



Project no: 028412

## **AIM-AP**

### **Accurate Income Measurement for the Assessment of Public Policies**

Specific Targeted Research or Innovation Project

*Citizens and Governance in a Knowledge-based Society*

#### **Deliverable 1.1g Imputed rents: the Netherlands**

Due date of deliverable: January 2007  
Actual submission date: February 2007

Start date of project: 1 February 2006

Duration: 3 years

Lead partner: CentERdata

Revision [draft]

**Accurate Income Measurement for the Assessment of Public Policies (AIM-AP):**

**Project 1. Non-cash incomes**

**WP1.1 Imputed rents and public housing subsidies**

**Deliverable D1.1g**

**Report on imputed rent in the Netherlands**

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January 2007

**Abstract**

This report analyses the distributional impact of imputed rents in the Netherlands. On the basis of the Euromod baseline simulation for 2001 we mainly examine the effect on the income distribution of adding the imputed rent of owner-occupied and rent-free accommodations to household income. In particular, the effects on relative poverty and income inequality are discussed, decomposed according to household type, employment status, age group, education of the head of the household, and home ownership. We compare the results of various approaches to the definition of imputed rent, also taking into account that the rent of tenants may be well below the market rent.

## **0. Introduction**

One principal objective of the AIM-AP project is to enrich the definition of household income with non-cash components such as education, housing and health care. In this second AIMAP report on the Netherlands we concentrate on housing. As our preferred option we calculate the imputed rent for owner occupiers as a fixed percentage of the value of the dwelling, net of mortgage debt and maintenance costs. Using micro-data on household income from the Euromod baseline 2001 we compare the baseline income distribution with the income distribution where this imputed rent is counted as additional income. We also calculate an alternative measure of imputed rent based on the equivalent rental value of the dwelling.

## **1. A brief overview of the Dutch housing system**

For a long time, the public sector has been a dominating factor in the Dutch housing system. A considerable part of the rental market consists of relatively low rent social housing for which government used to subsidize the building costs and still controls the rent (level and annual increase). However, for most of the other rented accommodations, the rent is also subject to government regulation. Only about 5% of the rental market is considered to be 'liberalised'. Replacing so-called object-subsidies lowering the building costs, government currently relies on means-tested subject-subsidies, given to the tenants to lower their net-rent (only for non-liberalised rental accommodations)<sup>1</sup>.

Whilst a large part of the tenants are in the lower quantiles of the income distribution, in the higher quantiles most people are owner-occupier. All in all, more than half of the accommodations are owner-occupied and almost two-thirds of the population live in their own accommodation. Here, the government also plays a crucial role, in particular by allowing mortgage interest payments to be income tax deductible. On the other hand, income from owner-occupation is imputed and taxed, but this imputed income is rather low. In addition government taxes the sale of owned accommodations (with a 6% tax).

Partly helped by decreasing interest rates, house prices have shown strong increases. In the period 1990-2005 median selling prices of existing houses more than trebled (source: [www.nvm.nl](http://www.nvm.nl)) while the cpi rose by about 44% ([www.cbs.nl](http://www.cbs.nl)) and rents were raised by about 75% (on average). Part of this strong increase may also be related to quality differences but still, despite the decrease in the mortgage interest rate, it is clear that in particular first-time buyers have faced increasing problems in being able to afford the purchase of a house. The fast increase in the number of two-earner households in the Netherlands has been linked to this phenomenon.

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<sup>1</sup> For a more elaborate description of the dutch rent policy see VROM (2002), <http://www2.vrom.nl/Docs/internationaal/HURENDEFE.pdf>

The tax deduction of mortgage interest payments is more and more subject to political discussion. So far (January 2007), government has not wanted to abolish it, but increasingly, political parties as well as independent economists argue that it is a subsidy from which the rich profit more than the poor, that it is very expensive for the government and that it may not be sustainable in the future.

One additional feature of the Dutch housing market is that there is a high extent of regional differentiation, especially where owned houses are concerned. In some areas (e.g., peripheral regions), prices of comparable houses are considerably below the national average whilst the reverse is true for houses in the more densely populated regions.

Due to the fact that most rents are subject to control, regional differences are less marked here. Instead, there are long waiting lists for rented accommodations in the more popular areas. In fact, it has been estimated that on average market rent would be 25% above actual rent (Elsinga et al, 2005), but it is likely that this percentage shows large variations by region.

## 2. Method

Three main approaches to the calculation of imputed rent can be distinguished: the capital market or user cost approach, the opportunity cost or rental value approach and the self-assessment approach.

- capital market / user cost

The capital market approach to calculate imputed rent is based on the idea that owner-occupiers could generate capital income by selling their dwelling and investing the proceeds on the capital market. When the value of the house and the outstanding mortgage is known, all we need is an assumption on the rate of return on investment to be able to approximate imputed rent. In this report we will use this approach, assuming a rate of return of 3% on investment, and we also deduct 0.5% of the value of the house as maintenance costs. If the resulting amount is negative, it is set to zero.

Hence:

$$IR = 0.03*(HV - MD) - 0.005*HV \text{ if } 0.03*(HV - MD) - 0.005*HV > 0$$

IR = 0 otherwise.

where IR stands for imputed rent, HV for the value of the house, and MD for mortgage debt.

- rental equivalence / opportunity cost

The rental equivalence approach is based on an estimation of the market rent a home owner would have to pay if he were to rent his accommodation. Usually, this is based on a so-called hedonic regression of the market rent of tenants. Because most rents in the Netherlands are subject to rent control, this approach would not be very plausible. However, for rent-free accommodations, for which we have no other alternative, we calculate imputed rent based on a hedonic regression of the rents of

all tenants, adding 25% to take into account that market rent would be 25% above actual rent. In the appendix we provide details on the regression used.

We also use this approach as an alternative method to calculate imputed rent for home-owners.

- self assessment

The self-assessment approach is based on information provided by the home-owners on the market rent they would pay if they were to rent their accommodation. This information is not available in the Euromod data used and hence we cannot apply this method.

### 3. Data

The data we use as our baseline is the Euromod simulation for 2001, updated from the Socio-Economic Panel (SEP) data collected by Statistics Netherlands in 2000. The SEP is a representative panel survey in which information on income, wealth, housing and work was collected on a yearly basis (1984-2002) from all household members aged 16 or over. It should be noted that households with one or more members who did not fill out the income questionnaire (unit non-response) have been dropped out of the Euromod baseline sample without adjusting the original weights produced by Statistics Netherlands. In addition, for the purpose of the analysis in this report, households with negative or zero post-government incomes have been dropped.

### 4. Results

#### 4.1 Overall results

Table A presents overall statistics on tenure status and proportions of beneficiaries of imputed rent. Almost two-third of the population is owner-occupier, and for most of them the capital market approach described above implies receipt of a positive amount of imputed rent. As for tenants, only those living in rent-free housing are assumed to receive imputed rent.

table A. Home ownership and overall proportions of beneficiaries

<b>Tenure status</b>	<b>Populati on share</b>	<b>Share with IR &gt; 0</b>
<i>Owner occupiers</i>	65.0	95.6
<i>thereof</i>		
outright owner	5.7	100.0
with outstanding mortgage	59.3	95.2
<i>Tenants</i>	35.0	1.4
<i>thereof</i>		
rent-subsidized by direct public transfers in cash	6.7	0.0
rent-free	0.5	100.0
other	27.7	0.0
Total	100.0	62.7

#### 4.2 Results subdivided by quintile

When they are subdivided by quintiles of disposable income (table C1a), the recipients of imputed rent appear to be overrepresented in the higher income quintiles. The picture is dominated by owner-occupiers with a mortgage.

table C1a. Population shares of beneficiaries of imputed rent by quintile

Quintile	Total	Owner-occupiers			Tenants	
		Total	own outright	on mortgage	Total	rent-free
1	32.0	31.0	6.7	24.3	1.0	1.0
2	55.5	55.3	4.2	51.1	0.3	0.3
3	68.5	67.5	6.4	61.1	1.0	1.0
4	77.0	76.8	5.3	71.5	0.2	0.2
5	80.2	80.0	6.0	74.0	0.2	0.2
Total	62.7	62.1	5.7	56.4	0.5	0.5

All in all, the percentages of beneficiaries of imputed rent increase from 32% in the lowest quintile to 80% in the highest. The percentages of potential beneficiaries increases even faster, from 33% in the lowest to 85% in the highest quintile (table C1b), indicating that almost all of the potential beneficiaries are also counted as actual beneficiaries, in particular in the lower quintiles.

Table C1b. % of potential beneficiaries of imputed rent by income quintile

Quintile	Total	Owner-occupiers			Tenants	
		Total	own outright	on mortgage	Total	rent-free
1	32.5	31.5	6.7	24.8	1.0	1.0
2	58.1	57.8	4.2	53.6	0.3	0.3
3	71.4	70.4	6.4	64.0	1.0	1.0
4	80.6	80.3	5.3	75.0	0.2	0.2
5	85.1	85.0	6.0	78.9	0.2	0.2
Total	65.5	65.0	5.7	59.3	0.5	0.5

Despite the fact that recipients of IR are overrepresented among the higher income groups, the income shares of the various quintiles are only marginally affected by the inclusion of imputed rent (table C2a). Again, the picture is dominated by the effects for owner-occupiers with a mortgage.

Table C2a. Income shares of income quintiles before and after including IR in various groups

Quintile	Baseline in %	Total	Owner-occupiers			Tenants	
			Total	own outright	on mortgage	Total	rent-free
1 (bottom)	9.97	10.02	10.00	10.10	9.87	9.98	9.98
2	14.32	14.35	14.35	14.33	14.34	14.33	14.33
3	18.24	18.34	18.33	18.29	18.29	18.25	18.25
4	23.02	23.00	23.01	22.98	23.05	23.00	23.00
5 (top)	34.45	34.29	34.31	34.30	34.45	34.44	34.44
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Overall, the percentage increase in disposable income resulting from adding imputed rent differs only marginally across quintiles: it varies between 5.6% in the highest quintile and 6.7 in the middle and lowest quintiles (table C2b). Adding imputed rent to the disposable income of owner-occupiers with a mortgage causes an increase in disposable income of 4% in the lowest quintile and about 5% in the other 4 quintiles. Imputed rent for outright owners adds 2.5% to disposable income in the lowest quintile, decreasing to 0.7% in the highest. Imputed rent for rent-free tenants contributes 0.3% in the lowest and less than 0.05% in the highest quintile.

Table C2b. Percentage increase in disposable income

Quintile	Total	Owner-occupiers			Tenants	
		Total	own outright	on mortgage	Total	rent-free
1 (bottom)	6.7	6.4	2.5	3.9	0.3	0.3
2	6.3	6.2	1.2	5.0	0.1	0.1
3	6.7	6.6	1.4	5.2	0.1	0.1
4	6.1	6.0	1.0	5.0	0.0	0.0
5 (top)	5.6	5.6	0.7	4.9	0.0	0.0
All	6.1	6.1	1.2	4.9	0.1	0.1

Expressed in Euros per year, the average amount of imputed rent per capita amounts to 766 Euro, varying from 434 Euro in the lowest quintile to 1281 Euro in the highest (table C2c). Again the share of outright owners and rent-free tenants is largest in the lowest quintiles, and the increase in the highest quintiles is largely made up by the imputed rent for owner-occupiers with a mortgage.

Tabel C2c. Mean amounts of IR per capita

Quintile	Baseline (EUR) mean	Total	Owner-occupiers			Tenants	
			Total	own outright	on mortgage	Total	rent-free
1 (bottom)	6432	434	413	186	227	21	21
2	8551	542	529	126	403	14	14
3	10764	717	701	174	527	15	15
4	14072	854	848	152	697	6	6
5 (top)	22705	1281	1272	168	1103	10	10
All	12506	766	753	161	591	13	13

The pattern is fairly similar when equivalized amounts of imputed rent are studied (table C2d) rather than amounts per capita.

Table C2d. Mean amounts of equivalized IR

Quintile	Baseline (EUR) mean	Total	Owner-occupiers			Tenants	
			Total	own outright	on mortgage	Total	rent-free
1 (bottom)	9054	606	583	228	355	23	23
2	13020	823	809	156	653	14	14
3	16591	1114	1092	233	858	22	22
4	20915	1266	1260	206	1054	6	6
5 (top)	31308	1768	1756	224	1532	11	11
All	18178	1115	1100	210	890	15	15

Looking at the average amounts of imputed rent for beneficiaries only (table C3) it can be noted that the average amounts in the lowest quintile exceed those in the second to fourth quintile. As we saw earlier, on average, the relative increase in the lowest quintile is not much higher than in the other quintiles. However, looking at beneficiaries only, the contribution of imputed rent is much more significant in the lowest quintile. On average it amounts to more than 20% of disposable income of the beneficiaries in the lowest income quintile, and it is even higher for rent-free tenants and outright owners in this income category.

Table C3. Mean amounts of equivalized IR (beneficiaries only).

	Baseline (EUR) mean	Total	Owner-occupiers			Tenants	
			Total	own outright	on mort- gage	Total	rent-free
1 (bottom)	9061	1894	1879	3402	1459	2371	2371
2	13142	1482	1463	3746	1277	5449	5449
3	16615	1626	1618	3662	1405	2117	2117
4	20918	1643	1640	3874	1474	2512	2512
5 (top)	31673	2204	2195	3716	2071	6224	6224
All	20141	1780	1771	3664	1579	2833	2833

Table D shows the effects of including imputed rent on a number of indices of inequality and poverty. The upper half presents the indicators of overall inequality after including imputed rent in the various groups only and the lower half presents the differences with the baseline. In general, the effects of including imputed rent on inequality are modest. In most cases the largest effects are found when imputed rent is added to the income of owner-occupiers with a mortgage. The effects of including imputed rent on income in this group on overall inequality are often even larger than those of adding imputed rent on all groups in question. Presumably, this is related to the fact that owner-occupiers on mortgage are distributed more unevenly over the income distribution than the other beneficiaries of imputed rent.

In general adding imputed rent has an increasing effect on overall inequality. This does not hold when imputed rent is added to outright owners or rent-free tenants only.

Poverty, as measured by FGT0 (the poverty rate) increases by about 13% (from 12.5% to 14.2%) when we recompute the poverty line after adding imputed rent. Again, the increase is largest when imputed rent is added to the income of owner-occupiers with a mortgage only. Poverty even decreases slightly when imputed rent is added to the income of rent-free tenants only. The effects on the FGT1 index (the mean poverty gap) are fairly comparable. The effects on the FGT2-index on adding imputed rent to income of all groups and to income of owner-occupiers on mortgage are (much) smaller, and the effects of adding imputed rent to outright owners and rent-free tenants are even (more) negative.

Table D. Effects of including IR on inequality and poverty

	Baseline	Total	Owner-occupiers			Tenants	
			Total	own outright	on mort- gage	Total	rent-free
Gini	0.246	0.248	0.248	0.246	0.249	0.246	0.246
Atkinson 0.5	0.050	0.050	0.050	0.050	0.051	0.050	0.050

Atkinson 1.5	0.155	0.152	0.153	0.154	0.155	0.155	0.155
MLD	0.105	0.105	0.105	0.104	0.106	0.104	0.104
Half SCV	0.119	0.119	0.120	0.119	0.121	0.119	0.119
DR: 90/10	3.00	3.09	3.10	2.99	3.13	3.00	3.00
DR: 90/50	1.71	1.71	1.71	1.70	1.72	1.71	1.71
DR: 50/10	1.75	1.81	1.82	1.76	1.81	1.75	1.75
FGT0	0.125	0.142	0.143	0.130	0.142	0.124	0.124
FGT1	0.023	0.026	0.026	0.023	0.026	0.022	0.022
FGT2	0.008	0.009	0.009	0.008	0.009	0.008	0.008
		Proportional change in %					
Gini		0.6	0.7	-0.3	1.3	-0.1	-0.1
Atkinson 0.5		0.8	1.0	-0.4	2.2	0.0	0.0
Atkinson 1.5		-1.8	-1.5	-0.8	-0.3	-0.3	-0.3
MLD		0.0	0.3	-0.7	1.6	-0.3	-0.3
Half SCV		0.0	0.4	-0.6	1.5	-0.2	-0.2
DR: 90/10		3.3	3.5	-0.1	4.3	-0.1	-0.1
DR: 90/50		-0.1	-0.1	-0.3	0.8	0.0	0.0
DR: 50/10		3.4	3.6	0.1	3.4	0.0	0.0
FGT0		13.2	14.0	4.1	13.3	-0.7	-0.7
FGT1		14.7	15.6	-0.1	13.9	-0.5	-0.5
FGT2		4.2	5.6	-1.6	5.6	-1.2	-1.2

#### 4.3. Results differentiated by socio-economic characteristics

In this section we look at the effects of adding imputed rent to income differentiated by a number of socio-economic characteristics: household type, socio-economic category of the head, education level of the head, age of the household member, and tenure status of the household. Table E1 presents effects on average income and income inequality, and table E2 presents effects on poverty.

Differentiated by household type, income increases fastest (by 8.3%, compared to an overall average of 6.1%) in the group of older single persons or couples. Households in this group are the most likely to own their accommodation outright. On the other hand, income increases the least in the group of mono-parental households. These households are the most likely to rent their accommodation. Remarkably, both household groups show a relatively large increase in income inequality when imputed rent is included. This increase is compensated by a decrease in income inequality in the larger groups of younger single persons and couples, and couples with children. Overall inequality (in terms of the mean log deviation) remains virtually unchanged, but the share of elderly and mono-parental households shows a clear increase.

Differentiated by socio-economic category of the head, the groups of self-employed, pensioners and others show the fastest increases in income when imputed rent is added to income. By contrast, the average increase among employed and unemployed persons is relatively slow. Inequality decreases amongst self-employed and unemployed but the increase in the other groups causes overall within group inequality to increase by 0.7% to 91.7% of total inequality.

Differentiated by education level of the head of the household, the overall income increase varies from 4.8% for persons in households with a head with primary education only to 6.5% for persons in

households with heads with upper secondary education. Inequality increases relatively fast in the group with primary education only. As a result, the share of this group in overall inequality increases from 7.0% to 7.6%. This is compensated by a decrease of the share of the group with upper secondary education. Overall, the share of within group inequality remains the same.

Differentiated by age of the household members, the increase in income is again relatively fast for the elderly, where we also see a relatively fast increase in income inequality. The share of this group in overall inequality increases from 12.6% to 14.0%, whilst the 25-64 year olds see their share in income inequality decrease from 55.8% to 54.2%.

As could be expected, the largest differential effects on income and inequality are found when we differentiate according to tenure status. The effects on income were already shown in table C2b. Inequality shows a considerable drop amongst the recipients of imputed rent, in particular amongst outright owners and rent-free tenants. Overall within group inequality drops from 81.9 to 76% of total inequality. The largest drop in the contribution to overall inequality is found for owners on mortgage: their share drops from 48.3% to 44.3%.

table E1. Effects of including IR differentiated by characteristics of household or household head

Characteristic of household or household head	A	B		C		D	E	F	G	H	I
	Pop. share in %	Mean		Income position		Increase in mean equiv. Inc. (%)	Mean Log Deviation (MLD)		% change in inequality	% contribution to aggregate inequality	
		Baseline	Including IR	Baseline	Including IR	Including IR	Baseline	Including IR	Including IR	Baseline	Including IR
<b>Household type</b>											
Older single persons or couples (at least one 65+)	15.2	16559	17927	91	93	8.3	0.0943	0.1040	10.3	13.7	15.1
Younger single persons or couples (none 65+)	28.6	21476	22640	118	117	5.4	0.1280	0.1241	-3.1	35.0	33.9
Couple with children up to 18 (no other HH members)	40.7	17218	18261	95	95	6.1	0.0807	0.0797	-1.3	31.4	31.0
Mono-parental household	3.1	10612	10874	58	56	2.5	0.0557	0.0601	8.0	1.7	1.8
Other household types	12.4	17624	18773	97	97	6.5	0.0794	0.0800	0.7	9.4	9.4
% Within groups inequality	./.	./.	./.	./.	./.	./.				91.1	91.2
% Between groups inequality	./.	./.	./.	./.	./.	./.				8.9	8.8
<b>Socioeconomic group of HH head</b>											
Blue collar worker }				0	0						
White collar worker }	72.2	19100	20116	105	104	5.3	0.0843	0.0852	1.1	58.1	58.7
Self-employed	4.7	19869	21655	109	112	9.0	0.1960	0.1810	-7.6	8.8	8.1
Unemployed	2.5	10136	10541	56	55	4.0	0.1936	0.1808	-6.6	4.6	4.3
Pensioner	16.9	16551	18016	91	93	8.8	0.0947	0.0999	5.5	15.3	16.1
Other	3.7	10888	11978	60	62	10.0	0.1175	0.1244	5.8	4.2	4.4
% Within groups inequality	./.	./.	./.	./.	./.	./.				91.0	91.7
% Between groups inequality	./.	./.	./.	./.	./.	./.				9.0	8.3
<b>Educational level of HH head</b>											
Tertiary education	30.5	22607	23924	124	124	5.8	0.0958	0.0956	-0.3	27.9	27.9
Upper secondary education	45.9	17472	18610	96	96	6.5	0.0876	0.0861	-1.7	38.4	37.8
Lower secondary education	14.7	14313	15235	79	79	6.4	0.0776	0.0783	1.0	10.9	11.0
Primary education or less	8.9	12985	13608	71	71	4.8	0.0822	0.0900	9.4	7.0	7.6
% Within groups inequality	./.	./.	./.	./.	./.	./.				84.2	84.2
% Between groups inequality	./.	./.	./.	./.	./.	./.				15.8	15.8
<b>ALL</b>	100.0	100.0	100.0	100	100	6.1	0.1047	0.1047	0.0	100.0	100.0

Characteristic of household or household head	A	B		C		D	E F		G	H I	
	Pop. share in %	Mean Including		Income position Including		% increase in mean equiv. Income Including IR	Mean Log Deviation (MLD)		% change in inequality Including IR	% contribution to aggregate inequality	
		Baseline	IR	Baseline	IR		Baseline	IR		Baseline	IR
<b>Age of HH member</b>											
Below 25	30.2	16071	16968	88	88	5.6	0.0928	0.0942	1.5	26.8	27.2
25-64	55.5	19782	20952	109	109	5.9	0.1054	0.1024	-2.8	55.8	54.2
Over 64	14.3	16400	17764	90	92	8.3	0.0925	0.1025	10.9	12.6	14.0
% Within groups inequality	./.	./.	./.	./.	./.	./.				95.3	95.4
% Between groups inequality	./.	./.	./.	./.	./.	./.				4.7	4.6
<b>Housing tenure</b>											
Owners, total	65.0	20269	21962	112	114	8.4	0.0892	0.0795	-10.8	55.3	49.3
Owner: own outright	5.7	18536	22200	102	115	19.8	0.1252	0.0920	-26.6	6.8	5.0
Owner: on mortgage	59.3	20437	21939	112	114	7.4	0.0853	0.0783	-8.2	48.3	44.3
Tenants, total	35.0	14295	14339	79	74	0.3	0.0954	0.0953	-0.2	31.9	31.9
Tenant: rent-subsidized by direct cash transfer	6.7	9652	9652	53	50	0.0	0.0612	0.0612	0.0	3.9	3.9
Tenant: other	27.7	15428	15428	85	80	0.0	0.0835	0.0835	0.0	22.1	22.1
Tenant: rent-free	0.5	14050	16883	77	88	20.2	0.1368	0.1127	-17.6	0.7	0.6
% Within groups inequality	./.	./.	./.	./.	./.	./.				81.9	76.0
% Between groups inequality	./.	./.	./.	./.	./.	./.				18.1	24.0
<b>ALL</b>	100.0	100.0	100.0	100	100	6.1	0.1047	0.1047	0.0	100.0	100.0

Table E2 shows the effects of adding imputed rent to income on the poverty indices FGT0, FGT1 and FGT2, subdivided by socio-economic characteristics. Consistent with the overall results discussed earlier, the poverty statistics with imputed rent included in income are based on recomputing the poverty line (60% of median equivalized income).

The first striking result of table E2 can be found in the first line where it is shown that of all household types distinguished, elderly single persons and couples face a relatively large increase in the poverty rate as a result of including imputed rent in disposable income. On average this group experiences a relatively fast increase in disposable income, due to the fact that outright owners are overrepresented. By contrast, the abundance of tenants with incomes only slightly higher than the original poverty line may be seen to cause poverty to increase relatively fast when the poverty line is drawn higher as a result of including imputed rent in disposable income. The same phenomenon also underlies the increase in poverty among mono-parental households.

It may also be seen that the poverty indices FGT1 (the average poverty gap) and FGT2 of elderly and mono-parental households increase even faster when imputed rent is included. However, the elderly remain the group with the lowest FGT1 and by far the lowest FGT2 indices, even after the inclusion of imputed rent.

Subdivided according to socio-economic group of the head of household we also see a relatively fast increase in the poverty rate of pensioners. Remarkably, the FGT2 index of pensioners shows a different development than the FGT2 index of the elderly. This is probably caused by the presence of a few pensioners with low incomes younger than 65. The self-employed may be seen to benefit from the inclusion of imputed rent: their poverty indices show a decrease. Apart from pensioners, the employed show the fastest increase in the poverty rate. However, in this group the poverty statistics remain below the overall average.

Subdivided according to the education level of the head of household we find a relatively fast increase in the poverty statistics of those with primary education or less. Again, this will at least partly be due to the fact that in this group, the elderly are overrepresented. Unsurprisingly, the elderly also show the largest increase in the poverty statistics subdivided according to age.

Subdivided according to housing tenure we again find the largest differences between the changes in the various groups. As expected, home owners, especially outright owners, see their poverty decrease, whilst tenants, except for rent-free tenants, face much higher poverty statistics when imputed rent is included. Making up 35% of the total population, tenants account for 72% of the poor when imputed rent is ignored and more than 82% of the poor when imputed rent is included in disposable income. In particular, the contribution to aggregate poverty of tenants whose rent is subsidized through a direct cash transfer is much larger than their share in the total population. Obviously, this was only to be expected given the fact that this rent subsidy is a means tested benefit.

Table E2. Effects of including IR on Poverty statistics subdivided by household characteristics

Characteristic of household or household head	Pop. share in %	FGT0		% change	% contribution to aggregate	
		Baseline	Incl. IR	Incl. IR	Baseline	Incl. IR
<b>Household type</b>						
Older single persons or couples (at least one 65+)	15.2	0.171	0.215	26.3	20.7	23.1
Younger single persons or couples (none 65+)	28.6	0.122	0.132	7.6	27.9	26.5
Couple with children up to 18 (no other HH members)	40.7	0.093	0.101	8.1	30.3	28.9
Mono-parental household	3.1	0.472	0.576	21.9	11.9	12.8
Other household types	12.4	0.094	0.100	6.3	9.3	8.7
		<b>FGT1</b>		<b>% ch</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Older single persons or couples (at least one 65+)		0.012	0.019	61.9	8.0	11.2
Younger single persons or couples (none 65+)		0.026	0.028	8.7	32.6	30.9
Couple with children up to 18 (no other HH members)		0.019	0.021	7.7	34.8	32.7
Mono-parental household		0.090	0.119	32.3	12.5	14.4
Other household types		0.022	0.023	1.9	12.2	10.8
		<b>FGT2</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Older single persons or couples (at least one 65+)		0.001	0.002	93.3	2.2	4.0
Younger single persons or couples (none 65+)		0.011	0.010	-5.6	37.3	33.8
Couple with children up to 18 (no other HH members)		0.008	0.008	1.9	37.8	37.0
Mono-parental household		0.029	0.037	29.8	10.6	13.3
Other household types		0.008	0.009	2.9	12.1	12.0
		<b>FGT0</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
<b>Socioeconomic group of HH head</b>						
Employed	72.2	0.072	0.085	19.0	41.3	43.5
Self-employed	4.7	0.157	0.141	-10.6	5.9	4.6
Unemployed	2.5	0.723	0.761	5.4	14.4	13.4
Pensioner	16.9	0.163	0.205	26.0	22.0	24.5
Other	3.7	0.556	0.538	-3.2	16.4	14.0
		<b>FGT1</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Employed		0.012	0.015	19.6	39.7	41.3
Self-employed		0.043	0.034	-20.3	8.9	6.2
Unemployed		0.181	0.205	13.4	20.0	19.8
Pensioner		0.014	0.020	45.2	10.5	13.4
Other		0.128	0.136	6.2	20.9	19.3
		<b>FGT2</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Employed		0.004	0.004	17.1	32.1	36.1
Self-employed		0.021	0.016	-25.5	11.7	8.4
Unemployed		0.084	0.090	6.9	24.8	25.4
Pensioner		0.004	0.004	3.6	7.2	7.2
Other		0.056	0.055	-1.4	24.3	23.0
		<b>FGT0</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
<b>Educational level of HH head</b>						
Tertiary education	30.5	0.049	0.056	12.6	12.0	12.0
Upper secondary education	45.9	0.111	0.122	9.4	40.8	39.5
Lower secondary education	14.7	0.215	0.230	6.7	25.2	23.7
Primary education or less	8.9	0.310	0.396	28.0	21.9	24.8
		<b>FGT1</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Tertiary education		0.013	0.015	12.1	17.9	17.5
Upper secondary education		0.021	0.023	9.2	42.5	40.4
Lower secondary education		0.035	0.039	10.5	22.9	22.0

Primary education or less		0.043	0.059	37.2	16.8	20.1
		<b>FGT2</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Tertiary education		0.007	0.007	-0.5	24.9	23.8
Upper secondary education		0.008	0.008	-3.5	44.4	41.2
Lower secondary education		0.010	0.011	8.1	17.9	18.6
Primary education or less		0.012	0.016	34.5	12.8	16.5
		<b>FGT0</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
<b>Age of HH member</b>						
Below 25	30.2	0.154	0.173	12.0	37.2	36.8
25-64	55.5	0.097	0.105	8.0	43.2	41.2
Over 64	14.3	0.172	0.218	26.8	19.6	22.0
		<b>FGT1</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Below 25		0.035	0.040	13.6	47.2	46.8
25-64		0.018	0.020	7.7	45.3	42.5
Over 64		0.012	0.019	64.0	7.5	10.7
		<b>FGT2</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Below 25		0.014	0.016	10.2	50.9	53.9
25-64		0.007	0.007	-6.3	47.0	42.3
Over 64		0.001	0.002	95.3	2.0	3.8
		<b>FGT0</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
<b>Housing tenure</b>						
Owners, total	65.0	0.054	0.038	-29.4	28.0	17.5
Owner: own outright	5.7	0.159	0.061	-61.8	7.3	2.5
Owner: on mortgage	59.3	0.044	0.036	-18.1	20.7	15.0
Tenants, total	35.0	0.258	0.334	29.8	72.0	82.5
Tenant: rent-subsidized by direct cash transfer	6.7	0.572	0.696	21.7	30.7	33.0
Tenant: other	27.7	0.180	0.250	39.3	39.8	49.0
Tenant: rent-free	0.5	0.342	0.147	-57.2	1.5	0.6
		<b>FGT1</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Owners, total		0.011	0.007	-33.0	31.4	18.4
Owner: own outright		0.029	0.008	-70.9	7.3	1.9
Owner: on mortgage		0.009	0.007	-21.4	24.1	16.5
Tenants, total		0.044	0.060	36.5	68.6	81.6
Tenant: rent-subsidized by direct cash transfer		0.104	0.139	33.9	30.9	36.1
Tenant: other		0.029	0.041	43.7	35.2	44.1
Tenant: rent-free		0.103	0.069	-32.4	2.5	1.4
		<b>FGT2</b>		<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
Owners, total		0.005	0.003	-36.5	37.5	22.9
Owner: own outright		0.010	0.002	-77.0	6.9	1.5
Owner: on mortgage		0.004	0.003	-27.3	30.6	21.4
Tenants, total		0.015	0.019	28.5	62.5	77.1
Tenant: rent-subsidized by direct cash transfer		0.040	0.050	25.7	31.7	38.2
Tenant: other		0.008	0.012	39.8	27.4	36.8
Tenant: rent-free		0.054	0.035	-35.4	3.4	2.1
				<b>% ch.</b>	<b>% contr. to aggr.</b>	
		<b>Baseline</b>	<b>Incl. IR</b>	<b>Incl. IR</b>	<b>Baseline</b>	<b>Incl. IR</b>
<b>ALL</b>	<b>FGT0</b>	0.125	0.142	13.2	100.0	100.0
	<b>FGT1</b>	0.023	0.026	14.7	100.0	100.0
	<b>FGT2</b>	0.008	0.009	4.2	100.0	100.0

**5. Sensitivity analysis**

5.1. Description of alternative approaches

In this section we discuss the results presented above, using our preferred approach to the calculation of imputed rent, in a comparison with some other possible approaches. We present summary statistics on beneficiaries and average amounts by income quintile for several alternative approaches. We also present a more in depth comparison, using one possible alternative approach.

Table F. Description of various approaches to IR

	Home owners	Rent-free tenants	Other tenants
<b>IR (A)</b>	Capital market, 3%	Rental eq, regression	0
<b>IR (B)</b>	Capital market, 2%	Rental eq, regression	0
<b>IR (C)</b>	Capital market, 4%	Rental eq, regression	0
<b>IR (D)</b>	Rental eq, by stratification	Rental eq, by stratification	25% of rent if rent below stratum
<b>IR (E)</b>	Rental eq, regression	Rental eq, regression	25% of rent

Table F summarizes the various approaches to imputed rent distinguished in this section. Approach (A) is the approach used so far in this report: the capital market approach for home owners, using an interest rate of 3%, and the rental equivalence approach for rent-free tenants, based on a Heckman regression of the rent paid by tenants, adding 25% to take into account that market rents are 25% above actual rents. Approaches (B) and (C) only differ from approach (A) in that the interest rate chosen for the capital market approach is 2% in approach (B) and 4% in approach (C). In approach (D) we stratify tenants by number of rooms (1-9) and type of accommodation (single-family-house, apartment, other), and use the average rent by stratum multiplied by 1.25 to obtain imputed rent for owners and rent-free tenants (subtracting mortgage interest payments and maintenance costs for owners). For tenants we use 25% of the rent as imputed rent, but only if the actual rent is below the average rent in the stratum. Approach (E) uses the Heckman regression of the rent paid by tenants to calculate imputed rent for home owners and rent-free tenants, again multiplied by 1.25 and subtracting mortgage interest payments and maintenance costs for home owners. Approach (E) awards 25% of the rent as imputed rent to all tenants. In all cases, imputed rent is set to zero when the calculations give rise to negative amounts.

Table G. Proportions of beneficiaries of IR using various approaches

	Popula tion share	Share with IR > 0 (A)	Share with IR > 0 (B)	Share with IR > 0 (C)	Share with IR > 0 (D)	Share with IR > 0 (E)
<b>Tenure status</b>						

<i>Owner occupiers</i>	65.0	95.6	90.5	99.9	47.4	62.5
<i>thereof</i>						
outright owner	5.7	100.0	100.0	100.0	100.0	100.0
with outstanding mortgage	59.3	95.2	89.5	99.8	42.4	58.8
<i>Tenants</i>	35.0	1.4	1.4	1.4	49.2	100.0
<i>thereof</i>						
rent-subsidized by direct public transfers in cash	6.7	0.0	0.0	0.0	45.7	100.0
other	27.7	0.0	0.0	0.0	49.0	100.0
rent-free	0.5	100.0	100.0	100.0	100.0	100.0
Total	100.0	62.7	59.3	65.4	48.0	75.6

Table G presents the proportions of beneficiaries of imputed rent using the various approaches. Using approach (B) with a 2% interest rate the proportion of home owners with positive imputed rent drops by about 5%, to 90.5%, whilst it increases to 99.9 using approach (C), the 4% interest rate. In the other two approaches, the proportions of home owners with positive imputed rent drop considerably, to 47.4% in approach (D) and 62.5% in approach (E). In these cases, the subtraction of mortgage interest payments causes many home owners to end up with negative amounts of imputed rent. As mentioned above, these amounts have been set to zero in the calculations presented below. The proportion of beneficiaries of imputed rent among tenants is 49.2% for approach (D) and 100% for approach (E). As a result, the total number of beneficiaries decreases to 48% for approach (D) whilst it increases to 75.6% using approach (E).

The fact that we only include imputed rent if it is positive is crucial for our outcomes. Statistics Netherlands usually uses a definition of disposable income in which mortgage interest payments are deducted even if these payments exceed the estimated imputed rent. As an example we mention the Income Panel Survey (IPO) 2003, in which net imputed rent (rental value minus mortgage interest payments) is a negative amount for more than 80% of all home owners. In fact, in this case Statistics Netherlands deducts mortgage interest payments in full from rather moderate estimates of the rental value of the owned accommodation.

Table H1. Proportions of beneficiaries of IR differentiated by income quintile

Quintile	IR (A)	IR (B)	IR (C)	IR (D)	IR (E)
1	32.0	30.6	32.5	62.2	90.5
2	55.5	52.9	58.1	51.0	83.8
3	68.5	65.4	71.3	47.3	74.5
4	77.0	72.8	80.4	39.5	66.3
5	80.2	74.9	84.9	40.2	63.0
Total	62.7	59.3	65.4	48.0	75.6

The varying proportions of beneficiaries among home owners and tenants are also reflected in varying proportions of beneficiaries differentiated by income quintile (table H1). In approach (A), (B), and (C)

the beneficiaries of IR are mainly home owners, and consequently, the proportions of beneficiaries clearly increase by increasing income quintile. On the other hand, in approach (D) and especially approach (E), where tenants benefit at least as much or even more than home owners, the proportions of beneficiaries clearly decrease by income quintile. This is also a consequence of the fact that in approach (D) both home owners and tenants with high incomes are less likely to benefit from IR whilst the same holds for home owners with high incomes in approach (E).

Table H2. Income shares by quintile (quintiles redefined after adding IR)

Quintile	Baseline	IR (A)	IR (B)	IR (C)	IR (D)	IR (E)
1 (bottom)	9.97	9.79	9.90	9.57	10.12	10.13
2	14.32	14.34	14.38	14.29	14.45	14.47
3	18.24	18.36	18.32	18.36	18.29	18.26
4	23.02	23.02	23.00	23.11	22.93	22.84
5 (top)	34.45	34.48	34.39	34.67	34.21	34.29
All	100.0	100.0	100.0	100.0	100.0	100.0

The resulting income shares by quintile after adding imputed rent (and redefining quintiles) are presented in table H2. It appears that the effects of adding imputed rent on these income shares is fairly marginal. Given the previous table, they move in the expected direction: in particular, approach (C) sees the largest decrease of the share of the lowest income quintile, and the largest increase in the share of the highest quintile. On the other hand, approaches (D) and (E) cause a slight increase in the shares of the lowest quintiles and a slight decrease in the shares of the highest quintiles.

Table H3. Average percentage income increase by income quintile

Quintile	IR (A)	IR (B)	IR (C)	IR (D)	IR (E)
1 (bottom)	6.7	4.0	10.3	6.1	9.5
2	6.3	3.6	10.3	3.5	7.5
3	6.7	3.8	11.1	3.3	6.1
4	6.1	3.3	10.5	2.4	5.4
5 (top)	5.6	3.1	9.9	1.9	5.0
All	6.1	3.4	10.4	2.9	6.1

All in all, approaches (A), (B) and (C) cause increases in disposable income of 6.1, 3.4 and 10.4% which are spread fairly evenly across quintiles (table H3). On the other hand, the increase in income of approach (D) and (E) is 2.9% and 6.1%, respectively, but in these cases, the percentage increases are clearly higher in the lower deciles than in the higher deciles. The average amounts per capita show clear rises by income quintile in all approaches except in approach (D). Moreover, in approach (E), the amount of imputed rent in the highest quintile is

less than twice as high as in the lowest, whilst it is more than three times as high under approach (C) (table H4). Similar differences are found when looking at equivalized imputed rent (table H5).

Table H4. Average amounts of IR per capita

Quintile	IR (A)	IR (B)	IR (C)	IR (D)	IR (E)
1 (bottom)	434	260	652	432	639
2	542	314	866	345	669
3	717	410	1172	390	696
4	854	473	1473	373	798
5 (top)	1281	709	2232	451	1195
All	766	433	1279	398	799

Table H5. Average amounts of equivalized IR

Quintile	IR (A)	IR (B)	IR (C)	IR (D)	IR (E)
1 (bottom)	606	359	929	553	862
2	823	470	1344	460	974
3	1114	633	1845	540	1020
4	1266	696	2204	498	1127
5 (top)	1768	974	3094	587	1571
All	1115	626	1883	528	1111

Looking at the average amounts for beneficiaries only, we still find the highest amounts by approach (C). Approach (A) now ends up above approach (E) whilst approach (B) ends up lowest, even below approach (D). Differentiated by income quintile, the differences are smaller than in the previous tables for approaches (A), (B) and (C), whilst they are larger for approaches (D) and (E). Obviously, this might have been expected given the increasing percentages of beneficiaries by income quintile for approach (A), (B) and (C) and the decreasing percentages in (D) and (E) as discussed earlier (table I).

Table I. Average amounts of equivalized IR (beneficiaries only)

Quintile	IR (A)	IR (B)	IR (C)	IR (D)	IR (E)
1 (bottom)	1894	1173	2863	889	953
2	1482	888	2315	902	1162
3	1626	967	2586	1142	1368
4	1643	957	2743	1259	1701
5 (top)	2204	1301	3643	1462	2495
All	1780	1056	2878	1098	1469

Table J. Effects of adding IR on various indicators of inequality and poverty

<b>Inequality index</b>	<b>Baseline</b>	<b>IR (A)</b>	<b>IR (B)</b>	<b>IR (C)</b>	<b>IR (D)</b>	<b>IR (E)</b>
Gini	0.246	0.248	0.246	0.252	0.242	0.242
Atkinson 0.5	0.050	0.050	0.050	0.052	0.048	0.048
Atkinson 1.5	0.155	0.152	0.151	0.156	0.145	0.146
MLD	0.105	0.105	0.103	0.108	0.100	0.100
Half SCV	0.119	0.119	0.119	0.122	0.115	0.115
DR: 90/10	3.00	3.09	3.03	3.17	2.94	2.96
DR: 90/50	1.71	1.71	1.70	1.71	1.70	1.72
DR: 50/10	1.75	1.81	1.79	1.85	1.73	1.73
FGT0	0.125	0.142	0.137	0.152	0.120	0.115
FGT1	0.023	0.026	0.024	0.029	0.021	0.021
FGT2	0.008	0.009	0.009	0.010	0.008	0.008
<b>Proportional change in %</b>						
Gini		0.6	-0.1	2.3	-1.8	-1.6
Atkinson 0.5		0.6	-0.6	3.5	-3.8	-3.6
Atkinson 1.5		-1.8	-2.6	0.7	-6.4	-6.0
MLD		0.0	-1.2	3.1	-4.7	-4.4
Half SCV		0.2	-0.7	2.2	-3.3	-3.6
DR: 90/10		3.3	1.2	5.7	-2.1	-1.2
DR: 90/50		-0.1	-0.7	0.2	-0.8	0.5
DR: 50/10		3.4	1.9	5.5	-1.3	-1.7
FGT0		13.2	9.1	21.2	-4.0	-7.9
FGT1		14.7	7.3	27.6	-6.7	-7.9
FGT2		4.2	0.6	12.4	-10.1	-9.4

Turning to the effects of adding imputed rent to income on inequality and poverty (table J) we find that, in general approach (C) has the largest increasing effect on inequality and poverty, whilst approach (D) and (E) cause all or most indicators of inequality and poverty to decrease. For approach (B) the picture is somewhat ambiguous: most inequality indicators show a (modest) decrease, but the FGT indicators of poverty increase.

## 5.2. Detailed analysis of approach (E)

All in all (table K1), some 75% of the population receives imputed rent if approach (E) is followed. In the lowest quintile this percentage rises to more than 90%, most of which are tenants (69%), whilst the 63% who receive imputed rent in the highest quintile are predominantly home owners (on mortgage: 42%).

table K1. Population shares of beneficiaries of imputed rent by quintile

<b>Quintile</b>	<b>Total</b>	<b>Owner-occupiers</b>			<b>Tenants</b>		
		<b>Total</b>	<b>own outright</b>	<b>on mortgage</b>	<b>Total</b>	<b>rent-free</b>	<b>other</b>

1	90.5	21.9	6.7	15.2	68.6	1.0	67.6
2	83.8	41.6	4.2	37.4	42.2	0.3	41.9
3	74.5	44.9	6.4	38.5	29.6	1.0	28.6
4	66.3	46.6	5.3	41.3	19.7	0.2	19.4
5	63.0	47.9	6.0	41.9	15.0	0.2	14.9
Total	75.6	40.6	5.7	34.9	35.0	0.5	34.5

Table K2. % of potential beneficiaries of imputed rent by income quintile

Quintile	Total	Owner-occupiers			Tenants		
		Total	own outright	on mortgage	Total	rent-free	other
1	100.0	31.4	6.7	24.7	68.6	1.0	67.6
2	100.0	57.8	4.2	53.6	42.2	0.3	41.9
3	100.0	70.4	6.4	64.0	29.6	1.0	28.6
4	100.0	80.3	5.3	75.0	19.7	0.2	19.4
5	100.0	85.0	6.0	78.9	15.0	0.2	14.9
Total	100.0	65.0	5.7	59.3	35.0	0.5	34.5

Comparing table K1 with table K2, it can be seen that all outright owners and tenants receive imputed rent, whilst approximately three fifths of the home owners on mortgage are awarded a positive amount of imputed rent by approach (E). Notably, the latter fraction is highest in the second quintile, whilst it is lowest (still more than half) in the highest quintile. Among the highest income group, the probability that the mortgage interest payments exceed the amount of rent predicted by the Heckman equation (multiplied by 1.25) is highest.

Because the recipients of IR are overrepresented among the lower income groups, the income shares of the lowest quintiles show a slight increase as a result of the inclusion of imputed rent (table K3). In this case, the picture is clearly dominated by the effects for tenants.

Table K3. Income shares of income quintiles before and after including IR in various groups

Quintile	Baseline in %	Total	Owner-occupiers			Tenants		
			Total	own outright	on mortgage	Total	rent-free	other
1 (bottom)	9.97	10.29	9.97	10.08	9.86	10.29	9.98	10.27
2	14.32	14.51	14.38	14.30	14.41	14.46	14.33	14.46
3	18.24	18.25	18.26	18.26	18.24	18.23	18.25	18.22
4	23.02	22.85	22.98	22.96	23.04	22.88	23.00	22.89
5 (top)	34.45	34.11	34.41	34.40	34.46	34.14	34.44	34.16

All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
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The percentage increase in disposable income resulting from adding imputed rent differs considerably across quintiles (table K4): it decreases from 9.5% in the lowest quintile to 5% in the highest quintile. Adding imputed rent to the disposable income of owner-occupiers causes an increase in disposable income of about 5% in all quintiles, but the percentage increase caused by adding imputed rent to the disposable income of tenants decreases from 4.7% in the lowest to 0.5% in the highest quintile.

Table K4. Percentage increase in disposable income

Quintile	Total	Owner-occupiers			Tenants		
		Total	own outright	on mortgage	Total	rent-free	other
1 (bottom)	9.5	4.8	2.2	2.6	4.7	0.3	4.4
2	7.5	5.1	0.9	4.3	2.3	0.1	2.2
3	6.1	4.8	1.2	3.6	1.3	0.1	1.2
4	5.4	4.6	0.8	3.9	0.8	0.0	0.7
5 (top)	5.0	4.6	0.9	3.7	0.5	0.0	0.4
All	6.1	4.7	1.0	3.7	1.4	0.1	1.3

Expressed in Euros per year, the average amount of imputed rent per capita is about 800 Euro (table K5). It varies from more than 600 Euro in the lowest quintile to almost 1200 Euro in the highest. In the lowest quintile, tenants are responsible for more than half of the increase in disposable income, but in the highest quintile the increase is largely caused by the imputed rent for owner-occupiers, mostly owner-occupiers with a mortgage.

Table K5. Mean amounts of IR per capita

Quintile	Baseline (EUR) mean	Total	Owner-occupiers			Tenants		
			Total	own outright	on mortgage	Total	rent-free	other
1 (bottom)	6432	638	306	155	151	332	21	312
2	8551	668	424	91	333	244	14	231
3	10764	695	523	148	375	173	15	158
4	14072	798	665	122	542	133	6	128
5 (top)	22705	1196	1074	203	871	121	10	112

All	12506	799	598	144	455	201	13	188
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The pattern is again fairly similar when equivalized amounts of imputed rent are studied (table K6) instead of amounts per capita.

Table K6. Mean amounts of equivalized IR

	Baseline (EUR) mean	Total	Owner-occupiers			Tenants		
			Total	own outright	on mortgage	Total	rent-free	other
1 (bottom)	9054	862	438	202	235	424	23	401
2	13020	974	670	113	557	304	14	290
3	16591	1020	797	193	605	223	22	201
4	20915	1127	968	162	806	159	6	153
5 (top)	31308	1571	1426	274	1153	145	11	134
All	18178	1111	860	189	671	251	15	236

The average amounts of imputed rent for beneficiaries only (table L) show a clear increase with increasing quintile. Still, as a percentage of baseline income, the contribution of imputed rent remains most significant in the lowest quintile. The absolute amounts increase not only because they increase in all categories of owners and tenants but also because the number of owner-occupiers (with on average high amounts of imputed rent) increases whilst the number of tenants (with lower amounts of imputed rent) decreases.

Table L. Mean amounts of equivalized IR (beneficiaries only).

	Baseline (EUR) mean	Total	Owner-occupiers			Tenants		
			Total	own outright	on mortgage	Total	rent-free	other
1 (bottom)	9061	953	1998	3017	1549	619	2371	593
2	13142	1162	1610	2700	1488	720	5449	691
3	16615	1368	1776	3022	1570	751	2117	701
4	20918	1701	2077	3055	1951	811	2512	790
5 (top)	31673	2495	2975	4529	2751	965	6224	902
All	20141	1469	2118	3298	1925	717	2833	684

As we saw earlier, in general, adding imputed rent (approach (E)) to income has a clearly decreasing effect on a number of indices of inequality and poverty. The various columns of table M show the effects on overall inequality and poverty of including imputed rent in the various

groups of home owners and tenants. Remarkably, the consistent decrease in inequality and poverty is reflected in the effects of adding imputed rent to tenants only. When imputed rent is added the income of home owners only, in particular of owners with a mortgage, inequality and poverty show a clear increase.

Table M. Effects of including IR on inequality and poverty

	Baseline	Total	Owner-occupiers			Tenants		
			Total	own outright	on mortgage	Total	rent-free	other
Gini	0.246	0.242	0.249	0.246	0.250	0.240	0.246	0.240
Atkinson 0.5	0.050	0.048	0.051	0.050	0.051	0.048	0.050	0.048
Atkinson 1.5	0.155	0.146	0.158	0.154	0.159	0.144	0.155	0.145
MLD	0.105	0.100	0.107	0.104	0.107	0.099	0.104	0.099
Half SCV	0.119	0.115	0.120	0.119	0.121	0.114	0.119	0.114
DR: 90/10	3.00	2.96	3.10	3.00	3.09	2.88	3.00	2.88
DR: 90/50	1.71	1.72	1.73	1.71	1.72	1.70	1.71	1.70
DR: 50/10	1.75	1.73	1.80	1.75	1.80	1.69	1.75	1.70
FGT0	0.125	0.116	0.138	0.129	0.138	0.113	0.124	0.113
FGT1	0.023	0.021	0.025	0.022	0.025	0.019	0.022	0.019
FGT2	0.008	0.008	0.009	0.008	0.009	0.007	0.008	0.008
Proportional change in %								
Gini		-1.6	1.1	-0.1	1.3	-2.5	-0.1	-2.4
Atkinson 0.5		-3.4	2.0	0.0	2.6	-4.8	0.0	-4.5
Atkinson 1.5		-6.0	1.7	-0.5	2.5	-7.0	-0.3	-6.7
MLD		-4.4	2.0	-0.3	2.7	-5.8	-0.3	-5.5
Half SCV		-3.6	0.9	0.2	1.2	-4.3	-0.2	-4.1
DR: 90/10		-1.2	3.6	0.0	3.2	-4.0	-0.1	-3.9
DR: 90/50		0.5	1.1	0.2	0.7	-0.7	0.0	-0.6
DR: 50/10		-1.7	2.4	-0.2	2.5	-3.4	0.0	-3.4
FGT0		-7.8	10.4	2.6	10.1	-10.2	-0.7	-9.6
FGT1		-7.9	10.8	-0.5	11.7	-13.9	-0.5	-16.4
FGT2		-9.4	6.8	-1.4	8.4	-12.4	-1.2	-11.0

## 6. Conclusion

Most of the Dutch live in their own accommodation and have taken out a mortgage to finance the acquisition of their house. Of the tenants, only very few can be said to rent on a free market. Most tenants live in rent-controlled houses, even if their house is owned by a private institution. As a result of the very small market of rental accommodations, the rental equivalence approach to computing imputed rent is subject to problems. In this report we prefer to use the capital market approach.

Using this preferred approach, we find that imputed rent adds about 6% to disposable income, is most usually received in the highest income quintiles, and in general has an increasing effect on inequality and poverty. If, on the other hand, it is assumed that the market rent of all tenants is 25% above their actual rent, and a rental equivalence approach is used for the calculation of imputed rent for home owners, imputed rent also adds 6% to disposable income. However, in this case it is most usually received in the lowest income quintiles and has a decreasing effect on indicators of inequality and poverty. It should be noted that in this case, the number of home owners with positive imputed rent is limited by the fact that mortgage interest payments are deducted.

## References

Elsinga, M, C. Lamain and G. Mariën (2005), *Huurbeleid en stedelijke vernieuwing*, Onderzoeksbureau OTB, Delft.

Maddala, G. (1983), *Limited dependent and qualitative variables in econometrics*, Cambridge University Press, Cambridge.

VROM (2002), *Dutch rent policy*, Netherlands Ministry of Housing, Spatial Development and the Environment, The Hague, <http://www2.vrom.nl/Docs/internationaal/HURENDEFE.pdf>.

## Appendix: details on rental equivalence method

In this appendix we describe the approach to computing imputed rent by the rental equivalence method. Because the truly free housing market is very small in the Netherlands, we assume that the rent for all tenants can be seen to reflect the market rent if we add 25% of that amount. Obviously, in reality the difference between actual and market rent will differ between different houses, but we have no way to infer who is living in a house with a rent close to the market rent and who lives in a house with a rent more than 25% below the market rent. In particular, regional and quality differences cannot be taken into account as the data do not contain this information.

We estimate a model of the logarithm of the rent paid by tenants, depending on a number of variables reflecting characteristics of the accommodation as well as characteristics of the household in question. To take into account the effects of selectivity bias, we also estimate a probit equation to distinguish between households with nonzero rent and other households. This is used to calculate Mills lambda which is included as explanatory variable in the rent equation to obtain unbiased estimates of the coefficients of the other explanatory variables in this equation<sup>2</sup>.

The resulting equations are presented in table AA. Next to variables such as the number of rooms and the period in which the accommodation is built, we find significant coefficients for the (log of) household income, age of the head, the weight factor used and the marital status of the head. In the probit selection equation we also find significant coefficients for the employment status of the head and the type of accommodation (apartment vs single family house).

To obtain a prediction of the log(rent) that home-owners would pay for their accommodation we use the regression of log(rent) as discussed above. We also predict the standard error of the forecast, and, assuming a normal distribution, we draw an error term. After adding the error to the prediction of log(rent) we take the exponential to obtain a prediction of the rent to be paid by home owners. This is multiplied by 1.25 to take into account that market rent is 25% higher than actual rent, an estimate based on Elsinga et al (2005).

Table AA

Heckman selection model -- two-step estimates (regression model with sample selection)		
Number of obs	=	4323
Censored obs	=	2518
Uncensored obs	=	1805
Wald chi2(19)	=	1133.36
Prob > chi2	=	0
log (rent)	Coef.	Std. Err.
log(eq. income)	-0.609	0.178

<sup>2</sup> For a more elaborate description of this so-called Heckman correction for selectivity bias, see e.g., Maddala (1983).

log(eq. income)**2	0.064	0.014
age head /100	0.725	0.346
(age head /100) **2	-0.654	0.328
1 room	-0.478	0.066
2 rooms	-0.153	0.038
3 rooms	-0.056	0.027
built before 1945	-0.319	0.029
built between 1945 and 1960	-0.268	0.029
built between 1960 and 1970	-0.094	0.027
weight factor * hhsz /10000	0.163	0.044
married	0.132	0.026
constant	9.187	0.589
Selection equation:		
log (eq. income)	2.858	0.402
log (eq. income) **2	-0.277	0.029
age head /100	-1.804	0.893
(age head /100) **2	1.923	0.879
built before 1945	-0.468	0.057
apartment	1.116	0.057
weight factor *hhsz /10000	-0.372	0.099
married	-0.574	0.052
in paid employment	-0.337	0.079
constant	-5.490	1.396
Mills lambda	-0.056	0.035