Discussion Papers
Statistics Norway
Research department
No. 829
November 2015

Statistics Norway

Statistisk sentralbyrå

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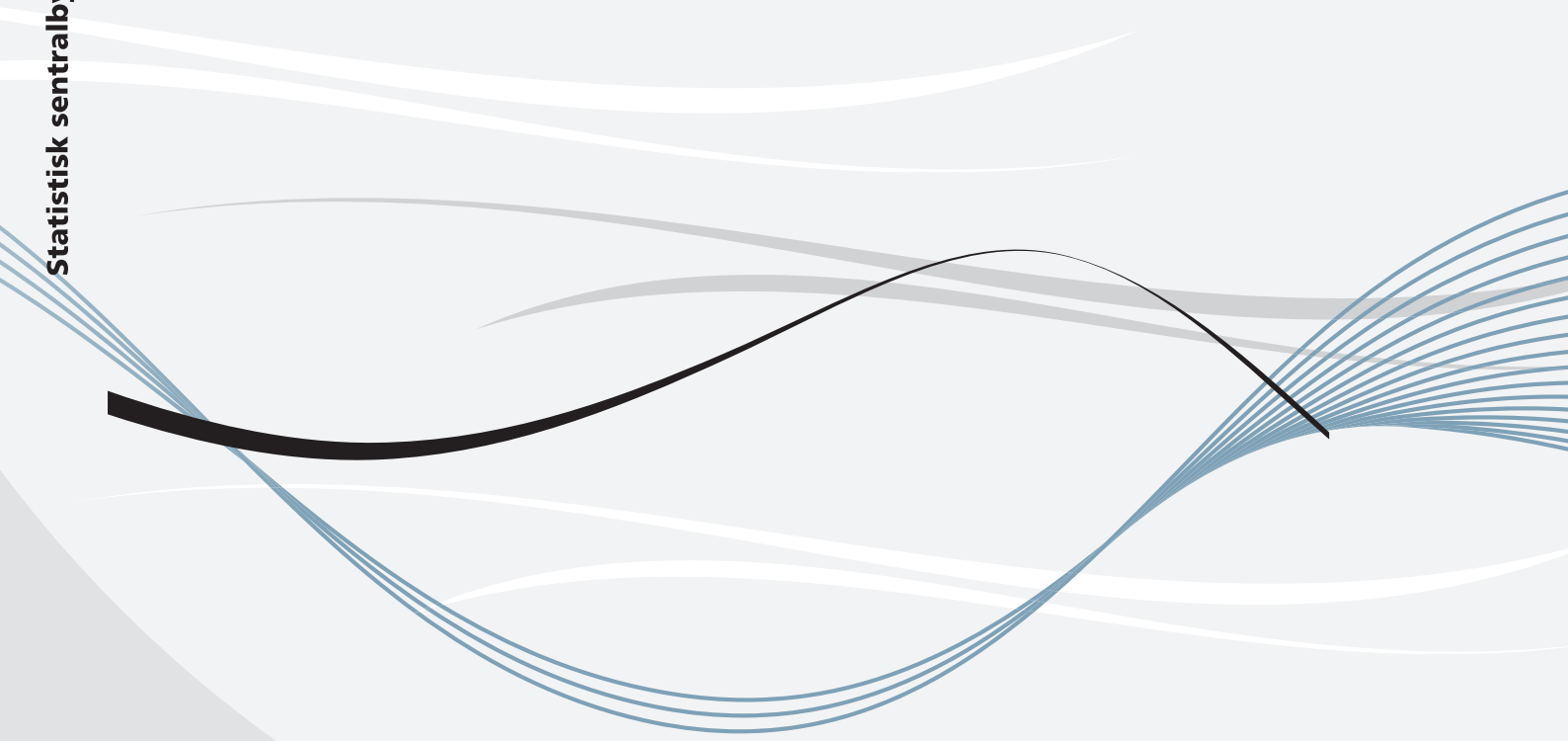
Killing several birds with one stone



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Abstract:
The Norwegian public policy debate regularly returns to the private housing market. Housing prices have increased by 200 percent in real terms over the last two decades, a large share of households have high debt ratios, and new home buyers face large costs to enter the housing market. In addition, maintaining the welfare state in the face of population aging will likely involve higher tax burdens on the working population in the years to come. As housing is taxed leniently in Norway, increased taxation of housing stands out as a way of killing several birds with one stone: it generates tax revenue, moderates housing prices and increases efficiency. In this paper I discuss the effects on revenue and distribution of a hypothetical change in the taxation of housing in which housing would be taxed as other capital assets. This involves taxing imputed rental income, and a modified wealth taxation schedule. In contrast to other papers on distributional effects of housing taxation, I also take into account the effects of taxation on housing demand. Changes in housing prices that would follow a reform are estimated using a simple user-cost model. I find that the housing tax increase would increase personal tax revenue by 11 percent and make the tax system more progressive. Housing prices would be reduced by 18 percent.

Keywords: Taxation, Distribution, Housing

JEL classification: D31, H24, R21

Acknowledgements: I thank Elin Halvorsen, Torbjørn Hægeland, Kjetil Telle and Thor Olav Thoresen for valuable comments, and Bård Lian for an introduction to LOTTE. This work has been supported by the Norwegian Research Council (grant no. 217423).

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ISSN 1892-753X (electronic)

Sammendrag

Utviklingen i boligmarkedet dukker stadig opp i den offentlige debatten i Norge. Rask prisstigning og høy terskel for førstegangskjøpere er særlig omtalt. Økt boligbeskatning har også vært foreslått, blant annet av flere offentlige utvalg. Det finnes gode argumenter for å øke skatten på bolig, som i det norske skattesystemet er lavere enn på andre formuesobjekter. Denne artikkelen ser på fordelingsvirkningene ved å øke beskatningen av selveid bolig.

Boligpriserne har steget over 200 prosent siden midten av 90-tallet, gjeldsgraden hos norske husholdninger er svært høy og det er vanskelig for førstegangskjøpere å komme inn i markedet. Både norske og internasjonale eksperter er bekymret for den raske prisstigningen og det høye gjeldsnivået.

På lengre sikt vil kostnadene ved å opprettholde velferdsstaten øke med aldring befolkningen, noe som vil føre til økt skattepress på den arbeidende delen av befolkningen. For å holde skatteprovenyet oppe er det viktig å opprettholde yrkesdeltakelsen. Insentivene til arbeidsdeltakelse endres ikke ved boligbeskatning.

Den teoretiske skattelitteraturen anbefaler at boliginvesteringer skattes likt med andre investeringer, for å unngå overinvesteringer i bolig.

Økt boligbeskatning kan dermed sees som en løsning på flere utfordringer:

1) Høyere boligbeskatning vil redusere boligpriser og redusere behovet for høye boliglån.
2) Det er en måte å øke skatteinntekene som ikke reduserer insentivene til å arbeide.
3) Økt boligskatt vil øke økonomisk effektiv ved å redusere overinvesteringer i bolig.

I enhver diskusjon rundt beskatning er fordelingseffektene viktige. I denne artikkelen bruker jeg en mikrosimuleringsmodell og data for alle norske husholdninger for å undersøke fordelingseffekter og økning i skatteproveny ved å øke beskatningen av bolig til et nivå som tilsvarer skattenivået på andre formuesobjekter (28 prosent skatt på avkastning, 100 verdsetting i formueskatten). I tillegg bruker jeg en enkel modell for boligetterspørsel for å anslå fallet i boligpriser ved økt beskatning. Jeg tar hensyn til dette prisfallet i fordelingsanalysen.

En provenynøytral reform, der skatteøkningen returneres som en lik sum til alle voksne innbyggere blir også omtalt.

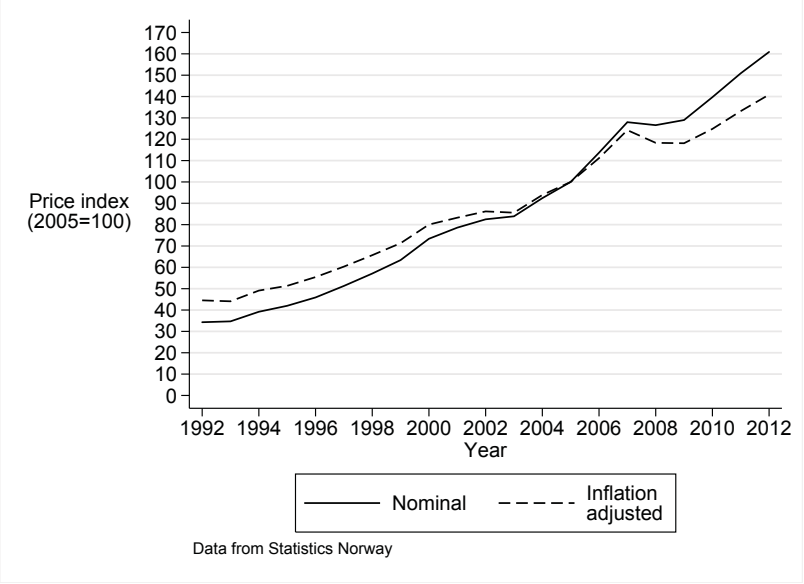
Boligskattøkningen jeg analyserer vil øke skatteprovenyet med 11 prosent og reduserer boligprisene med 18 prosent. Skatterøkningen er progressiv, men vil treffe en gruppe eldre med lav inntekt hardt.

1 Introduction

The taxation of housing is a hot topic in the Norwegian public policy debate. There are several reasons to increase the taxation of housing. This paper deals with the distributional effects that would follow a change in housing taxation, which are crucial to implementing a tax reform.

Housing prices in Norway have been increasing for a long time, to historically high levels, shown in Figure 1. Real prices increased by more than 200 percent between 1992 and 2012, and the increase has been almost continuous, with only a small dip following the financial crisis of 2008.

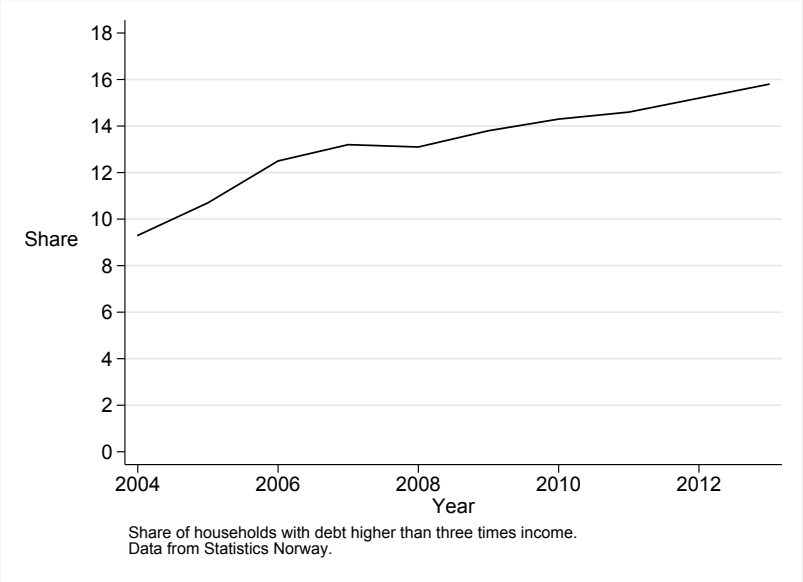
Figure 1: Housing Prices, 1992-2012



The debt of Norwegian households have also been increasing over the same period. Figure 2 shows the share of Norwegian households with debt higher than three times income over the period 2004-2013. The share has grown from less than 10 to almost 16 percent. The same trend also applies for households with debt higher than four and five times income.[1] Correspondingly, international audits (i.e. OECD, 2012) and national policy makers (Norges Bank, 2014) are concerned by the high share of mortgage financed housing assets in the

[1] The share of household debt being secured against housing has also increased over this period (Statistics Norway, 2014).

Figure 2: Share of Households with High Debt



portfolio of the average Norwegian household. A drop in housing price could affect the whole economy strongly as highly leveraged housing owners would reduce consumption (Mian et al., 2013).

Norway has a tax system that favors housing over other assets. The lenient taxation of housing in Norway is mentioned as one of the reasons for the high demand for housing (OECD, 2012). Several tax expert committees have called for increased taxation of housing (OECD, 2012; NOU, 2003; NOU, 2014).

The theoretical literature on the taxation of housing generally recommends neutrality of taxation (Mirrlees et al., 2011), out of consideration both for efficiency and fairness. Several papers have documented the efficiency cost of low housing taxation (Skinner, 1996; Gervais, 2002; Bye and Åvitsland, 2003; Van Ewjik et al., 2007). The main cause is the distortion of capital investments. In optimal tax theory, the principle of production efficiency says that taxation should not discriminate between input factors (Auerbach and Hines, 2002). Low housing taxation leads to over-investment in housing, at the expense of investments in business capital.

In a longer perspective, Norway, as well as most of Europe, face an aging of the population. This will put strains on the fiscal situation, as pension payments

and health costs are projected to increase substantially.[2] As shown in Aaberge et al. (2007), high employment rates are important to reduce the negative fiscal effect of the aging society. Taxation of housing is a source of revenue that does not disincentivize labor supply. Thus increased taxation of housing can be seen as a solution to several problems: 1) It will reduce housing prices and debt levels 2) It is advantageous for economic efficiency through restructuring of investments 3) It raises revenue without discouraging labor supply.

In any discussion on optimal taxes, distributional effects are important alongside efficiency (Sandmo, 1976). Distributional effects are also crucial to implementing a tax reform. This paper uses a micro simulation model with feedback to discuss effects on revenue, distribution and housing prices of a hypothetical change in the taxation of housing, using cross section data from 2010. The tax reform discussed would let housing be taxed as other capital assets.

With detailed housing valuation based on market prices, and the imputation method of Englund (2003), it is possible to impute rental income for the whole house owning population. A micro simulation tax benefit model is then used to calculate the tax revenue and distributional effects of a housing tax reform where houses are taxed similarly to other types of capital assets.[3]

An increase in housing taxation would affect housing demand. To illustrate the feedback effects of taxation on housing prices, I will use a simple user-cost model a la Poterba (1984). It allows me to model the tax induced reduction in housing prices and the second order effects of the house price reduction on distribution. Previous literature on the distributional effects of housing taxation have not taken this into account.

The redistributional effects of the increased taxation of housing, including feedback effects, are discussed in terms of the Gini based Reynolds-Smolensky index, and a similar index of the 90/10 percentile ratio. Distributional effects are also discussed with respect to a revenue neutral reform.

The next section gives an overview of how Norway taxes housing. Section 3 discusses previous literature. In section 4, I will look at modeling choices in micro simulation and the imputation of rental income, before dealing with how the reform affects housing prices in section 5. Section 6 presents distributional analysis of the housing tax reform and the impact of a revenue neutral reform.

[2] See Siebert (2002) for a general discussion, and Antolín and Suyker (2001) and Aaberge et al. (2007) for the Norwegian case.

[3] A 28 percent flat tax on returns and a wealth tax valuation of 100 percent of market value.

Section 7 concludes.

2 The Norwegian Setting

Leading up to the distributional analysis of housing taxation, I here give a short overview of the Norwegian direct tax system and the role of owner-occupied housing for Norwegian households.

Since 1992, Norway has had a dual tax system.[4] Labor income is taxed with a progressive schedule, while there is a proportional tax on capital income. There is no taxation of (imputed) housing income. Capital gains are taxed as other capital income, but capital gains on housing are not taxed if the owner has been living in the house at least 12 of the 24 months before it was sold. Interest payments on debts (including mortgages) can be deducted at the capital income rate, in unlimited amounts.[5]

In addition, Norway has a system of wealth taxation. Net wealth above a standard deduction is taxed. In 2010, the standard deduction was 700,000 NOK, beyond which the tax rate was 1.1 percent.[6] In the Norwegian wealth tax, the trend has been towards neutrality between different types of savings. In 2010, most assets were valued at 100 percent of market value. Owner-occupied housing on the other hand, enjoyed a large discount. The valuation of housing was 25 percent of market value.[7] This gives a large incentive for wealth to be invested in housing.[8]

Owner-occupied housing is favorably taxed in most developed countries, but few other countries have the Norwegian combination of no taxation of imputed rents and unlimited deductability of mortgage interest (Hendershott and White, 2000; Hemmelgarn et al., 2011). In addition, Norway has a unique wealth tax rebate on housing. In many countries the favorable tax treatment of housing has been somewhat reduced since the 1970s (Hendershott and White, 2000).

[4] See e.g. Thoresen et al. (2012) for more on the Norwegian tax system, and Sørensen (1994) on dual income tax.

[5] The interest deductability of non-mortgage debt is somewhat uncommon, and reduces the tax-favored status of housing compared to other countries.

[6] In the years following 2010, the standard deduction has been increased, and the tax rate somewhat reduced, which lessens the value of the housing rebate in the wealth tax.

[7] Or 40 percent of market value for secondary and investment housing.

[8] While there is no general property tax in Norway, municipalities may chose to have a property tax. In 2010, 180 of 430 municipalities had a property tax that covered housing (Statistics Norway, 2011). Municipal property taxes are often seen as user fees, an interpretation supported by the law and the large freedom of municipalities in structuring the tax. I will follow that interpretation, and not include the municipal property tax in my analysis.

This has not happened in Norway, even though expert advice has recommend it. In fact, in 2005, the prevailing (low) taxation of imputed housing income was abolished.

In a government mandated report that preceded the Norwegian tax reform of 2006, higher taxation of housing was called for (NOU, 2003). This was grounded both in a concern for neutrality and on the view that housing is a tax base not threatened by capital mobility. The expert panel suggested to increase the taxation of imputed housing income, while increasing the value of housing in the wealth tax towards market value, first to a valuation of 30 percent (NOU, 2003).

The Mirrlees Review of the UK tax system (Mirrlees et al., 2011) recommended that housing should be taxed as consumption. The implication is similar to a tax on imputed housing income, as the suggested tax was a VAT on the yearly consumption value of housing.

A 2014 review of taxation has again touched upon housing taxation (NOU, 2014). Written with a remit to make the tax system more internationally competitive, it suggested valuing all assets (including owner-occupied housing and debt) at 80 percent of market value.

Reflecting the tax advantages of housing, owner-occupied housing is a main form of capital ownership for the Norwegian population. As shown in Table 1 housing represents half the wealth or more for all deciles of households, on average two thirds of wealth. Housing wealth as share of gross total wealth has an inverted U-shape, with the first and tenth deciles having the lowest share. Ownership is very unequally distributed. While 91 percent of the 10th decile and two thirds of all households own their own homes, this only applies to 13 percent of the first decile. The next two columns give the average housing value and loan to value,[9] conditional on owning a house. Housing value mostly increases with disposable income, while loan to value is relatively high even for the highest deciles (debt is tax favored).[10]

The value of the interest deduction for debt, and the cost of the wealth taxation of housing for different deciles of the population is shown in Appendix A. The interest deduction is higher than the wealth tax on average for all deciles,

[9] The data does not allow separation of mortgages and other debt. Loan to value is calculated, for housing owners, as $min(LTV, 0.9)$, where LTV is total debt divided by housing value. The cut off at 0.9 represents a rule restricting banks to loan out maximum 90 percent of sales price.

[10] Decile 1 includes a number of wealthy business-owner households with very low taxable income, which may explain the high housing values conditional on owning in the decile.

but the difference is smallest for the lowest deciles, where the interest deduction represents the lowest relative share of income.

Table 1 also shows the average age of each decile. The low average age in decile 1 is probably explained by the low disposable income of students, while pensioners seem to cluster in decile 2 to 4, which may explain the low loan to value for these deciles.

Table 1: Descriptive Statistics

Decile[a]	Share Housing[b]	Share Owners	Housing Value, Owners	Loan to Value, Owners	Age[c]
1	0.52	0.13	2,151,400	0.40	31.9
2	0.69	0.38	1,694,600	0.22	59.4
3	0.72	0.50	1,843,700	0.30	55.5
4	0.73	0.64	1,977,600	0.36	54.4
5	0.75	0.72	2,128,300	0.42	52.0
6	0.75	0.78	2,266,100	0.48	50.4
7	0.75	0.82	2,420,400	0.50	50.1
8	0.73	0.85	2,625,700	0.51	50.4
9	0.71	0.88	2,939,400	0.52	50.9
10	0.54	0.91	3,899,100	0.52	52.0
Total	0.68	0.66	2,536,300	0.45	50.7

Notes: All households with household heads 18 or above and non-negative income; 2,315,990 obs. Values in NOK.
[a]Deciles of equivalised disposable income.
[b]Housing wealth as share of gross wealth.
[c]Age of oldest member of household.

3 Previous Literature

The literature most similar to this paper are the papers on how the inclusion of imputed rents affects distribution. Two papers also use tax simulations to study the taxation of imputed rents. Saarimaa (2011) uses data from a wealth survey to determine distributional effects of taxation of imputed rental income in Finland. Imputed rental income increases average income by 8.5 percent, and its taxation would increase personal income tax revenue by 15 percent while not affecting inequality much. The taxation of imputed rent in six different European countries is explored in Figari et al. (2012), using the tax benefit model Euromod on survey data. They calculate imputed rents and find that a reform taxing net imputed rents give small reductions in inequality in all

countries. The tax also increases personal income tax revenue by six (Germany) to 27 (the Netherlands) percent.

Studying Great Britain, West Germany and the US, Frick and Grabka (2003) show the effects on income inequality of adding imputed rents to income. Data comes from household panels, and imputed rents are calculated by several methods. Including imputed rent increases inequality between renters and owners, while it decreases inequality within the group of owners. The total effect on inequality is small, and decreases or increases depending on which of the two effects are stronger. They also note that imputed rents add a relatively large share to the income of elderly; including imputed rent in the income definition significantly reduces the share of poor elderly.

Yates (1994) imputes housing income for Australian households, using a household survey. Aggregate inequality, measured by the Gini coefficient, does not differ much whether gross income or gross income plus imputed rental income is used. Still, this hides a lot of redistribution between households. Owners with no mortgage, often pensioners, move up in the income distributions. Renters and owners with high mortgages and high maintenance costs move down.

My paper combines a study of the distribution of imputed income with a user-cost approach to study how taxes influences the demand for housing. A couple of previous papers also combine user cost and distribution: Poterba (1992) and Poterba and Sinai (2008) look at the distribution of gains from housing taxes and subsidies. Both show the cost for different groups and effect on user costs of hypothetical changes to the taxation of housing in the US, though do not consider effects on housing prices. The imputed income from housing in the US increases with income and with age, while the mortgage deduction is highest for wealthy, younger households.

4 Modeling the Housing Tax

4.1 Micro Simulation

To find the distributional effects of a hypothetical tax reform, I use micro data for the whole Norwegian population, and a micro simulation model. The micro simulation, tax benefit model LOTTE (Aasness et al., 2007), is also used by the Norwegian Ministry of Finance to estimate revenue effects of tax changes. Simulated taxes are virtually identical to real tax payments recorded in the

data. The model takes the micro data as input, and simulates taxes and benefits based on a set of tax rules and tax rates. There are no behavioral responses in the model. As output, the model delivers aggregate taxes, and the taxes and benefits of each individual. By changing tax rates and by e.g. adding imputed rental income to the income base to be taxed, and then comparing the results to the base line 2010 case, the model allows for estimation of the distribution of housing taxes and alternative taxation schemes.

Data comes from the Income Statistics on Persons and Families (Statistics Norway, 2006), a yearly panel with detailed information (e.g. income, wealth, education, age, family size) on the whole Norwegian population, including full coverage of variables from income tax returns. The income and wealth variables are further disaggregated into e.g. wage income, capital income, business income, benefits, bank deposits, stocks and debt. The data also includes (since 2010) tax values of housing based on imputed market valuation. This paper uses cross section data from 2010. The data allows for the aggregation of individual's income and wealth into household values. When analyzing effects on total revenue, I use the whole population (more than 4.9 million individuals), while distributional analyses is done at the household level, covering around 4.9 million individuals in 2.3 million households.[11] Household income is equivalised by dividing by the square root of household size.

The imputation of market and tax values of housing is done by the Norwegian tax authorities and documented in Kostøl and Holiløkk (2010). Data on housing transactions is used to impute a market value for the whole housing stock, the tax value is set at 25 percent of the imputed market value. Due to the way the market value is calculated, it is likely that houses of particularly high or low quality are respectively under- and over-valued.[12]

4.2 Calculating Imputed Rent

Neutral taxation of owner-occupied housing calls for taxation of imputed rent; the housing equivalent of asset returns, or the owner-occupier equivalent of rent. But where asset returns are often observed, the returns to owner-occupied housing have to be imputed. There are three different ways of calculating imputed rent, as discussed in Frick and Grabka (2003); the market-value, opportunity-

[11] In the distributional analysis, I discard a few thousand observations of households lead by children under 18, and households with negative income.

[12] There exists a procedure to reduce the tax valuation if an assessment shows the value to be higher than 30 percent of market value.

cost and capital-market approaches. The method chosen often depends on available data.

The market-value and opportunity-cost approaches are both based on finding the rental value of owner-occupied housing by matching with comparable rental housing. The difference is that while the market-value approach uses gross rent, the opportunity-cost approach includes costs (maintenance, interest payments, property taxes) to find net rent. A problematic aspect of using either of these approaches in Norway is the paucity of rental properties.[13] This makes it hard to find rental comparisons, especially for larger single family houses. The same problem is reported by Saarimaa (2011) and Figari et al. (2012) for Finland and the Netherlands.

The capital-market approach on the other hand, uses the alternative value of housing capital if it had been invested. Given housing value (gross or net), the question then is the appropriate interest rate. This approach is criticized in Frick and Grabka (2003) on two accounts. The return on housing value is often calculated on net housing value. While mortgage payments should be calculated using nominal interest, the real interest rate is appropriate for calculating housing value. Ignoring this distinction overstates imputed rent. Secondly, calculations of housing value often use owners self-reported valuation of houses, which may give large measurement errors.

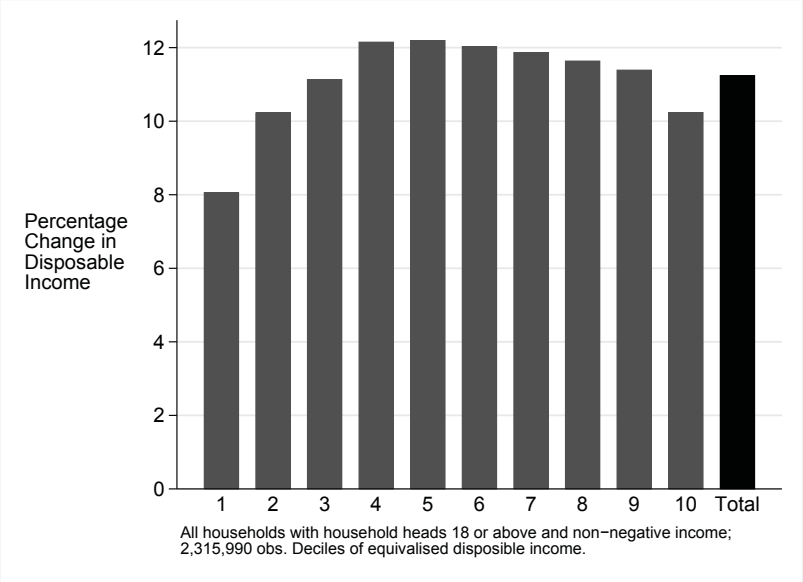
The Norwegian housing data avoids these two criticisms. Housing value and mortgage payments can be evaluated separately, using different interest rates, and the valuation of housing is based on market value.

Frick and Grabka (2003) use imputed income to see the effect of owner-occupied housing on the income distribution. They are not concerned with taxes. When tax neutrality is studied, it makes sense to think of the alternative investment in the capital-market approach as rental housing, as in Englund (2003). Englund shows that, assuming neutrality of taxation in the rental sector, equal maintenance cost for renters and owners and no taxation of capital gains for owner-occupied housing, the imputed rental income should equal the nominal interest rate times market value. This is the way I estimate imputed housing income in the following, with income as three percent of market value.[14] As in Frick and Grabka (2003), I equivalize imputed income by household size, with

[13] In 2011, 77 percent of households were owner-occupiers, the owner-occupying share of couples with grown children higher than 90 percent (Statistics Norway, 2012).

[14] Three percent is the 2010 average of the annual Norwegian Inter Bank Offered Rate (Norges Bank, 2015).

Figure 3: Imputed Rent as Share of Disposable Income



the reasoning that the fewer persons who live in a house of given size, the larger benefit it provides per person.

Figure 3 shows that imputed income adds over 11 percent to the average disposable household income. That is a higher share than in all countries reported in Frick and Grabka (2003), Saarimaa (2011) and Figari et al. (2012). Even though the numbers are not completely comparable, it underlines the importance of owner-occupied housing in the portfolio of Norwegian households. Average imputed income is sizable share even for household in the first decile, but is most important for middle-income households.

Including imputed rental income slightly reduces the Gini coefficient of gross income, and increases the Gini coefficient of disposable income somewhat, as shown in Table 2. The 90/10 ration is higher when imputed rental income is added, both pre and post tax.

Extended gross income is defined as gross income plus imputed rental income and extended disposable income as net of tax extended gross income (or disposable income plus net of tax imputed rental income). In theoretical discussions of income, it is commonly seen as preferable to use the extended income definition, see e.g. Canberra Group (2011), as it better reflects the real consumption of households. The normal definition of disposable income already subtracts

Table 2: Adding imputed income

	Gini coefficient		90/10 ratio	
	Without	With	Without	With
Pre tax	0.2991	0.2971	3.816	3.850
Post tax	0.2541	0.2568	2.985	3.123

Notes: All persons with household heads 18 or above and non-negative household income; 4,907,014 obs.

interest payments on debt, not including imputed rental income thus gives an asymmetry. The extended income definition will be used in the following.[15]

5 Accounting for Feedback Effects

5.1 Modeling Housing Demand

The LOTTE model is of a type often characterized as an arithmetical model (Bourguignon and Spadaro, 2006), with no behavioral effects. But an increase in housing taxation, in effect a permanent increase in the cost of housing, would likely affect housing demand, as the demand for owning a house would decrease due to the higher user cost. There is very little empirical evidence on the elasticity of housing prices to taxation, which leads me to model the response. I use the top-down approach (Bourguignon and Spadaro, 2006) to add feedback from a representative agent model of tax-induced reductions in housing prices into the micro simulation model. The micro simulation model can then be run again, estimating revenue and distributional effects when tax induced housing prices are taken into account.

I use a simple model based on the user-cost approach, following Poterba (1984), Englund (2003) and Svensson (2013), to calculate how housing prices would be affected by the fall in demand due to increased taxation. The idea is that in equilibrium, the cost of owning a house will equal the value of housing service provided by the house. In this fairly basic two-period model, I will obviously not be able to account for the dynamics of a transition period following

[15] The distinction between an income definition with or without imputed rental income makes a difference for the results. Increased housing taxation decrease the redistributional effects of the tax system if inequality is measured using disposable income, but increases redistribution if imputed rental income is added to disposable income. As argued, extended income is the preferable definition, but disposable income may well be more salient. Thus, a reform increasing housing taxation may be perceived as regressive.

the change. What I compare is the steady state housing price before and after a change in the tax. While a more thorough estimation of the house price elasticity to tax is outside the scope of this paper, the message to take away is that taxation of housing will change prices. This change may have an impact on the revenue gains and distributional effects of the reform.

As in Svensson (2013), the model is based on the idea that the marginal costs and investment gains of home ownership and the services a home provides should be equivalized in equilibrium.

The real value of housing services, or imputed rental value, over a year, is denoted h_t. This value will equal

$$h_t = [(1-\tau_i)i_t - E_t\pi_{t+1} + \delta + \tau_h + \sigma]p_t - (E_t p_{t+1} - p_t), \tag{1}$$

where $(1-\tau_i)i_t$ is the net of income tax mortgage payment, $E_t\pi_{t+1}$ is expected inflation, δ depreciation, τ_h a combined term for wealth and income taxes on housing, and σ reflects the premium required to cover risk and down payment constraints of owner-occupied housing. The term $(E_t p_{t+1} - p_t)$ represents the (expected) capital gain over the year. The capital gains tax is assumed to be zero, which reflects that in the Norwegian tax system very few housing sales are affected by capital gains tax. Equation (1) can be rewritten

$$h_t = \gamma_t p_t - (E_t p_{t+1} - p_t), \tag{2}$$

where $\gamma_t = (1-\tau_i)i_t - E_t\pi_{t+1} + \delta + \tau_h + \sigma$. Here γ_t represents the percentage cost of owning a house, which depends on the mortgage rate, inflation, depreciation, risk premium and housing taxes.

Rearranging to find the housing price:

$$p_t = \frac{h_t + E_t p_{t+1}}{1+\gamma_t}. \tag{3}$$

This equation can be solved in steady state. Assuming $\gamma_t = \gamma$ and a constant growth rate g of housing services, and solving (3) forwards gives a present value of housing services:

$$p_t = E_t \sum_{s=1}^{\infty} d_{t+s} h_{t+s-1}, \tag{4}$$

with $d_{t+s} = \frac{1}{1+\gamma}$ and $h_{t+s} = (1+g)^s h_t$.

$$p_t = \sum_{s=1}^{\infty} (\frac{1+g}{1+\gamma})^s \frac{1}{1+g} h_t = \frac{h_t}{\gamma - g}, \tag{5}$$

assuming $\gamma > g$.

Using (5), it is possible to find the steady state semi-elasticity of housing prices with respect to an increase in housing taxes:

$$\frac{\partial \ln p_t}{\partial \tau_h} = -\frac{1}{\gamma - g}. \tag{6}$$

5.2 The Effect on House Prices

When I simulate the model, I mainly use the same values as in Svensson (2013), though make some adjustments to reflect the Norwegian tax system and interest rates. Thus, $\delta + \tau_h + \sigma = .09$, $g = .02$, $i = .05$ and $\pi_{t+1} = .012$. The interest rate, i is the average nominal interest rate on loans in 2010, while I assume that households correctly predict the interest rate, π_{t+1}, of 2011 (Statistics Norway, 2013). The capital tax, $\tau_i = .28$, as previously noted. These values give $\gamma = .114$, and a semi-elasticity with respect to an increase in housing taxes of $-.106$. For each percentage point increase in the taxation of housing, housing prices decrease by 10.6 percent. Assuming wealth tax was paid in full, the 2010 tax rate on housing was[16] $.25 * .011 = .00275$. With the tax reform, it would change to $1 * .011 + 1 * .03 * .28 = .0194$. The tax rate increases from 0.28 to 1.94 percent of housing value, a change of 1.66 percentage points. Applying the previously calculated semi-elasticity of housing prices to tax, housing prices would decrease by 18 percent. If no wealth tax was paid, the tax would only increase by .84 percentage points, roughly half as much, with a corresponding 9 percent decrease in housing prices. It should be noted that the estimates are shown by Svensson (2013) to be quite sensitive to the assumed value of the cost of owning a house,γ.

In evaluating distributional effects, I will show results both for the case where housing prices do not decrease at all, and where all housing prices decrease 18 percent, which should also give some idea of what would happen with price changes somewhere in between.

An immediate reduction of prices by 18 percent, as predicted here, would cause large problems for many households, who would end up with negative equity, as well as for the financial sector. Obviously a reform of this scale would

[16] Given a valuation of 25 percent, and a tax rate of 1.1 percent.

have to be introduced gradually. The reduction in housing prices represents a one time windfall loss to current home owners, and a gain to current renters and future home owners, in addition to the distributional effects calculated below.

6 Results

6.1 Distributional Effects of Alternative Taxation

The distributional effects of the alternative schedule depend on the distribution of housing wealth and imputed housing income. This section presents the results of four tax simulations: 1) A tax simulation where imputed rental income is taxed (at the same rate as capital income), 2) A simulation where the full market value of housing is used in computing the wealth tax 3) A simulation of the full tax reform, which implements both measures 4) The full reform when the effect of housing prices are taken into account.

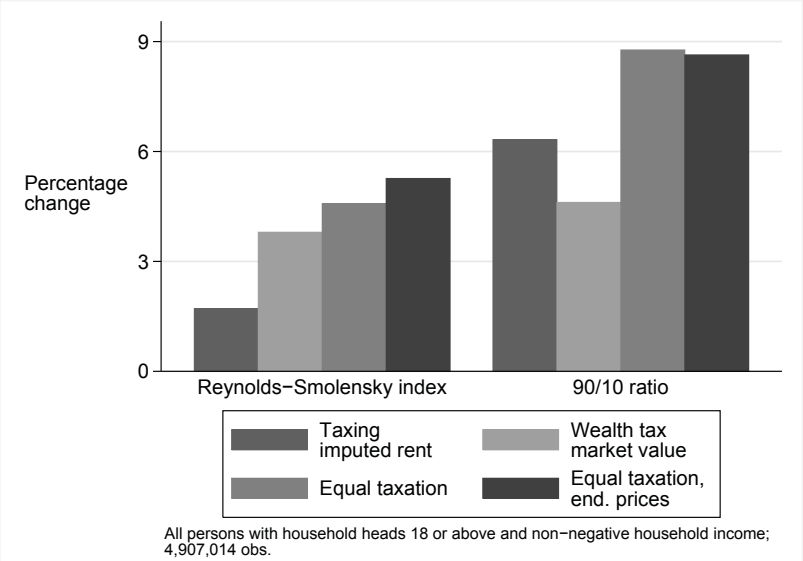
The distributional effects of different tax reforms are here evaluated using the Reynolds-Smolensky index (Reynolds and Smolensky, 1977), a measure of redistribution based on the Gini index. The Reynolds-Smolensky index, Π_{RS}, measures the difference between the Gini of pre tax income, G_I and of post tax (i.e disposable) income, G_D: $\Pi_{RS} = G_I - G_D$. The higher the Reynolds-Smolensky index, the more redistributional is the tax system. This index is more useful than the simple post tax Gini to study the impact of the tax system when pre tax income may differ. Only looking at the post tax Gini, G_D, would be misleading in a case where the tax also changes G_I, which happens when housing demand responses are included. Similarly, instead of presenting the 90/10 ratio on income inequality, I will present an index, $\Pi_{9/1}$ which is the difference between the pre and post tax 90/10 ratio.

While the Gini index is sensitive to changes in the middle of the income distribution, the 90/10 ratio, the ratio of the 90th percentile to the 10th percentile, obviously captures changes at the top and bottom of the income distribution. Thus, the two indexes Π_{RS} and $\Pi_{9/1}$ complement each other.

Figure 4 shows the percentage increase in the Reynolds-Smolensky index, and in the differenced 90/10 ration compared to the no-reform baseline.[17] The first two bars show the separate effects of the two elements of the tax change: taxing imputed rent and taxing housing at market value in the wealth tax. In-

[17] The data behind, pre and post tax Gini coefficients and 90/10 ratios, are presented in Appendix B.

Figure 4: Change in the Reynolds-Smolensky and 90/10 Index



creased housing taxation clearly increases redistribution. Notice that the result marked "Taxing imputed rent" in Figure 4 can be related to the results of Figari et al. (2012); as in the six other European countries covered there,[18] treating imputed rent as taxable income decreases inequality.

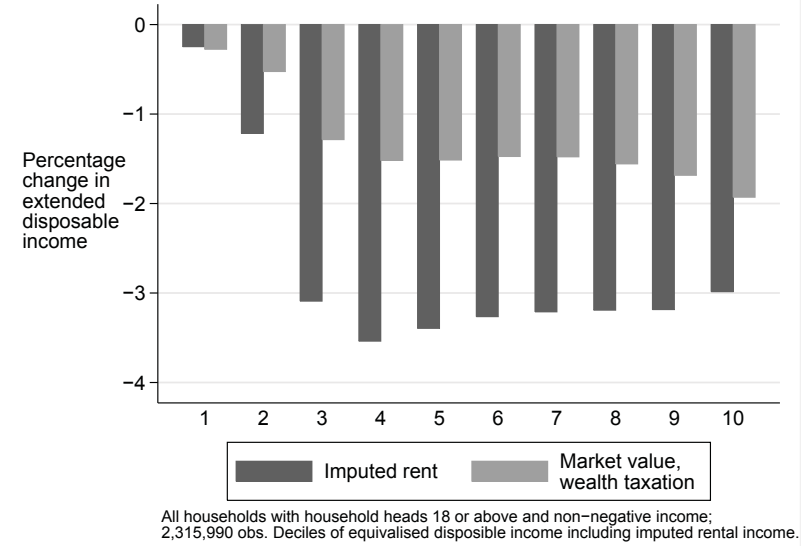
When taking into account that increased taxation affects housing values, the reform increases the progressivity slightly relative to when prices remain unchanged measure by the Reynolds-Smolensky index, while the differenced 90/10 ratio is almost unchanged. The largest effects of the tax reform show an increase in Π_{RS} of over 5 percent, and almost 9 percent for $\Pi_{9/1}$, a sizable effect.

How the taxation of imputed rental income and the full market value of housing impact on different deciles is shown in Figure 5. For the taxation of imputed rental income, the effect on the first decile is less than a tenth of the average effect, but the fourth and fifth decile is relatively hardest hit. The total added revenue is 34.5 Billion NOK, around 10 percent of 2010 personal tax revenue.[19] Changing the value of housing in the wealth tax to market value

[18] But unlike Finland, where the reform barely changes inequality (Saarimaa, 2011).

[19] This part of the reform is roughly similar to taxation of net imputed rent in Figari et al. (2012). Compared with those results, a tax revenue increase of 10 percent is in the lower range, but the Norwegian wealth tax somewhat complicates the comparison

Figure 5: Taxation of Imputed Rent and Market Value



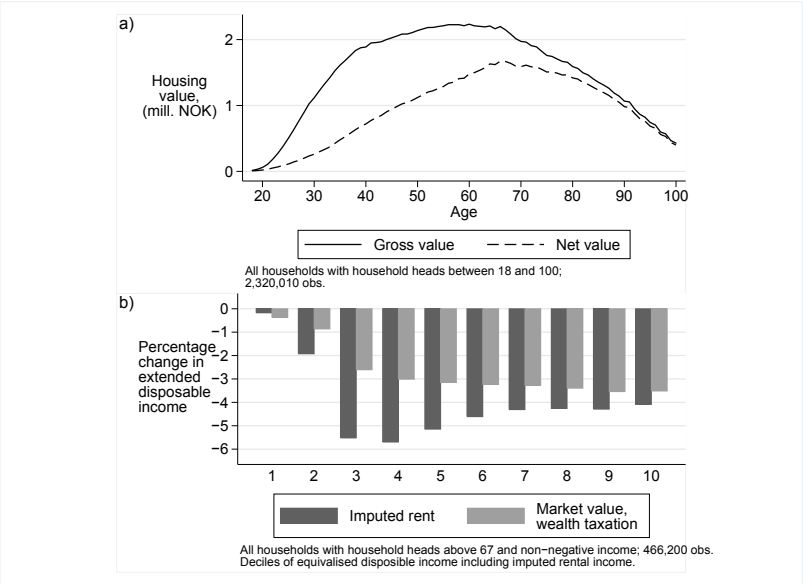
brings in around half the sum, 17 Billion NOK. Here, the effect is increasing over the deciles, with the first and second decile very little affected.[20] Figure 5 explains an aspect of Figure 4: while taxing imputed rent is less progressive than wealth taxation measured by the change in Π_{RS}, which is sensitive to the middle deciles, the opposite is clearly true when measured by the change in $\Pi_{9/1}$.

As there is little interaction between wealth and income tax, a reform that implemented both these changes would increase personal tax revenue by 15 percent, 51.4 Billion NOK. This revenue represents around a third of the revenue from the income tax. Such a large tax increase may leave room to reduce other taxes; a revenue neutral reform is discussed later.

When the effect on housing prices of increased taxation is taken into account, the full reform discussed in subsection 3.5 would increase personal tax revenue by 11 percent, or 39.8 Billion NOK, compared to 15 percent with no effects on house prices.

[20] Worth noting is that a similar exercise on the individual level gives fairly different results, with the first decile much harder hit by a wealth tax. This shows the importance of having household level data when analyzing housing taxation.

Figure 6: Housing Taxation and Age



6.2 The Age Dimension

The age aspect is of special interest when discussing housing taxation in a redistributional context, as elderly often own valuable and mortgage free houses. Frick and Grabka (2003) find that imputed rental income is particularly significant for elderly in the US, UK and West Germany. Thus, a tax on housing income may hit the elderly hard. A first look at the connection between age and housing in Norway comes in Figure 6, panel a, which shows average net and gross value of housing by the age of the household head. Gross value has an inverse U shape, increasing steeply from close to 0 at age 20 to two million at age 40, topping out in the 50s before a marked decrease from the late 60s. As housing is usually bought with borrowed money, net housing value has a different pattern, increasing more slowly to a maximum around age 65.

Another way to see how a tax on housing affects different age groups is Figure 6, panel b, which repeats Figure 5 with only households with household heads over 67 (standard pension age in Norway is 67). The tax reform puts a much higher burden on pensioners in all deciles. In particular, for the pensioners in deciles 3-5, the tax reform would on average increase taxes by almost nine percent of extended disposable income.

Thus, it is clear that an increased tax on the net value of housing will be relatively high for quite a few pensioners, some of whom already have low disposable incomes. It seems politically unfeasible to force pensioners with valuable houses to pay a tax that may take a large share of their income. What could be implemented is a solution where housing taxes for certain groups (i.e. low-income elderly) are deferred until the sale or bequest of the house. Such a system exists in Denmark (Mirrlees et al., 2011). Another way to reduce the burden on pensioners, or others with high net housing equity, could be to increase the standard deduction in the wealth tax, to reflect the general increase in wealth as housing values are increased.

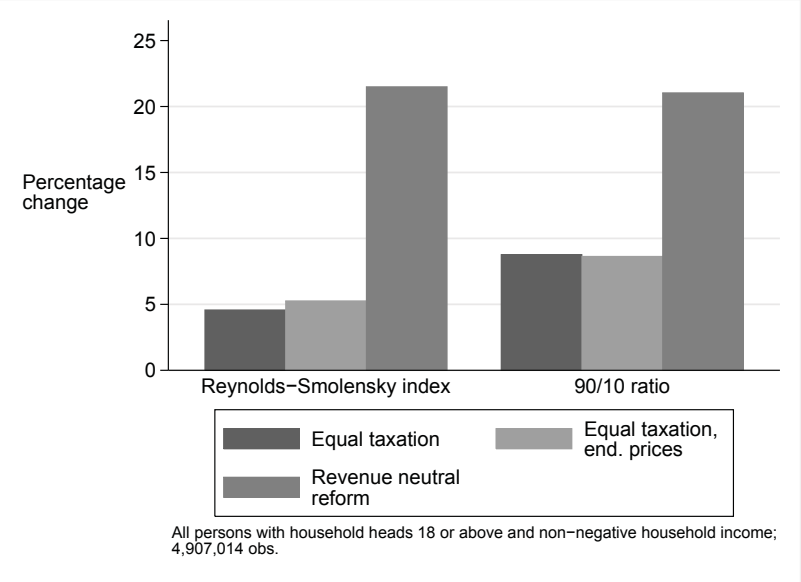
6.3 Revenue Neutrality

A massive increase in tax revenue, which would follow from the applied housing tax reform (39.8 Billion NOK or an 11 percent increase in personal tax revenue), is probably politically infeasible. Thus, I also analyze a revenue neutral reform. There are innumerable combinations of tax cuts and tax changes that could be enacted with the extra revenue from the housing tax. To make it simple, I present the case where the revenue from the housing tax is given out as a lump sum tax rebate.[21] This equals one of the revenue neutral scenarios of Figari et al. (2012), except that I allow the tax rebate to be received even by persons without taxable income. I do this to show how progressive the reform could possibly be. When 39.8 Billion NOK is given out as lump sum payments, it equals 10,460 NOK (or three percent of average extended disposable income) to each inhabitant aged 18 or above.

Figure 7 shows the results from the full reform in Figure 4, alongside the percentage increase in the Reynolds-Smolensky index and the differenced 90/10 index when all extra revenue is given back as lump sum rebates. The revenue neutral reform increases the progressivity of increased housing taxation in each case, by large amounts. Using both measures, the redistribution through the tax system increases by more than 20 percent.

[21] Alternatively, one could imagine reducing taxes where the compliance cost is higher than for a housing tax. Since the housing valuation already exists, and the tax would be hard to evade (a house is not easy to hide), there could be efficiency gains to spending revenue from a housing tax at e.g. reducing the income tax.

Figure 7: Revenue Neutral Reform



7 Conclusion

The relationship between tax policy and housing is a concern in the Norwegian public policy debate. Norway has a tax system that strongly favors housing over other assets and a very high home ownership rate. This combination leads to worries about households indebtedness and inefficient investments.

This paper looks at the effects of changing the Norwegian housing taxation on revenue, house prices and distribution. I use a detailed tax benefit model on new micro data that includes housing valuations for all Norwegian households. In addition, I use a simple model to suggest how housing prices would react to the increase in taxation, showing a decrease in prices of 18 percent. A housing tax reform which treats housing as a normal asset has large revenue effects. Direct taxes increase by a total of 11 percent even when accounting for the induced decrease in housing prices, with two thirds of the increase coming from the taxation of imputed rent. The large predicted reduction in housing prices suggests that a smaller reform may be more feasible, i.e. going some, but not all the way towards neutrality with the taxation of other assets.

The reform increases the progressivity of the tax system, measured both by the Reynolds-Smolensky index and the differenced 90/10 index. I thus confirm

the results of Figari et al. (2012) from six other European countries: more neutral taxation of housing decreases inequality.

Taxation of housing comes with an important age dimension, which may constitute a challenge to political feasibility. The tax burden of pensioners with low disposable incomes and high housing income will increase. This burden on the elderly could be a reason for the difficulty of enacting an efficiency improving housing tax reform in Norway, even though the reform would fulfill several other policy goals.

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Appendix A: Distribution of Present Taxes

The central aspects of the taxation of owner-occupied housing in Norway are: no taxation of housing income, full interest deduction and housing value discounted in the calculation of wealth tax. Table A.1 shows the value of the interest deduction (the interest deductions for all debts, not only mortgages), and the cost of the wealth taxation of housing, as average value and as average percentage of equivalised disposable household income for different deciles of the population. The last two columns of the table shows imputed rental income for each decile.

Table A.1: Difference in Disposible Income, 2010

Decile[a]	Interest Deduction	Percentage[b]	Wealth Tax	Percentage[b]	Imputed Income	Percentage[b]
1	475	0.6	-237	-0.3	6,778	8.1
2	1,424	0.9	-466	-0.3	17,140	10.2
3	3,434	1.7	-534	-0.3	22,708	11.1
4	5,089	2.1	-603	-0.3	28,883	12.2
5	6,452	2.4	-639	-0.2	32,978	12.2
6	7,700	2.5	-649	-0.2	36,483	12.0
7	8,658	2.6	-709	-0.2	40,179	11.9
8	9,635	2.5	-805	-0.2	44,340	11.6
9	10,890	2.5	-1,016	-0.2	50,474	11.4
10	14,716	2.2	-2,405	-0.4	69,711	10.2
Total	6,847	2.2	-806	-0.3	34,968	11.2

Notes: All households with household heads 18 or above and non-negative income; 2,315,990 obs. Values in NOK.
[a]Deciles of equivalised disposable income.
[b]Percentages of equivalised disposible income.

The interest deduction is increasing in share as disposable income increases, until a leveling at the 6th decile, and a decrease in the 10th decile. The wealth tax is roughly stable as share of disposable income, somewhat higher in the lower and the highest decile. The total value of the interest deduction is 24 billion NOK, or somewhat more than 7 percent of total revenue from direct taxes. The wealth tax of housing increases revenue with 2.5 Billion NOK, though the net effect when including deductions for mortgages may well be negative. Table A.1 suggests that both interest deduction and imputed rental income are more equally distributed over the population than Poterba and Sinai (2008) report for the US.

Appendix B: Gini Coefficients and 90/10 Ratios

Table A.2: Tax Reforms

		Baseline	Taxing imputed rent	Wealth tax market value	Equal taxation	Equal tax., end. prices
Gini	Pre tax	0.2971	0.2971	0.2971	0.2971	0.2971
	Post tax	0.2568	0.2561	0.2552	0.2549	0.2547
90/10	Pre tax	3.8500	3.8500	3.8500	3.8500	3.8349
	Post tax	3.1232	3.0773	3.0897	3.0595	3.0454

Notes: All persons with household heads 18 or above and non-negative household income; 4,907,014 obs.

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ISSN: 1892-753X

Statistisk sentralbyrå
Statistics Norway

Design: Siri Boquist