Brand31	+ 61%	Brand53	- 18%	Brand28	-38%
Brand41	+ 7%	Brand56	+ 11%	Brand30	-12%
Brand42	+ 9%	Brand60	+ 30%	Brand31	+35%
Brand53	- 6%	Brand67	- 13%	Brand38	-1%
Brand59	- 8%	Brand74	- 1%	Brand42	-23%
Brand62	+ 17%	Brand76	+ 83%	Brand44	-21%

a) Base-brand itself also belongs to top10

Table 7 shows that brand effects can be substantial. The most extreme case is brand08 for televisions which suggests that consumers are willing to pay nearly three times as much for a television set of this brand than for a model with the same characteristics of the reference brand. This behaviour does not seem realistic. The extreme value is probably, at least partly, due to the ambiguous nature of the coefficient of the brand name. It is well-known that brands can have a certain reputation for which consumers are willing to pay. Quite often, this reputation is historically based and cannot explicitly be attributed to specific features. This causes brand names having a (positive or negative) influence on the price of a durable. Another, and maybe more important, problem is that not all price determining factors are known or available. A quality difference between two models of a durable good can be difficult to quantify. Examples are the quality of the components or the appearance of a durable, i.e. the way it is designed. A specific styling can be very appealing to a certain group of consumers who are willing to pay a considerable bonus for it. When no specific variables are available to describe these features the price effect will be included in the coefficient of the brand name. In that sense the brand name is a kind of garbage bin of the effect of all characteristics which have not been included in the regression model.

OLS-regression assumes that the errors are independently and identically distributed with expectation zero and constant variance (homoscedasticity). No formal tests to check these conditions have been applied. We did, however, analyse graphs of residuals. Those graphs did not show strong signs of heteroscedasticity. We refer to the detailed reports for some figures (Van der Grient, 2003a, 2003b and Oei, 2003).

3.2.2 Stability of coefficients with OLS regression

The hedonic technique can be used in several ways when correcting for quality changes in the CPI. Triplett (2003) gives an overview. One of the methods is the time dummy variable method, which will be further explored in section 4. An important condition which must be met when applying this variant is the constancy (stability) of the regression coefficients over time, at least in two consecutive periods. A first impression of this kind of stability is presented in figures 6-8 which show the OLS coefficient estimates for the most important (technical) characteristics of each durable. All these coefficients differ significantly from zero at the 5%-level in all 18 periods. In general, instability does not seem to pose a serious problem.

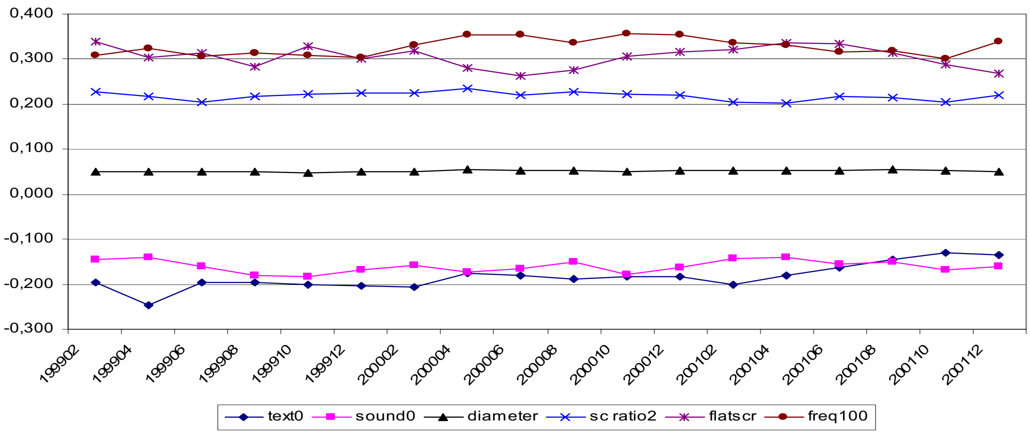

Figure 6. Televisions: OLS regression coefficients

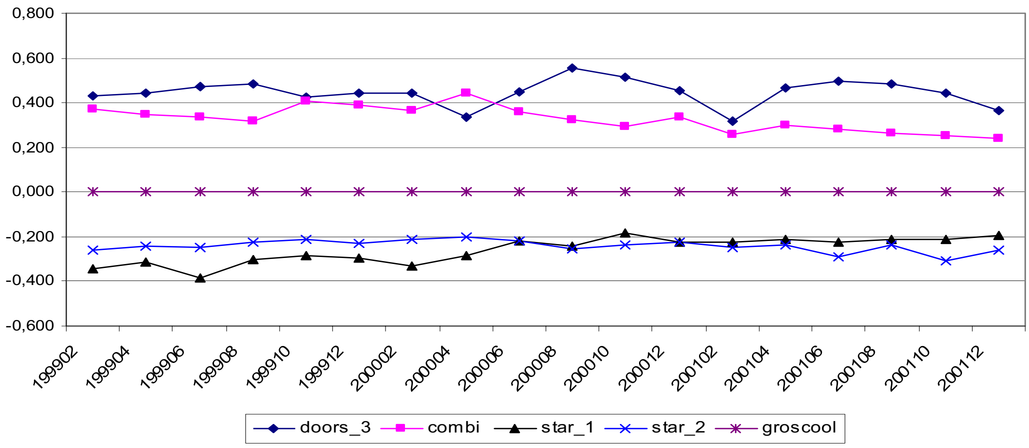

Figure 7. Refrigerators: OLS regression coefficients

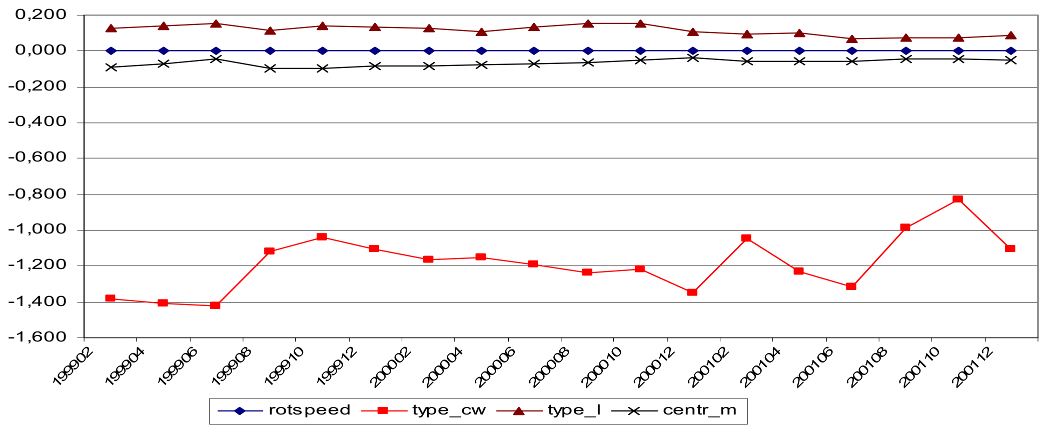

Figure 8. Washing machines: OLS regression coefficients

We will now perform a formal test. Special attention will be paid to the length of the period over which coefficients can be considered constant. The constancy is tested using a Chow-test statistic in which the residual sum of squares of separate regressions in two periods is compared with the residual sum of squares of the regression on the data of both periods. In this pooled regression a time dummy variable has been added to correct for a general price change between the two periods involved. The log-linear hedonic models for the unpooled and pooled data read

$$\ln(p_i^t) = \alpha^t + \sum_{k=1}^{K} \beta_k^t X_{ik} + \sum_{j=1}^{J} \gamma_j^t D_{ij} + \varepsilon_i^t \qquad \text{(t=0,1)} \qquad (2)$$

and

$$\ln(p_i^t) = \alpha + \delta T_i^t + \sum_{k=1}^{K} \beta_k X_{ik} + \sum_{j=1}^{J} \gamma_j D_{ij} + \varepsilon_i^t \qquad \text{(t=0,1)} \qquad (3)$$

respectively, where T_i^t in (3) is a dummy variable that takes on the value of 1 if the observation comes from period 1 (0 otherwise).

Under the null-hypothesis $H_0 : \alpha_t = \alpha_{t-1}, \beta_{k,t} = \beta_{k,t-1}$ for *k*=1..K

The test-statistic $F_{[K,n-2K]} = \dfrac{\left[RSS_{0+1} - RSS_0 - RSS_1\right]/K}{\left[RSS_0 + RSS_1\right]/(n-2K)}$

has an F-distribution with *K* and *n-2K* degrees of freedom where *n* is the total number of observations in periods 0 and 1 combined. Rejection of the null-hypothesis means that one or more of the coefficients are not constant. Table 8 shows the results of this test. The coefficients appear to be fairly stable. Over a period of four months (a comparison between *t* and *t+2*) constancy of coefficients is never rejected. Over the period of half a year the hypothesis on constancy has to be rejected three times for televisions and only once for washing machines. In chapter 4 only adjacent periods will be combined. Apparently this may be done without violating the assumption of stability.

Table 8. Test on stability of coefficients (OLS) at a 5% significance level

Periods compared		Number of combined periods with stable and unstable coefficients		
		Televisions	Refrigerators	Washing machines
t, t+1 [a)]	Stable	17	17	17
	Not stable	0	0	0
t, t+2	Stable	16	16	16
	Not stable	0	0	0
t, t+3	Stable	12	15	14
	Not stable	3	0	1
t, t+4	Stable	8	11	10
	Not stable	6	3	4
t, t+5	Stable	7	9	8
	Not stable	6	4	5
t, t+6	Stable	3	7	2
	Not stable	9	5	10

a) t=199902, … ,200110

3.3 Hedonic regressions (WLS)

3.3.1 Results

There may be two reasons to prefer weighted least squares regression (WLS) over unweighted regression (OLS). First, WLS can correct for heteroscedasticity. Second, items with high expenditures or sales should have a bigger impact than low-expenditure ones. The last point is particularly important for the time dummy variable method where the estimated hedonic model directly leads to a price index (see for example Silver, 2002 and Diewert, 2003)

Although the OLS-regression did not point to strong heteroscedasticity, we ran (expenditure) weighted regressions to see the effect weighting has on the coefficients. It was assumed that the log-linear functional form is the optimal one here as well although this was not tested formally. In table 9 summarising statistics are given.

Table 9. Summary results of WLS-regression (expenditure-weighted) in 18 periods

Type of Durable		Average	St. Deviation	Minimum	Maximum
Televisions	Adjusted R^2	0.969	0.005	0.962	0.979
	SEE	0.107	0.007	0.095	0.115
	No of cases	1356	121	1095	1485
	No of variables	63	3	57	66
Refrigerators	Adjusted R^2	0.928	0.017	0.902	0.954
	SEE	0.145	0.015	0.123	0.179
	No of cases	1045	132	762	1268
	No of variables	66	3	62	70
Washing machines	Adjusted R^2	0.939	0.009	0.921	0.965
	SEE	0.096	0.007	0.079	0.106
	No of cases	898	74	757	998
	No of variables	48	2	44	52

We compare the WLS-results given in table 9 with the corresponding OLS-results of table 6. For televisions the fit hardly improves. For the other two durables, on the other hand, the adjusted R^2 improves considerably. Moreover, the adjusted R^2 from the weighted regression appears to be much more stable over time which follows from a comparison between the standard deviations in tables 6 and 9. The standard error of the estimate (*SEE*) also indicates that weighted regression is to be preferred in terms of goodness of fit. The adjusted R^2 decreases over time here as well, but less sharply as was the case with OLS. Graphically this is shown in figure 9. A comparison between figures 5 and 9 illuminates the remarks made above.

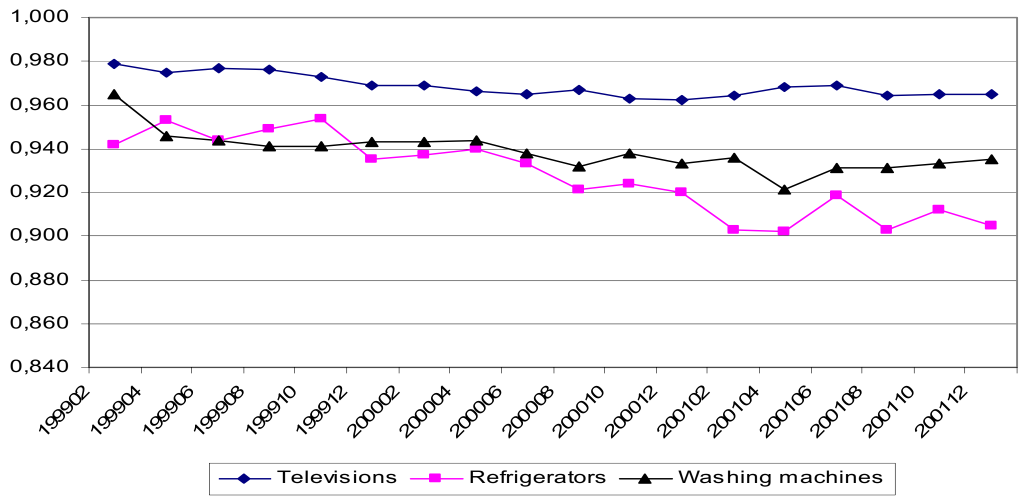

Figure 9. Development of adjusted R^2 (WLS, expenditure-weighted)

The 'most important' characteristics found with OLS are also the most important ones using WLS. The number of variables whose coefficients differ significantly from zero in all 18 periods is a bit lower, however. In most cases this is due to the situation in one particular period. Sales and so the relative importance of items sometimes change dramatically between two time periods and this affects the WLS-estimates. Summary results for all the explanatory variables are given in appendices 10-12. Details are available from the author.

3.3.2 Stability of coefficients with WLS regression

As the adjusted R^2 is more stable using WLS, the question arises whether the same holds for the coefficients of the most important characteristics. Figures 10-12 depict the WLS-coefficients of the same technical characteristics as were presented in figures 6-8 for the OLS-case. Surprisingly, the WLS-coefficients are slightly more volatile than their OLS-counterparts. Furthermore, four coefficients (two for refrigerators and two for washing machines) are no longer significantly different from zero in all 18 periods. So generally spoken, the coefficients from the weighted regressions are a bit less stable than those from the unweighted regressions. The standard deviations of the coefficients for the 18 periods, presented in appendices 10-12 show that on average the WLS-coefficients have a somewhat greater dispersion than the OLS-coefficients.

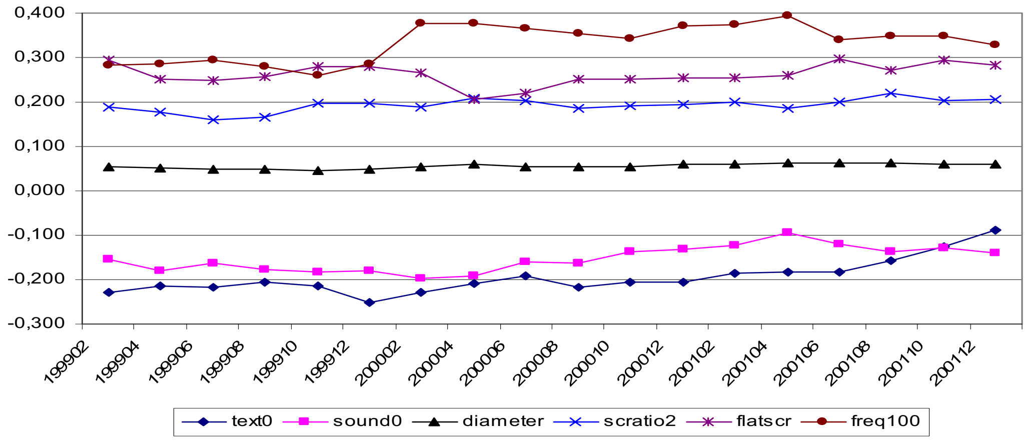

Figure 10. Televisions: WLS regression coefficients

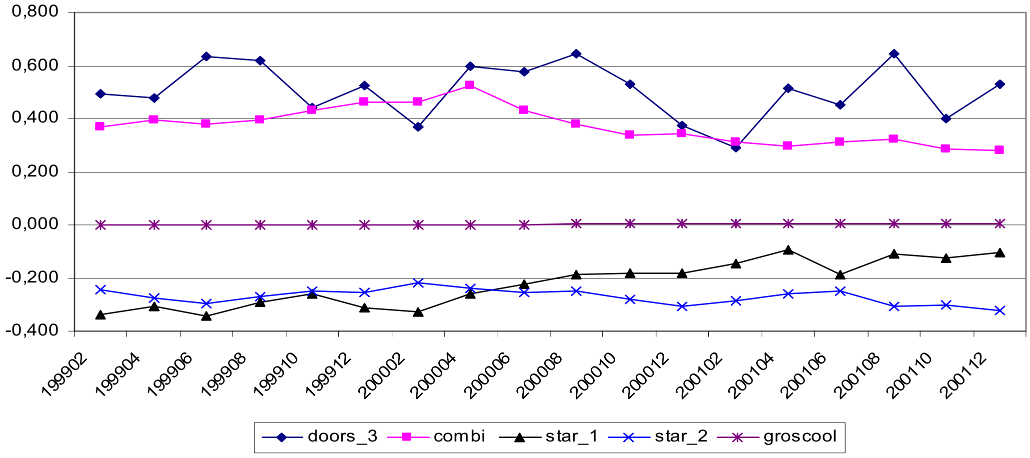

Figure 11. Refrigerators: WLS regression coefficients

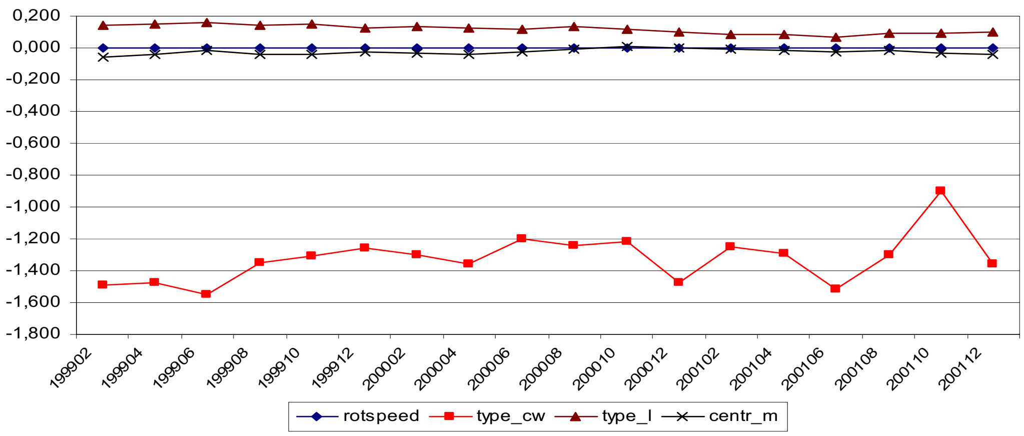

Figure 12. Washing machines: WLS regression coefficients

The stability of the WLS-coefficients has also formally been tested in the same way as was done for the OLS-coefficients. In the pooled regressions, expenditure shares have been used instead of the expenditures themselves. Diewert (2003) points out that expenditure share weights should be used as opposed to expenditures to avoid inflation increasing period 1 value weights resulting in possible heteroscedastic residuals. The results of the test are shown in table 10. A comparison of this table with table 8 confirms the impression of less stable WLS-coefficients. Even between two consecutive periods the assumption of constant coefficients is sometimes rejected. For longer intervals the instability increases sharply.

Table 10. Test on stability of coefficients (WLS) at a 5% significance level

Periods compared		Number of combined periods with stable and unstable coefficients		
		Televisions	Refrigerators	Washing machines
t, t+1 [a)]	Stable	16	14	17
	Not stable	1	3	0
t, t+2	Stable	8	8	12
	Not stable	8	8	4
t, t+3	Stable	6	7	4
	Not stable	9	8	11
t, t+4	Stable	4	1	3
	Not stable	10	13	11
t, t+5	Stable	2	0	1
	Not stable	11	13	12
t, t+6	Stable	2	0	0
	Not stable	10	12	12

a) t=199902, … ,200110

One of the main aims in this project was to develop hedonic models, based on the population of sales, for specific durable goods. When using the hedonic technique in CPI-practice, it could be advisable to estimate models on subpopulations that are more homogeneous than the total population. We tested this for refrigerators. An (expenditure shares) weighted regression was run on a subpopulation consisting of the ten most important brands, after a further reduction of items with low sales. The stability of coefficients increased considerably. The null-hypothesis of stability between adjacent periods was never rejected and only once for a comparison between periods *t* and *t+2*.

4. Time dummy indexes for durables

4.1 Introduction

A well-known method (although not frequently used by statistical agencies) to estimate a hedonic price index is the time dummy method. Consider two periods, denoted by 0 and 1. Recall the pooled version of the log-linear hedonic model already used in section 3.2.2

$$\ln(p_i^t) = \alpha + \delta T_i^t + \sum_{k=1}^{K} \beta_k X_{ik} + \sum_{j=1}^{J} \gamma_j D_{ij} + \varepsilon_i^t \quad \text{(t=0,1)} \qquad (4)$$

Note again that the β_k's and γ_j's are assumed constant over time. For televisions, refrigerators and washing machines this restriction does not seem a serious problem, for computers we have some doubts whether this condition is met. Due to an insufficient number of cases Van Mulligen (2003) did not run period-specific regressions on the computer data and did not test for stability.

Model (4) will be estimated, using weighted and unweighted regression, on the pooled data from both periods. The estimated or predicted price of *i* is $\hat{p}_i^t$, the residual $u_i^t = \ln(p_i^t) - \ln(\hat{p}_i^t) = \ln(p_i^t / \hat{p}_i^t)$. The antilogarithm (exponent) of the time dummy coefficient $\hat{\delta}$ automatically produces a quality-adjusted price index. In the case of WLS we will apply three types of weighting, expenditure shares, quantities and a specific type of average weights. This average weight is based on Diewert (2003) who suggests using the average expenditure shares of both periods as weights for an item that has been sold in both periods. For new and disappearing items, which are by definition available in one period only, the expenditure shares relating to that period should serve as weights. If there happen to be no new or disappearing items, in which case there are only matched items, this WLS-estimator coincides with the Törnqvist index. According to Diewert the resulting WLS-estimator provides a generalisation of the (superlative) Törnqvist index[3]. We believe that his procedure, when applied to the whole population, offers a benchmark index that can be used to assess other indexes[4]. Using a specific decomposition of the generalised Törnqvist index we will investigate if a matched-model index can be considered to be a good approximation thereof.

4.2 Results

Figures 13-16 depict several time dummy indexes and the importance of weighting is clearly demonstrated. For televisions, refrigerators and washing machines, the OLS time dummy index approximates the generalised Törnqvist index, *WLS(Gen. Törnqvist)*, surprisingly well, although both indexes seem to diverge at the end of the period studied. The use of time-specific expenditure shares as weights, on the other hand, results in a widening gap with the benchmark index. For computers there is a great similarity between both WLS time dummy indexes. The OLS index is slightly higher.

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[3] The use of other types of weights in the WLS-regression does not lead to a 'standard' price index in the matched-model situation. OLS-regression leads to the Jevons price index. See Van der Grient and De Haan (2003).

[4] In section 2 it was shown that the sales of durables goods have a seasonal pattern. It is unclear whether this pattern could result in biased (chained) indexes. The new international manual on Consumer Price Indexes (ILO, 2004) does not explicitly address this topic. We have not explored this aspect in our study.

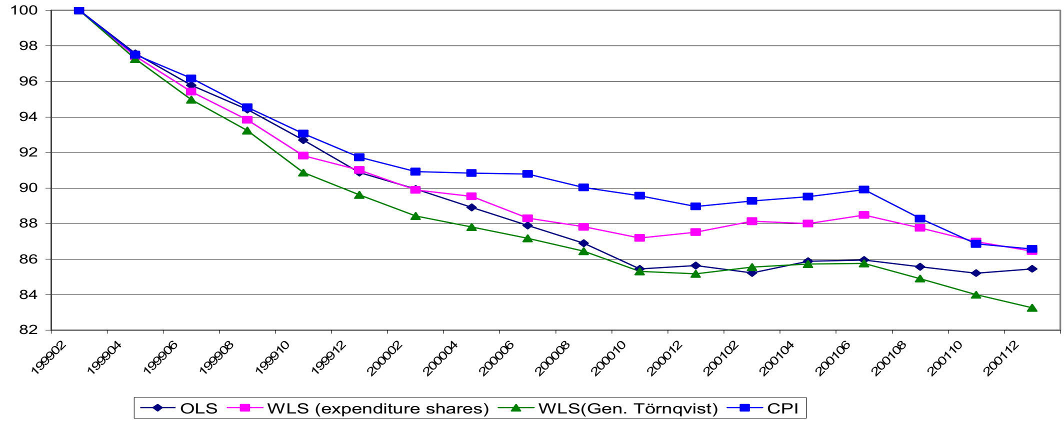

Figure 13 Televisions, three time dummy indexes and the CPI

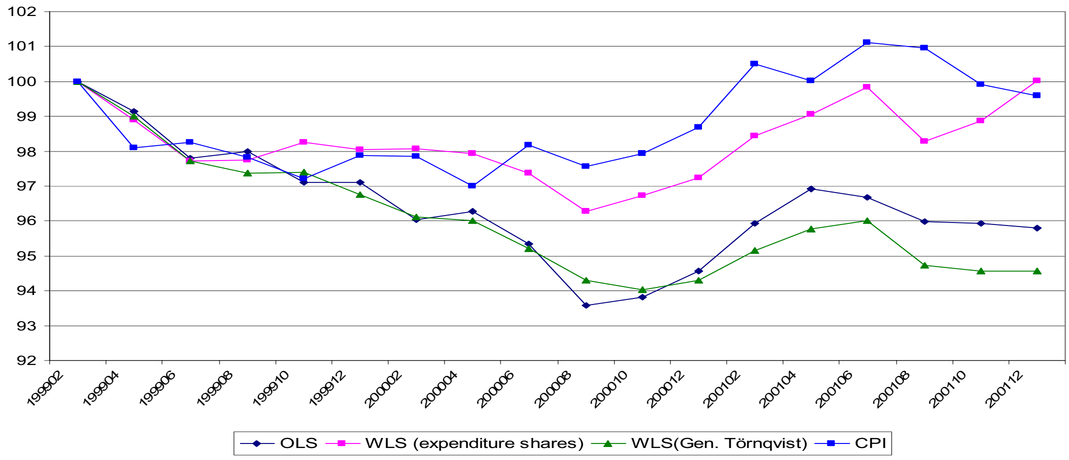

Figure 14. Refrigerators, three time dummy indexes and the CPI

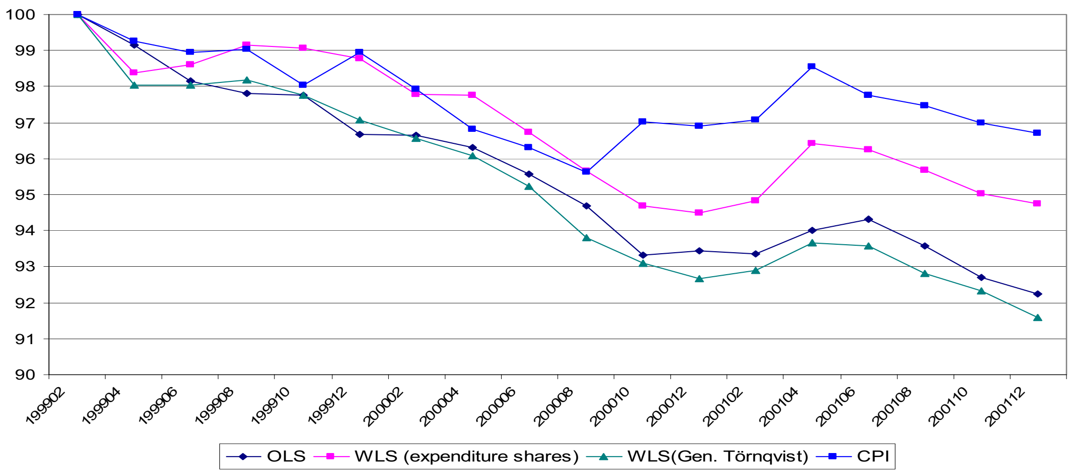

Figure 15. Washing machines, three time dummy indexes and the CPI

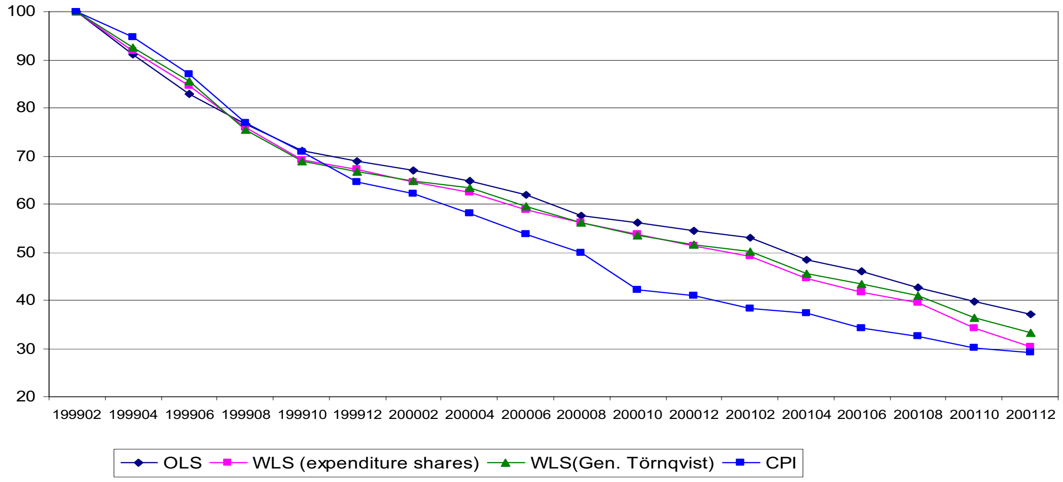

Figure 16. Computers, three time dummy indexes and the CPI

To keep the figures surveyable, the quantity weighted time dummy indexes are not shown. They can be found in appendices 14-17 together with the indexes shown in the figures. For refrigerators, washing machines and computers the quantity weighted time dummy indexes are closer to the generalised Törnqvist than the expenditure-share weighted ones. Detailed regression results for televisions, refrigerators and washing machines are not presented, because the average coefficients of the pooled regressions only slightly differ from those of the period-specific regressions. This is the case for OLS- and for WLS-regression, using the same type of weight. Therefore only the summary results for computers are presented in appendices 9 and 13.

The CPI-figures, which are presented in figures 13-16 as well, diverge significantly from the benchmark index[5]. For televisions, refrigerators and washing machines the CPI seems to be upwardly biased. Surprisingly, the CPI for PCs is lower than all time dummy indexes. Another remarkable point is that the CPI and the expenditure-share weighted time dummy index converge sharply in the last quarter of 2001 for televisions, refrigerators and computers. In fact, both indexes coincide in the last period.

One should bear in mind that the CPI methodology and the data used differ in many respects from the time dummy indexes. The CPI is based on a relatively small sample (between 15 and 20 models for televisions and refrigerators and less than 10 models for washing machines) for which prices are collected on a monthly basis. It is a Laspeyres-type index; the (constant) weights reflect the 1995 market share of the brands involved. The number of explicit quality adjustments is limited; in practice a matched-model

[5] Statistics Netherlands does not publish separate indexes for televisions, refrigerators and washing machines. We computed these indexes ourselves from the official CPI data. A specific adjustment made refers to the so-called energy premium households receive when buying a low-energy durable. This premium is not included in the scanner data prices and has therefore been excluded from the CPI.

approach is applied. The official price index for computers is essentially an unweighted matched model chain index. Prices of identical computers per retailer are compared. New computers are incorporated using the class mean method, so no explicit quality adjustments are made. See Van Mulligen (2003) for the details. Finally, the CPI is based on list prices, not on (average) transaction prices as are the time dummy indexes. So, there are several aspects that contribute to the difference between the CPI and the population based time dummy indexes. Our findings about the representativity of the CPI-sample, discussed in appendix 1, suggest that sampling aspects play an important role. Van Mulligen (2003) also concluded that for PCs "the sampling and weighting issues are more likely candidates for the widening gap between the matched-model (scanner data based) indices and the CPI"[6].

4.3 Decomposition of the WLS time dummy price index

4.3.1 Introduction

Recently, Van der Grient and De Haan (2003) showed that for televisions the matched-model Törnqvist index is a very good approximation of the generalised Törnqvist index (P_{GT}). Their analysis was based on a decomposition of P_{GT}. In this section a similar analysis will be performed for refrigerators, washing machines and computers. For comparison, the results for televisions will be repeated.

Based on hedonic model (4), Van der Grient and De Haan (2003) demonstrated that the resulting time dummy index can be written as

$$P_{GT} = \left(P_{MGL}\right)^{\frac{s_M^0}{s_M^0+s_M^1}} \left(P_{MGP}\right)^{\frac{s_M^1}{s_M^0+s_M^1}} \left[\exp(\bar{u}_N)\right]^{\frac{2(1-s_M^1)}{s_M^0+s_M^1}} \left[\exp(-\bar{u}_D)\right]^{\frac{2(1-s_M^0)}{s_M^0+s_M^1}}, \qquad (5)$$

where s_M^t denotes the period t expenditure share (t= 0,1) of the matched population. The expenditure shares weighted average residuals of new and disappearing items are denoted by $\bar{u}_N = \sum_{i \in U_N} s_i^1 u_i^1 \Big/ \sum_{i \in U_N} s_i^1$ and $\bar{u}_D = \sum_{i \in U_D} s_i^0 u_i^0 \Big/ \sum_{i \in U_D} s_i^0$ where s_i^0 and s_i^1 represent the expenditure shares of item i in periods 0 and 1 respectively. The other part of (5) relates to the weighted geometric average of two matched-model price indexes: the geometric Laspeyres index $P_{MGL} = \prod_{i \in U_M} (p_i^1 / p_i^0)^{s_{iM}^0}$ and the geometric Paasche index $P_{MGP} = \prod_{i \in U_M} (p_i^1 / p_i^0)^{s_{iM}^1}$, with $s_{iM}^t = s_i^t / s_M^t$ being the share of item i in the period t expenditures on the set U_M of all matched items. In equation (5) the impact of new and disappearing items on P_{GT} is made explicit. Note that all factors depend on the expenditure share of new and disappearing items.

The matched-model Törnqvist index is defined as the unweighted geometric average of P_{MGL} and P_{MGP}, i.e.

[6] In recent years Statistics Netherlands has been expanding its efforts to use scanner data information in improving the CPI-sample.

$$P_{MT} = \left(P_{MGL} P_{MGP}\right)^{1/2} \qquad (6)$$

Comparing equations (5) and (6) shows that two assumptions are needed to ensure that the matched-model Törnqvist index coincides with the generalised one:

<u>Assumption *i*</u>: $s_M^1 = s_M^0$.

Replacing s_M^1 by s_M^0 in decomposition (5) gives

$$P_{GT(i)} = P_{MT}\left[\exp(\bar{u}_N - \bar{u}_D)\right]^{\frac{1}{s_M^0}-1}. \qquad (7)$$

<u>Assumption *ii*</u>: $\bar{u}_N = \bar{u}_D$.

Under this assumption $P_{GT(i)}$ reduces to P_{MT}.

Note that it is not the variability of the quality-adjusted prices of unmatched items that matters. Rather it is *systematic* effects – giving rise to positive or negative *average* residuals – that matter. Whether *ii* holds depends on the prevailing market conditions and the pricing strategies followed by manufacturers when introducing new models into the market.

4.3.2 Results

In this section we will calculate the factors of decomposition of equation (5) for the different durables and analyse whether assumptions *i* and *ii* will hold.

Factors of decomposition

Table 11 contains the results of the decomposition of P_{GT} according to expression (5). F(L/P)=$\left(P_{MGL}\right)^{\frac{s_M^0}{s_M^0+s_M^1}}\left(P_{MGP}\right)^{\frac{s_M^1}{s_M^0+s_M^1}}$ is the weighted average of the matched-model Laspeyres and Paasche indexes and *F(res)* denotes the remaining part of the right-hand side of (5). For televisions, refrigerators and washing machines the effect of *F(res)* in P_{GT} appears to be negligible. For computers on the other hand, the effect is substantial. In the following we will analyse these aspects in greater detail and explain why computers behave so differently.

Table 11. P_{GT} **and factors of decomposition according to (5)**

Period	Televisions			Refrigerators			Washing machines			Computers		
	P_{GT}	*F(L/P)*	*F(res)*	P_{GT}	*F(L/P)*	*F(res)*	P_{GT}	*F(L/P)*	*F(res)*	P_{GT}	*F(L/P)*	*F(res)*
199901										100.00	100.00	1.000
199902	100.00	100.00	1.000	100.00	100.00	1.000	100.00	100.00	1.000	96.28	94.77	1.016
199903										92.71	61.68	1.011
199904	97.26	96.95	1.003	99.01	99.09	0.999	98.03	97.76	1.001	88.92	89.12	0.998
199905										85.68	86.99	0.985
199906	94.97	94.87	1.001	97.71	98.05	0.997	98.03	97.55	1.005	82.41	83.99	0.981
199907										77.26	78.12	0.989
199908	93.24	93.24	1.000	97.37	97.67	0.997	98.20	97.93	1.003	70.80	72.48	0.977
199909										67.47	69.15	0.976
199910	90.86	91.10	0.997	97.41	97.25	1.002	97.76	97.54	1.002	67.87	69.53	0.976
199911										66.31	68.15	0.973
199912	89.62	89.79	0.998	96.75	96.77	1.000	97.09	96.95	1.001	64.88	67.48	0.961
200001										64.30	66.51	0.967

Period	Televisions			Refrigerators			Washing machines			Computers		
	P_{GT}	*F(L/P)*	*F(res)*	P_{GT}	*F(L/P)*	*F(res)*	P_{GT}	*F(L/P)*	*F(res)*	P_{GT}	*F(L/P)*	*F(res)*
200002	88.43	88.72	0.997	96.12	96.24	0.999	96.55	96.19	1.004	62.88	66.16	0.950
200003										62.59	65.78	0.952
200004	87.81	87.63	1.002	96.02	95.60	1.004	96.07	95.66	1.004	61.67	65.09	0.947
200005										60.31	63.66	0.947
200006	87.16	87.31	0.998	95.21	94.63	1.006	95.24	94.80	1.005	56.56	60.30	0.938
200007										55.72	59.26	0.940
200008	86.44	86.62	0.998	94.29	93.75	1.006	93.82	93.64	1.002	54.37	58.34	0.932
200009										53.16	57.65	0.922
200010	85.31	85.76	0.995	94.04	93.70	1.004	9308	93.00	1.001	51.69	56.21	0.920
200011										50.63	55.51	0.912
200012	85.17	85.40	0.997	94.30	93.59	1.008	92.66	92.48	1.002	50.62	54.72	0.925
200101										50.22	54.37	0.924
200102	85.55	85.70	0.998	95.16	94.25	1.010	92.91	92.82	1.001	47.99	52.34	0.917
200103										44.81	50.14	0.894
200104	85.72	85.68	1.000	95.76	95.07	1.007	93.68	93.45	1.002	44.39	49.76	0.892
200105										43.24	48.63	0.889
200106	85.75	85.74	1.000	96.00	94.44	1.017	93.59	93.04	1.006	41.95	47.43	0.884
200107										41.61	45.96	0.905
200108	84.90	84.75	1.002	94.72	93.55	1.012	92.82	92.57	1.003	38.59	44.29	0.871
200109										35.79	41.11	0.871
200110	83.99	84.08	0.999	94.58	93.39	1.013	92.32	92.07	1.003	35.49	40.28	0.881
200111										33.21	39.52	0.840
200112	83.25	83.42	0.998	94.57	93.19	1.015	91.58	91.21	1.004	32.22	38.77	0.831

Expenditure shares of matched items

Appendix 18 shows the expenditure shares of the matched items in both period *t*-1 and *t* for all adjacent periods. In table 12 the average values are presented. For most durables a very small part of the monthly expenditures is due to disappearing items. For televisions, for instance, the average expenditure share of disappearing items is 2% on a bimonthly basis, say 1% on a monthly basis. For refrigerators, this fraction amounts to 3.5%. The part of turnover due to newly appearing items is nearly twice as high but still small compared to turnover based on items that are sold in both periods. As could be expected, the fractions of new and disappearing items for computers are much higher. Note that the expenditure shares for computers in table 12 are on a monthly basis, so each month 15% of turnover is lost due to disappearing items while turnover grows with 22% due to new items.

Table 12. Expenditure shares of the matched items in period t-1 and period t; average over 199901-200112 [a)]

	Televisions		Refrigerators		Washing machines		Computers	
	s_M^{t-1}	s_M^t	s_M^{t-1}	s_M^t	s_M^{t-1}	s_M^t	s_M^{t-1}	s_M^t
Average	0.98	0.96	0.93	0.90	0.96	0.93	0.85	0.78

a) Bimonthly periods for televisions, refrigerators and washing machines, monthly periods for computers

These figures present a completely different picture of the market dynamics than figures 2 and 3 in section 2 did. Those figures were based on numbers sold, while the shares of table 12 are based on expenditures. The difference between sales and expenditures was already illustrated in table 4.

$P_{GT(i)}$, the first approximation of P_{GT}, is based on *assumption i* that the expenditure shares of the matched items does not change between periods *t-1* and *t*. According to table 12 the differences between the two seem to be small on average, at least for three of the four durable goods. For all four durables the consequences of *assumption i* is shown in table 13. The differences between P_{GT} and $P_{GT(i)}$ are indeed small, even for computers. In fact, the differences are almost negligible compared with the decline in the indexes during the period studied.

Table 13. P_{GT} **and** $P_{GT(i)}$**, effect of *assumption i***

Period	Televisions		Refrigerators		Washing machines		Computers	
	P_{GT}	$P_{GT(i)}$	P_{GT}	$P_{GT(i)}$	P_{GT}	$P_{GT(i)}$	P_{GT}	$P_{GT(i)}$
199901							100.00	100.00
199902	100.00	100.00	100.00	100.00	100.00	100.00	96.28	96.02
199903							92.71	92.44
199904	97.26	97.01	99.01	99.02	98.03	98.01	88.92	88.66
199905							85.68	85.70
199906	94.97	94.73	97.71	97.81	98.03	97.87	82.41	82.42
199907							77.26	77.13
199908	93.24	92.99	97.37	97.51	98.20	98.18	70.80	70.68
199909							67.47	67.32
199910	90.86	90.75	97.41	97.49	97.76	97.73	67.87	67.64
199911							66.31	66.29
199912	89.62	89.44	96.75	96.86	97.09	97.15	64.88	64.95
200001							64.30	64.35
200002	88.43	88.24	96.12	96.23	96.55	96.50	62.88	63.24
200003							62.59	63.11
200004	87.81	87.61	96.02	96.02	96.07	96.00	61.67	62.18
200005							60.31	60.87
200006	87.16	87.07	95.21	95.15	95.24	95.18	56.56	57.21
200007							55.72	56.27
200008	86.44	86.34	94.29	94.24	93.82	93.86	54.37	55.09
200009							53.16	54.14
200010	85.31	85.27	94.04	94.02	9308	93.15	51.69	52.65
200011							50.63	51.80
200012	85.17	85.01	94.30	94.22	92.66	92.69	50.62	51.48
200101							50.22	51.07
200102	85.55	85.34	95.16	95.09	92.91	92.93	47.99	48.80
200103							44.81	45.68
200104	85.72	85.48	95.76	95.76	93.68	93.64	44.39	45.38
200105							43.24	44.13
200106	85.75	85.52	96.00	95.97	93.59	93.46	41.95	42.77
200107							41.61	42.71
200108	84.90	84.56	94.72	94.80	92.82	92.73	38.59	40.37
200109							35.79	37.39
200110	83.99	83.68	94.58	94.07	92.32	92.16	35.49	36.86
200111							33.21	34.85
200112	83.25	82.97	94.57	94.85	91.58	91.39	32.22	33.95

Average residuals (weighted) of new and disappearing items

Manufacturers can follow different strategies when introducing new models into the market. They can use the opportunity to increase prices more than can be justified by the change in quality (so-called hidden price increases). Another strategy may be to price new models relatively low with the aim of enlarging the market share. Schultze and Mackie (2001) quote BLS-research (Moulton and Moses, 1997) that found price changes during the introduction of new models to outnumber price changes for models that remain on the market. Stokey (1979) and Kahn (1986) argue that technologically new models are often introduced at high price levels. After the introduction a rapid price fall occurs. In our study new items should be interpreted as new combinations of existing characteristics. With the exception of a DVD-player built into a television, a feature that we found occasionally at the end of the period, no really new technologies have been introduced. When price changes do not solely reflect differences in quality between new and disappearing models, this should be reflected by a systematic deviation of the residuals from the regression surface when prices are regressed on the characteristics of the different durables. If new models are based on new technologies, hidden price increases cannot always be detected by analysing residuals. The price change will presumably be caught by the new characteristic, if included in the regression.

For disappearing models a similar reasoning can be developed for relatively high as well for relatively low prices. New models i.e. new combinations of characteristics can make a durable good more effective, more powerful or less energy consuming. If this is not fully reflected in the price, 'older' models become relatively expensive. When these models are still on stock and the retailer wants to clear the shelves in favour of the new model he can choose to sell the 'old' model at sales' prices.

A detailed table with average residuals per period can be found in appendix 19. Table 14 contains some summary results. There is no evidence that all new and disappearing durable goods systematically are priced differently compared with similar goods that remain on the market. For three durable goods the prices of new items fall on average on the regression surface, only new televisions are slightly more expensive than similar already existing ones. A systematic difference may exist for disappearing televisions and PCs. During the period studied, prices of these items are structurally higher than their predicted values.

Table 14. Average residuals

	Televisions	Refrigerators	Washing machines	Computers
Average residual of new models	0.02	0.00	0.00	0.00
Average residual of disappearing models	0.05	-0.01	0.00	0.03
Average residual of new models (based on absolute values)	0.04	0.02	0.02	0.03
Average residual of disappearing models (based on absolute values)	0.05	0.02	0.02	0.04

To get an impression of the average value of the residuals, whether positive or negative, the mean of the absolute values is also included in table 14. For televisions this mean is highest, but does not exceed 0.05. This points to a modest difference of approximately 5% between the observed prices and their predicted values.

Assumption ii in the previous section refers to the difference between the average residuals of new and disappearing items. Table 14 shows that these differences are quite small. Table 15 compares $P_{GT(i)}$ with the second approximation, the matched-model Törnqvist index P_{MT}. Personal computers are the only durable good where an increasing spread is found between $P_{GT(i)}$ and P_{MT}, despite the fact that the difference between the average residuals of new and disappearing items is roughly the same for computers and televisions. What is important here, is the combination of the difference between the average residuals and the expenditure shares of matched items discussed in the previous section. Expression (7) shows that the matched-model expenditure share plays a decisive role in the effect of the difference between the average residuals. For refrigerators and washing machines this difference is very small and so is the difference between $P_{GT(i)}$ and P_{MT}.

Table 15. P_{MT} and $P_{GT(i)}$, effect of *assumption ii*

Period	Televisions		Refrigerators		Washing machines		Computers	
	$P_{GT(i)}$	P_{MT}	$P_{GT(i)}$	P_{MT}	$P_{GT(i)}$	P_{MT}	$P_{GT(i)}$	P_{MT}
199901							100.00	100.00
199902	100.00	100.00	100.00	100.00	100.00	100.00	96.02	94.77
199903							92.44	91.73
199904	97.01	96.95	99.02	99.09	98.01	97.96	88.66	89.17
199905							85.70	87.05
199906	94.73	94.87	97.81	98.06	97.87	97.56	82.42	84.05
199907							77.13	78.20
199908	92.99	93.25	97.51	97.68	98.18	97.93	70.68	72.51
199909							67.32	69.30
199910	90.75	91.10	97.49	97.26	97.73	97.54	67.64	69.69
199911							66.29	68.27
199912	89.44	89.79	96.86	96.79	97.15	96.94	64.95	67.61
200001							64.35	66.63
200002	88.24	88.72	96.23	96.26	96.50	96.19	63.24	66.37
200003							63.11	66.03
200004	87.61	87.63	96.02	95.61	96.00	95.66	62.18	65.33
200005							60.87	63.92
200006	87.07	87.31	95.15	94.64	95.18	94.79	57.21	60.55
200007							56.27	59.50
200008	86.34	86.63	94.24	93.77	93.86	93.64	55.09	58.59
200009							54.14	57.92
200010	85.27	85.77	94.02	93.72	93.15	93.00	52.65	56.47
200011							51.80	55.80
200012	85.01	85.42	94.22	93.61	92.69	92.47	51.48	55.01
200101							51.07	54.66
200102	85.34	85.71	95.09	94.27	92.93	92.62	48.80	52.61
200103							45.68	50.39
200104	85.48	85.70	95.76	95.09	93.64	93.44	45.38	50.02
200105							44.13	48.90
200106	85.52	85.76	95.97	94.46	93.46	93.03	42.77	47.69
200107							42.71	46.19
200108	84.56	84.77	94.8	93.57	92.73	92.57	40.37	44.51
200109							37.39	41.32
200110	83.68	84.10	94.07	93.41	92.16	92.06	36.86	40.50
200111							34.85	39.75
200112	82.97	83.44	94.85	93.20	91.39	91.21	33.95	39.02

Thus, for three of the four durable goods both assumptions approximately hold. This is again illustrated in figures 17-20, which depict the period-to-period changes of the generalised Törnqvist index and its approximations $P_{GT(i)}$ and P_{MT}.

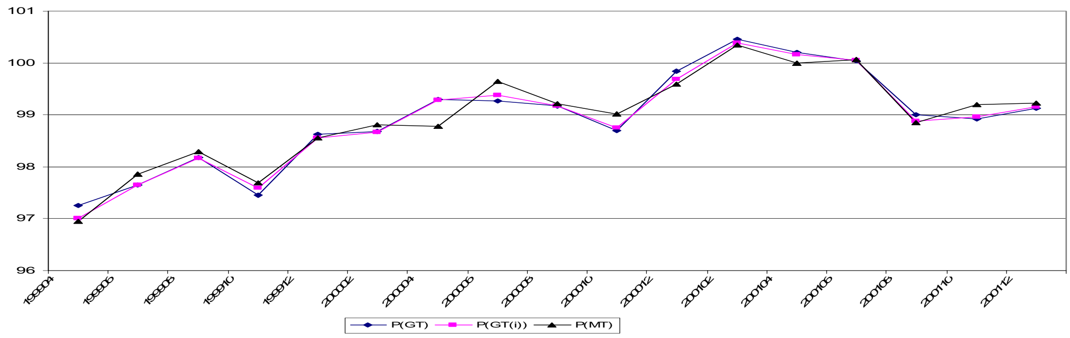

Figure 17. Price indexes of televisions, changes with respect to the preceding period

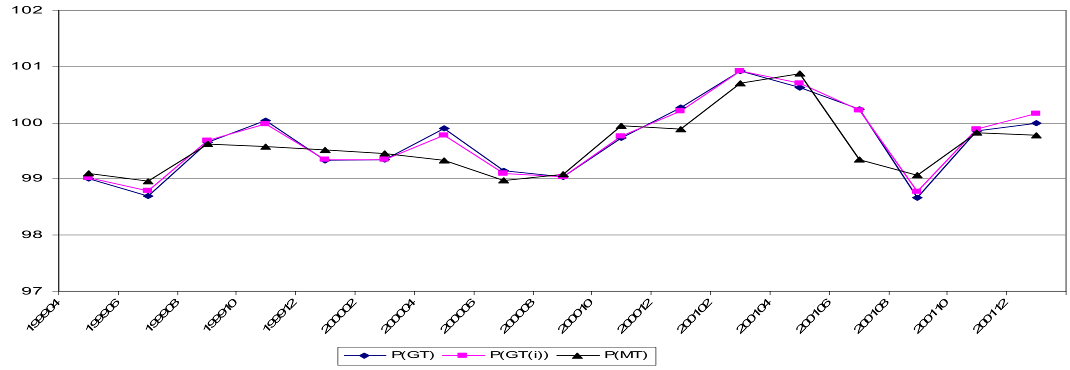

Figure 18. Price indexes of refrigerators, changes with respect to the preceding period

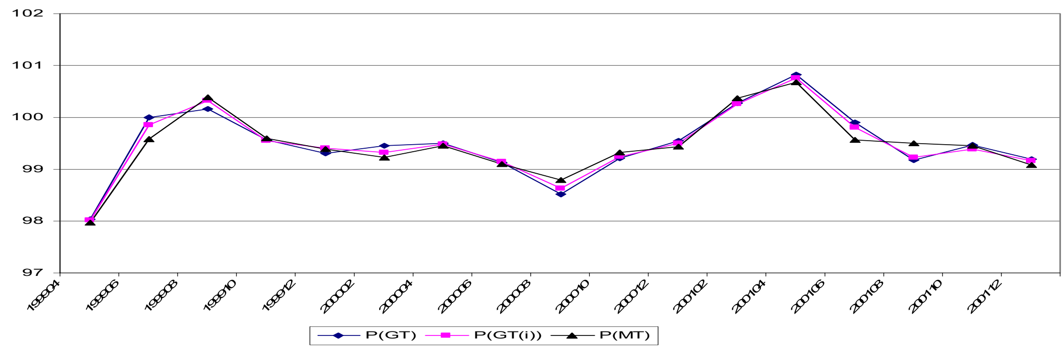

Figure 19. Price indexes of washing machines, changes with respect to the preceding period

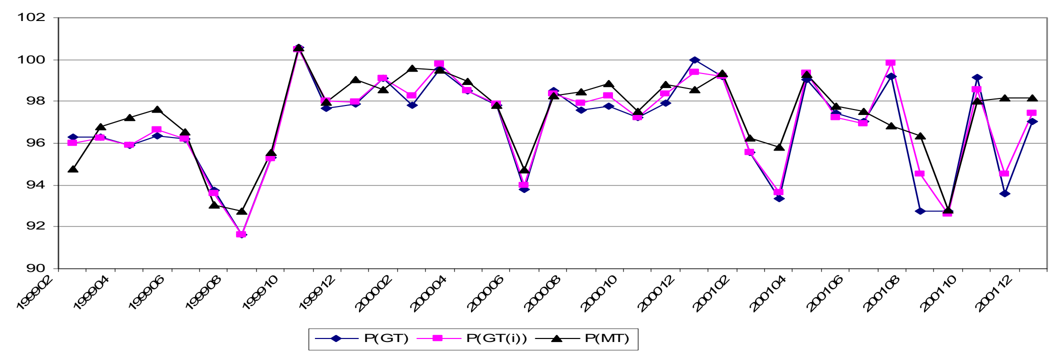

Figure 20. Price indexes of computers, changes with respect to the preceding period

4.4 Numerical comparison between the different indexes

The various price indexes can be compared by ranking them according to the distance between the index and the generalised Törnqvist index, since we consider the latter to be the reference or benchmark index. We define this distance as the average value of the absolute differences of the (bi)monthly indexes. The distances are given in table 16. For illustrative purposes we add the chained Laspeyres index. The first approximation of P_{GT} is left out because this index will not be calculated in normal CPI practices.

Table 16. Distance between index and generalised Törnqvist index [a) b)]

Index	Televisions	Refrigerators	Washing machines	Computers
P_{MT}	0.16 (1)	0.58 (3)	0.26 (1)	3.71 (4)
Chained Laspeyres	0.28 (2)	0.23 (1)	0.85 (4)	6.97 (6)
OLS time dummy	0.81 (3)	0.53 (2)	0.44 (2)	2.27 (3)
WLS time dummy (quantities)	2.18 (5)	0.75 (4)	0.81 (3)	0.72 (1)
WLS time dummy (expenditure shares)	1.67 (4)	2.22 (5)	1.70 (5)	1.18 (2)
CPI	2.73 (6)	2.87 (6)	2.58 (6)	5.64 (5)

a) Distance: average of absolute differences
b) Ranking of indexes is indicated between brackets

This table underlines the special position of computers. For televisions, refrigerators and washing machines the matched-model Törnqvist index performs best on average, although the chained Laspeyres is very close. Among the time dummy indexes the OLS-version approximates P_{GT} clearly better than both weighted versions. Van der Grient and De Haan (2003) indicated that a time dummy price index should be completely based on observed prices when there are no new or disappearing goods. Time-dependent weights, whether (relative) expenditures or quantities, do not satisfy that condition. This could be the underlying reason for the low ranking of both WLS time dummy indexes in table 16. For computers, the ranking between matched-model and time dummy indexes is exactly the opposite. The quantity-weighted time dummy index performs best, while the chained Laspeyres is a bad candidate. The time dummy indexes for computers should be handled with some care, however. In section 4.1 we already expressed our doubts about the stability of the model parameters.

Generally spoken, the fraction of new and disappearing items seems to be decisive for a choice between matched-model and time dummy indexes. The distance between the CPI and the benchmark index is fairly big for all durables. The underlying causes were already discussed in section 4.2.

4.5 An aggregate hedonic index for 'durables'

The expenditures on the four durables discussed in this paper form nearly 50% of the CPI-weight of the total group of household appliances, audio-visual equipment and data processing equipment. An aggregate index of these four goods can thus considered to be a reasonable approximation of an index of all durables (excluding cars). Based on the various price indexes presented above, we will calculate aggregate indexes. The weights are taken from the CPI(1995=100). Before, the monthly computer indexes have been recalculated on a bimonthly basis as unweighted averages of two monthly indexes. It is tempting to compare our aggregate indexes with the official CPI for all durables. However, this is complicated by the fact that the official CPI includes the (price reducing) effect of so-called energy-premiums for low-energy durables. Unfortunately, it proved impossible to calculate a CPI for all durables excluding those premiums. Therefore, we will restrict ourselves to a comparison of our aggregates, presented in table 17, with the CPI based on the four durables only. Figure 21 visualises the development of all aggregate indexes.

Table 17. Price index numbers for durables[a)] (199902=100)

	P_{GT}	$P_{GT(i)}$	P_{MT}	WLS time dummy [b)]	OLS time dummy	CPI
199902	100.00	100.00	100.00	100.00	100.00	100.00
199904	95.66	95.52	95.71	95.46	95.36	96.73
199906	91.99	91.95	92.82	91.84	91.19	93.10
199908	87.28	87.20	88.07	87.89	88.15	88.48
199910	83.83	83.76	84.83	94.48	85.25	85.29
199912	82.40	82.41	83.62	83.38	83.56	82.57
200002	81.03	81.10	82.50	81.83	82.36	81.18
200004	80.14	80.32	81.66	80.85	81.13	79.21
200006	78.17	78.41	79.86	78.73	79.40	77.79
200008	76.20	76.46	78.02	77.14	76.97	75.45
200010	74.61	75.04	76.87	75.85	75.80	72.41
200012	73.78	74.17	75.90	75.04	75.29	71.84
200102	73.40	73.70	75.39	74.54	74.66	71.09
200104	71.78	72.11	74.15	72.98	73.27	70.97
200106	70.97	71.25	73.22	72.02	72.33	69.80
200108	69.39	69.90	71.50	70.63	70.64	68.58
200110	67.15	67.68	69.33	68.14	69.20	66.91
200112	65.59	66.22	68.32	66.47	68.02	66.31

[a)] Televisions, refrigerators, washing machines and computers

[b)] Time-specific expenditure shares as weights.

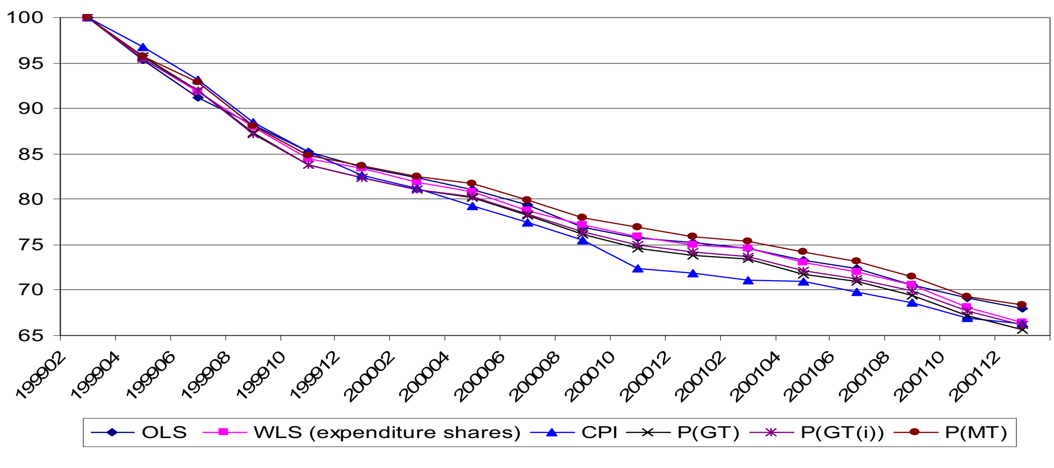

Figure 21. Price indexes for durables (199902=100)

The difference between P_{GT} and (its second approximation) P_{MT} accumulates over time, up to slightly more than 3 indexpoints, which is nearly entirely due to computers. Apart from the period end 2000, early 2001, the CPI is surprisingly close to P_{GT}. The positive 'biases' for televisions, refrigerators and washing machines are more than compensated by the downward 'bias' for computers. However, it cannot be guaranteed that positive and negative 'biases' will compensate each other structurally.

5. Conclusion

This study had two aims: describing the market dynamics for some major durable goods and, most importantly, to investigate the potential of hedonic regression techniques for quality adjustments in the CPI. To this end we utilized scanner data on personal computers, televisions, washing machines and refrigerators. It appeared that all these durable goods have a clear seasonal pattern in their sales. Refrigerators reach their maximum sales level around August, the other three durables exhibit a peak at the end of the year. The market of each of these durables is dominated by approximately 10 brands. The distribution of sales is highly skewed, relatively few models count for the major part of total sales. The market is highly dynamic; each month many models appear on the market or disappear from it. Based on expenditures however, the attrition rate is much lower, except for computers.

The main focus in this paper is on hedonic modelling. Prices of televisions, refrigerators and washing machines can well be explained by the available technical characteristics and dummy variables for brand name and outlet type. Using OLS, the coefficients for the most important characteristics appeared to be stable for at least half a year. This makes hedonics a promising tool for quality adjustments in the CPI, the advantage being that the data collection on characteristics is needed only twice a year. The lack of weights is less important when an explicit variant of the hedonic technique will be used.

For implicit quality adjustments, like the time dummy variant, weighting is essential. The data requirements, however, are stronger because prices, quantities and of course characteristics are needed on a monthly basis. Using WLS, the coefficients appear to be a bit less stable. Parameter stability was satisfactory between adjacent periods, though. The use of different sets of weights resulted in substantial differences in the resulting indexes. We took the WLS-procedure proposed by Diewert (2003), leading to a generalised Törnqvist index, as our benchmark. The OLS time dummy index did not differ much from the generalised Törnqvist, which was actually surprising. We also compared the official CPI-figures with this benchmark price index. For televisions, washing machines and refrigerators the CPI was systematically above the generalised Törnqvist index, for computers the situation was reverse. Sampling aspects seem to be a major reason in explaining these differences.

Finally, we investigated whether a superlative matched-model index would suffice or new and disappearing items should explicitly be taken into account. Our findings confirmed that this is mainly determined by market dynamics. As the attrition rates, based on expenditures, are low for televisions, washing machines and refrigerators the matched-model Törnqvist index appeared to be a very good approximation of the generalised one. For computers, where the expenditure shares of new and disappearing items are substantial, a matched-model index seems not to suffice.

Our conclusion that a matched-model index suffices in case the attrition rates of new and disappearing items are low, is not very surprising. Less evident was our finding that there seemed to be no structural pricing policy for new and disappearing goods. An exception could be observed for disappearing televisions and PCs. The price level of these items seems to be structurally higher than the price level of similar models that remain on the market.

Although the use of hedonics seems promising, the practical application is not a simple next step. One problem is the use of brand names in the regression model. Since brand effects are important it could be advisable (data permitting) to estimate hedonic models for individual brands or for groups of similar brands. Secondly, rules for how to deal with outliers should be developed, a point that has earlier been stressed by Silver (2002). Thirdly, the bias possibly created by the seasonal pattern in sales of durables should be examined. Last but not least, sampling remains an important issue. For the time being it is not realistic to expect that on a regular basis population data, like the scanner data we utilized, can be obtained. Sampling aspects should receive more attention in research on hedonics since this is where improvements are feasible.

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Appendix 1. Representativity of CPI-sample

As stated in section 2 of the main text, the scanner data can be viewed as the population of sales over the period 1999-2001. This enabled us to examine whether the samples used for the official CPI were representative for the population. Table 1-1 indicates whether Statistics Netherlands has been successful in selecting the best selling models for their price collection. All models available during 1999-2001 are ranked according to their numbers sold. We distinguish four groups, the top10 of models, two groups with intermediate sales and a last group of models with modest sales. Table 1-1 shows how these groups are represented in the CPI-sample.

Table 1-1. Representativity of CPI-sample, 1999-2001 [a)]

Ranking of models in population, based on numbers sold	Number of models in CPI-sample		
	Televisions	Refrigerators	Washing machines
1-10	6	0	0
11-25	2	2	2
26-100	7	6	2
>= 101	20	23	18
Total	35	31	22

a) Computers are not included, due to the specific market with many 'clones'

The information should be handled with some care. The grouping is made at the level of individual models and not on brands. For televisions for instance, the top25 of best sold models is dominated by two brands. These brands are well represented. To represent other brands as well, automatically models are selected which are lower on the list.

The table shows that Statistics Netherlands has not always been successful in tracking the dynamics of the market. For both refrigerators and washing machines the ten best sold models were not included in the CPI-sample. For refrigerators this can partly be explained by the structure of the market. The list of best-sold refrigerators is dominated by a few models of a less important brand. The brands which dominate the market all sell a wide variety of models, each with medium sales. As Statistics Netherlands' main concern is to have the most important brands to be represented in their sample, it is clear why the best sold models are not selected. The brands that dominate the market are all included in the CPI-sample although not always with their best sold models. One reason could be that updating of the sample is not considered urgent as long as enough price observations (for older but still existing models) are available. A second reason is that the replacement rule for an item that has become obsolete – i.e. choosing the most comparable item – might result in selecting the next obsolete item. However, this is common practice in many statistical offices. Silver and Heravi (2002) and Schultze and Mackie (2001) argue that sample degradation can be a source of bias. The criterion for selecting a replacement item should be representativity rather than comparability.

Appendix 2. Televisions: List of all characteristics used

Variable	Explanation	Base model
Brand01 to brand77	Brand	Brand05
Outlet2	Sold in chain stores	Sold in buying combinations
Outlet3	Sold in department stores or mail-order houses	Sold in buying combinations
Outlet4	Sold in independent stores	Sold in buying combinations
Outlet5	Sold in photo retail stores	Sold in buying combinations
Diameter	Screen diameter	
Scrtype2	Flat screen	Spherical screen
Ntuners	Television with 2 tuners	Television with 1 tuner
Pip1	Option 'picture in picture' present	No 'picture in picture'
Mltpip1	Dynamic picture and text	No multipip possibilities
Mltpip2	Dynamic picture and picture	No multipip possibilities
Syst2	Pal / Secam	Pal
Syst4	Pal / Secam / ntsc	Pal
Syst6	Pal +	Pal
Syst7	Pal + / Secam	Pal
Syst8	Pal + / Secam / ntsc	Pal
Model	Speakers on side	Frontal speakers
Freeze1	Possibility to freeze picture	No possibility to freeze picture
S_vhs1	s-vhs connector present (for camcorder)	No s-vhs connector
Sattune1	Built-in satellite tuner	No satellite tuner
Nicam1	Nicam decoder present	No Nicam decoder
Scratio2	Widescreen (16:9)	Standard screen (4:3)
Freq100	100 Hz	50 Hz
Wattage	Power	
Dolby1	Dolby surround sound	No Dolby surround sound
Dvd	Presence of DVD-player	No DVD-player
Portab	Portable Television	Not portable
Remote0	No remote control	With remote control
Sound0	Mono sound	Stereo sound
Text0	No teletext	Teletext with toptext
Text1	Simple teletext	Teletext with toptext
Text3	Teletext with 2.5 resolution	Teletext with toptext
Pc_conn	PC connection	No PC connection
Flatscr	Completely flat screen	No completely flat screen

Appendix 3. Refrigerators: List of all characteristics used

Variable	Explanation	Base model
Brand01 to brand76	Brand	Brand05
Outlet2	Sold in chain stores	Sold in buying combinations
Outlet3	Sold in department stores or mail-order houses	Sold in buying combinations
Outlet4	Sold in independent stores	Sold in buying combinations
Outlet5	Sold in kitchen retail stores	Sold in buying combinations
Doors_1, _3 and _4	Number of doors	Two doors
No_frost	No-frost option present	No-frost option not present
Combi	Fridge freezer	Refrigerator
Star_1, _2 and _3	Refrigerator with 1, 2 or 3 stars	Refrigerator with 4 stars
Groscool	Gross content cooling part (litres)	
Grosfrez	Gross content freezing part (litres)	
No-kwh	Energy-use	
Syst_0	Absorption system	One compressor
Syst_2	Two compressors	One compressor
No_label	No low-energy refrigerator	Low-energy refrigerator, Class A
X_label	Low-energy refrigerator, class not specified	Low-energy refrigerator, Class A
B_label	Low-energy refrigerator, class B	Low-energy refrigerator, Class A
C_label	Low-energy refrigerator, class C	Low-energy refrigerator, Class A
D_label	Low-energy refrigerator, class D	Low-energy refrigerator, Class A
E_label	Low-energy refrigerator, class E	Low-energy refrigerator, Class A
F_label	Low-energy refrigerator, class F	Low-energy refrigerator, Class A
G_label	Low-energy refrigerator, class G	Low-energy refrigerator, Class A
A1_label	Low-energy refrigerator, class A-plus	Low-energy refrigerator, Class A

Appendix 4. Washing machines: List of all characteristics used

Variable	Explanation	Base model
Rotspeed	Rotation speed	
Type_cw	Separate built-in spin-dryer	No separate spin-dryer
Type_l	Top loader	Frontloaded
Brand01 to brand45	Brand	Brand 01
EnerA to EnerF	Energy label A to F	Energy label A
Centr_m	Mechanical spin-dryer	Electronical spin-dryer
WashresA to WashresG	Washing result A to G	Washing result A
Buying	Sold in buying combinations	Sold in chain stores
Depmoh	Sold in department stores or mail-order houses	Sold in chain stores
Indep	Sold in independent stores	Sold in chain stores

Appendix 5. Personal computers: List of all characteristics used

Variable	Explanation	Base model
Speed	Processor speed (MHz)	
Hdisk	Storage capacity of hard disk (MB)	
Memory	Memory capacity (MB)	
Monitor	Presence of monitor	No monitor
Workstat	Stand alone PC or workstation in Network	Stand alone PC
USB	USB port present	No USB port
Proc01 to proc27	Type of processor	
Brand01 to brand34	Brand	
Buying	Sold in buying combinations	Sold in computer stores
Chains	Sold in chain stores	Sold in computer stores
Depmoh	Sold in department stores or mail-order houses	Sold in computer stores
Indep	Sold in independent stores	Sold in computer stores
Prt	Sold in Photo retail stores	Sold in computer stores
Tcs	Sold in Telecom specialists shops	Sold in computer stores

Appendix 6. Televisions: Summary results of 18 bimonthly OLS-regressions 1)

		average	st dev	min	max
Constant	coefficient	**4,671**	0,071	4,572	4,798
	st. error	*0,049*	*0,003*	*0,043*	*0,052*
diameter	coefficient	**0,051**	0,002	0,049	0,054
	st. error	*0,002*	*0,000*	*0,002*	*0,002*
dolby1	coefficient	0,028	0,014	0,002	0,061
	st. error	*0,018*	*0,001*	*0,017*	*0,021*
dvd	coefficient	**0,541**	0,021	0,513	0,575
	st. error	*0,069*	*0,014*	*0,057*	*0,095*
flatscr	coefficient	**0,305**	0,023	0,263	0,340
	st. error	*0,018*	*0,005*	*0,012*	*0,028*
freez1	coefficient	0,026	0,036	-0,024	0,093
	st. error	*0,024*	*0,003*	*0,019*	*0,030*
freq100	coefficient	**0,327**	0,019	0,301	0,356
	st. error	*0,015*	*0,001*	*0,014*	*0,016*
mltpip1	coefficient	0,060	0,041	-0,047	0,114
	st. error	*0,029*	*0,005*	*0,020*	*0,038*
mltpip2	coefficient	0,012	0,033	-0,051	0,072
	st. error	*0,022*	*0,001*	*0,020*	*0,025*
model1	coefficient	-0,004	0,014	-0,025	0,028
	st. error	*0,015*	*0,002*	*0,011*	*0,017*
nicam1	coefficient	0,006	0,015	-0,018	0,044
	st. error	*0,013*	*0,001*	*0,012*	*0,014*
ntuners	coefficient	0,129	0,042	0,086	0,186
	st. error	*0,077*	*0,013*	*0,067*	*0,095*
pc_conn	coefficient	0,088	0,063	-0,023	0,215
	st. error	*0,083*	*0,018*	*0,054*	*0,109*
pip1	coefficient	0,008	0,080	-0,251	0,119
	st. error	*0,044*	*0,007*	*0,031*	*0,056*
portab	coefficient	**0,083**	0,015	0,057	0,116
	st. error	*0,021*	*0,001*	*0,018*	*0,023*
remote0	coefficient	0,036	0,111	-0,088	0,263
	st. error	*0,119*	*0,033*	*0,074*	*0,170*
s_vhs1	coefficient	0,016	0,024	-0,015	0,082
	st. error	*0,012*	*0,001*	*0,011*	*0,013*
sattune1	coefficient	-0,129	0,159	-0,514	0,078
	st. error	*0,100*	*0,039*	*0,057*	*0,161*
scratio2	coefficient	**0,218**	0,009	0,203	0,234
	st. error	*0,013*	*0,001*	*0,012*	*0,014*
scrtype2	coefficient	0,061	0,018	0,035	0,098
	st. error	*0,019*	*0,001*	*0,016*	*0,021*
sound0	coefficient	**-0,160**	0,013	-0,184	-0,141
	st. error	*0,019*	*0,002*	*0,016*	*0,021*
syst2	coefficient	0,011	0,011	-0,008	0,034
	st. error	*0,014*	*0,001*	*0,012*	*0,015*
syst4	coefficient	0,037	0,018	0,005	0,073
	st. error	*0,022*	*0,001*	*0,021*	*0,023*
syst6	coefficient	0,073	0,070	-0,054	0,259
	st. error	*0,056*	*0,015*	*0,035*	*0,078*
syst7	coefficient	0,022	0,032	-0,035	0,086
	st. error	*0,043*	*0,007*	*0,033*	*0,055*
syst8	coefficient	0,013	0,099	-0,146	0,176
	st. error	*0,071*	*0,025*	*0,036*	*0,116*

		average	st dev	min	max
text0	coefficient	**-0,184**	0,027	-0,247	-0,130
	st. error	*0,023*	*0,002*	*0,020*	*0,026*
text1	coefficient	**-0,056**	0,015	-0,092	-0,031
	st. error	*0,015*	*0,001*	*0,013*	*0,016*
text3	coefficient	0,062	0,039	0,002	0,128
	st. error	*0,018*	*0,002*	*0,015*	*0,021*
wattage	coefficient	**0,003**	0,001	0,002	0,004
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
brand01	coefficient	-0,102	0,040	-0,195	-0,064
	st. error	*0,057*	*0,007*	*0,049*	*0,070*
brand02	coefficient	-0,114	0,035	-0,198	-0,059
	st. error	*0,031*	*0,008*	*0,022*	*0,047*
brand06	coefficient	**-0,239**	0,041	-0,306	-0,175
	st. error	*0,046*	*0,004*	*0,038*	*0,052*
brand08	coefficient	**1,342**	0,128	1,082	1,509
	st. error	*0,059*	*0,005*	*0,049*	*0,074*
brand09	coefficient	-0,228	0,035	-0,287	-0,180
	st. error	*0,101*	*0,008*	*0,089*	*0,120*
brand11	coefficient	0,047	0,055	-0,045	0,141
	st. error	*0,149*	*0,010*	*0,130*	*0,160*
brand12	coefficient	**-0,170**	0,023	-0,208	-0,115
	st. error	*0,028*	*0,002*	*0,023*	*0,032*
brand14	coefficient	**-0,313**	0,074	-0,486	-0,225
	st. error	*0,042*	*0,016*	*0,026*	*0,079*
brand19	coefficient	-0,140	0,035	-0,192	-0,077
	st. error	*0,045*	*0,022*	*0,030*	*0,094*
brand21	coefficient	0,082	0,034	0,029	0,162
	st. error	*0,022*	*0,001*	*0,020*	*0,024*
brand23	coefficient	-0,404	0,087	-0,513	-0,175
	st. error	*0,122*	*0,029*	*0,090*	*0,156*
brand27	coefficient	0,070	0,039	0,019	0,150
	st. error	*0,025*	*0,002*	*0,022*	*0,028*
brand29	coefficient	**0,706**	0,091	0,583	0,891
	st. error	*0,066*	*0,007*	*0,052*	*0,080*
brand30	coefficient	**-0,127**	0,025	-0,168	-0,087
	st. error	*0,033*	*0,008*	*0,027*	*0,057*
brand31	coefficient	**0,479**	0,077	0,329	0,562
	st. error	*0,027*	*0,001*	*0,025*	*0,030*
brand37	coefficient	0,061	0,063	-0,100	0,149
	st. error	*0,065*	*0,040*	*0,025*	*0,157*
brand38	coefficient	-0,001	0,041	-0,044	0,053
	st. error	*0,152*	*0,009*	*0,138*	*0,161*
brand39	coefficient	-0,178	0,049	-0,265	-0,088
	st. error	*0,126*	*0,017*	*0,108*	*0,154*
brand41	coefficient	0,065	0,019	0,033	0,111
	st. error	*0,023*	*0,001*	*0,020*	*0,024*
brand42	coefficient	**0,084**	0,023	0,051	0,150
	st. error	*0,019*	*0,001*	*0,017*	*0,021*
brand43	coefficient	-0,169	0,069	-0,280	-0,070
	st. error	*0,100*	*0,019*	*0,076*	*0,153*
brand44	coefficient	-0,320	0,134	-0,558	-0,018
	st. error	*0,144*	*0,015*	*0,107*	*0,160*

		average	st dev	min	max
brand46	coefficient	**-0,449**	0,028	-0,476	-0,395
	st. error	*0,148*	*0,013*	*0,119*	*0,159*
brand48	coefficient	-0,203	0,051	-0,295	-0,088
	st. error	*0,066*	*0,004*	*0,057*	*0,074*
brand49	coefficient	-0,219	0,028	-0,269	-0,171
	st. error	*0,084*	*0,007*	*0,070*	*0,094*
brand50	coefficient	-0,196	0,043	-0,262	-0,121
	st. error	*0,097*	*0,033*	*0,061*	*0,159*
brand51	coefficient	-0,150	0,103	-0,287	0,132
	st. error	*0,083*	*0,049*	*0,037*	*0,222*
brand53	coefficient	-0,060	0,022	-0,098	-0,018
	st. error	*0,026*	*0,001*	*0,023*	*0,028*
brand54	coefficient	0,016	0,017	-0,014	0,028
	st. error	*0,115*	*0,024*	*0,088*	*0,153*
brand57	coefficient	-0,327	0,075	-0,430	-0,215
	st. error	*0,107*	*0,028*	*0,081*	*0,160*
brand59	coefficient	-0,087	0,033	-0,141	-0,006
	st. error	*0,025*	*0,002*	*0,021*	*0,028*
brand62	coefficient	**0,159**	0,024	0,126	0,218
	st. error	*0,027*	*0,002*	*0,024*	*0,030*
brand63	coefficient	**-0,261**	0,052	-0,374	-0,175
	st. error	*0,059*	*0,012*	*0,046*	*0,088*
brand66	coefficient	**-0,476**	0,089	-0,707	-0,300
	st. error	*0,101*	*0,023*	*0,065*	*0,156*
brand68	coefficient	0,107	0,133	-0,019	0,454
	st. error	*0,039*	*0,010*	*0,029*	*0,065*
brand69	coefficient	-0,160	0,133	-0,357	0,057
	st. error	*0,133*	*0,031*	*0,078*	*0,161*
brand72	coefficient	**-0,244**	0,041	-0,313	-0,182
	st. error	*0,058*	*0,008*	*0,048*	*0,073*
brand74	coefficient	**-0,352**	0,096	-0,665	-0,258
	st. error	*0,074*	*0,023*	*0,053*	*0,150*
outlet2	coefficient	**-0,072**	0,011	-0,101	-0,048
	st. error	*0,011*	*0,000*	*0,010*	*0,011*
outlet3	coefficient	0,028	0,021	-0,021	0,056
	st. error	*0,016*	*0,001*	*0,013*	*0,017*
outlet4	coefficient	-0,023	0,017	-0,058	-0,002
	st. error	*0,011*	*0,001*	*0,010*	*0,012*
outlet5	coefficient	**-0,094**	0,033	-0,182	-0,054
	st. error	*0,016*	*0,002*	*0,013*	*0,018*

1) Coefficients in bold are significant at the 5% level in all periods

Appendix 7. Refrigerators: Summary results of 18 bimonthly OLS-regressions 1)

		Average	st dev	min	max
Constant	coefficient	**5,377**	0,057	5,280	5,467
	st. error	*0,034*	*0,002*	*0,030*	*0,038*
doors_1	coefficient	0,047	0,038	-0,007	0,114
	st. error	*0,025*	*0,002*	*0,022*	*0,029*
doors_3	coefficient	**0,445**	0,057	0,316	0,556
	st. error	*0,086*	*0,023*	*0,058*	*0,152*
no_frost	coefficient	0,021	0,060	-0,099	0,119
	st. error	*0,043*	*0,004*	*0,037*	*0,051*
combi	coefficient	**0,327**	0,055	0,241	0,443
	st. error	*0,033*	*0,002*	*0,029*	*0,036*
star_0	coefficient	-0,052	0,023	-0,086	-0,014
	st. error	*0,025*	*0,002*	*0,021*	*0,029*
star_1	coefficient	**-0,260**	0,057	-0,386	-0,183
	st. error	*0,052*	*0,009*	*0,041*	*0,070*
star_2	coefficient	**-0,242**	0,026	-0,307	-0,203
	st. error	*0,041*	*0,009*	*0,030*	*0,058*
star_3	coefficient	0,004	0,055	-0,112	0,128
	st. error	*0,048*	*0,014*	*0,032*	*0,072*
groscool	coefficient	**0,003**	0,000	0,002	0,003
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
grosfrez	coefficient	**0,003**	0,000	0,002	0,003
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
syst_2	coefficient	-0,078	0,042	-0,151	0,004
	st. error	*0,033*	*0,002*	*0,029*	*0,037*
no_label	coefficient	-0,182	0,059	-0,287	-0,084
	st. error	*0,047*	*0,012*	*0,035*	*0,079*
x_label	coefficient	0,094	0,138	-0,085	0,507
	st. error	*0,144*	*0,029*	*0,108*	*0,222*
b_label	coefficient	-0,089	0,030	-0,122	-0,002
	st. error	*0,016*	*0,001*	*0,014*	*0,018*
c_label	coefficient	-0,088	0,036	-0,143	-0,015
	st. error	*0,022*	*0,003*	*0,018*	*0,028*
d_label	coefficient	-0,121	0,047	-0,186	-0,040
	st. error	*0,040*	*0,012*	*0,028*	*0,062*
e_label	coefficient	-0,079	0,076	-0,181	0,126
	st. error	*0,059*	*0,012*	*0,045*	*0,085*
f_label	coefficient	-0,178	0,249	-0,940	0,177
	st. error	*0,123*	*0,051*	*0,052*	*0,223*
g_label	coefficient	-0,299	0,292	-0,768	0,239
	st. error	*0,122*	*0,033*	*0,085*	*0,221*
a1_label	coefficient	0,119	0,026	0,063	0,170
	st. error	*0,037*	*0,005*	*0,027*	*0,044*

1) Coefficients in bold are significant at the 5% level in all periods

		Average	st dev	min	max
brand01	coefficient	-0,010	0,032	-0,078	0,066
	st. error	*0,031*	*0,002*	*0,028*	*0,035*
brand02	coefficient	-0,438	0,155	-0,671	-0,067
	st. error	*0,109*	*0,040*	*0,065*	*0,207*
brand03	coefficient	0,318	0,137	0,137	0,611
	st. error	*0,126*	*0,037*	*0,084*	*0,197*
brand06	coefficient	-0,072	0,045	-0,173	0,000
	st. error	*0,052*	*0,012*	*0,035*	*0,077*
brand08	coefficient	0,602	0,246	0,217	1,101
	st. error	*0,084*	*0,012*	*0,063*	*0,107*
brand09	coefficient	**-0,301**	0,068	-0,402	-0,179
	st. error	*0,071*	*0,010*	*0,060*	*0,095*
brand10	coefficient	-0,142	0,060	-0,257	-0,034
	st. error	*0,032*	*0,004*	*0,027*	*0,041*
brand11	coefficient	-0,280	0,072	-0,413	-0,169
	st. error	*0,062*	*0,011*	*0,047*	*0,095*
brand12	coefficient	-0,328	0,193	-0,481	0,096
	st. error	*0,125*	*0,011*	*0,112*	*0,147*
brand13	coefficient	0,082	0,194	-0,157	0,265
	st. error	*0,180*	*0,033*	*0,132*	*0,221*
brand17	coefficient	-0,117	0,098	-0,238	0,044
	st. error	*0,073*	*0,034*	*0,042*	*0,158*
brand19	coefficient	**-0,182**	0,041	-0,299	-0,128
	st. error	*0,048*	*0,005*	*0,042*	*0,061*
brand23	coefficient	**-0,411**	0,085	-0,569	-0,230
	st. error	*0,074*	*0,025*	*0,050*	*0,125*
brand24	coefficient	**-0,392**	0,056	-0,499	-0,271
	st. error	*0,059*	*0,006*	*0,050*	*0,071*
brand25	coefficient	-0,397	0,029	-0,471	-0,363
	st. error	*0,141*	*0,034*	*0,093*	*0,216*
brand26	coefficient	-0,068	0,025	-0,098	-0,022
	st. error	*0,096*	*0,002*	*0,093*	*0,097*
brand27	coefficient	**-0,541**	0,110	-0,743	-0,399
	st. error	*0,115*	*0,037*	*0,069*	*0,209*
brand28	coefficient	**-0,297**	0,028	-0,340	-0,248
	st. error	*0,035*	*0,003*	*0,031*	*0,042*
brand29	coefficient	-0,076	0,106	-0,327	0,056
	st. error	*0,149*	*0,056*	*0,068*	*0,223*
brand30	coefficient	0,143	0,109	-0,034	0,305
	st. error	*0,165*	*0,030*	*0,136*	*0,218*
brand33	coefficient	**-0,497**	0,029	-0,567	-0,447
	st. error	*0,055*	*0,007*	*0,044*	*0,070*
brand34	coefficient	-0,233	0,145	-0,384	-0,025
	st. error	*0,098*	*0,012*	*0,074*	*0,108*
brand35	coefficient	**-0,376**	0,068	-0,474	-0,276
	st. error	*0,041*	*0,005*	*0,031*	*0,051*
brand36	coefficient	**-0,388**	0,050	-0,473	-0,251
	st. error	*0,074*	*0,018*	*0,056*	*0,126*
brand37	coefficient	**0,669**	0,004	0,666	0,673
	st. error	*0,218*	*0,002*	*0,215*	*0,220*
brand38	coefficient	**0,443**	0,090	0,332	0,606
	st. error	*0,180*	*0,024*	*0,153*	*0,225*
brand40	coefficient	-0,112	0,042	-0,169	-0,071
	st. error	*0,200*	*0,016*	*0,187*	*0,222*
brand41	coefficient	0,278	0,161	-0,170	0,413
	st. error	*0,112*	*0,059*	*0,043*	*0,210*

		Average	st dev	min	max
brand42	coefficient	-0,237	0,034	-0,307	-0,182
	st. error	*0,074*	*0,034*	*0,049*	*0,167*
brand43	coefficient	**-0,394**	0,024	-0,416	-0,358
	st. error	*0,164*	*0,030*	*0,133*	*0,209*
brand44	coefficient	-0,195	0,047	-0,259	-0,124
	st. error	*0,053*	*0,015*	*0,036*	*0,083*
brand46	coefficient	-0,546	0,081	-0,716	-0,372
	st. error	*0,180*	*0,023*	*0,147*	*0,221*
brand47	coefficient	**-0,333**	0,063	-0,479	-0,225
	st. error	*0,060*	*0,019*	*0,036*	*0,094*
brand49	coefficient	**-0,436**	0,056	-0,521	-0,349
	st. error	*0,038*	*0,003*	*0,033*	*0,046*
brand52	coefficient	-0,122	0,058	-0,229	-0,052
	st. error	*0,132*	*0,035*	*0,091*	*0,195*
brand53	coefficient	**0,102**	0,024	0,054	0,150
	st. error	*0,026*	*0,002*	*0,023*	*0,031*
brand55	coefficient	-0,051	0,051	-0,140	0,028
	st. error	*0,039*	*0,006*	*0,029*	*0,052*
brand56	coefficient	0,006	0,014	-0,024	0,028
	st. error	*0,032*	*0,004*	*0,025*	*0,038*
brand59	coefficient	-0,247	0,057	-0,386	-0,184
	st. error	*0,047*	*0,004*	*0,040*	*0,053*
brand60	coefficient	0,266	0,073	0,119	0,394
	st. error	*0,058*	*0,012*	*0,039*	*0,081*
brand61	coefficient	**-0,401**	0,075	-0,529	-0,252
	st. error	*0,090*	*0,015*	*0,068*	*0,122*
brand62	coefficient	-0,147	0,045	-0,223	-0,059
	st. error	*0,085*	*0,011*	*0,067*	*0,105*
brand64	coefficient	**-0,248**	0,056	-0,357	-0,140
	st. error	*0,044*	*0,008*	*0,035*	*0,060*
brand65	coefficient	0,170	0,169	-0,231	0,495
	st. error	*0,134*	*0,011*	*0,116*	*0,160*
brand67	coefficient	-0,020	0,024	-0,072	0,017
	st. error	*0,025*	*0,003*	*0,020*	*0,031*
brand68	coefficient	-0,070	0,009	-0,082	-0,063
	st. error	*0,209*	*0,001*	*0,208*	*0,210*
brand70	coefficient	**0,755**	0,098	0,522	0,924
	st. error	*0,153*	*0,012*	*0,129*	*0,173*
brand72	coefficient	**-0,794**	0,074	-0,959	-0,685
	st. error	*0,206*	*0,010*	*0,185*	*0,221*
brand74	coefficient	**-0,201**	0,046	-0,258	-0,121
	st. error	*0,025*	*0,003*	*0,020*	*0,030*
brand75	coefficient	**-0,214**	0,043	-0,300	-0,147
	st. error	*0,046*	*0,009*	*0,034*	*0,063*
brand76	coefficient	**-0,154**	0,033	-0,207	-0,097
	st. error	*0,026*	*0,003*	*0,022*	*0,031*

outlet2	coefficient	-0,066	0,017	-0,095	-0,030
	st. error	*0,014*	*0,001*	*0,012*	*0,016*
outlet3	coefficient	0,038	0,025	0,004	0,087
	st. error	*0,025*	*0,003*	*0,019*	*0,029*
outlet4	coefficient	0,003	0,018	-0,039	0,033
	st. error	*0,019*	*0,003*	*0,015*	*0,025*
outlet5	coefficient	0,294	0,095	0,057	0,410
	st. error	*0,041*	*0,003*	*0,037*	*0,047*

Appendix 8. Washing machines: Summary results of 18 bimonthly OLS-regressions 1)

		Average	st dev	min	max
Constant	coefficient	**5,693**	0,072	5,540	5,783
	st. error	*0,037*	*0,002*	*0,030*	*0,040*
rotspeed	coefficient	**0,001**	0,000	0,001	0,001
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
type_cw	coefficient	**-1,184**	0,154	-1,424	-0,826
	st. error	*0,099*	*0,018*	*0,079*	*0,145*
type_l	coefficient	**0,116**	0,028	0,066	0,156
	st. error	*0,014*	*0,001*	*0,011*	*0,015*
enerb	coefficient	-0,050	0,028	-0,091	0,000
	st. error	*0,012*	*0,001*	*0,010*	*0,016*
enerc	coefficient	-0,045	0,020	-0,080	-0,012
	st. error	*0,024*	*0,005*	*0,015*	*0,033*
enerd	coefficient	0,060	0,091	-0,071	0,227
	st. error	*0,053*	*0,007*	*0,041*	*0,062*
enere	coefficient	-0,158	0,135	-0,448	-0,002
	st. error	*0,093*	*0,034*	*0,042*	*0,148*
enerf	coefficient	0,064	0,087	-0,080	0,142
	st. error	*0,139*	*0,017*	*0,111*	*0,150*
centr_m	coefficient	**-0,065**	0,019	-0,095	-0,034
	st. error	*0,012*	*0,001*	*0,011*	*0,013*
washresb	coefficient	-0,100	0,030	-0,141	-0,037
	st. error	*0,014*	*0,001*	*0,011*	*0,015*
washresc	coefficient	-0,077	0,036	-0,149	-0,019
	st. error	*0,024*	*0,003*	*0,017*	*0,028*
washresd	coefficient	-0,035	0,057	-0,156	0,053
	st. error	*0,055*	*0,010*	*0,033*	*0,072*
washrese	coefficient	0,429	0,025	0,399	0,463
	st. error	*0,147*	*0,002*	*0,144*	*0,149*
washresf	coefficient	0,040	0,100	-0,094	0,175
	st. error	*0,128*	*0,019*	*0,090*	*0,149*
washresg	coefficient	-0,180	0,052	-0,260	-0,091
	st. error	*0,121*	*0,018*	*0,097*	*0,149*
buying	coefficient	**0,082**	0,013	0,063	0,109
	st. error	*0,011*	*0,001*	*0,009*	*0,012*
depmoh	coefficient	**0,133**	0,026	0,093	0,194
	st. error	*0,017*	*0,001*	*0,013*	*0,019*
indep	coefficient	**0,073**	0,015	0,037	0,099
	st. error	*0,013*	*0,001*	*0,010*	*0,016*

		Average	st dev	min	max
brand02	coefficient	**-0,643**	0,088	-0,754	-0,494
	st. error	*0,111*	*0,021*	*0,087*	*0,145*
brand03	coefficient	**-0,320**	0,055	-0,402	-0,207
	st. error	*0,046*	*0,008*	*0,027*	*0,060*
brand04	coefficient	**0,280**	0,044	0,221	0,373
	st. error	*0,050*	*0,016*	*0,036*	*0,096*
brand05	coefficient	**-0,887**	0,000	-0,887	-0,887
	st. error	*0,136*	*0,000*	*0,136*	*0,136*
brand06	coefficient	-0,225	0,057	-0,331	-0,134
	st. error	*0,078*	*0,004*	*0,070*	*0,085*
brand07	coefficient	**-0,105**	0,016	-0,143	-0,078
	st. error	*0,019*	*0,001*	*0,016*	*0,022*
brand08	coefficient	**-0,410**	0,049	-0,497	-0,309
	st. error	*0,085*	*0,030*	*0,059*	*0,142*
brand09	coefficient	0,069	0,121	-0,284	0,194
	st. error	*0,082*	*0,037*	*0,031*	*0,142*
brand10	coefficient	**-0,616**	0,138	-0,830	-0,411
	st. error	*0,119*	*0,020*	*0,088*	*0,145*
brand11	coefficient	-0,012	0,027	-0,045	0,041
	st. error	*0,018*	*0,001*	*0,014*	*0,019*
brand12	coefficient	-0,083	0,048	-0,164	0,009
	st. error	*0,035*	*0,011*	*0,025*	*0,070*
brand13	coefficient	**-0,317**	0,026	-0,370	-0,279
	st. error	*0,028*	*0,002*	*0,024*	*0,031*
brand14	coefficient	**-0,617**	0,053	-0,696	-0,534
	st. error	*0,125*	*0,021*	*0,092*	*0,147*
brand15	coefficient	**-0,305**	0,098	-0,396	-0,126
	st. error	*0,108*	*0,024*	*0,070*	*0,145*
brand16	coefficient	**-0,340**	0,014	-0,364	-0,327
	st. error	*0,099*	*0,002*	*0,096*	*0,100*
brand17	coefficient	**-0,366**	0,040	-0,404	-0,293
	st. error	*0,038*	*0,003*	*0,036*	*0,045*
brand18	coefficient	**-0,419**	0,109	-0,594	-0,199
	st. error	*0,073*	*0,027*	*0,046*	*0,141*
brand19	coefficient	**-0,384**	0,047	-0,482	-0,319
	st. error	*0,028*	*0,002*	*0,021*	*0,031*
brand20	coefficient	-0,216	0,104	-0,359	-0,047
	st. error	*0,081*	*0,028*	*0,051*	*0,136*
brand21	coefficient	**0,384**	0,023	0,361	0,406
	st. error	*0,138*	*0,002*	*0,135*	*0,140*
brand22	coefficient	**-0,288**	0,092	-0,420	-0,169
	st. error	*0,073*	*0,010*	*0,059*	*0,096*

		Average	st dev	min	max
brand23	coefficient	**-0,379**	0,064	-0,465	-0,288
	st. error	*0,101*	*0,047*	*0,049*	*0,207*
brand24	coefficient	-0,185	0,057	-0,274	-0,127
	st. error	*0,111*	*0,024*	*0,071*	*0,130*
brand25	coefficient	**-0,337**	0,068	-0,458	-0,199
	st. error	*0,048*	*0,009*	*0,030*	*0,066*
brand26	coefficient	**-0,456**	0,097	-0,606	-0,351
	st. error	*0,120*	*0,018*	*0,087*	*0,143*
brand27	coefficient	**-0,388**	0,056	-0,491	-0,296
	st. error	*0,074*	*0,023*	*0,051*	*0,137*
brand28	coefficient	**-0,475**	0,029	-0,540	-0,414
	st. error	*0,027*	*0,002*	*0,020*	*0,031*
brand29	coefficient	-0,083	0,046	-0,164	0,013
	st. error	*0,067*	*0,031*	*0,043*	*0,142*
brand30	coefficient	**-0,124**	0,021	-0,167	-0,092
	st. error	*0,036*	*0,005*	*0,030*	*0,044*
brand31	coefficient	**0,297**	0,026	0,258	0,347
	st. error	*0,018*	*0,001*	*0,014*	*0,019*
brand32	coefficient	**-0,332**	0,038	-0,392	-0,267
	st. error	*0,038*	*0,003*	*0,030*	*0,047*
brand33	coefficient	**-0,446**	0,074	-0,579	-0,283
	st. error	*0,108*	*0,018*	*0,083*	*0,141*
brand34	coefficient	**-0,718**	0,076	-0,900	-0,576
	st. error	*0,104*	*0,024*	*0,070*	*0,141*
brand35	coefficient	**-0,495**	0,066	-0,609	-0,386
	st. error	*0,094*	*0,032*	*0,051*	*0,143*
brand36	coefficient	-0,137	0,138	-0,357	0,024
	st. error	*0,113*	*0,021*	*0,091*	*0,145*
brand37	coefficient	**-0,344**	0,041	-0,406	-0,243
	st. error	*0,032*	*0,003*	*0,028*	*0,038*
brand38	coefficient	-0,006	0,038	-0,058	0,074
	st. error	*0,019*	*0,001*	*0,015*	*0,021*
brand39	coefficient	-0,147	0,230	-0,543	0,014
	st. error	*0,086*	*0,011*	*0,072*	*0,101*
brand41	coefficient	-0,151	0,142	-0,362	0,274
	st. error	*0,123*	*0,028*	*0,082*	*0,191*
brand42	coefficient	**-0,257**	0,023	-0,294	-0,211
	st. error	*0,023*	*0,002*	*0,020*	*0,026*
brand43	coefficient	-0,075	0,030	-0,142	-0,021
	st. error	*0,031*	*0,004*	*0,022*	*0,036*
brand44	coefficient	**-0,234**	0,029	-0,283	-0,175
	st. error	*0,023*	*0,002*	*0,017*	*0,026*
brand45	coefficient	**-0,463**	0,000	-0,463	-0,463
	st. error	*0,141*	*0,000*	*0,141*	*0,141*

1) Coefficients in bold are significant at the 5% level in all periods

Appendix 9. Computers: Summary results of 35 pooled OLS-regressions 1)

		average	st. dev.	min	max
Constant	coefficient	**6,303**	0,260	5,765	6,709
	st. error	*0,090*	*0,065*	*0,035*	*0,328*
speed	coefficient	**0,001**	0,001	0,000	0,003
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
hdisk	coefficient	**0,000**	0,000	0,000	0,000
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
memory	coefficient	**0,002**	0,001	0,000	0,003
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
monitor	coefficient	**0,323**	0,171	0,089	0,730
	st. error	*0,029*	*0,009*	*0,016*	*0,042*
workstat	coefficient	**0,455**	0,132	0,206	0,846
	st. error	*0,090*	*0,044*	*0,042*	*0,238*
usb	coefficient	-0,062	0,142	-0,379	0,284
	st. error	*0,096*	*0,077*	*0,036*	*0,325*
proc01	coefficient	**1,009**	0,063	0,947	1,072
	st. error	*0,248*	*0,002*	*0,246*	*0,250*
proc02	coefficient	**0,643**	0,097	0,522	0,785
	st. error	*0,227*	*0,039*	*0,161*	*0,255*
proc03	coefficient	-0,018	0,061	-0,098	0,110
	st. error	*0,027*	*0,016*	*0,019*	*0,098*
proc04	coefficient	**-0,193**	0,033	-0,255	-0,092
	st. error	*0,020*	*0,003*	*0,017*	*0,034*
proc05	coefficient	-0,134	0,068	-0,229	0,026
	st. error	*0,057*	*0,012*	*0,037*	*0,075*
proc06	coefficient	-0,090	0,100	-0,302	0,123
	st. error	*0,046*	*0,021*	*0,022*	*0,089*
proc07	coefficient	-0,206	0,085	-0,338	-0,057
	st. error	*0,108*	*0,039*	*0,084*	*0,231*
proc08	coefficient	-0,109	0,070	-0,199	0,099
	st. error	*0,035*	*0,023*	*0,024*	*0,119*
proc09	coefficient	-0,266	0,148	-0,514	-0,042
	st. error	*0,132*	*0,045*	*0,082*	*0,218*
proc10	coefficient	-0,077	0,058	-0,190	0,004
	st. error	*0,061*	*0,038*	*0,030*	*0,161*
proc11	coefficient	-0,201	0,193	-0,412	0,144
	st. error	*0,216*	*0,032*	*0,158*	*0,263*
proc12	coefficient	-0,188	0,060	-0,264	0,028
	st. error	*0,031*	*0,012*	*0,021*	*0,072*
proc13	coefficient	-0,050	0,100	-0,133	0,120
	st. error	*0,191*	*0,042*	*0,117*	*0,241*
proc14	coefficient	-0,125	0,177	-0,446	0,210
	st. error	*0,108*	*0,055*	*0,040*	*0,236*
proc15	coefficient	**-0,576**	0,286	-1,035	-0,248
	st. error	*0,132*	*0,073*	*0,058*	*0,246*
proc16	coefficient	-0,254	0,124	-0,494	-0,067
	st. error	*0,100*	*0,054*	*0,054*	*0,222*
proc17	coefficient	0,274	0,528	-0,665	1,514
	st. error	*0,165*	*0,090*	*0,065*	*0,387*
proc18	coefficient	0,049	0,038	-0,014	0,105
	st. error	*0,044*	*0,029*	*0,022*	*0,110*
proc19	coefficient	-0,036	0,415	-0,499	0,671
	st. error	*0,193*	*0,061*	*0,102*	*0,316*
proc20	coefficient	-0,119	0,178	-0,628	0,292
	st. error	*0,122*	*0,070*	*0,038*	*0,236*
proc21	coefficient	0,466	1,015	-0,627	1,937
	st. error	*0,223*	*0,022*	*0,168*	*0,246*
proc22	coefficient	0,441	0,280	0,164	0,909
	st. error	*0,288*	*0,067*	*0,222*	*0,386*
proc23	coefficient	0,514	0,327	0,123	0,976
	st. error	*0,239*	*0,018*	*0,214*	*0,263*
proc24	coefficient	**0,933**	0,154	0,755	1,154
	st. error	*0,219*	*0,030*	*0,161*	*0,262*
proc25	coefficient	-0,003	0,283	-0,547	0,470
	st. error	*0,053*	*0,006*	*0,043*	*0,069*
proc26	coefficient	**0,651**	0,112	0,436	0,929
	st. error	*0,066*	*0,033*	*0,049*	*0,208*
proc27	coefficient	0,674	0,078	0,596	0,752
	st. error	*0,192*	*0,006*	*0,185*	*0,198*
brand01	coefficient	0,063	0,141	-0,157	0,455
	st. error	*0,076*	*0,022*	*0,047*	*0,123*
brand02	coefficient	**0,540**	0,000	0,540	0,540
	st. error	*0,045*	*0,000*	*0,045*	*0,045*
brand03	coefficient	0,044	0,066	-0,056	0,171
	st. error	*0,084*	*0,030*	*0,058*	*0,156*
brand04	coefficient	**-0,138**	0,039	-0,209	-0,051
	st. error	*0,021*	*0,003*	*0,017*	*0,028*
brand05	coefficient	-0,207	0,018	-0,225	-0,189
	st. error	*0,216*	*0,005*	*0,211*	*0,220*
brand06	coefficient	0,135	0,050	0,019	0,204
	st. error	*0,022*	*0,003*	*0,018*	*0,028*
brand07	coefficient	**-0,018**	0,583	-0,598	0,648
	st. error	*0,220*	*0,012*	*0,206*	*0,235*
brand08	coefficient	-0,468	0,000	-0,468	-0,468
	st. error	*0,266*	*0,000*	*0,266*	*0,266*
brand09	coefficient	**0,872**	0,028	0,844	0,900
	st. error	*0,223*	*0,001*	*0,222*	*0,224*
brand10	coefficient	-0,065	0,109	-0,247	0,256
	st. error	*0,049*	*0,020*	*0,029*	*0,091*
brand11	coefficient	0,264	0,148	0,018	0,428
	st. error	*0,060*	*0,007*	*0,053*	*0,075*
brand12	coefficient	**-0,218**	0,075	-0,385	-0,142
	st. error	*0,039*	*0,019*	*0,027*	*0,100*
brand13	coefficient	-0,139	0,120	-0,382	0,054
	st. error	*0,036*	*0,005*	*0,026*	*0,049*
brand14	coefficient	0,052	0,081	-0,160	0,165
	st. error	*0,037*	*0,008*	*0,025*	*0,057*
brand15	coefficient	-0,042	0,109	-0,314	0,132
	st. error	*0,046*	*0,021*	*0,024*	*0,105*
brand16	coefficient	-0,173	0,052	-0,273	-0,090
	st. error	*0,183*	*0,046*	*0,143*	*0,261*
brand17	coefficient	**0,584**	0,003	0,581	0,587
	st. error	*0,233*	*0,014*	*0,219*	*0,247*
brand18	coefficient	-0,067	0,098	-0,250	0,108
	st. error	*0,037*	*0,004*	*0,030*	*0,045*
brand19	coefficient	-0,101	0,179	-0,381	0,252
	st. error	*0,093*	*0,066*	*0,040*	*0,236*
brand20	coefficient	-0,156	0,217	-0,619	0,274
	st. error	*0,157*	*0,035*	*0,104*	*0,219*
brand21	coefficient	**-0,348**	0,052	-0,438	-0,309
	st. error	*0,090*	*0,017*	*0,076*	*0,120*
brand22	coefficient	0,031	0,094	-0,093	0,181
	st. error	*0,021*	*0,003*	*0,018*	*0,030*
brand23	coefficient	0,078	0,142	-0,259	0,284
	st. error	*0,187*	*0,042*	*0,144*	*0,279*
brand24	coefficient	-0,368	0,056	-0,424	-0,312
	st. error	*0,196*	*0,031*	*0,165*	*0,227*
brand25	coefficient	-0,008	0,100	-0,162	0,167
	st. error	*0,039*	*0,006*	*0,032*	*0,052*
brand26	coefficient	-0,122	0,179	-0,594	0,086
	st. error	*0,087*	*0,059*	*0,036*	*0,235*
brand27	coefficient	**-0,286**	0,094	-0,434	-0,113
	st. error	*0,038*	*0,007*	*0,026*	*0,054*
brand28	coefficient	-0,483	0,100	-0,742	-0,347
	st. error	*0,171*	*0,055*	*0,103*	*0,243*
brand29	coefficient	0,211	0,129	0,021	0,404
	st. error	*0,115*	*0,033*	*0,077*	*0,179*
brand30	coefficient	0,012	0,226	-0,326	0,381
	st. error	*0,155*	*0,055*	*0,071*	*0,249*
brand31	coefficient	0,043	0,080	-0,083	0,160
	st. error	*0,083*	*0,009*	*0,067*	*0,110*
brand32	coefficient	0,028	0,173	-0,280	0,412
	st. error	*0,059*	*0,011*	*0,041*	*0,084*
brand33	coefficient	-0,009	0,160	-0,361	0,316
	st. error	*0,146*	*0,044*	*0,085*	*0,259*
brand34	coefficient	-0,249	0,115	-0,572	-0,097
	st. error	*0,081*	*0,027*	*0,050*	*0,135*
buying	coefficient	0,091	0,031	0,048	0,184
	st. error	*0,029*	*0,004*	*0,024*	*0,041*
chains	coefficient	0,024	0,031	-0,032	0,084
	st. error	*0,019*	*0,002*	*0,015*	*0,023*
depmoh	coefficient	0,006	0,078	-0,114	0,196
	st. error	*0,026*	*0,003*	*0,022*	*0,032*
indep	coefficient	-0,043	0,039	-0,108	0,013
	st. error	*0,022*	*0,002*	*0,018*	*0,028*
prt	coefficient	0,067	0,036	-0,015	0,143
	st. error	*0,025*	*0,004*	*0,021*	*0,035*
tcs	coefficient	-0,049	0,073	-0,198	0,043
	st. error	*0,149*	*0,054*	*0,079*	*0,234*

1) Coefficients in bold are significant at the 5% level in all periods

Appendix 10. Televisions: Summary results of 18 bimonthly WLS-regressions (expenditure weighted) 1)

		gem	st dev	min	max
Constante	coefficient	**4,557**	0,166	4,343	4,824
	st. error	*0,049*	*0,005*	*0,041*	*0,055*
diameter	coefficient	**0,056**	0,005	0,046	0,063
	st. error	*0,002*	*0,000*	*0,001*	*0,002*
dolby1	coefficient	0,038	0,027	-0,011	0,098
	st. error	*0,015*	*0,001*	*0,013*	*0,017*
dvd	coefficient	**0,624**	0,078	0,526	0,765
	st. error	*0,092*	*0,031*	*0,071*	*0,154*
flatscr	coefficient	**0,263**	0,024	0,205	0,296
	st. error	*0,015*	*0,003*	*0,011*	*0,021*
freez1	coefficient	0,066	0,136	-0,102	0,242
	st. error	*0,022*	*0,008*	*0,014*	*0,041*
freq100	coefficient	**0,334**	0,041	0,259	0,395
	st. error	*0,014*	*0,001*	*0,011*	*0,015*
mltpip1	coefficient	0,087	0,027	0,029	0,130
	st. error	*0,021*	*0,004*	*0,012*	*0,026*
mltpip2	coefficient	-0,007	0,044	-0,072	0,071
	st. error	*0,016*	*0,001*	*0,013*	*0,018*
model1	coefficient	-0,020	0,028	-0,072	0,025
	st. error	*0,016*	*0,004*	*0,011*	*0,021*
nicam1	coefficient	0,027	0,023	-0,025	0,057
	st. error	*0,012*	*0,000*	*0,011*	*0,013*
ntuners	coefficient	0,278	0,015	0,264	0,299
	st. error	*0,114*	*0,074*	*0,050*	*0,218*
pc_conn	coefficient	0,017	0,082	-0,166	0,181
	st. error	*0,158*	*0,096*	*0,037*	*0,334*
pip1	coefficient	0,039	0,067	-0,051	0,192
	st. error	*0,050*	*0,023*	*0,028*	*0,129*
portab	coefficient	**0,105**	0,031	0,049	0,150
	st. error	*0,026*	*0,003*	*0,021*	*0,029*
remote0	coefficient	0,051	0,153	-0,080	0,374
	st. error	*1,034*	*1,097*	*0,099*	*3,258*
s_vhs1	coefficient	0,002	0,032	-0,048	0,086
	st. error	*0,011*	*0,001*	*0,010*	*0,012*
sattune1	coefficient	-0,122	0,171	-0,421	0,122
	st. error	*0,361*	*0,404*	*0,049*	*1,216*
scratio2	coefficient	**0,193**	0,014	0,159	0,221
	st. error	*0,012*	*0,001*	*0,010*	*0,014*
scrtype2	coefficient	0,057	0,021	0,023	0,094
	st. error	*0,024*	*0,004*	*0,018*	*0,030*
sound0	coefficient	**-0,154**	0,028	-0,197	-0,095
	st. error	*0,023*	*0,003*	*0,018*	*0,027*
syst2	coefficient	-0,015	0,018	-0,042	0,030
	st. error	*0,015*	*0,001*	*0,013*	*0,017*
syst4	coefficient	-0,005	0,052	-0,091	0,110
	st. error	*0,022*	*0,001*	*0,020*	*0,023*
syst6	coefficient	0,097	0,087	-0,034	0,292
	st. error	*0,133*	*0,112*	*0,027*	*0,364*
syst7	coefficient	-0,036	0,058	-0,144	0,114
	st. error	*0,037*	*0,017*	*0,023*	*0,094*
syst8	coefficient	0,025	0,142	-0,277	0,264
	st. error	*0,250*	*0,222*	*0,047*	*0,761*

1) Coefficients in bold are significant at the 5% level in all periods

		gem	st dev	min	max
text0	coefficient	**-0,195**	0,038	-0,253	-0,090
	st. error	*0,032*	*0,007*	*0,023*	*0,044*
text1	coefficient	-0,066	0,029	-0,111	-0,002
	st. error	*0,017*	*0,001*	*0,015*	*0,019*
text3	coefficient	0,043	0,066	-0,032	0,155
	st. error	*0,013*	*0,001*	*0,011*	*0,015*
wattage	coefficient	**0,002**	0,001	0,001	0,004
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
brand01	coefficient	-0,031	0,062	-0,167	0,054
	st. error	*0,075*	*0,027*	*0,054*	*0,150*
brand02	coefficient	-0,084	0,036	-0,139	0,011
	st. error	*0,094*	*0,123*	*0,028*	*0,450*
brand06	coefficient	**-0,237**	0,056	-0,339	-0,167
	st. error	*0,055*	*0,008*	*0,041*	*0,076*
brand08	coefficient	1,460	0,158	1,177	1,658
	st. error	*0,041*	*0,004*	*0,035*	*0,049*
brand09	coefficient	**-0,162**	0,061	-0,309	-0,048
	st. error	*0,207*	*0,043*	*0,140*	*0,293*
brand11	coefficient	0,097	0,053	0,025	0,185
	st. error	*0,480*	*0,556*	*0,141*	*1,581*
brand12	coefficient	-0,127	0,037	-0,181	-0,042
	st. error	*0,039*	*0,006*	*0,030*	*0,049*
brand14	coefficient	-0,264	0,107	-0,667	-0,162
	st. error	*0,232*	*0,238*	*0,029*	*0,845*
brand19	coefficient	-0,160	0,035	-0,210	-0,106
	st. error	*0,063*	*0,038*	*0,038*	*0,144*
brand21	coefficient	0,098	0,038	0,040	0,162
	st. error	*0,026*	*0,003*	*0,021*	*0,031*
brand23	coefficient	-0,359	0,109	-0,496	-0,070
	st. error	*0,399*	*0,226*	*0,150*	*1,016*
brand27	coefficient	0,094	0,034	0,037	0,160
	st. error	*0,022*	*0,001*	*0,020*	*0,024*
brand29	coefficient	**0,785**	0,104	0,622	0,934
	st. error	*0,202*	*0,072*	*0,091*	*0,336*
brand30	coefficient	-0,067	0,035	-0,135	-0,009
	st. error	*0,070*	*0,062*	*0,041*	*0,282*
brand31	coefficient	**0,479**	0,108	0,239	0,589
	st. error	*0,023*	*0,001*	*0,021*	*0,026*
brand37	coefficient	0,095	0,073	0,015	0,239
	st. error	*0,437*	*0,603*	*0,034*	*2,078*
brand38	coefficient	0,071	0,100	-0,062	0,192
	st. error	*1,177*	*1,015*	*0,154*	*2,283*
brand39	coefficient	-0,126	0,058	-0,208	-0,032
	st. error	*0,249*	*0,099*	*0,151*	*0,517*
brand41	coefficient	**0,081**	0,021	0,042	0,127
	st. error	*0,022*	*0,001*	*0,019*	*0,023*
brand42	coefficient	**0,110**	0,022	0,072	0,148
	st. error	*0,018*	*0,001*	*0,016*	*0,020*
brand43	coefficient	-0,137	0,071	-0,249	-0,041
	st. error	*0,540*	*0,488*	*0,073*	*1,610*
brand44	coefficient	-0,272	0,125	-0,482	0,021
	st. error	*0,707*	*1,174*	*0,102*	*4,044*

		gem	st dev	min	max
brand46	coefficient	-0,410	0,029	-0,454	-0,362
	st. error	*0,300*	*0,374*	*0,099*	*1,125*
brand48	coefficient	-0,153	0,058	-0,270	-0,052
	st. error	*0,156*	*0,170*	*0,056*	*0,663*
brand49	coefficient	-0,195	0,048	-0,270	-0,101
	st. error	*0,109*	*0,056*	*0,060*	*0,277*
brand50	coefficient	-0,153	0,048	-0,215	-0,028
	st. error	*0,995*	*0,878*	*0,065*	*2,819*
brand51	coefficient	-0,113	0,115	-0,249	0,232
	st. error	*0,699*	*0,680*	*0,087*	*2,013*
brand53	coefficient	-0,052	0,031	-0,104	-0,001
	st. error	*0,029*	*0,003*	*0,025*	*0,036*
brand54	coefficient	0,061	0,007	0,049	0,068
	st. error	*0,323*	*0,186*	*0,193*	*0,644*
brand57	coefficient	-0,305	0,080	-0,403	-0,178
	st. error	*0,552*	*0,483*	*0,086*	*1,517*
brand59	coefficient	-0,062	0,044	-0,127	-0,003
	st. error	*0,030*	*0,005*	*0,022*	*0,038*
brand62	coefficient	**0,200**	0,041	0,122	0,270
	st. error	*0,030*	*0,004*	*0,024*	*0,036*
brand63	coefficient	-0,218	0,048	-0,345	-0,124
	st. error	*0,235*	*0,247*	*0,052*	*0,842*
brand66	coefficient	-0,487	0,096	-0,657	-0,205
	st. error	*0,455*	*0,434*	*0,062*	*1,527*
brand68	coefficient	0,095	0,090	-0,009	0,294
	st. error	*0,067*	*0,036*	*0,034*	*0,138*
brand69	coefficient	-0,145	0,173	-0,407	0,095
	st. error	*0,944*	*0,700*	*0,127*	*2,234*
brand72	coefficient	-0,177	0,028	-0,225	-0,126
	st. error	*0,063*	*0,007*	*0,048*	*0,079*
brand74	coefficient	-0,280	0,047	-0,397	-0,201
	st. error	*0,109*	*0,067*	*0,051*	*0,343*
outlet2	coefficient	**-0,071**	0,010	-0,091	-0,048
	st. error	*0,009*	*0,001*	*0,008*	*0,010*
outlet3	coefficient	0,018	0,017	-0,013	0,054
	st. error	*0,027*	*0,003*	*0,022*	*0,037*
outlet4	coefficient	0,017	0,016	-0,017	0,045
	st. error	*0,010*	*0,001*	*0,008*	*0,011*
outlet5	coefficient	-0,022	0,033	-0,083	0,043
	st. error	*0,026*	*0,004*	*0,020*	*0,032*

Appendix 11. Refrigerators: Summary results of 18 bimonthly WLS-regressions (expenditure weighted) 1)

		Average	st dev	min	max
Constant	coefficient	**5,364**	0,074	5,209	5,453
	st. error	*0,028*	*0,003*	*0,023*	*0,033*
doors_1	coefficient	0,063	0,036	0,009	0,138
	st. error	*0,022*	*0,002*	*0,018*	*0,027*
doors_3	coefficient	0,506	0,101	0,290	0,644
	st. error	*0,132*	*0,067*	*0,062*	*0,295*
no_frost	coefficient	-0,068	0,081	-0,237	0,079
	st. error	*0,038*	*0,004*	*0,030*	*0,045*
combi	coefficient	**0,373**	0,067	0,283	0,524
	st. error	*0,026*	*0,002*	*0,022*	*0,029*
star_0	coefficient	-0,048	0,025	-0,092	-0,008
	st. error	*0,023*	*0,002*	*0,019*	*0,028*
star_1	coefficient	-0,221	0,084	-0,342	-0,094
	st. error	*0,065*	*0,014*	*0,038*	*0,098*
star_2	coefficient	**-0,270**	0,028	-0,321	-0,218
	st. error	*0,044*	*0,020*	*0,026*	*0,113*
star_3	coefficient	0,026	0,079	-0,126	0,141
	st. error	*0,047*	*0,013*	*0,032*	*0,072*
groscool	coefficient	**0,003**	0,000	0,002	0,003
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
grosfrez	coefficient	**0,003**	0,000	0,002	0,004
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
syst_2	coefficient	-0,120	0,047	-0,215	-0,048
	st. error	*0,026*	*0,001*	*0,023*	*0,029*
no_label	coefficient	-0,169	0,072	-0,311	-0,015
	st. error	*0,058*	*0,027*	*0,034*	*0,126*
x_label	coefficient	0,078	0,170	-0,217	0,489
	st. error	*0,231*	*0,121*	*0,087*	*0,546*
b_label	coefficient	-0,065	0,024	-0,104	0,003
	st. error	*0,015*	*0,002*	*0,012*	*0,018*
c_label	coefficient	-0,077	0,039	-0,165	0,008
	st. error	*0,023*	*0,006*	*0,017*	*0,035*
d_label	coefficient	-0,054	0,087	-0,180	0,112
	st. error	*0,048*	*0,021*	*0,025*	*0,095*
e_label	coefficient	-0,034	0,140	-0,324	0,257
	st. error	*0,085*	*0,022*	*0,052*	*0,131*
f_label	coefficient	-0,184	0,255	-0,881	0,179
	st. error	*0,273*	*0,217*	*0,091*	*0,800*
g_label	coefficient	-0,130	0,306	-0,821	0,290
	st. error	*0,160*	*0,134*	*0,055*	*0,528*
a1_label	coefficient	**0,112**	0,021	0,083	0,148
	st. error	*0,029*	*0,005*	*0,018*	*0,037*

1) Coefficients in bold are significant at the 5% level in all periods

		Average	st dev	min	max
brand01	coefficient	-0,024	0,035	-0,081	0,027
	st. error	*0,030*	*0,006*	*0,022*	*0,042*
brand02	coefficient	-0,422	0,170	-0,726	-0,104
	st. error	*0,313*	*0,275*	*0,069*	*0,854*
brand03	coefficient	0,342	0,219	-0,098	0,703
	st. error	*0,147*	*0,081*	*0,061*	*0,418*
brand06	coefficient	-0,077	0,060	-0,204	0,025
	st. error	*0,063*	*0,025*	*0,037*	*0,151*
brand08	coefficient	0,568	0,350	-0,106	1,336
	st. error	*0,075*	*0,017*	*0,053*	*0,118*
brand09	coefficient	-0,281	0,059	-0,398	-0,187
	st. error	*0,113*	*0,137*	*0,035*	*0,557*
brand10	coefficient	-0,161	0,076	-0,319	-0,060
	st. error	*0,031*	*0,003*	*0,026*	*0,034*
brand11	coefficient	-0,266	0,071	-0,420	-0,170
	st. error	*0,084*	*0,024*	*0,051*	*0,152*
brand12	coefficient	-0,313	0,166	-0,474	0,038
	st. error	*0,179*	*0,043*	*0,106*	*0,226*
brand13	coefficient	0,047	0,206	-0,217	0,234
	st. error	*0,150*	*0,042*	*0,083*	*0,187*
brand17	coefficient	-0,146	0,144	-0,350	0,043
	st. error	*0,089*	*0,069*	*0,037*	*0,300*
brand19	coefficient	**-0,199**	0,046	-0,300	-0,109
	st. error	*0,063*	*0,013*	*0,047*	*0,098*
brand23	coefficient	-0,395	0,141	-0,552	0,011
	st. error	*0,097*	*0,035*	*0,054*	*0,174*
brand24	coefficient	**-0,366**	0,089	-0,509	-0,182
	st. error	*0,052*	*0,014*	*0,036*	*0,086*
brand25	coefficient	-0,418	0,025	-0,458	-0,376
	st. error	*0,244*	*0,079*	*0,129*	*0,407*
brand26	coefficient	-0,163	0,064	-0,243	-0,059
	st. error	*0,075*	*0,014*	*0,049*	*0,088*
brand27	coefficient	-0,533	0,154	-0,846	-0,331
	st. error	*0,481*	*0,340*	*0,098*	*1,197*
brand28	coefficient	**-0,284**	0,021	-0,333	-0,253
	st. error	*0,034*	*0,005*	*0,027*	*0,044*
brand29	coefficient	-0,091	0,106	-0,322	0,048
	st. error	*0,322*	*0,190*	*0,113*	*0,791*
brand30	coefficient	0,102	0,128	-0,113	0,249
	st. error	*0,280*	*0,175*	*0,084*	*0,499*
brand33	coefficient	**-0,485**	0,031	-0,539	-0,420
	st. error	*0,059*	*0,012*	*0,043*	*0,090*
brand34	coefficient	-0,198	0,079	-0,297	-0,083
	st. error	*0,109*	*0,024*	*0,071*	*0,135*
brand35	coefficient	**-0,379**	0,065	-0,494	-0,273
	st. error	*0,036*	*0,005*	*0,027*	*0,045*
brand36	coefficient	-0,375	0,086	-0,488	-0,207
	st. error	*0,130*	*0,043*	*0,063*	*0,221*
brand37	coefficient	0,647	0,017	0,630	0,664
	st. error	*0,142*	*0,029*	*0,113*	*0,170*
brand38	coefficient	0,461	0,109	0,326	0,729
	st. error	*0,267*	*0,178*	*0,102*	*0,561*
brand40	coefficient	-0,185	0,046	-0,237	-0,124
	st. error	*0,273*	*0,122*	*0,142*	*0,437*
brand41	coefficient	0,273	0,138	-0,154	0,399
	st. error	*0,115*	*0,064*	*0,039*	*0,248*

		Average	st dev	min	max
brand42	coefficient	**-0,264**	0,060	-0,360	-0,168
	st. error	*0,081*	*0,038*	*0,042*	*0,168*
brand43	coefficient	-0,419	0,025	-0,444	-0,380
	st. error	*0,215*	*0,048*	*0,123*	*0,301*
brand44	coefficient	-0,163	0,074	-0,264	0,018
	st. error	*0,066*	*0,024*	*0,041*	*0,126*
brand46	coefficient	-0,576	0,104	-0,807	-0,360
	st. error	*0,407*	*0,123*	*0,212*	*0,661*
brand47	coefficient	**-0,362**	0,086	-0,553	-0,279
	st. error	*0,082*	*0,035*	*0,038*	*0,148*
brand49	coefficient	**-0,448**	0,063	-0,552	-0,342
	st. error	*0,029*	*0,003*	*0,024*	*0,035*
brand52	coefficient	-0,112	0,059	-0,168	0,027
	st. error	*0,138*	*0,080*	*0,063*	*0,316*
brand53	coefficient	**0,100**	0,026	0,064	0,150
	st. error	*0,021*	*0,002*	*0,018*	*0,026*
brand55	coefficient	-0,076	0,056	-0,157	0,020
	st. error	*0,035*	*0,005*	*0,028*	*0,046*
brand56	coefficient	0,014	0,028	-0,033	0,061
	st. error	*0,021*	*0,002*	*0,018*	*0,026*
brand59	coefficient	**-0,278**	0,057	-0,371	-0,179
	st. error	*0,030*	*0,007*	*0,022*	*0,041*
brand60	coefficient	0,340	0,086	0,194	0,486
	st. error	*0,077*	*0,048*	*0,037*	*0,245*
brand61	coefficient	-0,357	0,102	-0,606	-0,147
	st. error	*0,113*	*0,036*	*0,067*	*0,198*
brand62	coefficient	-0,161	0,078	-0,297	-0,060
	st. error	*0,113*	*0,034*	*0,073*	*0,199*
brand64	coefficient	-0,197	0,081	-0,329	-0,030
	st. error	*0,036*	*0,004*	*0,027*	*0,042*
brand65	coefficient	0,183	0,193	-0,241	0,512
	st. error	*0,146*	*0,039*	*0,067*	*0,214*
brand67	coefficient	-0,011	0,025	-0,050	0,033
	st. error	*0,024*	*0,003*	*0,019*	*0,029*
brand68	coefficient	-0,072	0,037	-0,120	-0,030
	st. error	*0,168*	*0,029*	*0,127*	*0,192*
brand70	coefficient	0,685	0,203	0,096	0,979
	st. error	*0,132*	*0,033*	*0,071*	*0,193*
brand72	coefficient	-0,770	0,077	-0,944	-0,680
	st. error	*0,670*	*0,340*	*0,128*	*1,239*
brand74	coefficient	**-0,225**	0,062	-0,325	-0,145
	st. error	*0,021*	*0,003*	*0,017*	*0,026*
brand75	coefficient	-0,167	0,036	-0,242	-0,115
	st. error	*0,050*	*0,014*	*0,031*	*0,072*
brand76	coefficient	**-0,156**	0,028	-0,206	-0,116
	st. error	*0,021*	*0,002*	*0,017*	*0,025*

outlet2	coefficient	**-0,089**	0,013	-0,111	-0,050
	st. error	*0,013*	*0,001*	*0,010*	*0,016*
outlet3	coefficient	0,037	0,021	-0,008	0,072
	st. error	*0,033*	*0,004*	*0,025*	*0,039*
outlet4	coefficient	0,030	0,029	-0,013	0,085
	st. error	*0,020*	*0,002*	*0,017*	*0,026*
outlet5	coefficient	**0,304**	0,119	0,085	0,527
	st. error	*0,037*	*0,007*	*0,030*	*0,061*

Appendix 12. Washing machines: Summary results of 18 bimonthly WLS-regressions (expenditure weighted) 1)

		Average	st dev	min	max
Constant	coefficient	**5,583**	0,059	5,486	5,697
	st. error	*0,030*	*0,002*	*0,025*	*0,033*
rotspeed	coefficient	**0,001**	0,000	0,001	0,001
	st. error	*0,000*	*0,000*	*0,000*	*0,000*
type_cw	coefficient	-1,324	0,147	-1,554	-0,903
	st. error	*0,231*	*0,231*	*0,089*	*1,040*
type_l	coefficient	**0,116**	0,026	0,068	0,156
	st. error	*0,012*	*0,001*	*0,010*	*0,014*
enerb	coefficient	-0,021	0,027	-0,071	0,030
	st. error	*0,012*	*0,004*	*0,008*	*0,022*
enerc	coefficient	-0,069	0,021	-0,103	-0,041
	st. error	*0,029*	*0,006*	*0,018*	*0,039*
enerd	coefficient	0,125	0,124	-0,098	0,317
	st. error	*0,044*	*0,007*	*0,036*	*0,062*
enere	coefficient	-0,138	0,134	-0,439	0,070
	st. error	*0,236*	*0,207*	*0,077*	*0,937*
enerf	coefficient	0,087	0,079	-0,033	0,178
	st. error	*0,655*	*0,355*	*0,256*	*1,028*
centr_m	coefficient	-0,026	0,017	-0,057	0,006
	st. error	*0,008*	*0,001*	*0,008*	*0,010*
washresb	coefficient	-0,104	0,024	-0,152	-0,064
	st. error	*0,012*	*0,001*	*0,010*	*0,014*
washresc	coefficient	-0,067	0,027	-0,116	-0,020
	st. error	*0,026*	*0,004*	*0,017*	*0,036*
washresd	coefficient	-0,044	0,069	-0,173	0,103
	st. error	*0,081*	*0,040*	*0,036*	*0,214*
washrese	coefficient	0,597	0,042	0,528	0,638
	st. error	*0,300*	*0,008*	*0,290*	*0,313*
washresf	coefficient	0,084	0,116	-0,119	0,243
	st. error	*0,604*	*0,275*	*0,217*	*1,152*
washresg	coefficient	-0,009	0,101	-0,151	0,157
	st. error	*0,187*	*0,046*	*0,116*	*0,276*
buying	coefficient	**0,081**	0,012	0,063	0,102
	st. error	*0,007*	*0,000*	*0,006*	*0,008*
depmoh	coefficient	**0,127**	0,034	0,081	0,199
	st. error	*0,021*	*0,002*	*0,017*	*0,025*
indep	coefficient	**0,094**	0,012	0,069	0,117
	st. error	*0,012*	*0,001*	*0,009*	*0,013*

		Average	st dev	min	max
brand02	coefficient	-0,693	0,103	-0,813	-0,525
	st. error	*0,344*	*0,307*	*0,090*	*1,196*
brand03	coefficient	**-0,304**	0,057	-0,408	-0,212
	st. error	*0,069*	*0,028*	*0,030*	*0,147*
brand04	coefficient	**0,295**	0,043	0,213	0,383
	st. error	*0,037*	*0,015*	*0,024*	*0,089*
brand05	coefficient	-0,902	0,000	-0,902	-0,902
	st. error	*1,480*	*0,000*	*1,480*	*1,480*
brand06	coefficient	-0,277	0,079	-0,410	-0,137
	st. error	*0,073*	*0,060*	*0,040*	*0,274*
brand07	coefficient	**-0,107**	0,025	-0,145	-0,069
	st. error	*0,013*	*0,001*	*0,011*	*0,014*
brand08	coefficient	-0,446	0,081	-0,597	-0,332
	st. error	*0,382*	*0,384*	*0,082*	*1,212*
brand09	coefficient	0,045	0,087	-0,138	0,168
	st. error	*0,090*	*0,045*	*0,031*	*0,186*
brand10	coefficient	-0,644	0,135	-0,827	-0,402
	st. error	*0,833*	*0,444*	*0,205*	*1,335*
brand11	coefficient	-0,047	0,034	-0,105	0,013
	st. error	*0,012*	*0,001*	*0,009*	*0,013*
brand12	coefficient	-0,055	0,028	-0,104	0,003
	st. error	*0,034*	*0,018*	*0,020*	*0,100*
brand13	coefficient	**-0,346**	0,035	-0,415	-0,263
	st. error	*0,034*	*0,005*	*0,028*	*0,049*
brand14	coefficient	-0,634	0,050	-0,689	-0,559
	st. error	*0,644*	*0,323*	*0,335*	*1,305*
brand15	coefficient	-0,350	0,114	-0,476	-0,140
	st. error	*0,382*	*0,201*	*0,158*	*0,837*
brand16	coefficient	-0,363	0,013	-0,385	-0,350
	st. error	*0,350*	*0,120*	*0,221*	*0,506*
brand17	coefficient	**-0,399**	0,015	-0,413	-0,372
	st. error	*0,057*	*0,006*	*0,052*	*0,069*
brand18	coefficient	-0,379	0,133	-0,638	-0,205
	st. error	*0,353*	*0,410*	*0,030*	*1,294*
brand19	coefficient	**-0,438**	0,050	-0,535	-0,350
	st. error	*0,033*	*0,004*	*0,025*	*0,039*
brand20	coefficient	-0,240	0,113	-0,390	0,015
	st. error	*0,292*	*0,294*	*0,039*	*1,157*
brand21	coefficient	0,319	0,025	0,294	0,345
	st. error	*0,885*	*0,013*	*0,872*	*0,897*
brand22	coefficient	-0,385	0,076	-0,480	-0,276
	st. error	*0,111*	*0,038*	*0,071*	*0,189*

		Average	st dev	min	max
brand23	coefficient	-0,410	0,101	-0,535	-0,232
	st. error	*0,265*	*0,367*	*0,071*	*1,450*
brand24	coefficient	-0,183	0,089	-0,321	-0,087
	st. error	*0,398*	*0,274*	*0,181*	*0,865*
brand25	coefficient	**-0,373**	0,059	-0,435	-0,209
	st. error	*0,048*	*0,017*	*0,028*	*0,114*
brand26	coefficient	-0,476	0,059	-0,590	-0,422
	st. error	*0,369*	*0,313*	*0,115*	*1,011*
brand27	coefficient	-0,430	0,093	-0,580	-0,283
	st. error	*0,180*	*0,091*	*0,092*	*0,472*
brand28	coefficient	**-0,501**	0,034	-0,565	-0,437
	st. error	*0,024*	*0,005*	*0,017*	*0,034*
brand29	coefficient	-0,052	0,052	-0,128	0,058
	st. error	*0,094*	*0,101*	*0,033*	*0,363*
brand30	coefficient	**-0,153**	0,028	-0,189	-0,095
	st. error	*0,032*	*0,005*	*0,023*	*0,045*
brand31	coefficient	**0,277**	0,023	0,237	0,309
	st. error	*0,011*	*0,001*	*0,008*	*0,012*
brand32	coefficient	**-0,319**	0,051	-0,478	-0,231
	st. error	*0,031*	*0,013*	*0,020*	*0,084*
brand33	coefficient	-0,425	0,128	-0,567	-0,048
	st. error	*0,330*	*0,114*	*0,122*	*0,473*
brand34	coefficient	**-0,686**	0,086	-0,810	-0,558
	st. error	*0,170*	*0,067*	*0,089*	*0,311*
brand35	coefficient	-0,547	0,084	-0,665	-0,404
	st. error	*0,526*	*0,523*	*0,048*	*1,362*
brand36	coefficient	-0,165	0,178	-0,460	0,003
	st. error	*0,137*	*0,022*	*0,102*	*0,163*
brand37	coefficient	**-0,321**	0,055	-0,429	-0,230
	st. error	*0,033*	*0,011*	*0,023*	*0,059*
brand38	coefficient	-0,020	0,031	-0,066	0,037
	st. error	*0,015*	*0,001*	*0,012*	*0,017*
brand39	coefficient	-0,196	0,285	-0,687	0,008
	st. error	*0,170*	*0,167*	*0,064*	*0,458*
brand41	coefficient	-0,152	0,125	-0,314	0,206
	st. error	*0,328*	*0,243*	*0,130*	*1,054*
brand42	coefficient	**-0,282**	0,030	-0,341	-0,203
	st. error	*0,018*	*0,001*	*0,016*	*0,021*
brand43	coefficient	-0,051	0,049	-0,159	0,024
	st. error	*0,029*	*0,004*	*0,023*	*0,039*
brand44	coefficient	**-0,263**	0,023	-0,308	-0,222
	st. error	*0,018*	*0,002*	*0,015*	*0,024*
brand45	coefficient	**-0,514**	0,000	-0,514	-0,514
	st. error	*0,110*	*0,000*	*0,110*	*0,110*

1) Coefficients in bold are significant at the 5% level in all periods

Appendix 13. Computers: Summary results of 35 pooled WLS-regressions (Diewert-variant) 1)

		average	st. dev.	min	max
Constant	coefficient	**6,309**	0,484	5,706	7,799
	st.error	*0,311*	*0,390*	*0,034*	*1,654*
speed	coefficient	**1,28E-03**	0,001	0,000	0,003
	st.error	*0,000*	*0,000*	*0,000*	*0,000*
hdisk	coefficient	**1,25E-05**	0,000	0,000	0,000
	st.error	*0,000*	*0,000*	*0,000*	*0,000*
memory	coefficient	1,72E-03	0,001	0,000	0,003
	st.error	*0,000*	*0,000*	*0,000*	*0,000*
monitor	coefficient	**0,327**	0,192	0,065	0,615
	st.error	*0,041*	*0,020*	*0,013*	*0,074*
workstat	coefficient	0,442	0,097	0,252	0,620
	st.error	*0,105*	*0,060*	*0,049*	*0,273*
usb	coefficient	-0,102	0,345	-1,050	0,637
	st.error	*0,420*	*0,427*	*0,030*	*1,653*
proc01	coefficient	1,246	0,114	1,132	1,360
	st.error	*1,001*	*0,001*	*1,000*	*1,002*
proc02	coefficient	0,804	0,174	0,635	1,063
	st.error	*0,910*	*0,350*	*0,304*	*1,132*
proc03	coefficient	-0,013	0,065	-0,134	0,120
	st.error	*0,023*	*0,012*	*0,015*	*0,079*
proc04	coefficient	-0,180	0,056	-0,280	0,003
	st.error	*0,017*	*0,006*	*0,010*	*0,037*
proc05	coefficient	-0,115	0,068	-0,232	0,032
	st.error	*0,047*	*0,018*	*0,021*	*0,082*
proc06	coefficient	-0,003	0,230	-0,485	0,513
	st.error	*0,067*	*0,052*	*0,016*	*0,196*
proc07	coefficient	-0,195	0,107	-0,407	-0,026
	st.error	*0,176*	*0,069*	*0,104*	*0,368*
proc08	coefficient	-0,111	0,078	-0,243	0,081
	st.error	*0,061*	*0,120*	*0,019*	*0,516*
proc09	coefficient	-0,321	0,248	-0,685	0,021
	st.error	*0,377*	*0,291*	*0,057*	*0,919*
proc10	coefficient	-0,012	0,191	-0,298	0,216
	st.error	*0,077*	*0,074*	*0,024*	*0,255*
proc11	coefficient	-0,232	0,256	-0,504	0,203
	st.error	*0,951*	*0,598*	*0,185*	*1,820*
proc12	coefficient	-0,154	0,117	-0,321	0,288
	st.error	*0,047*	*0,045*	*0,016*	*0,184*
proc13	coefficient	-0,050	0,101	-0,184	0,104
	st.error	*0,457*	*0,407*	*0,100*	*1,185*
proc14	coefficient	-0,065	0,186	-0,598	0,311
	st.error	*0,438*	*0,455*	*0,044*	*1,726*
proc15	coefficient	-0,593	0,358	-1,229	-0,129
	st.error	*0,899*	*0,887*	*0,031*	*2,579*
proc16	coefficient	-0,181	0,189	-0,570	0,135
	st.error	*0,369*	*0,392*	*0,037*	*1,282*
proc17	coefficient	0,335	0,450	-0,486	1,132
	st.error	*0,714*	*0,554*	*0,102*	*1,808*
proc18	coefficient	0,049	0,052	-0,013	0,167
	st.error	*0,033*	*0,027*	*0,017*	*0,107*

1) Coefficients in bold are significant at the 5% level in all periods

		average	st. dev.	min	max
proc19	coefficient	-0,092	0,561	-0,821	0,757
	st.error	*0,412*	*0,269*	*0,110*	*1,003*
proc20	coefficient	-0,049	0,234	-0,745	0,410
	st.error	*0,590*	*0,558*	*0,038*	*1,883*
proc21	coefficient	0,486	0,953	-0,482	1,845
	st.error	*0,868*	*0,423*	*0,292*	*1,481*
proc22	coefficient	0,458	0,408	0,032	1,097
	st.error	*1,099*	*0,580*	*0,521*	*1,936*
proc23	coefficient	0,699	0,319	0,383	1,103
	st.error	*0,986*	*0,242*	*0,631*	*1,277*
proc24	coefficient	1,036	0,219	0,700	1,354
	st.error	*0,697*	*0,109*	*0,544*	*0,827*
proc25	coefficient	0,021	0,322	-0,490	0,559
	st.error	*0,075*	*0,016*	*0,044*	*0,108*
proc26	coefficient	0,677	0,180	0,351	1,148
	st.error	*0,129*	*0,039*	*0,077*	*0,239*
proc27	coefficient	0,718	0,041	0,677	0,759
	st.error	*0,403*	*0,022*	*0,381*	*0,426*
brand01	coefficient	0,184	0,200	-0,144	0,660
	st.error	*0,173*	*0,120*	*0,054*	*0,545*
brand02	coefficient	**0,162**	0,354	-0,340	0,575
	st.error	*0,072*	*0,018*	*0,045*	*0,098*
brand03	coefficient	0,197	0,120	-0,029	0,398
	st.error	*0,180*	*0,071*	*0,118*	*0,347*
brand04	coefficient	-0,012	0,142	-0,173	0,213
	st.error	*0,019*	*0,002*	*0,017*	*0,024*
brand05	coefficient	-0,083	0,000	-0,083	-0,082
	st.error	*1,760*	*0,100*	*1,660*	*1,860*
brand06	coefficient	0,121	0,101	-0,032	0,344
	st.error	*0,019*	*0,003*	*0,013*	*0,026*
brand07	coefficient	-0,086	0,502	-0,615	0,616
	st.error	*0,424*	*0,108*	*0,318*	*0,568*
brand08	coefficient	-0,537	0,000	-0,537	-0,537
	st.error	*1,354*	*0,000*	*1,354*	*1,354*
brand09	coefficient	0,657	0,059	0,598	0,716
	st.error	*0,628*	*0,022*	*0,605*	*0,650*
brand10	coefficient	-0,045	0,180	-0,304	0,509
	st.error	*0,041*	*0,015*	*0,025*	*0,102*
brand11	coefficient	0,332	0,043	0,259	0,403
	st.error	*0,085*	*0,059*	*0,037*	*0,221*
brand12	coefficient	-0,112	0,090	-0,223	0,071
	st.error	*0,031*	*0,009*	*0,021*	*0,056*
brand13	coefficient	-0,102	0,087	-0,253	0,052
	st.error	*0,021*	*0,003*	*0,017*	*0,030*
brand14	coefficient	0,096	0,108	-0,145	0,285
	st.error	*0,027*	*0,005*	*0,019*	*0,038*
brand15	coefficient	0,034	0,063	-0,092	0,155
	st.error	*0,070*	*0,049*	*0,025*	*0,178*
brand16	coefficient	-0,047	0,036	-0,136	-0,012
	st.error	*0,242*	*0,032*	*0,203*	*0,316*

		average	st. dev.	min	max
brand17	coefficient	0,717	0,017	0,700	0,734
	st.error	*0,517*	*0,007*	*0,509*	*0,524*
brand18	coefficient	-0,042	0,112	-0,202	0,222
	st.error	*0,042*	*0,011*	*0,026*	*0,081*
brand19	coefficient	0,043	0,160	-0,235	0,381
	st.error	*0,256*	*0,297*	*0,041*	*1,017*
brand20	coefficient	-0,153	0,287	-0,682	0,298
	st.error	*0,417*	*0,630*	*0,049*	*2,157*
brand21	coefficient	-0,178	0,072	-0,290	-0,114
	st.error	*0,062*	*0,016*	*0,034*	*0,077*
brand22	coefficient	0,101	0,081	-0,106	0,262
	st.error	*0,021*	*0,004*	*0,014*	*0,028*
brand23	coefficient	0,189	0,148	-0,128	0,405
	st.error	*0,192*	*0,132*	*0,119*	*0,648*
brand24	coefficient	-0,208	0,012	-0,221	-0,196
	st.error	*0,296*	*0,082*	*0,214*	*0,378*
brand25	coefficient	0,015	0,086	-0,188	0,117
	st.error	*0,031*	*0,009*	*0,022*	*0,057*
brand26	coefficient	-0,119	0,202	-0,642	0,143
	st.error	*0,370*	*0,467*	*0,046*	*1,631*
brand27	coefficient	-0,336	0,104	-0,512	-0,047
	st.error	*0,034*	*0,005*	*0,023*	*0,043*
brand28	coefficient	-0,597	0,206	-1,043	-0,315
	st.error	*0,940*	*0,621*	*0,256*	*2,172*
brand29	coefficient	**0,394**	0,095	0,240	0,557
	st.error	*0,101*	*0,027*	*0,060*	*0,153*
brand30	coefficient	0,073	0,230	-0,306	0,557
	st.error	*0,372*	*0,323*	*0,110*	*1,326*
brand31	coefficient	0,022	0,142	-0,177	0,332
	st.error	*0,157*	*0,025*	*0,121*	*0,203*
brand32	coefficient	0,097	0,163	-0,230	0,517
	st.error	*0,102*	*0,038*	*0,036*	*0,175*
brand33	coefficient	0,043	0,130	-0,181	0,282
	st.error	*0,189*	*0,076*	*0,076*	*0,371*
brand34	coefficient	-0,218	0,096	-0,395	0,006
	st.error	*0,248*	*0,258*	*0,022*	*1,197*
buying	coefficient	0,104	0,049	0,009	0,206
	st.error	*0,028*	*0,006*	*0,020*	*0,039*
chains	coefficient	0,031	0,049	-0,062	0,135
	st.error	*0,018*	*0,002*	*0,013*	*0,022*
depmoh	coefficient	0,045	0,121	-0,135	0,257
	st.error	*0,030*	*0,005*	*0,020*	*0,041*
indep	coefficient	-0,050	0,066	-0,148	0,102
	st.error	*0,024*	*0,005*	*0,017*	*0,037*
prt	coefficient	0,091	0,057	-0,040	0,173
	st.error	*0,021*	*0,003*	*0,016*	*0,028*
tcs	coefficient	-0,004	0,077	-0,141	0,182
	st.error	*0,527*	*0,445*	*0,160*	*1,863*

Appendix 14.

Price index numbers for televisions (199902=100)

	P_{GT}	$P_{GT(i)}$	P_{MT}	WLS time dummy (exp. shares)	WLS time dummy (quantities)	OLS time dummy	CPI [1)]
199902	100.00	100.00	100.00	100.00	100.00	100.00	100.0
199904	97.26	97.01	96.95	97.42	97.93	97.57	97.50
199906	94.97	94.73	94.87	95.42	96.22	95.78	96.17
199908	93.24	92.99	93.25	93.84	94.32	94.42	94.54
199910	90.86	90.75	91.10	91.82	92.74	92.70	93.06
199912	89.62	89.44	89.79	91.02	91.77	90.87	91.73
200002	88.43	88.24	88.72	89.90	90.61	89.94	90.92
200004	87.81	87.61	87.63	89.53	89.84	88.91	90.84
200006	87.16	87.07	87.31	88.30	88.44	97.89	90.79
200008	86.44	86.34	86.63	87.82	87.96	86.90	90.04
200010	85.31	85.27	85.77	87.18	87.53	85.45	89.56
200012	85.17	85.01	85.42	87.51	87.64	85.64	88.97
200102	85.55	85.34	85.71	88.13	88.25	85.22	89.27
200104	85.72	85.48	85.70	87.99	88.60	85.87	89.52
200106	85.75	85.52	85.76	88.48	89.07	85.95	89.91
200108	84.90	84.56	84.77	87.75	88.31	85.57	88.28
200110	83.99	83.68	84.10	86.98	87.92	85.21	86.85
200112	83.25	82.97	83.44	86.45	87.61	85.45	86.57

[1)] Based on official CPI-data.

Appendix 15.

Price index numbers for refrigerators (199902=100)

	P_{GT}	$P_{GT(i)}$	P_{MT}	WLS time dummy (exp. shares)	WLS time dummy (quantities)	OLS time dummy	CPI [1)]
199902	100.00	100.00	100.00	100.00	100.00	100.00	100.00
199904	99.01	99.02	99.09	98.89	98.88	99.14	98.11
199906	97.71	97.81	98.06	97.71	97.40	97.81	98.26
199908	97.37	97.51	97.68	97.76	97.29	97.98	97.84
199910	97.41	97.49	97.26	98.27	97.56	97.11	97.21
199912	96.75	96.86	96.79	98.05	97.41	97.09	97.88
200002	96.12	96.23	96.26	98.06	97.06	96.04	97.86
200004	96.02	96.02	95.61	97.93	96.58	96.28	97.01
200006	95.21	95.15	94.64	97.38	95.97	95.35	98.16
200008	94.29	94.24	93.77	96.28	94.92	93.58	97.55
200010	94.04	94.02	93.72	96.73	95.63	93.83	97.92
200012	94.30	94.22	93.61	97.25	95.44	94.55	98.68
200102	95.16	95.09	94.27	98.45	96.10	95.93	100.49
200104	95.76	95.76	95.09	99.05	96.81	96.91	100.03
200106	96.00	95.97	94.46	99.84	96.94	96.68	101.11
200108	94.72	94.8	93.57	98.28	95.45	95.99	100.95
200110	94.58	94.07	93.41	98.87	95.83	95.94	99.91
200112	94.57	94.85	93.20	100.02	96.23	95.80	99.59

[1)] Based on official CPI-data.

Appendix 16.

Price index numbers for washing machines (199902=100)

	P_{GT}	$P_{GT(i)}$	P_{MT}	WLS time dummy (exp. shares)	WLS time dummy (quantities)	OLS time dummy	CPI [1)]
199902	100.00	100.00	100.00	100.00	100.00	100.00	100.00
199904	98.03	98.01	97.96	98.39	98.06	99.16	99.27
199906	98.03	97.87	97.56	98.61	98.05	98.14	98.94
199908	98.20	98.18	97.93	99.16	98.61	97.81	99.02
199910	97.76	97.73	97.54	99.07	98.33	97.76	98.04
199912	97.09	97.15	96.94	98.78	98.25	96.67	98.95
200002	96.55	96.50	96.19	97.77	96.99	96.63	97.94
200004	96.07	96.00	95.66	97.75	96.99	96.32	96.83
200006	95.24	95.18	94.79	96.74	96.03	95.56	96.32
200008	93.82	93.86	93.64	95.64	94.78	94.68	95.63
200010	9308	93.15	93.00	94.68	93.80	93.31	97.01
200012	92.66	92.69	92.47	94.49	93.57	93.43	96.91
200102	92.91	92.93	92.62	94.83	93.85	93.36	97.09
200104	93.68	93.64	93.44	96.41	95.34	94.01	98.55
200106	93.59	93.46	93.03	96.26	95.00	94.33	97.76
200108	92.82	92.73	92.57	95.68	94.12	93.59	97.48
200110	92.32	92.16	92.06	95.03	93.38	92.71	96.99
200112	91.58	91.39	91.21	94.75	92.89	92.25	96.70

[1)] Based on official CPI-data.

Appendix 17.

Price index numbers for computers (199901=100)

	P_{GT}	$P_{GT(i)}$	P_{MT}	WLS time dummy (exp. shares)	WLS time dummy (quantities)	OLS time dummy	CPI [1)]
199901	100.00	100.00	100.00	100.00	100.00	100.00	100.00
199902	96.28	96.02	94.77	94.87	94.50	96.55	94.42
199903	92.71	92.44	91.73	91.55	91.19	90.20	93.95
199904	88.92	88.66	89.17	87.35	87.16	88.76	90.21
199905	85.68	85.70	87.05	84.02	82.91	83.59	86.73
199906	82.41	82.42	84.05	81.01	80.34	79.53	82.25
199907	77.26	77.13	78.20	77.49	76.53	77.04	75.59
199908	70.80	70.68	72.51	70.56	70.42	73.66	73.98
199909	67.47	67.32	69.30	67.07	66.72	69.73	69.56
199910	67.87	67.64	69.69	67.46	67.16	70.08	68.07
199911	66.31	66.29	68.27	65.88	65.78	68.46	63.66
199912	64.88	64.95	67.61	64.90	65.30	66.80	61.93
200001	64.30	64.35	66.63	63.85	63.90	65.49	60.78
200002	62.88	63.24	66.37	62.02	62.33	65.98	60.17
200003	62.59	63.11	66.03	61.43	61.70	64.16	56.25
200004	61.67	62.18	65.33	60.38	60.83	63.05	56.78
200005	60.31	60.87	63.92	59.09	59.29	62.82	53.01
200006	56.56	57.21	60.55	55.53	55.99	58.69	51.67
200007	55.72	56.27	59.50	55.21	55.64	56.17	48.91
200008	54.37	55.09	58.59	54.01	54.57	56.84	48.05
200009	53.16	54.14	57.92	52.89	53.49	55.85	42.40
200010	51.69	52.65	56.47	51.60	51.91	54.64	39.48
200011	50.63	51.80	55.80	50.23	51.29	53.93	40.49
200012	50.62	51.48	55.01	49.76	50.41	53.32	39.17
200101	50.22	51.07	54.66	48.95	49.89	52.92	37.95
200102	47.99	48.80	52.61	46.84	47.53	51.16	36.59
200103	44.81	45.68	50.39	43.56	45.08	48.25	36.45
200104	44.39	45.38	50.02	43.37	44.79	47.11	36.23
200105	43.24	44.13	48.90	41.41	43.14	45.94	33.44
200106	41.95	42.77	47.69	39.91	41.23	44.62	33.11
200107	41.61	42.71	46.19	40.07	41.58	42.90	32.34
200108	38.59	40.37	44.51	37.05	38.52	41.11	31.10
200109	35.79	37.39	41.32	33.71	35.33	39.96	29.92
200110	35.49	36.86	40.50	32.82	34.23	38.39	28.63
200111	33.21	34.85	39.75	30.19	32.51	37.22	28.21
200112	32.22	33.95	39.02	28.74	30.87	35.53	28.32

[1)] Based on official CPI-data.

Appendix 18. Expenditure shares of the matched models in period t-1 and period t

Table A. Televisions, refrigerators and washing machines

t-1	t	Televisions		Refrigerators		Washing machines	
		s_M^{t-1}	s_M^t	s_M^{t-1}	s_M^t	s_M^{t-1}	s_M^t
199902	199904	0.98	0.95	0.94	0.93	0.96	0.94
199904	199906	0.98	0.98	0.94	0.87	0.94	0.91
199906	199908	0.98	0.95	0.95	0.85	0.96	0.91
199908	199910	0.99	0.93	0.91	0.89	0.96	0.94
199910	199912	0.98	0.96	0.91	0.93	0.96	0.92
199912	200002	0.98	0.98	0.94	0.91	0.96	0.90
200002	200004	0.97	0.97	0.92	0.89	0.94	0.94
200004	200006	0.98	0.95	0.94	0.90	0.96	0.93
200006	200008	0.98	0.95	0.92	0.88	0.95	0.91
200008	200010	0.97	0.93	0.90	0.89	0.94	0.92
200010	200012	0.97	0.95	0.93	0.91	0.95	0.92
200012	200102	0.99	0.98	0.93	0.92	0.93	0.94
200102	200104	0.97	0.97	0.93	0.90	0.95	0.92
200104	200106	0.98	0.97	0.90	0.88	0.96	0.93
200106	200108	0.98	0.97	0.93	0.90	0.96	0.94
200108	200110	0.98	0.95	0.96	0.94	0.97	0.92
200110	200112	0.98	0.98	0.94	0.97	0.97	0.95
Average		0.98	0.96	0.93	0.90	0.96	0.93

Table B. Computers

t-1	t	Computers		t-1	t	Computers	
		s_M^{t-1}	s_M^t			s_M^{t-1}	s_M^t
199901	199902	0.83	0.79	200007	200008	0.87	0.78
199902	199903	0.84	0.79	200008	200009	0.79	0.67
199903	199904	0.72	0.71	200009	200010	0.80	0.85
199904	199905	0.87	0.76	200010	200011	0.88	0.74
199905	199906	0.86	0.81	200011	200012	0.90	0.81
199906	199907	0.85	0.80	200012	200101	0.81	0.85
199907	199908	0.89	0.82	200101	200102	0.87	0.83
199908	199909	0.87	0.70	200102	200103	0.88	0.81
199909	199910	0.85	0.83	200103	200104	0.92	0.88
199910	199911	0.94	0.70	200104	200105	0.88	0.78
199911	199912	0.88	0.85	200105	200106	0.90	0.82
199912	200001	0.83	0.82	200106	200107	0.84	0.93
200001	200002	0.75	0.59	200107	200108	0.90	0.76
200002	200003	0.71	0.61	200108	200109	0.88	0.81
200003	200004	0.85	0.85	200109	200110	0.89	0.81
200004	200005	0.77	0.71	200110	200111	0.87	0.80
200005	200006	0.86	0.77	200111	200112	0.92	0.76
200006	200007	0.87	0.82				
				Average		0.85	0.78

Appendix 19 Average residuals for new and disappearing models

Table A. Televisions, refrigerators and washing machines

t-1	t	Televisions		Refrigerators		Washing machines	
		$\bar{u}_N$	$\bar{u}_D$	$\bar{u}_N$	$\bar{u}_D$	$\bar{u}_N$	$\bar{u}_D$
199902	199904	0.08	0.04	-0.03	-0.01	0.01	0.00
199904	199906	0.01	0.12	-0.01	0.01	0.04	-0.01
199906	199908	0.01	0.07	0.00	-0.02	-0.03	-0.01
199908	199910	-0.02	0.04	0.02	-0.02	0.00	0.02
199910	199912	0.04	0.04	0.01	0.03	-0.02	-0.02
199912	200002	0.03	0.10	0.00	0.01	0.02	-0.01
200002	200004	0.12	-0.04	0.04	-0.01	0.03	0.02
200004	200006	-0.03	0.10	0.01	-0.01	0.00	-0.01
200006	200008	0.00	0.03	0.00	0.01	-0.03	0.00
200008	200010	-0.01	0.07	-0.03	-0.01	-0.01	0.00
200010	200012	0.07	0.03	0.03	-0.01	0.01	-0.01
200012	200102	0.07	0.04	0.00	-0.03	-0.01	0.01
200102	200104	0.05	-0.02	-0.02	0.00	0.02	0.00
200104	200106	-0.01	0.00	0.00	-0.08	0.03	-0.03
200106	200108	0.08	0.06	-0.03	0.00	-0.02	0.05
200108	200110	-0.01	0.11	-0.01	-0.03	0.01	0.04
200110	200112	-0.04	0.00	0.04	-0.01	0.02	-0.01
Average		0.02	0.05	0.00	-0.01	0.00	0.00

Table B. Computers

t-1	t	Computers		t-1	t	Computers	
		$\bar{u}_N$	$\bar{u}_D$			$\bar{u}_N$	$\bar{u}_D$
199901	199902	0.05	-0.02	200007	200008	-0.03	0.01
199902	199903	0.01	0.04	200008	200009	-0.03	0.00
199903	199904	0.01	0.05	200009	200010	0.00	0.01
199904	199905	-0.02	0.05	200010	200011	-0.02	0.01
199905	199906	0.00	0.03	200011	200012	0.05	-0.02
199906	199907	0.03	0.00	200012	200101	0.00	0.01
199907	199908	0.00	0.09	200101	200102	0.01	0.06
199908	199909	0.01	0.03	200102	200103	-0.02	0.14
199909	199910	0.04	0.05	200103	200104	-0.05	-0.06
199910	199911	-0.01	-0.02	200104	200105	0.02	0.06
199911	199912	-0.03	0.05	200105	200106	0.01	0.07
199912	200001	0.02	-0.01	200106	200107	0.05	-0.11
200001	200002	-0.01	0.03	200107	200108	-0.11	0.06
200002	200003	-0.01	-0.02	200108	200109	0.02	0.04
200003	200004	-0.01	0.01	200109	200110	0.05	0.02
200004	200005	-0.01	-0.01	200110	200111	-0.09	0.17
200005	200006	-0.01	0.04	200111	20112	-0.01	0.07
200006	200007	0.03	0.02				
				Average		0.00	0.03