Closing the gender gap in pensions.

A microsimulation analysis of the Norwegian NDC pension system

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Abstract

In this paper we use an advanced micro-simulation model to study the distributional effects of the reformed Norwegian pension system with a particular focus on gender equality. The reformed Norwegian system is based on the notional defined contribution (NDC)-formula with fixed contribution/accrual rates over the active life-phase and with accumulated pension wealth being transformed into an annuity upon retirement. A number of redistributive components are built into the system: a unisex annuity divisor, a ceiling on annual earnings, generous child credits, a possibility for widows/widowers to inherit pension rights from a deceased spouse, a targeted guarantee pensions with higher benefit rates to single pensioners compared to married/cohabitating pensioners, and finally a tax system that is particularly progressive in its treatment of pensioners and pension income. Taking complete actuarial fairness as the point of departure, we conduct a stepwise analysis to investigate how these different components of the National Insurance pension system impact on the gender gap in pensions and on general (Gini) inequality in the distribution of pension income within a cohort of pensioners. Our analysis concentrates on one birth cohort – individuals born in 1963 – and we study three different outcomes: the distribution of annual pensions early in retirement (at age 70), the distribution of the total sum of pension benefits received over retirement, and the distribution of the average annual pension benefits received over the retirement phase. In addition we look at three alternative income concepts. These are personal income, equivalised household income, and finally an original income concept developed for this study: personal income adjusted for the economies of scale enjoyed by couple households.

Introduction

Due to enduring gender differences in labour market behaviour and outcomes, marriage behaviour, and longevity, men and women have different outcomes in national pension systems and have different interests with respect to pension design. It is a universal finding from developed countries that male pensioners on average receive higher benefits than female pensioners, have a lower poverty risk (OECD, 2015: 170-171), and enjoy a higher level of economic well-being (Hurd 1990; Ginn and Arber 1992; Whiteford and Kennedy, 1995).

In recent years the so-called gender gap in pensions[1] has received considerable attention from international organisations like the OECD (OECD 2012)[2] and the EU (European Commission and Social Protection Committee 2015). According to the latest "Pension Adequacy Report", the weighted gender gap in pensions across the entire EU-27 population of pensioners aged 65+ stood at 40% in 2011 (European Commission and Social Protection Committee 2015: 151). According the same source, cross-national variation is huge: from a gender pension gap of only 3% in Estonia to 46% in the Netherlands.

The purpose of this article is to investigate the distributive implications of the reformed Norwegian pension system with a particular focus on gender inequality. The Norwegian reform of 2011 copies central features of the more famous Swedish and Italian pension reforms of the 1990s, and it involves the adoption of the so-called Notional Defined Contribution (NDC) approach in which the accumulation of pension rights is directly linked to earnings over the entire life-course. One of the objections that have been raised against the NDC approach is that it is likely to have in-egalitarian implications and be particularly unfavourable to women (Williamson 2004). However, in the Norwegian case the core NDC-scheme has been flanked by a number of redistributive mechanisms that can be expected to modify the overall distributive effects and contribute to close the gender gap.

An important limitation of most of the existing comparative work on the gender gap in pensions is that it studies the distribution of pensions among current generations of retirees although these outcomes will reflect historical labour market structures and historical pension system features. In order to analyse the outcome of current pension institutions, under current labour market conditions it is necessary to simulate outcomes that lie well into the future. Attempts have been done in this direction also in comparative terms (see for instance Falkingham and Rake 2001, European Commission and Social Protection Committee 2015), but they typically rely on the specification of a few stylised cases. By contrast we here use micro-data that reflect the true heterogeneity of income trajectories over the life-course, and we rely on a detailed, realistic calculation of pension rights as specified in current Norwegian legislation. The downside of this approach is of course that our analysis is confined to one specific country case.

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[1] Typically measured as 1 minus the ratio between average benefits received by female and male pensioners at a given point in time and expressed in percentage terms.
[2] See also
https://www.oecd.org/gender/data/newoecddataandanalysisrevealingthewidegapinpensionbenefitsbetweenmenandwomen.htm

With the help of an advanced micro-simulation model we project and evaluate the overall distributive outcome of the reformed Norwegian system and disentangle the distributive impact of different components for a particular birth cohort, individuals born in 1963 who are projected to retire around 2030. Our analysis covers three different types of outcome: the distribution of yearly pension benefits early in the retirement phase, the distribution of the total sum of pensions received during retirement and the distribution of average yearly pensions received during the retirement phase. Furthermore, we look at three income concepts: individually received pension benefits, equivalised household pension income and a new individual income concept that takes account of differences in economies of scale between single and married/cohabiting pensioners.

We are primarily concerned with how different components in the Norwegian pension system affect the gender gap in pensions but we are also interested in their effects on inequality. The gender gap in pensions and pension income can be seen as a between-group component in overall inequality, while the average of inequality among male and female pensioners can be seen as a measure of within group inequality, and the two are components in the overall level of inequality in pension income.

It should be emphasised that our aim is purely descriptive and analytical as opposed to normative. We do not intend to defend specific ideas about what the ideal policy target would be in a gender perspective – whether a narrowing of the gender gap is in and by itself a legitimate policy objective and if so how it should be weighed against other (potentially) legitimate objectives, like general inequality reduction or improving work incentives.

Sources of the gender gap

Cross-national variation in the size of a gender gap in pensions can be attributed to three main sources: a) variation in labour market behaviour of women and the male/female wage gap, b) variation in marriage and divorce patterns and the scope of gender differences in longevity, and c) variation in pension design. Although we here focus on the latter, it is helpful to try and clarify how socio-economic and demographic factors contribute to gender differences in pension outcomes and how they might give rise to differences in pension policy interests between men and women. We give special attention to the current situation in Norway which is the context of our analysis of pension policy outcomes.

Gender differences in the participation in paid work and unpaid care-work is the most important explanation for the universal existence of gender gap in pensions and an important source of variation in the size of the gap across countries and over time (Ginn and MacIntyre 2013). In most OECD-countries and in the Nordic welfare states in particular female labour force participation has grown significantly since the 1950-60s and this will inevitably contribute to a gradual narrowing of the gender gap in pensions in the long run. However, even in Norway, the lifetime earnings of women continue to lack behind due to more frequent career breaks, more part-time work and lower wages. Currently the labour force participation of women aged 20-66 in Norway is 5.5 percentage points lower than the participation rate for men, the (unadjusted) gender gap in wages is 15%, while the largest contribution to gender differences in lifetime earnings comes from a comparatively high part-time rate work among

female employees (40% as compared to 17% among males).[3] These gender differences in labour market outcomes imply that women as a group will benefit from a generally progressive benefit formula and from benefit components that compensate for career breaks and part-time work.

In addition to this, there are two relevant demographic factors: gender differences in longevity and marriage/partnering behaviour. The higher life-expectancy of women compared to men implies that women can expect to spend more years and a larger share of their life-course being dependent on the receipt of old age pensions. While the average yearly benefits received by female pensioners are typically lower than the benefits of men, the difference in lifetime benefits tend to be smaller, and they might even be negative. The higher life-expectancy of women also means that the returns on pension contributions typically are higher for women than for men (Ståhlberg, Kruse and Sundén, 2005), unless gender differences in longevity are taken into consideration in the benefit formula. It is also worth noting that the higher life-expectancy means that women have a stronger interest in life-annuities as opposed to lump-sum benefits or benefits paid out over a fixed number of years, and for the same reason women have a stronger interest than men in generous indexation rules (James, 2014). Currently the life-expectancy of Norwegian women is 84 years compared to 80 for men.[4]

The second important demographic source of gender differences in pension outcomes and economic well-being over the retirement phase is the propensity for women to marry (or cohabitate with) partners who are somewhat older than themselves. Together with the difference in longevity, the age gap between spouses implies that females have a far higher risk of becoming widows and females can expect to spend a longer part of the retirement phase as single pensioners (Holden, Burkhauser and Myers 1986). As a consequence female pensioners would enjoy a lower level of economic wellbeing compared to male pensioners, even if their old age pension benefits were equal to those of men. In other words, women have a stronger interest than men in pension mechanisms or benefit components that compensate widows/widowers for the loss of economies of scale that come with sharing expenses in a household. In Norway, the average age gap between spouses is currently 3.5 years.[5]

The Norwegian pension reform

The Norwegian public pension system has since the late 1960s provided a combination of (relatively generous) minimum benefits to all elderly and a second tier of earnings-related benefits. The earnings-related second tier is based on a point system in which a full pension is achieved after 40 years of participation in gainful work and in which benefits are calculated on the 20 best earnings-years.

Between 2001 and 2011, a major pension reform was prepared, enacted and put into force. In the policy making process leading up to the enactment of the reform, the potential

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[3] https://www.ssb.no/befolkning/nokkeltall/likestilling
[4] https://www.fhi.no/en/op/public-health-report-2014/befolkning-og-levealder/levealderen-i-norge/
[5] http://www.ssb.no/befolkning/artikler-og-publikasjoner/tiden-gaar-aldersforskjellen-bestaar.

consequences for the gender gap in pensions and gender equality more generally was a hotly debated topic (Bay, Pedersen and Teigen, 2015).

The Norwegian reform is strongly inspired by the path-breaking Swedish pension reform and based on the NDC approach. The accrual of pension rights will in the new system take place continuously over the life-course with a fixed rate of 18.1 percent of annual earnings up to a ceiling at approximately 1.3 times the average fulltime wage. The accumulated deposits on individual notional accounts will eventually be transferred into an annuity upon retirement based on the individual's age at take-up and the remaining life expectancy of the cohort to which the individual belongs.

A key rationale behind the NDC framework is to achieve a closer and more transparent link between lifetime earnings and lifetime contributions on the one hand and (expected) pension benefits on the other. This is assumed to improve both the fairness and the economic sustainability of the system. Arguably, fairness is enhanced by removing "opaque" and sometimes directly regressive redistributive elements found in traditional systems (Myles, 2002, Eriksen and Palmer, 2004), while economic sustainability is improved by an assumed strengthening of the incentives to work when contributions to the pension system can be viewed as a form of forced savings rather than as an ordinary tax (Lindbeck and Persson, 2003; Disney, 2004).

However, a tight link between lifetime earnings and (expected) pension benefits is likely to produce a significant gender gap in pensions as long as women continue to have lower lifetime earnings due to a much higher propensity for part-time work and lower wage levels compared to men, as is the case also among the present generation in Norway.

While the core of the reformed pension system is an NDC-system in which pension rights are in principle strictly proportional to lifetime earnings, a number of mechanisms and additional components contribute to break or weaken the link between previous earnings and expected pension benefits and hence to deviate from the principle of perfect actuarial fairness (Lindbeck and Persson, 2003). These redistributive mechanisms and components can be divided into three main groups: General redistributive mechanisms that (are intended to) reduce inequality in the distribution of benefits as compared to previous earnings, specific family/household related redistributive mechanisms, and finally a category of more latent redistributive mechanisms.

In the Norwegian NDC-system, the most obvious *general redistributive mechanisms* are the social security ceiling on annual earnings that give rise to pension rights, an individual guarantee pension that truncates the distribution of old age pensions from below, and the tax system. The social security ceiling on annual earnings that give rise to pension rights is 7.1 base-amounts (about 1.3 times the average full time wage). Since men tend to have higher annual earnings than women, we expect that the ceiling will reduce the gender gap in pensions/pension income as well as reduce overall inequality. The guarantee pension secures a comparatively high minimum benefit to individuals with low earnings-related entitlements - - with a gross level for a single pensioner at about 36 percent of an average fulltime wage. The benefit is tested against NDC-pension rights with an 80 percent taper. Finally the tax

system is particularly mild and progressive with respect to pensioners and pension income. Pensioners with low incomes (at or just above the guarantee level) do not pay any income tax, while relatively high marginal tax-rates apply to pension income in a large interval above the minimum.

A system for granting of child credits to parents of children under the age of six belongs to the set of *specific family/household related redistributive mechanisms* (D'Addio 2012). The credits take the form of a yearly guaranteed minimum pension accrual for the parent with the lowest earnings (almost always the mother). The credits correspond to annual earnings of 4.5 base-amounts (about 80 percent of an average fulltime wage).

In the old system spouses could inherit part of the pension rights of a deceased spouse and a similar rule is supposed to also apply in the reformed system.[6] A widow/widower is entitled to earnings-related pension benefits equal to at least 55% of the sum of the earnings-related benefits received by the couple before the spouse's death. If the individual pension rights of the survivor exceeds this limit no addition with be granted.

Finally in the category of specific family/household related redistributive mechanisms, we include the existing differentiation of the level of the guarantee pension between married and cohabitating couples on the one hand and single pensioners on the other. The benefit guarantee for pensioners living with a partner (married or cohabitating) is fixed at 1.85 base-amounts, while the benefit for single pensioners is 2 base-amounts. The minimum benefit is somewhat higher for single pensioners in order to compensate for higher living expenses per person compared to pensioner couples.

A category of more latent redistributive mechanisms is related to the fact that the reformed pension system – just like the old system – provides life-long annuities and is a solidaristic insurance scheme in which groups with a relative high life-expectancy participate on equal terms with groups with a relatively low life-expectancy. In the new system each cohort will have to pay for its own (estimated) life-expectancy, but the annuity divisor is gender neutral despite the significant difference in life-expectancy between men and women. The implicit redistribution from men to women that follows from the use of a gender neutral as opposed to a gender specific annuity divisor is however somewhat reduced due to an explicit under-indexation of running pension benefits by 0.75 percentage points below the annual growth in wages. If running benefits had been subject to full wage indexation, the redistribution embedded in the gender neutral annuity divisor would have been even stronger (James, 2014).

Table 1 Redistributive components of the reformed Norwegian system

	Type of redistributive effect
Gender neutral annuity divisor	Latent
Social security ceiling on earnings	General
Child credits	Family/household related
Inherited pension rights	Family/household related

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[6] The legislative details of this have not yet been decided. In the present work we assume that the rules applied to the reformed system will be identical to the rules that have so far been applied in old system.

Guarantee pension	General
Differentiation of the guarantee pension	Family/household related
Income taxes	General

All the redistributive mechanisms outlined above are summed up in Table 1, and presented in the order that we employ in the distributional analysis. There is reason to believe that the redistributive components of the Norwegian system are comparatively comprehensive and strong. All existing NDC schemes operate with a gender neutral annuity divisor, a social security ceiling on earnings, and some form of minimum protection (see Williamson 2004 and Holzmann, Palmer and Robalino (eds.) 2012). However, compared to the Swedish prototype, we can identify five differences that all point in the direction of a stronger redistributive impact in Norway: the guarantee pension offered in the Norwegian system is far more generous, pensioner taxation is more progressive, child credits are more generous, the possibility to inherit pension rights is lacking in the Swedish system and, finally, the under-indexation of running pension benefits is milder (see Pedersen 2005 for a comparison of the Norwegian and Swedish NDC-reforms).

Data, simulation assumptions and demographic composition

The analysis is done using the Norwegian microsimulation model MOSART. This is a dynamic microsimulation model that simulates lifetime trajectories for the entire Norwegian population (see Fredriksen, 1998 for an introduction to the model). The version used here starts in 2013 and simulates a wide range of lifetime events and processes, mainly demographics, educational choices, income and pensions. Up until 2013 the data are based on historical trajectories as recorded in national registers such as the Central population register, and registers in the Norwegian Tax Administration and the Labour and Welfare Service. For the simulation of trajectories from 2013 and onwards, the model uses transition probabilities depending on individual characteristics that are estimated from observed transitions in a recent period. Events included in the simulation are migration, deaths, births, household formation, educational activities, retirement, labour force participation, income and wealth. Public pension benefits are calculated from the simulated labour market earnings and other characteristics included in the simulation according to an accurate description of the public pension system. The pensions covered by the model include old age pensions, disability pensions, survival pensions and early retirement benefits. Changes in the pension system may be analysed by calculating several pension systems in parallel while keeping the stochastic events constant.

We have chosen to follow one specific birth cohort, those born in 1963. The 1963-cohort is the first cohort whose pensions are fully determined by the new system. It is also a cohort for whom we have most of the crucial demographic decisions and labour income development already resolved. In 2013 members of this cohort were 50 years old, so the events up till then are historically determined while the remaining life-course is simulated with respect to labour earnings and potential divorces, remarriages etc.

To make the analysis as clean as possible, focusing on how the system for accruing pension rights affects women and men, we restrict all persons to work until they are 67 years old, and be retired afterwards, even though the new system allows for a flexible combination of pensions and earnings between ages 62 and 75 with full actuarial adjustments for the timing of pension take-up. This is to ensure that the results are not driven by behavioural adjustments to this feature of the pension system. As shown by Fredriksen and Stølen (2014), since this new flexibility was introduced in 2011 men have been much more likely than women to take out pension rights from age 62 often in combination with continued full-time work, and as a result of this their annual pension income will be lower and their total income becomes low when they eventually withdraw from the labour market. Since the decision to take out pension rights while in full-time work is a voluntary, calculated act, we believe that the consequences this choice in terms of lower annual benefits later in retirement do not belong in a distributive analysis.

Figure 1 shows the sample sizes and the distribution of demographic characteristics by age over the entire retirement phase. According to the simulation the 1963 cohort will consist of 30 771 men and 31 319 women at age 67.[7] The bars represent the number of observations, and we note how mortality is lower for women than for men so the decline in sample size is slower for women than for men. The simulated life expectancy at age 62 is 86 for men and 88 for women.

Furthermore, the figure shows how the share who are married decreases more sharply while the share of widows increases faster for women compared to men. In the early stage of retirement, at age 68, 62 percent of the men and 66 percent of the women are married. The difference corresponds to a higher share of widows (8 percent) compared to widowers (3 percent). When reaching age 78 the share of married women has decreased to 51 percent due to an increase in the share of widows – going up from 8 to 20 percent. Among males the share of widowers has gone up from 3 to 8 percent. The higher risk of widowhood among females is partly result of their lower mortality compared to men and the tendency for women to marry/cohabitate with men that are slightly older than themselves (the age difference is about 2 years in our data on the 1963 cohort).

From age 85 (when more than half of the female cohort are still alive) there are more widowed than married women, while the corresponding age where the two curves cross for males is 94 years – an age at which only a small minority of males are still alive.

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[7] 948 individuals have been excluded from the sample if they are registered as married but no partner can be found in the data – presumably because they live abroad.

Figure 1. Sample size and demographic characteristics by age.
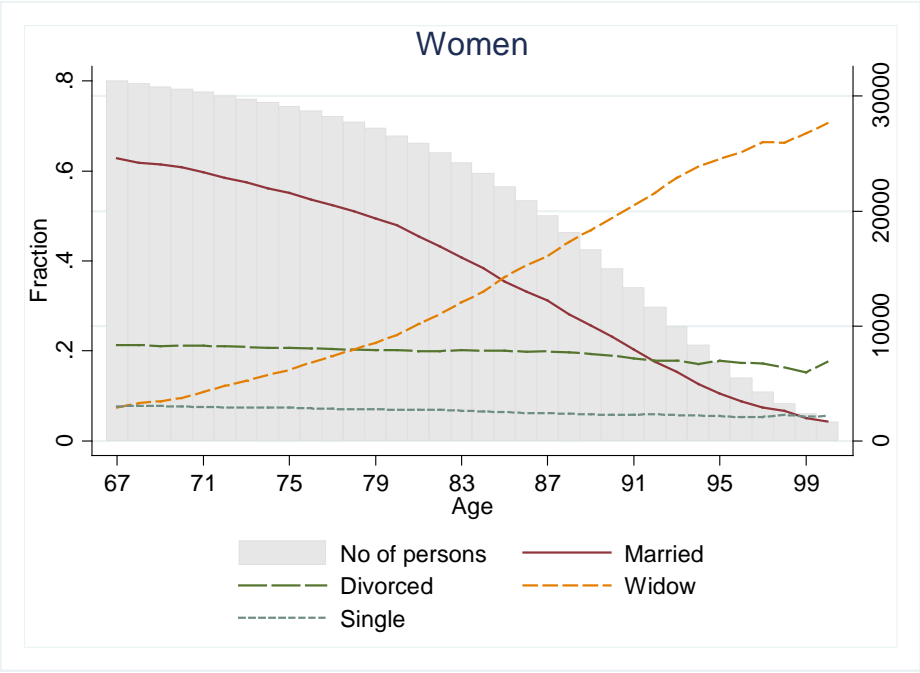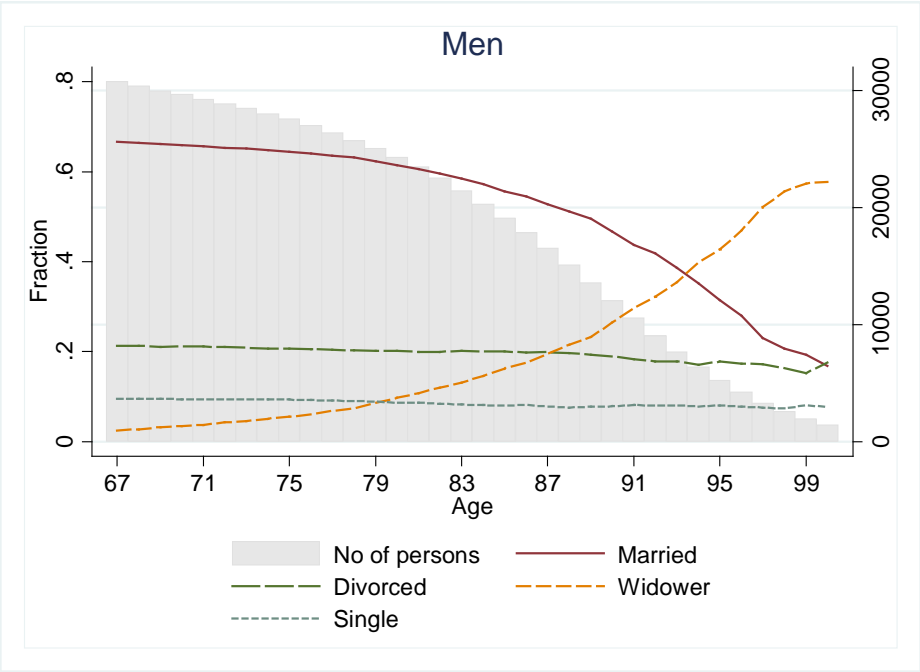
Analytic strategy

Our distributional analysis is done step-wise. In step 0, we simulate a hypothetical pension system that lacks any redistributive elements. Pension rights are simply proportional to lifetime earnings.[8] , and we have applied gender specific annuity divisors taking account of estimated differences in life-expectancy between men and women in this cohort (about two years). This hypothetical pension system can be said to represent the ideal of perfect actuarial fairness where expected benefits (taking account of gender differences in longevity) are proportional to lifetime earnings.

Thereafter, we add each of the redistributive elements in steps: 1) the gender neutral annuity divisor, 2) the social security ceiling on annual earnings, 3) the child credits, 4) the right to inherit pension rights from a diseased spouse, 5) the minimum guarantee pension (but without higher rates for single pensioners), 6) the guarantee pension with higher rate to single pensioners, and finally, 7) tax on pension income.

The sequence in which the different components are entered is crucial for the results obtained. We believe, however, that the chosen sequence is the only possible given the intention to provide a consistent decomposition of the total redistributive effect compared to the hypothetical, completely actuarially fair pension system. The criterion used for establishing the sequence is that the more residual benefit components that are adjusted to other benefit components come last. For instance, the size of the minimum guarantee pension depends on the total accrual of NDC pension rights, including child credits and any inherited pension rights, while the entitlement to child credits does not depend on any of the subsequent elements. A possible alternative approach would be to look at the net effect of removing one component at a time while taking account of compensatory changes in other components. For instance, removing the child credits would mean that more individuals would be entitled to higher amounts of guarantee pension and the net effect would be smaller than the gross effect that is estimated by the sequential approach. The problem with this "partial" approach is that the estimated effects of the respected components will not add up to the total redistributive effect of all components combined. For selected benefit components we will, however, also present the net effects of a partial removal of the component.

Alternative outcome indicators and income concepts

When analysing the gender gap and inequality we consider three alternative outcome indicators. *Annual pension income* is the most conventional of the three and here it is measured at age 70, i.e. at an early stage in the retirement phase. *Total pension income* is the sum of all incomes received over the retirement period, deflated by a wage index. Finally we look at a*verage pension income* which is the total income divided by the number of retirement years (for an earlier use of this indicator see Pedersen, 1999: 380). The latter is our preferred

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[8] Ideally, we would have based it on lifetime earnings only. Unfortunately, the model did not allow for a separation of the different income components, thus earnings include also taxable social security benefits. Since women receive more social security benefits than men (through paid maternity leave and higher take-up of sickness and disability benefits), a distributional element in favor of women is already in place, before our analysis begins.

outcome statistic because it takes account of income conditions experienced over the entire retirement age without being driven by differences in longevity.

Finally we use three alternative definitions of pension income: individual pension income, equalized household pension income (using the modified OECD-scale), and individual income adjusted for economies of scale. While the first is conventionally used in analyses of the distribution of pension benefits and the gender gap in pensions in particular, the second is the conventional choice in poverty and (income) inequality research. The third alternative definition is a novel concept that – as far as we know – has not been suggested and used before. It differs from equalized household income by adjusting individual income with a factor equal to the number of household members divided by the number of household units. In the case of two household members and using the OECD-scale, this factor will be 2/1.5 = 1.33. Our new measure combines features of the two traditional income concepts, individual income and equivalised household income. Unlike individual income, it takes account of economies of scale, but unlike equivalised household income it does not assume equal sharing among spouses/partners. Instead of the latter assumption it makes the stylized assumption that the intra-household distribution of economic well-being is determined by the relative size of the individual incomes. In other words, the measure is sensitive to the fact that a single pensioner (a widow) will achieve a lower level of economic well-being than a married/cohabitating pensioner with the same level of income, and at the same time it is sensitive to the potential significance for autonomy and economic well-being of the distribution of income between spouses.

Results

We start by showing each of the redistributive elements' quantitative effect on (individual) average pension income over retirement for men and women respectively.

Table 2. Individual pension benefits. Average over the retirement phase.

	Average amount at each step in NOK*		Gender gap	Change compared to previous step in NOK		Change in gender gap
	Men	Women		Men	Women	
0. Baseline	268 164	154 176	43 %	-	-	-
1. Gender neutral annuity divisor	242 600	168 341	31 %	-25 564	14 166	-12 %
2. Social security ceiling	206 926	158 741	23 %	-35 674	-9 600	-7 %
3. Child credits	209 087	174 748	16 %	2 161	16 007	-7 %
4. Inherited benefits	209 726	181 298	14 %	639	6 549	-3 %
5. Guarantee pension undifferentiated	214 718	191 563	11 %	4 992	10 265	-3 %

6. Guarantee pension with higher benefits for singles	215 891	193 815	10 %	1 173	2 252	-1 %
7. Income taxes	189 320	175 459	7 %	-26 571	-18 356	-3 %

* Norwegian kroners. 9.34 NOK=1 €

As shown by Table 2, we estimate that for the 1963 cohort a hypothetical actuarially fair pension system would produce a gender gap of 43%, while the actual reformed system is projected to produce a gender gap of only 7% after taking account of income taxation.

Compared to the baseline system, the application of a gender neutral annuity divisor reduces the annual pensions received by men and increases the annual benefits received by women, and altogether the effect is a decrease in the gender gap by 12 percentage points to 31%. The social security ceiling reduces the average benefits received by both men and women, but the reduction is much more severe among men. The result is a reduction in the gender gap by 7 percentage points to 23%. The system of child credits has a further substantial effect in narrowing the gender gap with 7 percentage points to 20%.[9] The possibility to take over pension rights from a deceased spouse reduces the gender gap with 3 percentage points on average. It raises the average amount of annual pension benefits received by female pensioners by 6500 NOK, but one should remember that most of the women who benefit from this only do it for a part of their retirement phase. The impact for those who do benefit the effect is much larger during the years spent in widowhood.

The guarantee pension reduces the gap altogether by 4 percentage points of which the differentiation in favour of single pensioners (step 6) is responsible for 1 percentage point. Finally income taxation reduces disposable income for both men and women, but the progressivity of taxation implies that the relative effect is stronger for men, reducing the gender gap by 3 percentage points.

In the political debate on the Norwegian pension reform, child credits and (to a smaller extent) the right to take over pension rights from a deceased spouse were discussed as women friendly (family related) components in the system. The results in Table 3 indicate that child credits are the more important component of the two, but this hinges at least partly on the chosen sequence. Without child credits the effect of the right to inherit benefits would have been stronger, and it is possible that the two benefit components interact with the guarantee pension in different ways. In order to test for this we have for these two components calculated also the partial (net) effect of removing the component while leaving the other components in place, allowing them to automatically compensate for the removal. The results are shown in Table 3.

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[9] This should be considered a lower bound estimate since the estimated average amount received by males due to child credits is likely to be somewhat overestimated. The simulation assumes that child credits are received by the parent with the lowest income. In case this is the father, however, the couple needs to apply to have the credits transferred to him, and presumably this rarely happens in practice.

Table 3. Contribution by child credits and inherited pension rights to average pensions for men and women and the gender gap – gross and net effects in NOK and change in gender gap.

	Stepwise (gross) effect			Partial (net) effect		
	Men	Women	Change in gender gap	Men	Women	Change in gender gap*
Child credits	2 161	16 007	-7%	1 393	7 137	-3%
Inherited pension rights	639	6549	-3%	564	7 013	-3%

* The evaluation of partial effect is done in terms of step 6, i.e. before taxation.

The partial contribution of child credits to average pension would be 7,137 NOK for women, which is considerably lower than the stepwise (gross) contribution of 16,000 NOK, and the net effect on the gender gap is only 3 percentage points due to automatic compensation effects from increased inherited pension rights and the Guarantee pension. From this perspective the two family related benefit components have rather similar effects on the gender gap.

In Figure 2 we present results of the stepwise analysis for the three outcomes (annual income at age 70, average income over retirement, and the sum of income received over retirement) multiplied by our three alternative income concepts (individually received pensions, individual pensions adjusted for economies of scale and equivalised sum of household pensions). The vertical axis shows the gender gap while the horizontal axis shows the weighted average of Gini-inequality measured for males and females respectively. Note that the axis has been turned so that it runs from high to lower Gini-values.

Figure 2. Gender gap and within gender Gini-inequality for three outcome measures and three alternative income concepts. Stepwise analysis.
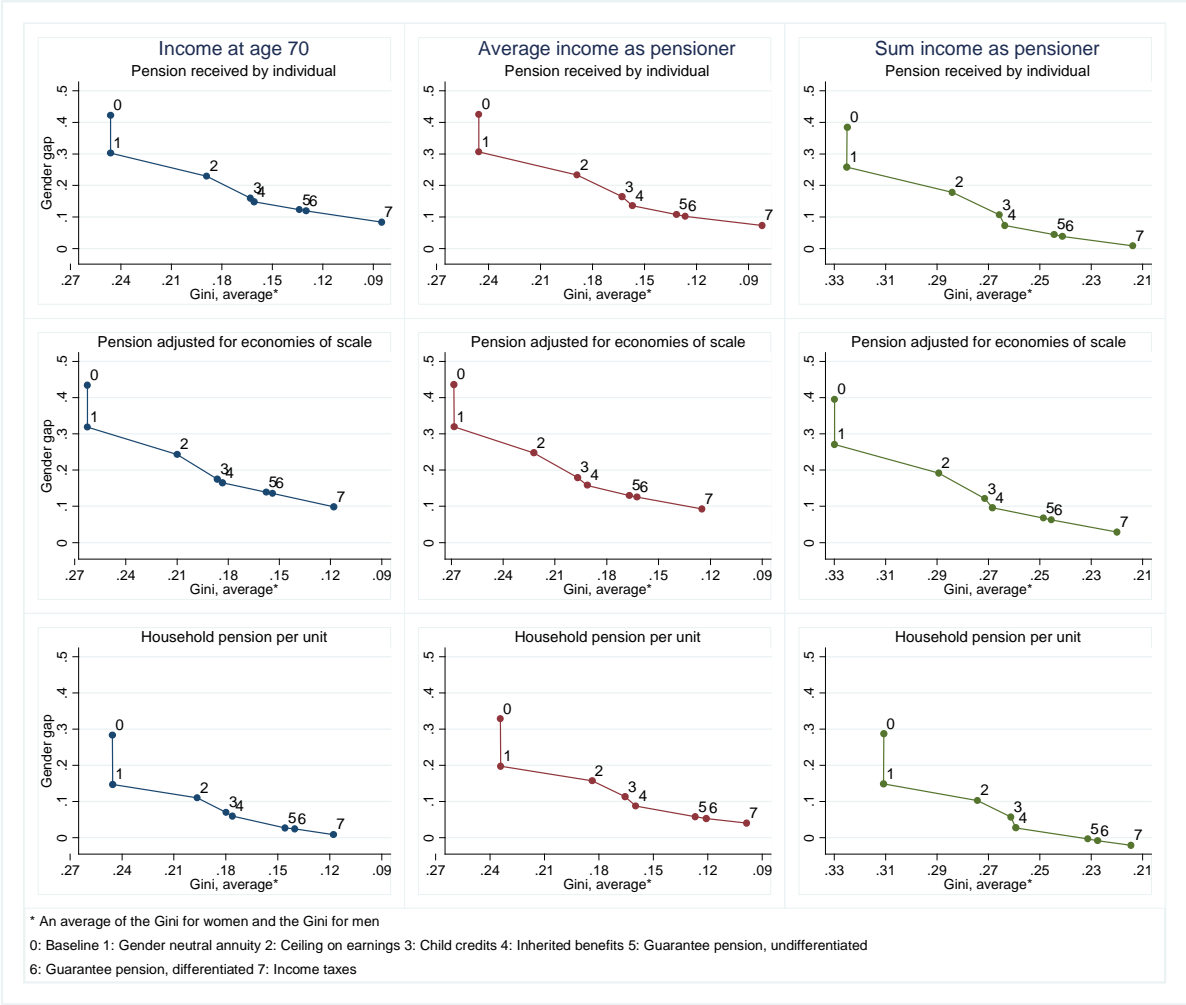
As is apparent in the figure, all the redistributive elements cause the gender gap to shrink. In addition most of the elements also cause a lowering of within-group inequality in income.

By construction, going from a gender specific to a gender neutral divisor does not change the income inequality within each gender group. However, the gender neutral annuity divisor is the redistributive component that contributes the most to reducing the gender gap in pensions compared to the baseline system with a gender specific annuity divisor.

The redistributive element that contributes the most to reducing within-group inequality is the ceiling on earnings, which turns out to affect 70 percent of the men and 40 percent of the women in our simulation (results from analyses not shown here).

The profiles are very similar across the different outcome measures and income concepts. However, while the right to take over pension rights from a deceased spouse/partner has a very small impact on annual incomes at age 70, the effect becomes more substantial when looking at the average over the retirement phase (both on the gap and on intra-gender

inequality). Another difference to note is that the child credits have a smaller impact when looking at equivalised household income compared to the individual income concepts.

Apart from that, the graphs appear to differ mostly in terms of the resulting level of the gender gap and inequality. In order to highlight these differences we complete our presentation of results by showing two tables summarising the final outcomes in terms of the gender gap (Table 4), intra-gender inequality (Table 5).

Table 4. Gender gap in disposable pensions.

	Annual income age 70	Sum over retirement	Mean over retirement
Individual pensions	8 %	1 %	7 %
Equivalised household pensions	1 %	-2 %	4 %
Individual pensions adjusted for economies of scale	10 %	3 %	9 %

As shown in Table 4, the resulting gender gap in disposable pensions is positive everywhere except for the middle cell that refers to the sum over retirement of equivalised household pensions. In line with a-priori expectations, the gender gap is small or negative in all the cells of the second column looking at the sum of benefits received over retirement and the reason is of course that women tend to live longer than men and receive benefits for a longer time. The gender gap is, however, somewhat larger when incomes are measured annually in the first and the third columns – either early in retirement or as an average over the retirement phase -, and particularly it is larger in the four corner cells that refer to individual income with or without adjustment for economies of scale.

Comparing vertically we see how the different income definitions give different results. The gender gap is small when measured in terms of equivalised household income. The obvious reason is that this income concept by construction ignores all intra-household differences in income, and the gender gap is driven entirely by differences between household types (single females versus single males versus couples). Conversely, our new concept – individual income adjusted for economies of scale – shows a larger gender gap than the conventional individual income concept. The reason is that our new income concept is sensitive to the negative implications for economic well-being of living alone. It captures the fact that females tend to spend a higher fraction of the retirement phase as singles (widows). Apparently the loss of economies of scale when the husband dies is not fully compensated by the reformed system despite the right to inherit pension rights and the modest differentiation of the minimum pension.

Table 5. Intra-gender Gini-inequality in disposable pensions

	Annual income age 70	Sum over retirement	Mean over retirement
Individual pensions	.085	.214	.082
Equivalized household pensions	.118	.215	.099
Individual pensions adjusted for economies of scale	.118	.220	.124

As shown in Table 5, intra-gender inequality in pension income is significantly higher for the "sum over retirement" outcome compared to the two other outcome statistics based on annual pension income. The explanation is that social inequalities in life-expectancy correlate with lifetime earnings and accumulated pension rights. The rich tend to live longer and receive benefits for more years and taking this into account adds to the inequalities found in annual incomes. Comparing across the three income concepts we find that intra-gender inequality tends to be lowest for the individual income concept and highest for individual pensions adjusted for economies of scale. The main explanation for this is that married pensioners tend to have higher individual pensions on average than single pensioners and this advantage is being reinforced by adjusting for economies of scale.

Conclusion and discussion

Although the core of the reformed Norwegian pension system is built on the Notional Defined Contribution model and designed to achieve a close link between life-time earnings and expected pension benefits received over the retirement phase, a series of redistributive components ensure that the gender gap in pensions is very significantly reduced.

Looking at individual pension income, the projected gender gap in average benefits received over the retirement phase is reduced from 43% to only 7% with all the redistributive components in place, including the progressive system of pensioner taxation.

The gender neutral annuity divisor gives the single most important contribution to close the gender gap, and the effect would have been even larger if benefits had been fully indexed with wages over the retirement phase. Among those components that we have classified as generally redistributive (from rich to poor) the income ceiling appears to be the most important for closing the gender gap followed by the guarantee pension and the tax system. An important caveat here is that the two latter components would have had a stronger impact without the other redistributive components in place.

Among the last group of redistributive components that we labelled *family/household related,* child credits have the strongest effect followed by inherited pension rights and the differentiation of the guarantee pension. Again – as we have seen – the sequence plays a role

here. Child credits reduce the amount of pension rights that can be derived from a deceased spouse/partner is and hence removing the child credits would to a certain degree be automatically compensated by higher inherited pension rights and higher guarantee pensions. The partial (net) effect of removing the child credits is therefore much smaller and about the same as the corresponding effect of removing the right to inherit benefits.

The family/household related benefits tend to reduce intra-gender inequalities as well as closing the gender gap. In particular the child credits have a fairly strong inequality reducing effect (particularly among women, of course), but also here a significant share of the redistribution achieved would be automatically taken over by the guarantee pension if the child credits were simply removed.

As could be expected, the final gender gap is smaller or even negative when looking at the sum of future benefits received over the retirement phase, and it tends to be smaller when looking at household equivalised income rather than individual income. The largest gender gap appears when we apply our new income concept: individual income adjusted for economies of scale. When this income concept is used in combination with our preferred outcome indicator (average yearly income received over the retirement phase), we find an after tax gender gap of 9%. The reason is that our new income concept is sensitive to the fact that female pensioners can expect to spend a larger share of the retirement phase as widows and hence with the associated loss of economies to scale.

We should emphasise that these results refer to a particular cohort – individuals born in 1963, and that our simulations of future labour market and family careers are based on assumptions about stability in the basic behavioural patterns. Among younger cohorts in Norway the educational gap in favour of women is growing and female labour force participation over the life-course is likely to increase. On the other hand population ageing and an associated increase in the share of frail elderly might exert a downward pressure on the labour force participation of adult daughters, but in Norway this effect is likely to be comparatively modest due to the comprehensive system of publicly provided eldercare.

Our findings cannot be generalised to other countries that have adopted the NDC framework like Sweden, Italy and Latvia (see Holzmann, Palmer and Robalino (eds) 2012). As we have already suggested, the Norwegian version contains a particularly comprehensive set of redistributive mechanisms, at least compared to the Swedish prototype, and therefore the reduction in the gender gap achieved by the Norwegian system is likely to be particularly large. Generous child credits, the right to inherit pension rights after a deceased spouse and a comparatively generous minimum guarantee are all peculiarities of the Norwegian system that contribute significantly to close the gender gap. On the other hand, most (if not all) NDC schemes that have been implemented internationally use gender neutral annuity divisors (Williamson 2004), and we have found this to be the single most important redistributive mechanism from men to women, also in Norway.

In Norwegian debates, the child credits and the right to inherit pension rights from a deceased spouse have been recognized and discussed as particularly "women friendly" components of the reformed system. This study confirms that they do indeed help to close the gender gap in

pensions. However, an alternative notion of women-friendliness and alternative criteria against which to evaluate the pension system would be to require that the pension system provides equally strong incentives to labour supply for women compared to men, and to demand that the system does not systematically favour couples that distribute formal and informal work in line with traditional gender roles. On this critierion there is every reason to expect that child credits, inherited benefits and the guarantee pension all tend to be particularly unfavourable to women.

So while the reformed Norwegian pension system performs comparatively well in terms of closing the gender gap in pensions, it does so partly thanks to benefit components that weaken the incentives for women to work and reward couples who chose an unbalanced sharing of informal and formal work in accordance with traditional gender roles.

An alternative policy route towards more gender equality of pension outcomes that has received little attention in Norway, would be to introduce a system for sharing pension accrual between spouses and cohabitating couples. Often sharing is criticised from a feminist perspective because it implies a stronger reliance on "derived" pension rights for married women, but it would not to the same extent as the present Norwegian system reward and subsidise couples who behave according to traditional gender roles. An exploration of the distributive and incentive implications of a system for sharing pension rights is a relevant theme for future research.

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