The Tax Reform
and the Housing Market

Peter Englund*, Patric H. Hendershott**
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Summary

■ The 1990–91 tax reform had a major impact on the housing sector. The main elements were the reduction of the tax rate applicable to interest deductions, the increase in VAT, and the subsequent reduction of interest subsidies from 1993. We calculate the impact of these changes on the user cost of owner-occupied housing and on rents, and analyze the impact on income distribution, housing demand and real estate prices. Our results suggest that demand for owner-occupied homes decreased by around 15 per cent including the effects of the withdrawal of interest subsidies. We estimate that the short-run impact on market prices of owner-occupied homes was between 10–15 per cent, which is less than half the fall in real prices recorded between 1990 and 1993. The reform also led to sharply increased rents and a rise in vacant flats. Production of new dwellings fell by 80 per cent between 1991 and 1995.■

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A dominant aim of Swedish housing policy after World War II has been
to ensure that all households, even those with low income, can afford and
will demand dwellings of at least a certain minimum size and standard.
In order to achieve this goal two main instruments have been used: guar-
anteed low interest rates (through regulation or subsidies) and income de-
pendent housing allowances. In addition to these subsidies, there has also
been an implicit subsidy to homeowners due to the asymmetry of the in-
come tax system with interest payments fully deductible and imputed in-
come from housing taxed at a much lower rate. With accelerating infla-
tion in the 1970s the degree of subsidization grew rapidly, transforming
the system from a rather effective way of subsidizing the housing con-
sumption of a specific group of households into huge general subsidies to
housing consumption. Sweden can boast of a very high housing standard,
but this has come at a very large cost as the tax and transfer system has di-
verted resources away from other sectors into housing.

One of the main goals of the 1991 tax reform was to reduce the dis-
tortions in housing, and key elements such as the introduction of low
flat-rate capital taxation were directly geared towards this goal. In this
paper we try to assess whether the goal has been attained and discuss
what, if any, costs have been involved. After giving some background
facts about Swedish housing in Section 1 of the paper, we describe the
various taxes and subsidies before and after the reform in Section 2 and

translate them into their effects on the cost of housing consumption. Section 3 considers the impact effect of the reform assuming unchanged housing conditions. In Section 4 we combine our measures of cost change due to the reform with estimated demand elasticities for owner-occupied housing and forecast a 15 per cent decline in housing demand. The predicted demand decrease will not show up in lower housing consumption until after a likely lengthy period of subnormal construction activity. In the short run, the main effects will mainly be on new construction, rental vacancies and asset prices. We attempt to measure the magnitude of the real price fall for single-family homes in Section 5. Our conclusion is that the real price decline due to the reform is considerably smaller (less than half) than the observed 30 per cent real price fall between 1990 and 1993.

1. Basic facts about housing in Sweden

1.1. The housing stock and tenure distribution

There are three main forms of tenure in the Swedish housing market. Around 40 per cent of all households live in one-family houses, almost all *owner occupied.* Another 45 per cent live in rental apartments. Slightly more than half of the rental apartments are owned by the public sector through non-profit municipal housing companies, typically only one in each municipality. Fifteen per cent of all households live in the tenant-owner or *cooperative sector,* where apartment buildings, or complexes of row houses etc. are owned by cooperative housing associations. Each household owns a share in the association with a right to occupy a certain dwelling. The shares are traded in an active, unregulated secondary market. Table 1 shows how the distribution of households across tenure has changed between census years after World War II. Note in particular the sharp drop in private rental housing. Changes in the composition of tenure are matched by significant differences in vintage distribution across tenure (Table 2).[1] In 1989 only 12 per cent of all public rental dwellings had been constructed before 1951, in contrast to more than half of the private rental housing stock.

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[1] The numbers in Table 2 differ somewhat from the corresponding census data. This is probably due to sampling errors in the Housing and Rent Survey.

Table 1. Distribution of households across tenure, 1945–1990 (%)

Year	Private rental	Public rental	Coopera-tive	Home ownership	Total
1945	52	6	4	38	100
1960	43	14	9	34	100
1970	30	23	13	34	100
1980	21	24	14	41	100
1990	20	25	15	40	100

Source: Housing Census, different years, Statistics Sweden.

Table 2. Dwellings per production period and form of tenure, 1989 (%)

Production period	Private rental	Public rental	Coopera-tive	Home ownership	Total
–1951	54.1	11.9	21.2	32.1	31.0
1951–70	33.8	54.9	51.7	29.2	39.3
1971–80	6.9	24.0	14.2	30.3	21.2
1981–88	5.3	9.2	13.0	8.3	8.6
Total	100.0	100.0	100.0	100.0	100.0
(share)	22.7	22.4	14.9	40.0	100.0

Source: Housing and Rent Survey, 1989.

Table 3. Age of household head and tenure, 1989 (%)

Age	Private rental	Public rental	Coopera-tive	Home ownership	Total
–30	34.4	34.9	18.9	11.9	100
31–40	20.3	20.7	11.5	47.5	100
41–50	10.2	17.1	11.2	61.5	100
51–60	15.4	17.5	12.2	54.8	100
61–	28.9	23.2	18.1	33.5	100

Source: Housing and Rent Survey, 1989.

Tenure varies with the age of the head of the household (Table 3). The home ownership rate follows an inverted U profile where both the young and the old are less likely to be owners. The decline in old age contrasts markedly with the U.S., where ownership continues to rise for individuals in their seventies. There are also differences across household types (Table 4) with couples four times more likely to be homeowners than single persons. Moreover, the probability of owning increases if there are

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Table 4. Household type and tenure, 1989 (%)

Household type	Private rental	Public rental	Coopera-tive	Home ownership	Total
1 adult without children	35.9	31.8	20.1	12.2	100
1 adult with children	24.6	46.0	11.1	18.3	100
2 adults without children	16.1	16.3	14.5	53.1	100
2 adults with children	8.0	8.6	6.8	76.6	100

Source: Housing and Rent Survey, 1989.

Table 5. Tenure and household income per consumption unit, 1989 (%)

Income per consumption unit (1000 SEK)	Private rental	Publicr ental	Coopera-tive	Home Ownership	Total
0–54	30.1	31.3	14.4	24.0	100
54–78	19.7	29.2	16.7	34.3	100
78–95	23.9	26.0	11.9	38.3	100
95–112	20.6	21.5	10.9	46.9	100
112–130	21.7	19.0	14.1	45.2	100
130–159	23.5	20.3	14.1	42.1	100
159–187	23.8	22.2	14.3	39.7	100
187–210	24.2	18.5	16.4	41.0	100
210–240	19.8	21.9	17.4	40.9	100
over 240	20.1	15.3	18.7	45.9	100

Note: Income is measured as household disposable income per equivalent consumption unit based on an equivalence scale applied by Statistics Sweden. Two adults comprise 1.61 units and one adult and one child, 1.4 units, etc. The income limits in the table are those of the deciles of the income distribution.

Source: Housing and Rent Survey, 1989.

children in the household. Single parents have a higher propensity than other groups to choose rental dwellings, particularly publicly owned. This reflects a higher proportion of relatively poor households in this category. However, the correlation between household income and tenure is not very pronounced (Table 5). Poorer households (the three lowest deciles) are more likely to be found in the public rental sector than other groups. They are also less likely to be homeowners. There is little difference between medium and high-income households in this respect. Cooperative housing is less common among median-income than among either low or high-income households.

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Table 6. Household types and dwelling size, 1989 (%)

| Household type		Dwelling size (room units excluding kitchen)					Total	Share
Adults	Children	1	2	3	4	5+		
1	0	22.8	43.8	22.5	7.4	3.5	100	40.5
1	1	1.5	17.8	57.1	14.9	8.8	100	3.3
1	2+	0.0	3.5	27.9	48.0	20.6	100	1.9
2	0	1.8	16.8	30.0	27.0	24.3	100	31.1
2	1	0.2	3.1	22.6	32.3	41.8	100	9.2
2	2	0.0	0.9	12.8	30.5	55.8	100	10.1
2	3+	0.0	0.0	9.0	28.9	62.0	100	3.9
Total		9.9	24.0	24.6	20.0	21.6	100	100

Source: Housing and Rent Survey, 1989.

Household distribution across dwelling size matches household size quite closely (Table 6). In an international comparison there is little variation in space per person across households.[2] As noted from Tables 4 and 5, small and poorer households typically live in rented or cooperative dwellings, normally in multifamily houses. Most large dwellings are in single-family (owned) residences, and virtually all small dwellings (1–3 rooms + kitchen) refer to rental and cooperative housing.

1.2. Prices and rents

Real house prices in Sweden show marked cyclical patterns (Figure 1). For one-family dwellings, boom periods in the second half of the 1970s and late 1980s were followed by sharp downturns. Real prices are negatively correlated with the user cost of housing (cf. Table 7). The price fall between 1980 and 1985 coincided with an increase in user costs particularly for high-income owner-occupants that were hit by the limitations on interest deductibility after 1982. Between 1985 and 1990, when real prices rose, user costs fell for the same groups and the economy boomed. The drop in prices after 1991 again coincided with a sharp increase in user costs, now resulting from the 1991 tax reform as well as a declining

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[2] See Boverket (1993a), p. 39.

Figure 1. Real prices of owner-occupied one-family houses and rental apartment buildings, 1970–1993

—♦—One-family houses   —□—Apartment buildings
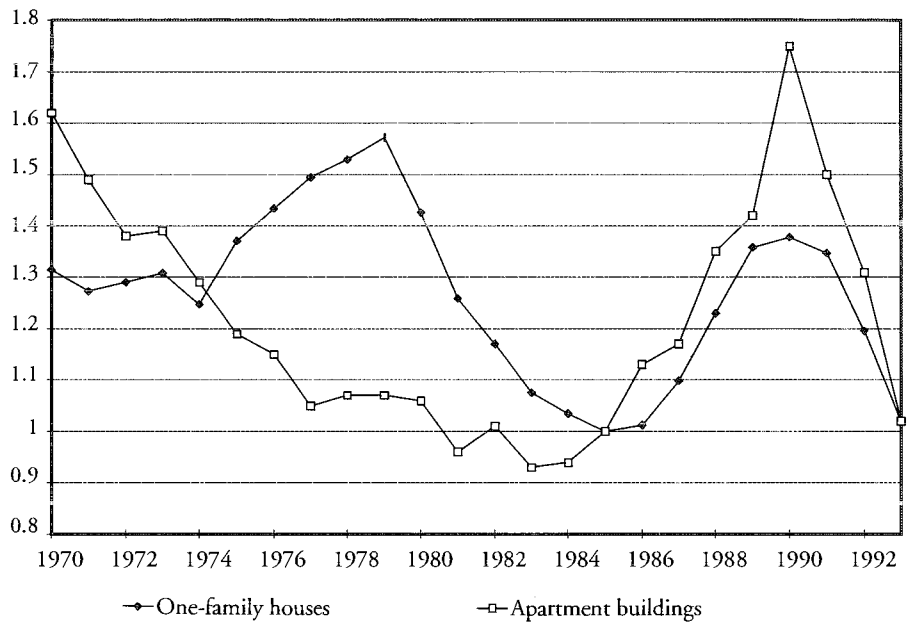
Source: Statistics Sweden, SmP. Figures for multi-family buildings before 1981 are based on the average (unweighted) ratio of transaction prices to assessed values (from *Bostads- och byggnadsstatistisk årsbok,* 1992, Table 7.2). Nominal price indices were converted into real indices using the consumer price index.

economy.[3] Prices of apartment buildings fell throughout the 1970s, and then stated rising, strongly after 1987, followed by a sharp rebound after 1990. A likely partial explanation for the increase during the 1980s is the gradual relaxation of rent regulations. The boom in the late 1980s was also associated with a sharp rise in real building costs between 1986 and 1989.

As expected, prices of rental apartment buildings and rents are closely correlated. Real rents started to increase around 1985, followed by a

[3] There is a slight timing problem here. In the early 1980s prices started to fall well before the tax reform was enacted, while the drop in prices during the 1990s is more closely linked in time with the tax reform. This is counter to the fact that the reform of 1982–85 was regarded as unexpected, whereas the contents of the reform of 1990–91 were known well in advance.

Figure 2. Real rents in public rental housing (3 room and kitchen), 1970-1994
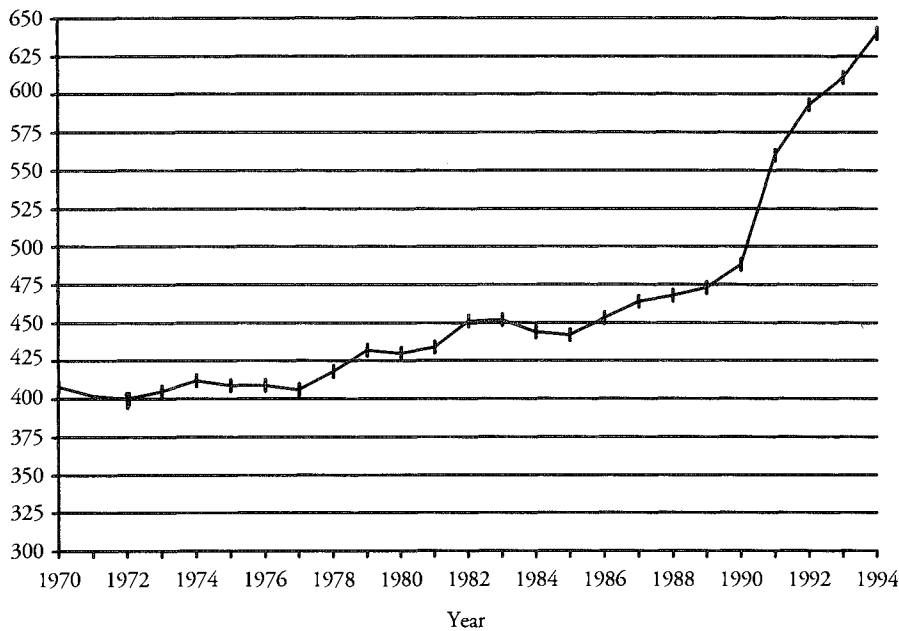
Note: Rent is measured in SEK per sq. meter in fixed 1994 prices.
Source: Housing and Rent Survey, Statistics Sweden, different years.

sharp 20 per cent increase between 1990 and 1992 (Figure 2).[4] The explosion in rents between 1989 and 1992 is at least partly due to the reduction in interest subsidies that was embedded in the tax reform. In Section 3 we discuss whether the tax reform is sufficient to explain the entire increase in rents, or whether explanations also have to be sought in other places.

2. Taxes and subsidies

Housing consumption has been subsidized through three main channels for a long time: interest subsidies, housing allowances, and favorable tax treatment of owner-occupiers. The magnitude of the sum of subsidies in terms of government cash flow increased rapidly from 1.7 per cent of

[4] The diagram refers to the *stock* of three-room apartments, the size and quality of which have varied slightly over time.

GDP in 1970 to 3.9 per cent in 1980 – a level that was more or less maintained throughout the 1980s (3.7 per cent in 1990); see Englund (1993). The economic effects of these subsidies may be best understood by describing them in terms of their impacts on household budget sets, and clarifying whether they have price effects at the housing choice margin or only income effects. In this section we attempt such a description of the system as of 1989, i.e., immediately before the recent reform. In principle the same system had existed since the mid 1970s.

2.1. Taxes

The tax system treated housing differently depending on the mode of tenure. *Owner-occupants* were taxed in four different ways. First, imputed income – calculated as the product of an assessed value of residential property and an imputation rate on a progressive scale – was added to other taxable income. During most of the 1980s the imputation rate was 2 per cent for assessed values up to SEK 450,000 and increased to 8 per cent at the margin above SEK 750,000. A vast majority of all houses, 97 per cent, were in the 2 per cent category. The average ratio of assessed value to market price for all houses transacted was 70 per cent when new assessed values came into effect in 1981. The ratio fell gradually to 40 per cent in 1989, when new assessed values brought it up to 52 per cent in 1990. The combined effect of this system was to make imputed income around one per cent of the market value for most households.

Second, a separate property tax was introduced in 1985, but at a sufficiently low rate that it did not add much to the combined taxation of income from owner-occupied homes. Third, a tax was levied on net taxable wealth, calculated by evaluating real estate at an assessed value, and debt and bank holdings at full nominal value. The wealth tax was progressive, starting at 1.5 per cent of net wealth exceeding SEK 400,000 and rising to 3 per cent at the margin for wealth in excess of SEK 1,800,000. There were large loopholes involved in the calculation of taxable wealth, and the total receipts from the wealth tax in 1989 were SEK 3.8 billion, corresponding to 0.2 per cent of household wealth evaluated at market prices.[5] Fourth, capital gains were taxed upon realization, with the net gain added to other taxable income. In practice, the effective tax rate was very low in

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[5] Source: *Statistics Sweden* (1994, Table 4.18).

most cases due to a combination of factors: (i) an interest-free tax credit due to the postponement of tax payments until realization, (ii) the further postponement due to rollover provisions, (iii) extra deductions in calculating taxable capital gains, (iv) taxation based on real capital gains until 1981, when a partially nominal system was introduced. As a result, the effective capital-gains rate was usually zero for most households; see Agell and Södersten (1982). Exceptions were short holding periods during times of rapidly rising housing prices, as the late 1980s.

While housing taxation had important real elements, primarily by computing taxable income by a fixed imputation rate times assessed value, other rules of capital taxation were nominal. In particular, interest income was fully taxed and all interest payments fully deductible (prior to the reform of 1982–85; see below). The effective tax rates on alternative investments like common stock were lower because capital gains were taxed on realization, and at a lower nominal rate after a longer holding period (two years in the case of quoted shares). The overall effect was to make the user cost of owner-occupied housing much lower than it would have been in the absence of taxation, i.e., in effect a tax subsidy that was increasing with the marginal tax rate. This became a serious policy issue in the 1970s when Sweden drifted into a steeply progressive income tax schedule. In 1980 the marginal tax rate of the median homeowner was 51 per cent and a fifth of all homeowners paid more than 79 per cent in marginal tax.

A first step towards reforming the system was taken in 1982–85 by reducing the tax rates and modifying the full deductibility of interest payments in the upper tax brackets. When it was fully implemented after 1985, the reform meant that net interest payments (i.e., net of imputed housing income) could only be deducted at a maximum rate of 50 per cent, even if other income was taxed at higher marginal rates. This contributed to decreasing the tax subsidy to owner-occupied housing. At about the same time the capital-gains tax was changed so as to be based on the full nominal gains for the first four years after purchase. Even though this led to high effective tax rates with short holding periods, it did not alter the general picture of negligible effective taxation of capital gains for most households. In what follows we will disregard capital-gains taxes.

The resulting development of the rental price of owner-occupied housing may be summarized on the basis of the following user cost expression:

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$$uc = P[r(1-\tau) + \tau\alpha\gamma + \theta(\gamma-1) - \pi^e + m] \qquad (1)$$

where user cost (uc) is expressed as the price index of owner-occupied homes.(P) times the user cost in per cent of house value, the term in square brackets. This equals the nominal interest net of marginal tax, $r(1-\tau)$, plus taxes on imputed housing income and on wealth (including housing) minus expected nominal capital gains (which are assumed untaxed), π^e, plus operating and maintenance costs required to maintain constant quality, m. The tax on imputed income is calculated by applying a coefficient α to the tax assessed value, which is typically only a fraction γ of the market value of the house. The wealth tax is applied at rate θ, with houses evaluated at their assessed value, and debt and many alternative forms of investment at full nominal value. This means that tax payments change by $\theta(\gamma-1)$ when a krona of wealth is transferred from financial assets to houses,[6] which is negative since γ is typically less than unity, i.e. the wealth tax acts to reduce user cost.

With several tax parameters varying across households, a large number of user costs may be computed. The three first columns of Table 7 give marginal user costs since 1980 for owner households in the 10th, 50th and 90th decile of the distribution of marginal tax rates (assuming α and θ to be at their minimum values). The next two columns apply to households facing maximum values of both α (0.08) and θ (0.05), and the maximum value of α but no wealth tax, respectively. The next column applies to those facing the maximum rate on interest deductions. The figures are based on actual nominal interest rates on five-year housing loans, but disregard value added taxes and interest subsidies to post-1975 vintages (see Section 2.2). Expected capital gains are set at 7.5 per cent, equal to the average yearly nominal price increase during the 1980s, and the sum of operating costs, maintenance and depreciation is assumed to be 5.5 per cent.

Generally speaking there is more horizontal than vertical variation in this table, i.e., large differences across households, especially in the early 1980s but relatively little change over time. In the early 1980s the user cost in high-tax brackets (the 90th percentile) was more than 6 percentage points less than that of low-income households (the 10th percentile). After the tax reform of 1983–85, the rightmost column is relevant for most high-income households, except those which chose to finance housing out of equity rather than debt at the margin. Households in the 90th

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[6] This presumes that houses are financed out of fully taxed financial assets at the margin.

Table 7. Marginal user costs on owner-occupied housing as a percentage of house value, 1980-1990

Year	10th min α $\theta=0$	50th min α $\theta=0$	90th percentile min α $\theta=0$	max α $\theta=0$	max α max θ	Deduction limit	Interest rate
1980	7.81	5.23	1.72	3.73	2.14	–	13.6
1981	9.22	6.14	2.44	5.81	5.10	–	15.5
1982	8.68	5.80	2.41	5.73	5.00	–	15.0
1983	8.12	5.90	3.04	6.11	4.94	2.75	14.4
1984	7.42	5.37	3.05	5.90	4.95	3.89	13.4
1985	7.78	5.76	3.28	6.01	4.98	5.62	13.8
1986	6.48	4.70	2.59	5.25	4.13	4.70	11.8
1987	6.77	4.95	2.81	5.13	3.80	4.99	12.5
1988	6.24	4.51	2.22	4.26	2.67	4.55	11.9
1989	6.31	4.78	2.12	3.86	2.06	4.94	12.2
1990	8.22	5.58	3.74	3.74	2.32	7.27	14.8

Note: The user cost of housing is measured according to the term in square brackets in (1) evaluated at actual housing consumption. The percentiles refer to the distribution of marginal tax rates across all owner households. The columns for max α and max θ refer to households in the 90th percentile of marginal tax rates. The interest rates are yearly averages of loans from mortgage institutions.

Source: HINK data bases and own calculations.

percentile who do this are likely to be older and often subject to a high imputation rate α. The reform implied a considerable reduction in the spread of user costs with the difference between the 10th and 90th percentile (rightmost column) decreasing to under 2 percentage points. The progressivity of the imputation rate α is rather important; the user cost for ninth-decile owners (max α) of the most expensive houses is about the same as that of median owners of standard homes. The overall effect of the wealth tax is to reduce user cost by around one percentage point.

The cost of *rental* housing is affected only to a limited extent directly by the tax system. Rents paid for rental apartments are by and large set by the non-profit public housing corporations. Due to special legislation, they have a leading role in determining the general level of rents in accordance with their zero-profit constraint, thereby setting a cap on rents in privately owned apartments (Turner, 1988). In practice, public housing companies pay virtually no taxes, which implies that apartment rents in both private and public housing on average reflect pre-tax costs.

The cost of *cooperative housing* is a more complicated matter. A co-op association effectively pays no taxes, and there is no taxation on the imputed income from owning a co-op share. This implies that the household, through monthly fees, bears the full interest burden on loans held by the housing association but benefits from the tax deductibility of privately held loans. This gives strong incentives for the housing association not to have any loans. For houses built or renovated after 1975, this tax advantage has been counteracted by interest subsidies only applying to loans held by the association. This means that net housing costs normally would be minimized if the housing association had no loans other than those entitled to interest subsidies with all other debt held by the households. In practice, however, the debt structure is far removed from this simple pattern. Absent a good theory to explain leverage, it is difficult to make precise statements about the impact of the tax system on co-op housing costs, except that the effect should in some sense be intermediate between the effects on the rental and owner-occupied sectors.

2.2. Interest subsidies, VAT and housing allowances

Most new housing units are entitled to interest-subsidized loans according to a system that has been in effect since 1975 (and was applied retroactively to residential property constructed prior to 1975). In short, long-term government-guaranteed mortgage loans covering 95 to 99 per cent of approved building costs are granted to all new units and major renovations that comply with certain government regulations on maximum and minimum standards. The system acts both as a general subsidy to recent vintage buildings and as a way of handling the "tilt problem" of mortgage payments, i.e., the fact that standard schedules for amortization and interest payments imply disproportionately high real payments during the first years, which may give rise to liquidity constraints (Kearl, 1979 and Hansson, 1977).

The tilt problem has been perceived as particularly important for the local-government housing companies, which have no equity apart from hidden values created by past capital gains on the existing stock, although these companies have been unwilling or unable to use these gains as a basis for second mortgages. Since the stock of buildings in these companies is heavily concentrated in post-war vintages (particularly from the 1960s and 1970s; see Table 2), many companies would have faced severe liquidity problems in the 1970s and 1980s in the absence of interest subsidies,

which presumably would have forced them to set rents temporarily above long-run costs.

Subsidized interest rates start at very low levels and are increased year by year until they reach the market rate. In 1989 loans to multi-family apartment buildings started at 2.7 per cent interest with 0.25 percentage point yearly increases until they reached the market interest rate. The corresponding rate for one-family houses was 4.9, with a 0.5 per cent increase per year. (See Table A1 for details on guaranteed interest rates over time and vintages.)[7] The lower interest rate for apartment houses was aimed at offsetting the favorable tax treatment of owners. The magnitude of these subsidies may be calculated as the discounted present value of the difference between the market interest rate and the subsidized rate. Assuming the market rate to be 12 per cent and discounting at an after-tax rate of 6 per cent (50 per cent marginal tax rate) yields a subsidy value (net of tax deductions) for homeowners of 20.1 per cent of approved building costs according to 1989 rules.[8]

Apart from the taxes levied on owners, housing costs are affected by *value-added taxes* (VAT). The VAT rate for building and construction was 60 per cent of the regular VAT rate, and various housing services such as heating, sewage and garbage collection were exempt from VAT. The effects of interest subsidies and VAT on user costs may readily be expressed by eq. (1) assuming that they are fully capitalized in house prices (see Bourassa and Hendershott, 1992).

Further, there is a scheme of housing allowances mainly applying to low-income families with children. The allowances depend on household income and housing costs. They cover a certain percentage of the housing costs between a lower and an upper limit, thereby creating a budget constraint with two kink points. For most households, housing costs exceed the upper kink point, implying that the allowances have no price effect at the margin, i.e., they only act as an income transfer. Housing allowances are also income dependent. For income in excess of a certain low limit, slightly below the minimum market full-time income, they are reduced by 20 per cent of income above the limit.

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[7] Tables A1–A9 are available in the working paper version of this paper, Englund *et al.* (1995).

[8] Basing the calculation on a lower market interest rate of 8 per cent would reduce the subsidy value by two thirds; see further calculations by Jacobsson (1995) and Hendershott, Turner and Waller (1993).

2.3. The 1990–91 tax and subsidy reform

Housing subsidies remained substantial throughout the 1980s. While the reform of 1982–85 reduced the favorable tax treatment of owner-occupied housing, the burden of the interest subsidies on government finances increased continually, with sustained high nominal interest rates and new vintages included in the system. Given this and the weak (or non-existent) case for a *general* subsidy to housing consumption, deep cuts in the subsidies to housing were to be expected. The following changes were enacted as of 1991.

A separate tax was introduced on net capital income, after interest deductions, at a flat 30 per cent rate. Further, an increase in the property tax rate to 1.2 per cent (and to 1.5 in 1993) was substituted for the tax on imputed income, which was abolished. (See Table A2 for exact information on the development of property taxes over time.) Under the new tax system user costs (as a percentage of house value) are the same for all owner-occupants not paying wealth tax.

In order to preserve parity between homeowners and renters whose rents are not directly affected by taxes, interest subsidies were reduced for rental housing. The first-year guaranteed interest rate was increased from 2.7 percent to 3.4 percent in 1991. As a sequel to the tax reform, there was a further general cut in *interest subsidies* in 1993, raising the first-year guaranteed interest rates, for renters to 5.4 and for homeowners to 7.2 per cent, with announcements of further cuts in future years (see Table A1). Expressed in present value terms the subsidies for new owner-occupied houses according to the 1993 rules amount to 11.2 per cent of building costs, i.e., a reduction by 9 per cent of building costs relative to the rules of 1989–91 (cf. Section 2.2). This calculation is based on a 12 per cent market interest rate and an 8.4 per cent discount rate (after 30 per cent tax).[9]

The *value added tax* on building material was increased by 12 per cent to reach the same level as for other goods and services. This corresponds to a 9.4 per cent increase in building costs (see SOU 1989:35, p. 163). Furthermore expenditures on heating and other housing services formerly exempt from VAT were now taxed at the full rate, which may be translated into an increase of user costs by 0.45 percentage points. A temporary

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[9] Interest rate subsidies could be included in the user cost expression as in Bourassa and Hendershott (1992), in which case *P* would be the price index for new houses, with the relative price of older houses reflecting subsidy differences (see also Section 5.3).

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10 per cent *investment subsidy* was introduced in 1991 to offset the effect of the increased VAT on building costs. It was reduced in 1992 and abolished in 1993. Finally, the rollover provision for *capital-gains taxes* was abolished, although it has been reintroduced with some modifications in 1995.[10]

The reform also contained other changes in taxes and subsidies. *Housing allowances* were increased with the intention of making the overall tax and subsidy reform neutral with respect to income distribution; see Björklund *et al.* (1995). From the point of view of housing demand, the most important change was that the upper housing-cost limit to qualify for housing allowances was increased by 35–40 per cent, with the explicit intention of bringing the limit in parity with the rents of new apartments. This resulted in a large increase in the fraction of housing-allowance recipients with housing costs below the upper limit. In 1993 around 30 per cent of all families with children had housing allowances. Of these, 58 per cent lived in rental housing, 17 per cent in cooperative dwellings and 25 per cent in owner-occupied homes. Table 8 expresses the mean housing cost in 1993 as a percentage of the upper qualifying limit. It demonstrates that the mean, for all categories, is quite close to the limit. This suggests that many households are now in the neighborhood of a kink on their budget constraint. For this rather limited category of households, i.e., those receiving housing allowances, the marginal price of housing may in fact have decreased following the tax and subsidy reform.

Summing up, the reform affected user costs through four different channels: First, the changes in the income tax code enacted from 1991 led to a general increase in user costs from between 2 and 6 per cent of house value according to Table 7 to slightly above 7 per cent according to eq. (2). Second, the VAT on heating and other housing services adds another 0.45 per cent to the user cost. These two channels were part of the 1991 reform package and contributed to increasing user costs to 7.61;

$$uc = P[0.7r + 1.2\gamma - \pi^e + m], \tag{2}$$

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[10] The effects of capital-gains taxes on mobility are analyzed by Lundborg and Skedinger (1995).

Table 8. Average housing costs in 1993 among recipients of housing allowances as a percentage of the upper qualifying cost limit

	Renters	Coop owners	Owner occupants
Two adults:			
1 child	92	114	105
2 children	90	110	102
3 or more children	86	99	92
One adult:			
1 child	89	102	100
2 children	87	100	94
3 or more children	84	97	88

Source: Boverket (1993b) Table A3.

which equals 7.61 at $r=12.2$[11], $\gamma=0.52$, and $\pi^e - m = 1.55$[12]. This implies a considerable increase for most households compared with the figures in Table 7.

Third, changes in VAT on construction and interest subsidies may be included in the user cost expression through their effects on the equilibrium house price P. This channel only operates from 1993 when the investment subsidy introduced in 1991 was removed and interest subsidies were reduced. The combined effect was, according to our calculation, to increase P by 20.6 per cent. Including this yields a user cost of 7.95 per cent of pre-reform house prices. Fourth, housing allowances were increased, but they only have income effects and do not affect user costs for most households.

3. Impact effects of the tax reform

In this section we analyze the immediate impact of the reform on expenditure, given households' choice of housing at the time of the reform. The impact analysis is based on a micro simulation model with a data set of 8,000 dwellings from the 1989 Housing and Rent Survey; see Berger

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[11] This is the same interest rate as the average for 1989 used in Table 7. The observed average interest rate on housing loans for 1991 was slightly higher, 12.5 per cent.
[12] This deducts an extra 0.45 per cent in maintenance costs due to the VAT. The underlying assumption that expected house inflation is 7.5 per cent, which may not seem realistic with the lower inflation rate after 1991, is made to maintain comparability with earlier years.

and Turner (1992) for a description of the model. We took the household pattern and housing choices observed in 1989 as given except for constant population growth, and assumed new construction of 30,000 dwellings per year to match population growth. Based on this and an assumed growth of one per cent real income per year, we computed expenditure patterns in 1989, with the 1989 rules, and in 1993, 1995 and 2002, using the 1991 rules. Even though we only treated impact effects, which are most naturally regarded as "short run", this long-run perspective is essential, since many of the changes in the finance system have a time dimension. Note also that we restrict our attention to the 1991 reform, thereby excluding the effects of the cut in interest subsidies (the so-called Danell system) enacted in 1993. The assumptions used in the long-term perspective are presented in Table A3.

A key factor in the analysis is the transmission from costs to rents. We interpret the rent-setting mechanism in Sweden as a direct pass-through from costs to rents in the public sector, with private sector rents accommodating. This presumes that demand factors are not considered, which is a natural assumption in periods of housing shortage for publicly owned non-profit companies. Assuming direct pass-through may seem more questionable in a situation with a growing number of vacant dwellings, but given the huge rent increases in the early 1990s we believe it is warranted as a description of short-term behavior, at least during these years. Over time we would expect to see modifications towards a more market adapted rent structure.

It has been estimated that 71 per cent of the increase in real rents between 1989 and 1991 was due to changes in VAT and the real estate tax.[13] This accounts for 13 out of the 18 per cent increase between these two years. The impact of reduced interest subsidies can be computed on the basis of an average loan per square meter of SEK 2100 (according to "*Intäkts- och kostnadsundersökningen*" for 1991). With an average increase in interest of one percentage point, this adds another 3 percentage points. We conclude that cost changes due to the tax reform account for the lion's share (16 out of 18 per cent) of the rent increase between 1989 and 1991.

In simulating the impact effects we assumed that changes in taxes and subsidies, due to the tax reform and due to the escalation of guaranteed interest rates over time, are completely passed on to tenants. The calcula-

[13] Boverket (1994) p. 120.

Table 9. Net housing expenditure in per cent of disposable household income by tenure in 1989, 1993, 1995 and 2002

Year	Private rental	Public rental	Coop share	Home ownership	Total
1989	23	22	21	25	23
1993	29	28	28	32	30
1995	30	30	31	32	31
2002	32	34	35	35	34

Note: All housing costs are calculated as net expenditures (outgoings), after allowances and amortizations for owners.

tions for owner-occupants were based on the actual indebtedness of the households in 1989, which is assumed to evolve over time following standard amortization patterns. In Table 9 we present the development of housing expenditures under these conditions expressed as a fraction of household disposable income. Income calculations follow the conventions employed by Statistics Sweden, i.e., the value of housing services received from owning a home is not treated as part of income. The expenditure measure includes neither the opportunity cost of equity nor capital gains as a proper cost measure would.

We see that, as intended, the immediate impact is quite neutral across modes of tenure. Expenditure increases by 6–7 percentage points for all categories. This brings housing expenditure up to around 30 per cent of disposable income, which is quite a high share by international standards. After 1993 housing expenditure continues to increase mainly as a result of "automatically" decreasing subsidies as the housing stock ages. This is particularly pronounced for co-op shares and the public rental sector, which have the largest proportion of recent-vintage dwellings.

The variation in the housing expenditure/income ratio around the average values within each tenure is also large (Table 10). In fact, the model indicates that a substantial share of the population would spend well beyond 50 percent of disposable income on housing in the year 2002. But this number is conditional on unchanged housing consumption, which is a very unrealistic assumption over this long horizon. These high numbers should be seen as indicators of the strong incentives to adjust housing consumption as a result of the tax reform.

In our representation of the tax reform in this section most household groups receive large income gains, reflecting that the reform was not fully financed. This shows up in Table 11 which indicates, for households with

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Table 10. Households divided according to housing expenditure in per cent of disposable income, 1989, 1993 and 2002

Share of housing costs	Private rental			Public rental			Coop share			Home ownership			Total		
	89	93	02	89	93	02	89	93	02	89	93	02	89	93	02
0–10	10	7	7	10	6	5	14	5	3	5	2	2	9	5	4
10–20	37	24	23	41	27	19	44	30	18	36	22	17	38	25	19
20–30	33	35	29	33	35	27	28	35	27	37	35	31	34	35	29
30–40	14	19	18	12	19	21	9	17	22	14	20	23	13	19	21
40–50	4	9	11	2	7	11	3	5	13	5	9	12	3	8	12
50–	3	7	13	2	6	16	2	7	17	4	11	15	3	8	15
(share)	(23)			(23)			(15)			(39)			(100)		

two adults and children, that large increases in housing consumption were more than compensated by increases in disposable income, resulting in more money to spend on other goods. In both absolute and relative terms the gains were increasing with household income. Non-housing expenditure increased by 1.7 per cent of disposable income in decile 2 compared with 6.1 per cent in decile 9. This pattern is in line with results in Eklind *et al.* (1995) based on the HINK data base.

Table 11. Changes in disposable income, housing and non-housing expenditure for different income deciles. Households with two adults and children

Income decile (1 000 SEK)	Change in disposable income	Change in housing expenditures	Change in non-housing expenditures
–161	1,072	2,825	–1,753
161–181	7,629	4,735	2,894
181–194	11,034	6,496	4,539
194–204	12,066	6,742	5,324
204–215	13,445	7,303	6,143
215–225	14,219	7,518	6,701
225–238	17,226	8,134	9,092
238–252	19,018	8,362	10,655
252–283	22,632	8,554	14,078
283–	32,975	9,376	23,599
Average	15,147	7,006	8,140

Note: Change in non-housing expenditure equals change in disposable income minus change in housing expenditure.

4. Effects on demand for owner-occupied housing

One of the main purposes of the tax reform was to contribute to a reallocation of capital away from housing towards other sectors of the economy. In previous sections we analyzed the impact of the reform on housing costs and thereby on the incentives to shift resources out of the housing sector. We now ask how large an impact these cost changes are likely to have had on demand. Estimates of the demand for housing have to be treated with care since housing markets are characterized by large transaction costs. In the rental market direct moving costs are low but rent regulation prevents an unrestricted choice of dwelling. For owner-occupied housing there are meaningful market prices but the observed consumption pattern reflects rather substantial moving costs.

Rent regulation results in a segmentation into submarkets with different rent levels based on location. Access to submarkets is restricted and costly and is gained by seniority and various "unorthodox" methods.[14] However, once a household has gained access to a certain submarket, there is considerable scope for choosing the level of housing consumption. In particular, the rent law permits an exchange of dwellings. In a study for the Stockholm metropolitan area Berger and Turner (1995) assume that the observed consumption pattern reflects free choices of dwelling within a particular submarket, and estimate a demand relation based on this. Their results suggest that the tax reform had rather small effects on demand. The mean apartment size is predicted to decrease by only three per cent. The mean conceals rather large changes in the composition of demand with a 20 per cent increase in the demand for one-room-and kitchen apartments and a 10 per cent decrease in the demand for three rooms and kitchen. Interestingly the demand for larger apartments is found to be insensitive to the tax reform.

In this study we focus on owner-occupied housing using data from the HUS panel data base. We think of "housing services" as a homogeneous good produced by the owner-occupant using as inputs his own time, maintenance and operating expenditures, and various characteristics embodied in the house. A unit of housing services is defined as the services embodied per krona house value in a certain base region,[15] assuming that

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[14] Brzeski (1988) explores the mechanisms that exist in Stockholm.
[15] Because housing prices vary across regions, the per unit price of housing services also varies.

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the owner-occupant makes optimal maintenance and operating decisions. Housing is heterogeneous with respect to the forms of ownership (modes of tenure) under which it is produced, which are treated differently by the tax system. With this in mind it is natural to view housing choice as a two-stage decision problem: (i) choice of mode of tenure and (ii) choice of "housing quantity" conditional on tenure.

For each mode of tenure we can define the per-unit user cost of housing consumption for each household in a micro data base. For *owner-occupancy* the definition is given by eq. (1), i.e., user cost equals the real rental cost of capital net of tax plus maintenance and operating costs. In previous studies, Brownstone, Englund and Persson (1985, 1988) and Brownstone and Englund (1991) exploited the cross-section price variation to estimate tenure choice and the demand for housing on Swedish household data (from the 1978–79 HINK and the 1984 HUS surveys, respectively) and used the estimated demand systems to predict the impact of tax reforms. In particular Brownstone et al. (1985) studied the 1983–85 tax reform, which was a precursor of the more recent reform. Here we use similar methods on data drawn from the 1984 and 1986 HUS surveys.

The *user cost of owner-occupied housing*, eq. (1), may be written $P \cdot MP$, where P is the regional house price index and MP is the marginal price (user cost) per krona house, i.e. the term in square brackets. We disregard wealth taxes (i.e., $\theta = 0$) and assume $\pi^e = m$.[16] In the calculation of user costs, P varies across households due to regional price differences. MP varies both due to regional differences in the ratio between assessed and market values γ and, more importantly, due to different marginal tax rates. MP also varies for the same household with the amount of housing consumed; with a more expensive house and more interest deductions (or less taxable capital income) the homeowner will move into a lower marginal tax bracket τ, and a higher value of the marginal imputation rate α.

The non-linearity of the budget constraint for homeowners implies that central economic variables like price and income are endogenous,

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[16] In describing the development of user costs in Table 1 we set $m = 5.5$ per cent and $\pi^e = 7.5$ per cent, reflecting average nominal price increases during the 1980s. The assumption made in our econometric work $(m = \pi^e)$ reflects a lower assumed value of π^e based on the smaller nominal price increases during the first half of the 1980s. Presuming that capital-gains expectations are the same for all households the choice of value for π^e is equivalent to the choice of functional form, a matter on which it is difficult to hold strong views.

posing econometric problems. We handled these by evaluating the budget constraint for owners at two exogenous points: one with no consumption of owner-occupied housing and one based on assumed home ownership for which pre-tax interest payments at 12 per cent interest amount to half of the disposable income the household would have had without owning a house. At these two points, we computed the marginal user costs, $P \cdot MP$, and the disposable income for consumption other than owner-occupied housing. We then used these two pairs of income and price variables in estimating the household's twin decision of whether to rent or own its home and the amount of housing demanded conditional on choosing to own.[17]

· Following Brownstone and Englund (1991), we limited the sample to those households that indicate a low probability of moving during the next twelve months.[18] Results from estimating these equations are presented in Tables A4–A7. Here we only use the conditional demand equation. The tenure choice equation had insignificant price effects presumably because we were unable to measure the relative price of owning versus renting. The conditional demand equation turned out to be sensitive to outliers and was estimated by robust regression. Because the budget constraint is represented by two points, it is not straightforward to interpret the coefficient estimates. We therefore computed an income effect that is the result of a parallell shift of the budget constraint (= sum of the two income coefficients) and a price effect that corresponds to an equal change in the slope of the budget constraint everywhere.

The price and income effects (Table 12) have the expected signs and are rather similar in the two years. Translated into elasticities evaluated at owner sample means of the marginal price at owner-occupancy and at the corresponding linearized income, they imply price elasticities of −0.35 for the 1984 data and −0.25 for 1986 and income elasticities of 0.37 and 0.41 respectively. These elasticities are close to those obtained by Brownstone and Englund (1991) based on 1984 HUS data. However, com-

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[17] Hansson Brusewitz (1994) recently used maximum-likelihood techniques of the sort pioneered by Burtless and Hausman (1978) to estimate preference parameters, taking the full non-linearity of the budget constraint into account. The results of the two methods with regard to the price and income elasticity of housing demand do not seem to differ markedly.
[18] Respondents were asked to indicate the probability that they will not move during the next twelve months. We excluded all households with a probability of moving exceeding 60 per cent because they are more likely to be in disequilibrium.

Table 12. Income and price effects of conditional demand for owner-occupied homes

	Year	Mean estimate	Prob(>0)
Income effect	1984	2.782	.0004
	1986	2.870	.0009
Price effect	1984	−4.591	.0006
	1986	−3.251	.0252

Note: The dependent variable is the log of the value of the house deflated by a regional price index. Prob(>0) indicates the marginal probability of rejecting the hypothesis that the corresponding effect is zero.

pared with the earlier results in Brownstone *et al.* (1985) based on the HINK 1978–79, which were used by Persson (1989) in predicting the effects of the recent reform, the price elasticity is considerably lower in our study.

Next, we used the estimated equations to predict the likely impact of the tax reform on housing demand, where the pre-reform situation is represented by the prices pertaining to 1986. We concentrated on price effects. Since the tax reform should be regarded as being financed, one way or the other, any income effects should arise from redistribution combined with different income sensitivity in housing demand for different categories of households. Absent very clear evidence on either of these two components, we chose to ignore income changes.

The tax reform rendered the marginal price of owner-occupied housing the same for all households regardless of the level of housing consumption. Evaluating the marginal prices at 12 per cent interest rate and only taking account of the tax changes in 1991 indicates price increases relative to 1984 and 1986 by more than two percentage points for most households with prices below the median, i.e. with taxable income above the median. Combining the estimated coefficients for 1986 with the price changes, we calculate predicted effects on *conditional demand for housing* for representative households with different marginal prices in 1986. Demand is predicted to decrease by 14 per cent for a household in the 10th percentile among homeowners, by 12 per cent in the 25th percentile, by 6 per cent for a median homeowner, and by 4 and 3 per cent in the 75th and 90th percentiles.[19] Aggregating gives a predicted decrease

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[19] Corresponding figures based on the 1984 estimates are: 12, 11, 7, 6, and 5.

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in total demand by 10 per cent;[20] this figure is much smaller than earlier calculations by Persson (1989). There are two main reasons for these differences. First, the impact of the reform on the marginal price is somewhat smaller in our calculations.[21] Second, our price elasticity is only about a third of that of Persson, based on Brownstone *et al.* (1985).[22] These differences partly reflect that our estimates, based on more recent data, yield lower elasticities, but the main reason is that we disregard tenure choice effects.

In practice, decreasing aggregate housing demand means that demand switches from large to small houses, i.e., demand for large houses goes down but demand for small houses *increases*. This is illustrated in Figure 3 which shows predicted demand for houses of different size classes. We see that the demand for large houses is predicted to decrease, whereas that for all smaller sizes is predicted to increase.

The tax reform was intended to be neutral with regard to tenure choice. This neutrality was achieved by reducing the interest subsidies to rental housing. These subsidies only apply to recent vintages, but given the rent-setting system in Sweden they were believed to be transmitted to all vintages. Calculations presented in Section 3 suggest that real rents indeed increased 16 per cent as a result of the tax reform, i.e., by about the same magnitude as the mean of the calculated effect on the user cost of owner-occupied housing. Some effects on tenure choice may arise from the general switch towards demand for smaller units as illustrated in Figure 3, but such effects are not covered directly by our econometric model, and we abstain from making a quantitative assessment.

Our analysis suggests that the tax changes between 1989 and 1991 brought about a decrease in the demand for owner-occupied homes of around 10 per cent, at given housing prices. Adding the effect of the cut in interest subsidies and removal of the investment subsidy in 1993 gives an extra demand decrease by 3–4 per cent. This disregards tenure choice

[20] This calculation could also be based on all households in the sample weighted by their predicted probability of owning in the base year 1986. The results of both calculations differ only at the first decimal.

[21] Persson (1989, p.18) analyzed a tax reform where the average marginal price across all households increases from 5.7 to 7.9 per cent, i.e., by 39 per cent. In our representation, mean MP increases by 34 per cent (from 6.73 to 9.02) evaluated at zero housing, and by 19 per cent (from 7.60 to 9.02) evaluated at a representative house value. Weighted by the mean quantity demanded conditional on the marginal price, the changes are 37 and 24 per cent respectively.

[22] Hansson Brusewitz (1994, p.22) also obtained small tax reform effects.

Figure 3. Predicted demand across house size classes with 1985 and 1991 tax rules
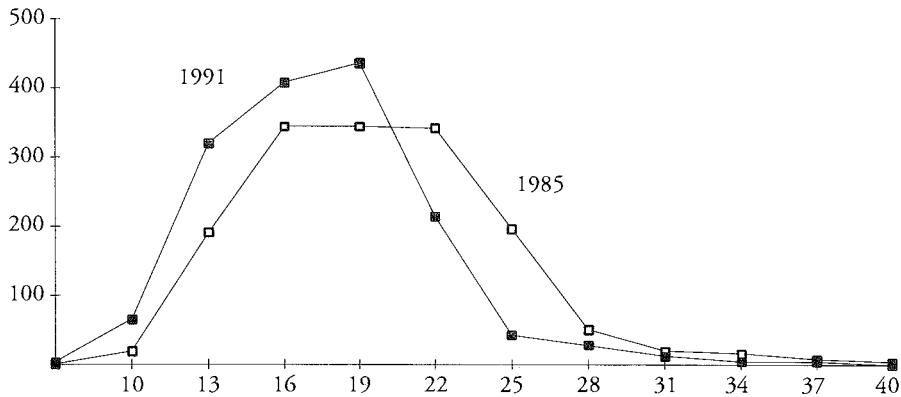
Vertical scale: Predicted aggregate number of households (in thousands) in each size class. *Horizontal scale:* House size class measured by standardized housing costs defined by real interest (3 per cent) plus depreciation (1.4 per cent) times house value in base region (1000 SEK, 1985 prices). Scale refers to lower interval limit.

effects, which we are unable to quantify. Since they should go in the direction of decreasing ownership we conclude that the net effect of the package of tax and subsidy changes enacted between 1989 and 1993 may have led to a demand decrease by around 15 per cent.

5. Market effects

5.1 The collapse of construction and rise in vacancies

Because the housing stock is fixed in the short run one should expect to see most of the reform effects on house prices and new construction.[23] As Figure 4 shows construction has indeed gone down. From a peak of 70,000 dwellings in 1991 it fell by more than 80 per cent to reach a predicted all time low of approximately 12,000 in 1995. The share of single family houses out of all new construction fell from 50 per cent in the 1980s to 25 per cent in 1993 and 30 per cent in the first quarter of 1995.

It may be surprising that new construction peaked as late as 1991 given that the contents of the reform were well known already in 1988 or

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[23] See also Jaffee (1994) for an analysis of the Swedish real estate crisis.

Figure 4. Number of new dwellings by house type

—◆— All dwellings   —□— Single family houses
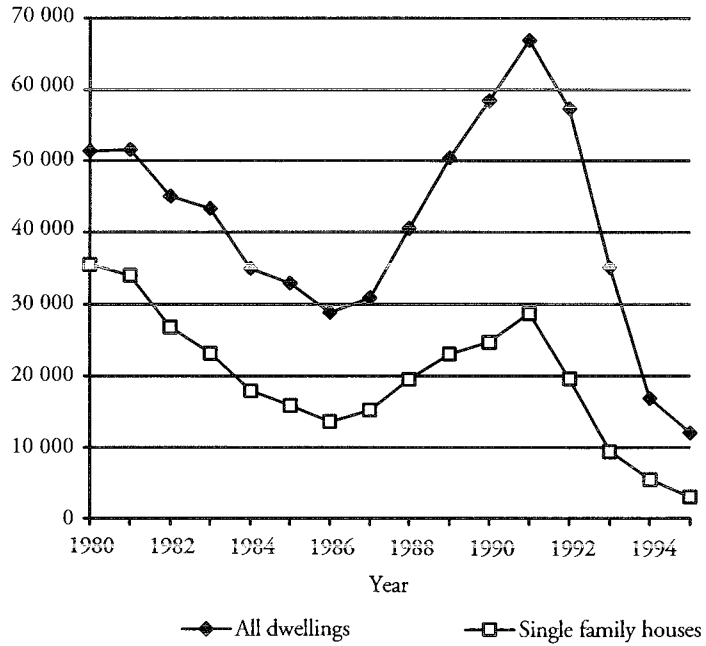
Figure 5. Total number of vacant flats in public and private rental housing

—◆— Public rental   —□— Private rental
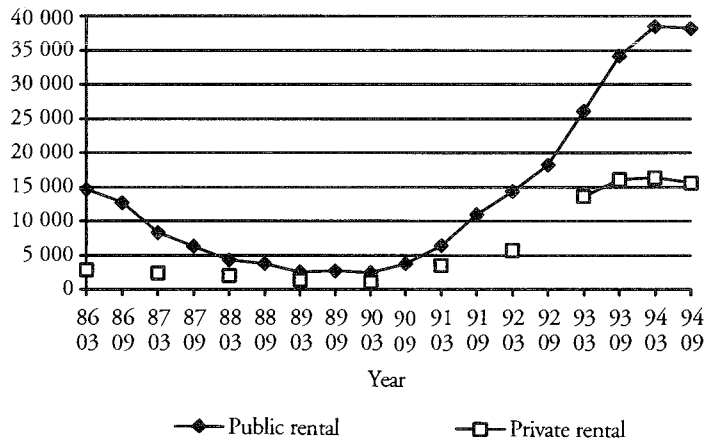
Source: Bostads- och byggnadsstatistisk årsbok, Statistics Sweden, 1994 (Figure 4: Table 2.1.16, Figure 5: Table 1.2.3) and *Statistiska meddelanden* for 1993 and 1994

1989. On the other hand the boom in the economy continued until 1990, and positive income effects may have contributed to postponing the downturn in construction. In any event the overproduction led to a sharp increase in rental vacancies (Figure 5). After a steady decline in the 1980s to minuscule levels in 1990 the vacancy rate rose by 3.4 percentage points (from 0.2 % to 3.6 %) between March 1990 and March 1994. A large share of the vacant flats are in the recently built stock, where the vacancy rate is 5.7 %, and vacancy rates are higher in municipal houses than among private landlords. The aggregate numbers conceal large regional variations with high vacancy rates coinciding with more general economic problems. Given the prolonged crisis, the earlier overproduction and the further withdrawal of interest subsidies in subsequent years, it is likely that vacancy rates will stay high and the low level of production will continue for a number of years.

5.2. The income tax reform and housing prices

Since the tax reform, real prices of owner-occupied homes have fallen by 25 per cent (Figure 1).[24] How much of these capital losses were due to the tax reform, to the subsidy reform, and to the recession in general?

With falling prices and construction reduced to a minimum, the housing stock will erode due to depreciation. A diminishing stock will reverse the price fall and lead to rising prices as the market adjusts toward a new long-run equilibrium where it is profitable to build just enough to replace depreciation and meet increased demand due to long-run trends in income and demographics. The dynamics of this process depend crucially on household expectations of future prices. If the process is well understood by households, they should realize that prices have a tendency to revert towards their long-run values, i.e., that the initial drop in prices will be reversed. This insight should lead households to expect future capital gains, which will reduce the initial price fall.[25] The extent of this counteracting effect depends primarily on the speed of the supply response. The intuition behind this process has been formalized in a widely quoted paper by Poterba (1984).

[24] Owner-occupied homes make up around half of the net wealth of the mean household (Edin *et al.*, 1994, Bager-Sjögren and Klevmarken, 1995), and the price fall corresponds to about a year's disposable income for an average homeowning household.
[25] Hendershott (1995) has employed the forward-looking framework to value Sydney office buildings following an increase in vacancies from 4 to 23 per cent and a halving of real rents.

The asset-pricing perspective sketched above may be applied to analyze the aggregate price effects on owner-occupied homes of the tax reform. Under *static expectations* and with completely inelastic supply this would be a trivial task if user cost was the same for all households. Heterogeneous user costs give rise to an aggregation problem that we handle heuristically by computing the percentage change in the representative marginal price as the average of the percentage change in marginal user cost across all households weighted by the mean housing value conditional on marginal price. Calculation of the price effect under *static expectations* then amounts to restoring the marginal user cost back to its pre-reform level. Referring to expression (1), it is immediately clear that the elasticity of P with respect to the terms within square brackets is -1. With the average increase in user cost between 1989 and 1991 on an order of magnitude of 24 per cent (see note 21), this translates immediately into a 24 per cent price decrease.

Under *forward-looking behavior*, price changes can only be calculated by solving for the full adjustment path toward long-run equilibrium, as was done in a recent study for Sweden by Åsberg and Åsbrink (1994). The results depend on supply and demand elasticities. The higher the supply elasticity, the faster house prices will return to long-run equilibrium and, hence, the higher the rate of price increase along the adjustment path and the smaller the initial price decrease. The higher the demand elasticity the larger the long-run change in housing quantity has to be and, hence, the longer the adjustment process and the deeper the initial price fall. Åsberg and Åsbrink estimated the supply elasticity on time-series data to be 1.5. With regard to demand they report results for different price elasticities. Simulating their model based on our estimated elasticity of 0.30–0.35 suggests that the perfect-foresight price reduction is around 10 per cent, slightly less than half of that under static expectations. We consider this a lower bound on the likely price impact of the reform for four reasons. First, perfect foresight may not be a realistic assumption. To the extent that there are elements of static or adaptive expectations the initial price decrease should be larger. Second, despite the aim of neutrality of the reform with regard to tenure, there may be some added elasticity in that dimension as demand switches towards smaller units. Third, our calculations are limited to the changes implemented in 1991 and do not take account of the tax and subsidy changes in 1993. To the extent that these were foreseen in advance they should have depressed prices further already in 1991. Fourth, since our estimated demand elas-

ticity is lower than most of those found in earlier studies, it is reasonable to consider it a lower bound on the actual elasticity. Considering these factors we conclude that the reform may have led to a price fall by 12–15 per cent.

The view that tax-induced changes in user cost have been an important driving force behind the development of housing prices has been substantiated by Hort (1995). She examined prices for 20 major metropolitan areas in Sweden for the period 1967–1992 and estimated a model that is broadly consistent with the theoretical perspective just outlined. The long-run *level of prices* is seen as dependent on fundamental determinants of demand and supply such as demographics, income, construction costs and the after-tax real interest rate (a proxy for the user cost). She embedded this into an error-correction model where the *rate of price change* depends on two sets of factors: (i) the deviation of prices from the long-run equilibrium level and (ii) current and past changes in various explanatory factors. Interpreted in terms of the model sketched above, the first part reflects the tendency to revert towards long-run equilibrium following a shock and the second part reflects the impact of new shocks. In her favored equation, the real after-tax interest rate has a negative effect on the long-run price level. Further, the rate of change in after-tax unit costs (lagged one year) has a negative impact on the rate of price change, significantly so in eight regions. Hort's estimates typically imply that the elasticity of price changes with respect to changes in real user cost is between 0.5 and 1, which is in line with our theoretical model. The implications of her model may be compared with the actual development after 1990 by looking at the residuals. It turns out that the model is successful in capturing the downturn in prices during 1992, but that there are large negative residuals in most areas for 1993. We conclude that the econometric evidence is consistent with the view that the income tax reform caused real house prices to fall by 12–15 per cent in the short run.

5.3. Value-added taxes and interest subsidies

The tax reform was not confined to the income tax code. It also contained a 12 per cent increase of the value-added tax (VAT) on new construction, and a reduction in interest subsidies (see Section 2.3), both of which were fully implemented from 1993. How did these changes affect the general level of housing prices and the price structure across vintages?

Let us start with the case of an investment tax such as the VAT. In a new long-run equilibrium after a tax increase, we expect (under zero profits and perfectly elastic long-run supply) the tax to be fully captured in market prices. In the short run, when supply is fixed, the rental cost of housing $(rP-\pi^e)$ should be unaffected. With anticipated price increases $(\pi^e>0)$ during the adjustment process towards the new long-run equilibrium, housing prices have to make an immediate jump in order to leave rental cost constant, i.e., existing homeowners will make a capital gain. According to the simulation study by Åsberg and Åsbrink (1994), the immediate price impact of a 12 per cent VAT increase is around 2 per cent.

Interest subsidies are more complicated because the older the house is, the smaller the subsidies become. Consider a cross section of houses of different construction years a observed in a certain year. Presume that all houses of a particular vintage are subsidized at the same rate $S(a)$.[26] With the introduction of subsidies to new houses, holders of older houses want to shift to new houses in order to capture the subsidy, causing prices of new houses to rise and those of old houses to fall. That is, the price of all houses (adjusted for depreciation) must be the same net of subsidies: $P(a) = P(A) + S(a)$, where $P(a)$ is the price of a standard-quality house of age a, and A indicates a construction year such that there are no subsidies.

In long-run equilibrium, however, the prices of new houses may be regarded as determined by production costs (disregarding endogenous land rents). Thus the subsidies act solely to lower the price of older houses with smaller subsidies. This implies that removing subsidies given only to younger vintages should lead to an *upward* shift of the long-run equilibrium price of older vintages equal to the present value of the subsidies removed from new houses. We have calculated that interest subsidies were reduced from 20 per cent of building costs prior to 1991 to 11 per cent for houses built in 1993, i.e., this change should give rise to a 9 per cent long-run increase in the price of houses which are currently without a subsidy. The average increase across the stock is given by multiplying the size of each vintage by the corresponding difference in subsidy value and weighting these products by the fraction of owner housing in them. This gives a long-run average price increase of approximately 7 per cent (around 60 per cent of the stock has no subsidies).

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[26] This is not quite true, since houses above a certain size limit are not covered by the subsidies. The fraction of houses without subsidies is very small, however.

The short-term impact of this subsidy removal on prices may be understood in analogy with a (negative) investment tax. Builders are given the right to sell a package of houses *cum* interest subsidy free of charge. Removing part of the subsidy is then analogous to increasing an investment tax. The magnitude of the subsidy removal is 9 per cent (75 of the VAT increase) and we conclude that the price *net of subsidy* should increase by 1.5 per cent, i.e., decreasing the price of new houses *cum subsidy* by 7.5 per cent. The price profile across vintages should adapt immediately to the new long-run. With prices of new houses falling and old houses rising the average effect across vintages is a one per cent decline.

5.4. An interpretation of the development of housing prices after 1990

We have identified three aspects of the tax reform that have had an impact on housing prices. Changes in the income tax code are estimated to have led to price decreases across all vintages by 12–15 per cent expressed in relation to the market price of non-subsidized houses. Changes in the VAT should have led to a short-run increase in the market price *cum* tax by 2 per cent for all vintages. The reduction in interest subsidies as of 1993 should have reduced the average price across all vintages by 1 per cent. Adding up gives our best guess of the overall price impact: a decrease of 11 to 14 per cent.

Between the peak year of 1990 and 1993, the real price index of one-family houses fell by 30 per cent. Our calculations suggest that no more than half of this was due to the tax reform. Another major factor would appear to be the development of income and income expectations during this period, when the Swedish economy went from a boom in 1990 to a deep crisis two years later. The crisis has had a profound impact on the expectations of many Swedes with regard to future market income and social security benefits. A crude way of measuring this would be in terms of the loss of GDP. Between 1990 and 1993, real GDP fell by 6 per cent. Compared with a 2 per cent yearly growth trend, the accumulated loss in production is 12 per cent. Assuming that the economy is able to resume growth at the 2 per cent trend in the future, but that the loss in production during these years will not be recovered due to hysteresis effects, this

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corresponds to a permanent income loss of 12 percent.[27] With an income elasticity of 0.4 and a price elasticity of –0.3, it would take a decrease in the rental price by 16 per cent to keep demand unchanged which, in analogy with the perfect foresight simulations from Åsberg and Åsbrink referred to above, translates into a price effect of 8 per cent.

Adding the price effect from the shortfall in income to that arising from the tax reform gives a predicted price decrease of 19–22 per cent which still falls short of the 30 per cent recorded after 1990. One interpretation is that the unexplained difference is a result of the inherent dynamics of house prices. As we see from figure 1 there is a pronounced autocorrelation in housing prices.[28] Many explain this by a tendency for bubbles to form and burst, and given the experience from other parts of the Swedish real estate market (see e.g. Jaffee, 1994), it does not seem implausible that such elements were present.

6. Concluding remarks

A major goal of the tax/subsidy reform was to improve the allocation of real capital both between housing and corporate capital (plant and equipment) and within the housing sector. The former required raising the real user cost of capital for housing relative to that for business capital, while the latter necessitated reducing the differential user costs across households. Another, possibly more important, goal was dampening the tidal wave of government funds flowing to encourage housing consumption. Thus we would anticipate housing user costs to have risen toward corporate user costs. While the price of consuming housing services would rise, increased productivity owing to the larger corporate capital stock would raise real wages and/or lower the price of other consumption. Adjustment costs would of course, have to be paid. Declines in prices of existing

[27] It might seem more natural to base calculations on disposable income, which increased by 7 per cent from 1990 to 1992 and fell by 4 per cent between 1992 and 1993. This irregular development partly reflects a growing budget deficit and a lack of short-term funding of the tax reform. It is difficult to use disposable income figures as a basis for an inference of household income expectations, although it could help explain why the steepest price decrease came in 1992 and 1993 rather than when the reform was decided in 1990.
[28] This is a general feature of housing prices in many countries; see e.g. Case and Shiller (1989), Abraham and Hendershott (1995) and Englund and Ioannides (1995).

houses and multifamily units would be expected, as would be a period of reduced housing construction.

From a user cost perspective, the changes have been quite successful. We consider 1985 to be a representative pre-reform year and compare net user costs of housing and corporate capital then and in 1991. Capital efficiency would require equality of (risk-adjusted) user costs net of depreciation across investments. The user costs for owner-occupied housing in 1985 varied widely across households by income class. From Table 7 we see that the cost for the highest income class was less than half of that for the lowest income class, owing to the wide variation in marginal income tax rates. The introduction of a flat tax rate for capital income has completely eliminated this variation in user costs across households, except for minor differences due to wealth taxes.

The net user cost for corporate capital varies by investment class and mode of financing. A weighted average of these was 4.5 per cent both in 1985 and 1991; based on 8 per cent interest and 4 per cent inflation (Agell, Englund and Södersten, 1995, Table 8.2). These compare with weighted average costs for owner-occupied housing of 1.7 per cent and 3.0 per cent, respectively.[29] Thus the weighted average advantage to owner-occupied housing shrunk from 2.8 per cent to 1.5 per cent between 1985 and 1991.

Some might argue that the cost of adjustment has been too high, i.e., housing asset prices have fallen too far and housing construction cut back too drastically. We agree that these impacts have been large. However, while the observed 30 per cent plunge in real house prices and virtual disappearance of construction are of concern, they are not mostly attributable to the tax/subsidy reform. By our estimates only a third to a half of the price decline can be so attributed. Rather, an unprecedented period of overbuilding, even in face of a highly likely tax and subsidy reform, combined with a greater than normal cyclical correction, explains much of the decline in asset prices and construction activity.

[29] These user costs of capital are defined net of depreciation and do not include housing operating and maintenance costs. This explains why they are smaller than the corresponding costs in Table 7.

Appendix

Tables A1–A9 are available in the working paper version of this paper, Englund *et al.* (1995).

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