How best to measure pension adequacy

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Editorial note

Aaron George Grech is a visiting research fellow at the LSE's Centre for Analysis of Social Exclusion (CASE) and works at the Modelling and Research Office of the Central Bank of Malta. This paper builds on research he carried out as part of his doctoral research at CASE between 2006 and 2010, and expands on results presented in CASEpapers 140 and 161. He would like to thank John Hills for having provided very helpful comments and suggestions on this research work. The latter also benefited from the comments of Nicholas Barr. The simulation model APEX, used to derive pension wealth estimates, was kindly provided by the Directorate for Employment, Labour and Social Affairs of the Organisation for Economic Co-operation and Development (OECD). The author is particularly indebted to Edward Whitehouse and Monika Queisser, for their kind help, advice and support.

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Abstract

Though the main benchmark used to assess pension reforms continues to be the expected resulting fall in future government spending, the impact of policy changes on pension adequacy is increasingly coming to the fore. As yet, there does not seem to be a broad consensus in policymaking circles and academic literature on what constitutes the best measure of pension adequacy. While various indicators have been developed and utilised, no single measure appears to offer a clear indication of the extent to which reforms will impact on the achievement of pension system goals. Many indicators appear ill-suited to study the effective impact of reforms, particularly those that change the nature of the pension system from defined benefit to defined contribution.

Existing measures are frequently hard to interpret as they do not have an underlying benchmark which allows their current or projected value to be assessed as adequate or inadequate. Currently used pension adequacy indicators tend to be point-in-time measures which ignore the impact of benefit indexation rules. They also are unaffected by very important factors, such as changes in the pension age and in life expectancy. This tends to make existing indicators minimise the impact of systemic reforms on the poverty alleviation and income replacement functions of pension systems. The emphasis on assumptions which are very unrepresentative of real-life labour market conditions also makes current indicators deceptive, particularly in relation to outcomes for women and those on low incomes.

This paper posits that these defects can be remedied by using adequacy indicators based on estimates of pension wealth (i.e. the total projected flow of pension benefits through retirement) calculated using more realistic labour market assumptions. These measures are used to give a better indication of the effective impact of pension

reforms enacted since the 1990s in ten major European countries. They suggest that these reforms have decreased generosity significantly, but that the poverty alleviation function remains strong in those countries where minimum pensions were improved. However, moves to link benefits to contributions have raised clear adequacy concerns for women and for those on low incomes which policymakers should consider and tackle.

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Introduction

In recent decades European governments have embarked on significant pension reforms meant to ensure system sustainability.[1] Since reducing the impact on future spending levels was frequently the main aim of these reforms, it is not surprising that many early studies focused just on this aspect.[2] However, more recently, researchers have broadened their analysis beyond fiscal considerations[3] and started to delve into the broader implications of these policy changes.[4]

This change in research focus was, in part, inspired by a shift in thinking on pension reforms in international economic institutions. For instance in the 1990s the World Bank was an all-out proponent of privatisation and retrenchment[5], so much so that a policy review by its Independent Evaluation Group[6] concluded that "Bank involvement in pension reform was often prompted by concerns about fiscal sustainability. Yet, in doing so, there often was a neglect of the primary goal of a pension system: to reduce poverty and provide retirement income *within* a fiscal constraint".[7] By contrast the Bank's present stance is that "pension systems need to provide adequate, affordable, sustainable, and robust benefits".[8]

However, while the standard measure of the fiscal success of a reform – reduced future spending[9] – is well-known, understandable and clear, there is no

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1 For an overview of these reforms, see European Commission (2010), OECD (2007) and Zaidi et al (2006).

2 See for instance, Disney (2000).

3 See, for example, Dekkers et al (2009) and Zaidi & Grech (2007). Grech (2012) contains an overview of many other such studies.

4 For instance, Forster & Mira D'Ercole (2005) conclude that "changes in the generosity of public transfers and taxes have played the largest role in shaping changes in poverty risks among the elderly within individual countries" of the OECD during the second half of the 1990s.

5 World Bank (1994).

6 The Independent Evaluation Group is an independent unit within the World Bank that acts as an auditor of the impact of policies advocated by the Bank.

7 The World Bank Independent Evaluation Group (2006). The World Bank's previous approach and its insistence on a mandatory fully funded second pillar had been criticised by a number of renowned economists, such as Kotlikoff (1999), Orszag & Stiglitz (1999) and Modigliani & Muralidhar (2005).

8 Holzmann & Hinz (2005).

9 A standard example of this approach is Schneider (2009). In it the author argues that "the larger the decrease in expected spending on public pensions in 2050 between two base years, the more successful a pension reform the country achieved".

similar consensus on how best to measure whether pension entitlements will remain adequate. The scope of this paper is to review the indicators that have been proposed and used in the literature, and suggest alternative measures. To start this discussion, the following section outlines the aims of pension provision typically envisaged by policymakers. Section 2 describes the main pension adequacy indicators used in the literature, and their defects. An alternative set of indicators based on estimates of pension wealth for ten European countries is then proposed in section 3. Using pension wealth, rather than the standard pension adequacy indicators, helps address many of the concerns raised in section 2 – such as the limited ability of existing indicators to reflect the impact of different benefit indexation rules,[10] changes in pension age and life expectancy and the impact of systemic reforms[11] on generosity. While the empirical results have already been presented in Grech (2010), the paper sets out more clearly the methodological improvements of this approach by comparing them with currently used pension adequacy indicators.

1. Pension adequacy objectives envisaged by policymakers

Pension policy differs largely across countries,[12] but this has not stopped international institutions from coming up with adequacy objectives. While in no way prescriptive, these objectives are given their due consideration by national policymakers.

The World Bank, for instance, has wielded considerable influence in shaping pension reforms. Its current stance is that "pension systems need to provide adequate, affordable, sustainable, and robust benefits".[13] By 'adequate' the Bank intends that "all people regardless of their level or form of economic activity" have access to benefits "that are sufficient to prevent old-age poverty on a country-specific absolute level in addition to providing a reliable means to

10 Benefit indexation rules determine how the value of a benefit changes after it is awarded. For instance, a benefit could be increased in line with inflation over time.

11 In a systemic reform, a scheme's financing and benefit accrual structure is changed. In most cases, pension systems are changed from pay-as-you-go defined benefit (where benefits are determined in relation to an agreed pensionable income, financed out of current contributions) to defined contribution schemes (where benefits depend on contributions made, any accrued returns on these contributions and the time to be spent receiving the benefit), either notional (i.e. benefits are still financed from current revenues) or funded (i.e. contributions are not immediately spent).

12 Nevertheless, pension provision tends to be uniformly collectively organised. See Jousten (2007) for some theoretical explanations of why this happens across countries. Eckstein et al (1985) shows it is potentially welfare improving to have a compulsory pension scheme.

13 See Holzmann & Hinz (2005).

smooth lifetime consumption for the vast majority of the population".[14] The Bank specifies that "for a typical, full-career worker, an initial target of net-of-tax income replacement from mandatory systems is likely to be about 40% of real earnings to maintain subsistence levels of income in retirement".[15] Systems offering rates above 60% are seen as unaffordable, as the Bank argues that they would require contribution rates which would be quite detrimental. Adequacy needs to be guaranteed over time such that "the pension program should be structured so that the financial situation does not require unannounced future cuts in benefits, or major and unforeseen transfers from the budget" and systems should be able to "sustain income-replacement targets in a predictable manner over the long term…in the face of unforeseen conditions and circumstances".[16]

The International Labour Organisation (ILO) has through the years led representatives of governments, employers and trade unions to agree on a number of conventions on pension provision. These conventions aim to "guarantee protected persons who have reached a certain age the means of a decent standard of living for the rest of their life" – which is set by Convention 238 as a replacement rate of 45%.[17] This needs to be maintained in view of changes in the cost of living subsequent to retirement. The ILO also argues that "statutory pension schemes must guarantee adequate benefit levels and ensure national solidarity"[18] and that risks should not be borne solely by the individual but must be shared among all social agents. Coverage must also extend to all members of society and there should not be gender inequality in provisions.[19]

Since 2001, the European Union (EU) has achieved agreement among Member States on common objectives on pension policy – the achievement of which is monitored through the open method of co-ordination (OMC). The latter is a voluntary process for political cooperation, where progress towards these goals is measured by monitoring agreed common indicators. EU Member States prepare national reports, which are then assessed by the Commission and

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14 Ibid.

15 Ibid. This is in line with International Labour Office (1952) – the basic convention for social security benefits.

16 Unfortunately, the same study, Holzmann & Hinz (2005) concludes that "most existing pension systems, including some of the recently reformed systems, are unable to deliver on these promises".

17 See Humblet & Silva (2002).

18 See International Labour Office (2001).

19 Ibid. Gruat (1998) describes further the ILO's adequacy principles for pension reform.

Council and reflected in joint reports.[20] In 2012 this culminated in the Commission preparing a white paper on pension reform.[21] The pension adequacy objective agreed as part of the OMC states that countries should "in the spirit of solidarity and fairness between and within generations, guarantee adequate retirement incomes for all and access to pensions which allow people to maintain, to a reasonable degree, their living standard after retirement".[22] The achievement of this objective is monitored by looking at 4 primary indicators, namely the at-risk-of-poverty rate of older people, their median relative income, the aggregate replacement ratio and the change in projected theoretical replacement ratio over the next 40 years.[23] These indicators will be discussed in the next section. At the outset, it should be noted that the EU has shied away from adopting a minimum quantified pension adequacy indicators approach.

2. Pension adequacy indicators

Arriving at a precise definition of pension adequacy and operationalising it into an indicator has proven to be difficult. Besides the standard conception that pension adequacy is determined by the degree of poverty alleviation and consumption smoothing[24] a system provides to the current pensioner generation, intergenerational comparisons of adequacy also play a role, particularly in the wake of substantial reforms.[25] The perceived lack of effective pension adequacy indicators potentially could distort the pension reform debate. Some argue that it partly explains the continued predominance of fiscal considerations. For instance, Eckardt (2005) argues that "as long as no reliable prospective income indicators exist, which allow one to evaluate the effect of more structural changes on future benefits, the rather short-term policy-making process may further favour the principle of financial sustainability".

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20 See, for example, European Commission (2010).

21 European Commission (2012).

22 See European Commission (2005).

23 See European Commission (2009). Member States also monitor developments in 8 secondary indicators and 1 context indicator.

24 See Barr and Diamond (2006) for a theoretical discussion of the purpose of pension systems, and Palacios & Sluchynsky (2006) and Caucatt et al (2007) for an outline of how national pension systems started being set up at the end of the nineteenth century.

25 Both Draxler & Mortensen (2009) and Abatemarco (2009) argue that adequacy has three different dimensions – intragenerational and intergenerational redistribution and lifetime income smoothing, propose separate indices to measure these dimensions but then fail to apply their frameworks empirically.

2.1 Theoretical replacement rates

Kolitkoff (1999) argues that pensions "should replace a reasonable fraction of pre-retirement income, i.e., they should be consistent with lifetime consumption smoothing". In fact, most pension adequacy measures concentrate on how benefits compare with previous income. The most commonly used measure is the replacement rate. The latter tries to "assess how well older people can maintain their pre-retirement levels of consumption once they stop working".[26] The most economically accurate measure would be one comparing someone's consumption pre-retirement with that post-retirement. Due to data unavailability, this is approximated by comparing incomes collected on a longitudinal basis. Goodin et al (1999), for instance, compute the 'effective replacement rate' of public transfers in Germany, the Netherlands and the US by finding in national income surveys "those people whose principal source of income in one year was market income and whose principal source of income in the next year was public-transfer income" and then "calculate their income in the second (public-transfer-dependent) year as a proportion of their income in the first (market-dependent) year".

However, this direct measure of adequacy has its limitations. First of all, it is a historical measure – in that one needs to wait until retirement to be able to assess replacement rates. Secondly, it is an individual measure and thus may not be representative of the whole population. Thirdly, it is not a prospective measure and so does not give information on future changes in pension system rules – replacement rates would reflect rules as they related to that individual. Fourthly, it is data-intensive and such longitudinal data are not usually available. Fifthly it has no direct link with poverty as if someone is poor, and the pension system replaces 100% of income, while the replacement rate would seem generous, it would still not reduce the risk-of-poverty.[27] Finally it is a single point-in-time indicator, and does not take longevity into account and how it affects transfers to the individual.

To surmount some of these issues, theoretical replacement rates are frequently resorted to. The European Commission, as part of the OMC, regularly publishes estimates of "the level of pension income the first year after retirement as a percentage of individual earnings at the moment of take-up of pensions…for an assumed hypothetical worker, who in the so-called 'base case' has a given earnings and career profile (male, earnings of average wage constant over his fulltime 40 years career, retiring at 65, etc)".[28] The latest estimates are shown in Table 1. The OECD also publishes theoretical

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26 Munnell & Soto (2005).

27 Goodin et al (1999), in fact, do not use the 'effective replacement rate' as an adequacy indicator but as a measure of the extent to which welfare systems promote stability over an individual's life course.

28 European Commission (2010).

replacement rates for a range of hypothetical individuals, but restricts its results to state pension provision.[29] Table 2 compares the OMC estimates with those made by the OECD for the hypothetical worker on average earnings, to give an idea of the role of private pensions. OECD estimates suggests that in ten countries state pensions do not offer the ILO recommended 45% replacement rate, while 6 countries offer what the World Bank deems unaffordable replacement rates. Note that the OECD prepares estimates for workers on different wage levels. This is similar to what is done in the United States, where the Social Security Trustees Report includes estimates for a number of stylised wage earners.[30]

Blondell & Scarpetta (1999) was one of the first studies of cross-country theoretical replacement rates. However the authors were quick to point out that "there is no such thing as a single pension replacement rate in any national retirement scheme". This because even with the simplest case – flat-rate universal old-age pensions – the gross replacement rate will still differ for individuals as it is determined by their previous earnings, while net replacement rates will be affected by the progressivity of the tax system. In fact, the estimates in Table 2 clearly show that replacement rates for people on different levels of wages differ greatly in most countries, while the data in Table 1 indicate that tax regimes also vary substantially. Table 2 also indicates that in some countries, the OMC replacement rate indicator is buoyed upwards substantially by private pensions. In some cases, such as Poland, Slovakia and the Netherlands, this is due to mandatory or quasi-mandatory private systems. Here the OMC replacement rates are subject to rate-of-return risk. In some other cases, there is also a considerable participation risk, as the OMC replacement rates assume that the average person voluntarily participates in a private pension scheme. For instance, in Ireland the replacement rate including private pensions is 47 percentage points higher than that from the mandatory state pension.

29 See OECD (2011).

30 See Social Security Administration (2012).

Table 1: Theoretical replacement rates (%) - OMC

	Gross replacement rate		Net replacement rate	
	At 65	**At 75**	**At 65**	**At 75**
Austria	69	58	84	73
Belgium	46	40	71	65
Bulgaria	47	32	59	40
Cyprus	47	44	53	48
Czech Rep	59	50	78	67
Denmark	58	53	81	74
Estonia	32	30	40	38
Finland	62	52	69	60
France	64	54	78	65
Germany	41	41	64	64
Greece	105	86	115	99
Hungary	65	64	105	106
Ireland	76	70	84	79
Italy	80	68	88	76
Latvia	48	34	64	46
Lithuania	49	47	66	61
Luxembourg	64	57	79	68
Malta	67	67	79	79
Netherlands	92	92	104	104
Poland	59	48	68	56
Portugal	76	65	94	79
Slovak Rep	58	53	75	71
Slovenia	42	39	61	57
Spain	88	82	95	89
Sweden	68	65	71	68
UK	61	54	73	66

Note: Replacement rates are worked out on a gross and net (of income taxes and employee contributions, but always including employer contributions) basis. They represent the situation of people retiring under the legislation enacted by 2008, including any transitional rules to be implemented gradually that may be legislated in enacted reforms. They also include income from private pensions if coverage is significant.

Source: European Commission (2010), and for Greece and Sweden, European Commission (2009).

Table 2: Theoretical gross replacement rates (%) – OECD

	At 0.5 times average wages	At 1.5 times average wage	At average wage (OECD)	At average wage (OMC)
Austria	77	72	77	69
Belgium	60	33	42	46
Czech Rep	80	37	50	59
Denmark	65	17	29	58
Estonia	38	21	26	32
Finland	66	58	58	62
France	56	41	49	64
Germany	42	42	42	41
Greece	96	96	96	105
Hungary	44	44	44	65
Ireland	58	19	29	76
Italy	65	65	65	80
Luxembourg	98	87	84	64
Netherlands	59	20	29	92
Poland	29	29	29	59
Portugal	63	53	54	76
Slovak Rep	26	26	26	58
Slovenia	64	62	62	42
Spain	81	81	81	88
Sweden	46	23	31	68
UK	54	23	32	61

Source: European Commission (2010), and for Greece and Sweden, European Commission (2009), OECD (2011).

Heterogeneity in replacement rates poses significant hurdles to use them as pension adequacy measures. To be able to do this, one would need to know to what extent the hypothetical individual, for whom the theoretical replacement ratio is estimated, is representative of the average pension recipient. On a theoretical level, Blondell & Scarpetta (1999) points out that the simplifying assumption of a flat earnings profile over the worker's lifetime and full indexation of earnings for benefit calculation may overstate the pension level. Workers tend to move across the wage distribution over their lifetime, starting with low wages and ending with higher wages closer to retirement. Moreover even if wages did not change with age, it is hardly likely that an individual would always receive the increase observed in average wages.

Leaving aside these simplifying assumptions, the main criticism of theoretical replacement rates is the representativeness (or not) of the hypothetical worker. For instance, the EU's OMC indicator specifies a single male on average

earnings, employed full-time for 40 years uninterruptedly and retiring at 65. Leaving aside the obvious issue of gender, the first consideration is that across Europe the average person does not retire at 65. Eurostat data suggest that the average exit age from the labour force of males in 2010 stood at 61.5 for the EU-27. Employment rates are well below 100%, particularly for women, tend to fall over the working age and differ greatly by country.[31] Close to a fifth of the workforce, most of them women, work part-time.[32] Moreover by definition, an average wage, while being representative of the wage most commonly experienced in an economy, does not provide any indication of the extent of inequality in wage distribution. Eurostat's Structure of Earnings Survey (SES)[33] reports that across the EU in 2010, the wage of those in the bottom tenth percentile of the wage distribution was more than 8 times that of those in the top tenth.[34] The same data source also indicates earnings follow a pronounced age profile, accelerating rapidly at first before then decelerating after age 50.[35]

The Commission is aware of these issues and its first report on theoretical replacement rates[36] had noted that "the choice of specific common assumptions about the hypothetical worker used for the calculation, such as the age of retirement and length of working and contribution period before retirement, inevitably implies that only a share of all possible situations are taken into account".[37] European Commission (2009), for instance, notes that in Greece "a

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31 The employment rate for men aged 25-64 stood at 75% in 2011 across the EU27, from a low of 67% in Bulgaria to a high of 83% in Sweden. For women the EU27 average was 62%, ranging from 43% in Malta to77% in Sweden. The employment rate for those aged 55-64 was just 55% for men and 40% for women.

32 The respective figure for women was 32%.

33 The SES provides EU-wide harmonised structural data on gross earnings, hours paid and annual days of paid holiday leave which are collected every four years.

34 Wage inequality differs greatly across countries. For example, in Sweden those in the bottom tenth percentile get a wage only a quarter less than the median wage; whereas in the neighbouring Baltic country of Estonia the ratio is more like half.

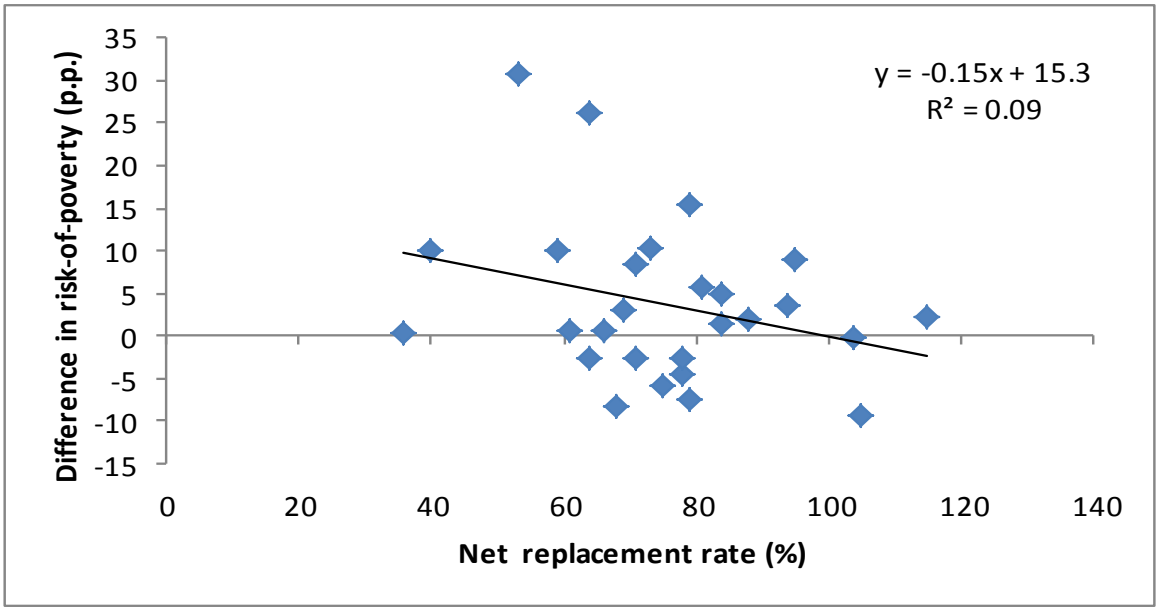
35 On average across the EU, in 2010, the mean wage of men aged under 30 was just three-fifths the mean wage of men aged 40 to 49. By contrast those aged over 60 have a wage only 3% higher than those aged 40-49.

36 European Commission (2006).

37 A further complication is the economic assumptions taken, as these can be a very important determinant of replacement rates for defined contribution systems. For instance European Commission (2006) had set the long run rate of return on investments at 2.5%. By contrast the real wage growth assumption for some countries, such as Poland, was set higher. Partly as a result of these awkward assumptions, that imply dynamic inefficiency, the replacement rate of Poland's defined contribution pension systems was shown to decline substantially over time. In their contribution to European Commission (2006), Polish national experts had

negligible portion of pensioners, below 3%, complete 40 contribution years before retirement". Since average career length in Greece is 25 years, while the OMC indicator suggests that pensions in Greece are the most generous in the EU, the poverty rate among Greek pensioners is the fifth highest, as people do not get that implied generous pension. Only in 9 EU countries, men contribute 40 years or more prior to retirement.[38] Given these issues, it is not surprising to find that there is only very weak correlation between the net theoretical replacement rate and the difference between the risk of poverty of men aged over 65 and that of men of working age (see Figure 1). The degree of correlation is even weaker when one considers gross theoretical replacement rates.

Figure 1: Cross plot of net replacement rate against the difference in the at-risk-of-poverty rate (2008)



Note: The difference in the at-risk-of-poverty rate measures the (percentage point) difference between the risk of poverty faced by the 65+ and that faced by the 15-64 in each EU country.
Source: Own analysis using EU-SILC data and European Commission (2010).

These problems with theoretical replacement rates are not specific to the OMC. Mitchell & Phillips (2006) assess how replacement rates computed by the US Social Security Administration (SSA) differ for actual and hypothetical earner profiles, using data from the Health and Retirement Study (HRS). They show that, on average, actual HRS workers have substantially lower earnings paths than the medium SSA hypothetical profile, and incorporating this would make the US system 15% more generous to the average worker than reported by the

pointed out that using a scenario based on historical data on rates of return and wage growth would result in a diametrically opposite result.

38 On average, across the EU, average career length appears to be around 38 years for men and slightly less than 30 years for women.

SSA. Rettenmaier & Saving (2006) also question the Social Security Trustees Report's practice of computing replacement rates by "converting workers' past earnings into today's dollars using the rise in average wages over time" and instead argue that price indexing would be a more accurate measure of pre-retirement resources available for consumption.

2.2 Moving beyond theoretical replacement rate measures

One could summarise the previous section by saying that theoretical replacement rates suffer from two problems; their being limited to a hypothetical case that might not be representative of the general population, and their being abstract measures of system generosity that may not play that much a role in determining the actual living standards of individuals. In fact, researchers that have sought to move beyond theoretical replacement rates have come up with two approaches; (i) look at results for various types of hypothetical cases to better approximate the actual population, and (ii) utilise other measures based on government spending and/or income survey data.

2.2.1 Increasing the number of hypothetical cases

Table 2 shows OECD replacement rate estimates for workers on different levels of wages. This makes a lot of difference for pension systems that do not have a linear earnings-related profile, particularly countries with flat-rate pensions. For instance while the replacement rate for those on half the average wage in the UK is more than double that for those earning one and a half times the average wage, in Germany and Italy replacement rates are the same across the wage distribution.

To investigate the impact of its assumptions, the European Commission requests countries to also present variants of theoretical replacement rates that depart from these assumptions; such as a case where the individual's wage grows linearly over the career from the average wage to twice the latter, a broken career variant where there are no contributions or credits for 10 years, cases where the career break is of 3 years either because of unemployment or childcare, and variants with earlier and later retirement. Unsurprisingly, as can be seen in Table 3, these cases confirm that replacement rates vary substantially. Rising wage profiles tend to result in lower rates, either as entitlements are based on career-average income rather than the final salary (e.g. Italy) and/or because there are maximum pensionable incomes (e.g. UK). Later retirement tends to yield very generous benefits (e.g. in Hungary the replacement rate is 17 percentage points higher), whereas early retirement is not as penalised (e.g. in Hungary the penalty of retiring early is 13 percentage points). In some counties, for example Slovakia, taking time off to take care of children results in a significant drop in replacement rates whereas in others, such as Sweden, there is no such fall.

Table 3: Different OMC theoretical net replacement rates (%)

	Base case	3 years unemployed	3 years childcare break	10 years career break	Retire at 63	Retire at 67	Wage rising to 2xaverage
Austria	84	83	82	70	77	88	76
Belgium	71	70	71	64	70	72	50
Bulgaria	59	48	46	40	51	67	59
Cyprus	53	49	49	41	53	53	45
Czech Rep	78	59	55	56	66	90	48
Denmark	74	74	74	74	73	78	46
Estonia	40	38	38	34	35	49	49
Finland	69	66	65	54	62	76	65
France	78	73	75	58	62	89	55
Germany	64	62	65	48	57	74	46
Greece	120	NA	NA	NA	NA	NA	NA
Hungary	105	102	105	92	92	122	89
Ireland	84	78	81	74	81	86	62
Italy	88	84	76	68	84	93	72
Latvia	64	52	53	48	56	73	57
Lithuania	66	50	50	51	54	79	45
Luxembourg	96	93	96	80	92	97	73
Malta	79	79	79	79	79	79	46
Netherlands	104	102	100	91	93	112	78
Poland	68	66	61	57	66	70	58
Portugal	94	94	88	70	78	109	90
Slovak Rep	75	54	53	57	64	87	56
Slovenia	61	60	61	50	56	70	49
Spain	95	93	95	87	84	100	81
Sweden	65	60	65	NA	62	76	71
UK	73	71	74	58	71	77	52

Note: Replacement rates are worked out on a net of income taxes and employee contributions basis, but include employer contributions. They represent the situation of people retiring under the legislation enacted by 2008, including any transitional rules to be implemented gradually that may be legislated in enacted reforms. They also include income from private pensions if coverage is significant.
Source: European Commission (2010).

The problem with having a number of stylised individuals rather than just a base case is that the stylised individuals are set up to reflect just one deviation from the base case – e.g. an earlier retirement age. Bridgen & Meyer (2008), by contrast, tries to inject more realism by creating hypothetical cases with different features (i.e. more of a scenario analysis approach than a simulation)

and seeing how they would be treated by six different public-private pension systems. The cases are a mother and unqualified part-time worker in the retail sector, a mother and qualified part-time worker in the welfare sector, a married carer working in the informal sector, a small business entrepreneur, an unqualified male worker in the car industry and a middle manager in financial services. The results differ greatly across countries, with the female workers and the business entrepreneur tending to fall below the poverty threshold, while male workers getting very high replacement, particularly in countries with strong defined benefit pension systems.

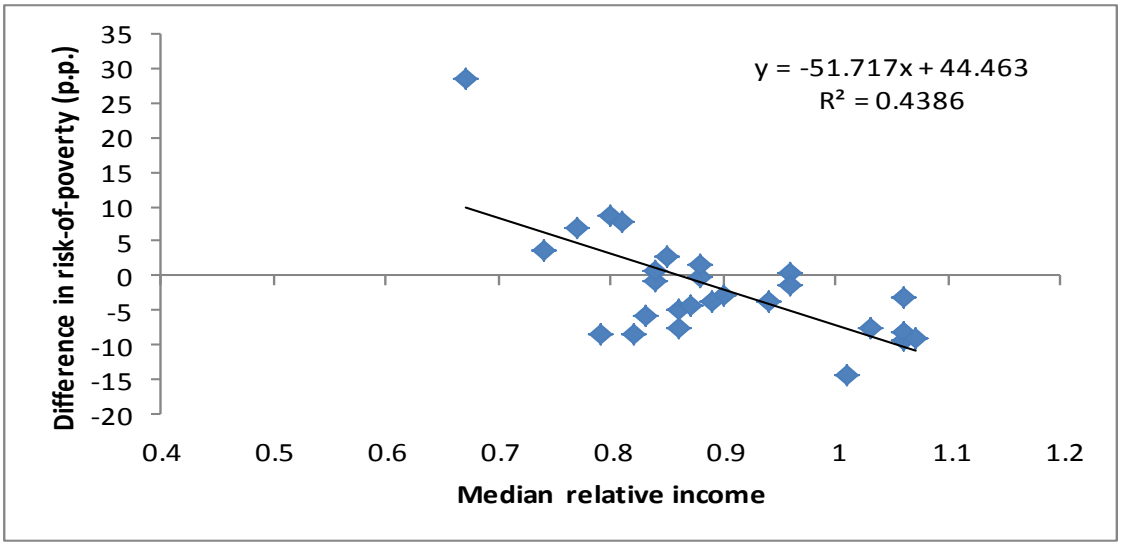
Still, trying to understand the overall impact of a system by having more hypothetical individuals raises the problem of how to weight the different cases to have a synthetic indicator of adequacy. Similarly, one needs to consider how the importance of a particular type of hypothetical case should be treated over time.

2.2.2 Spending and/or income based measures of adequacy

A rather wider measure, which departs from the concept of theoretical replacement rates, involves comparing the disposable income of retired persons to that of other groups. Forster & Mira D'Ercole (2005), using data collected from an OECD questionnaire on household incomes, compute 'quasi-replacement rates', defined as "the mean disposable income of persons aged 66 to 75, relative to the mean disposable income of persons aged 51 to 65".[39] Two conceptually similar measures are primary pension adequacy indicators monitored as part of the EU's OMC. The median relative income ratio compares the median income of persons aged over 65 to that of those aged below 65. The other OMC indicator, i.e. the aggregate replacement ratio, compares the median individual pension income of retirees aged 65-74 in relation to median earnings of employed persons aged 50-59 excluding social benefits other than pensions. These measures differ from the longitudinal replacement rates described in section 2.1, and may suffer from cohort effects particularly in countries which in recent decades passed through rapid periods of economic growth and/or changes in participation rates, such as Eastern European countries.

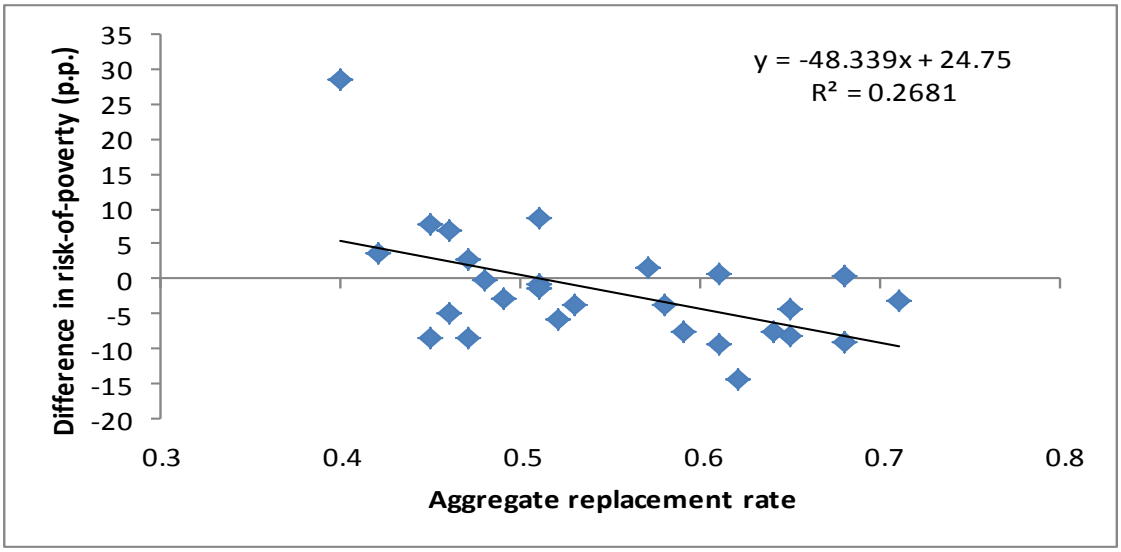
39 When calculating changes over time, they keep population shares constant, as an increase in the elderly (who tend to have lower incomes) depresses total income and this creates a bias in that ageing brings an improvement in the relative income position of the elderly.

Figure 2: Cross plot of median relative income ratio against the difference in the at-risk-of-poverty rate (2008)



Note: The difference in the at-risk-of-poverty rate measures the (percentage point) difference between the risk of poverty faced by the 65+ and that faced by the 15-64 in each EU country.
Source: Own analysis using EU-SILC data and European Commission (2010).

Figure 3: Cross plot of aggregate replacement ratio against the difference in the at-risk-of-poverty rate (2008)



Note: The difference in the at-risk-of-poverty rate measures the (percentage point) difference between the risk of poverty faced by the 65+ and that faced by the 15-64 in each EU country.
Source: Own analysis using EU-SILC data and European Commission (2010).

That said, these two indicators appear to be more strongly correlated with the difference between the risk-of-poverty rate observed for those aged over 65 and that of those of working age. As could be expected, the median relative income ratio appears to be more closely related to the difference in the incidence of poverty, as it includes all income streams of those aged over 65 rather than just focus on pensions. However, even the aggregate replacement ratio – which

conceptually should be the closest to the theoretical replacement rates – displays a significantly closer relationship. There appears to be very little correlation between the aggregate replacement ratio and the theoretical replacement ratios estimated for many EU27 countries. For instance, while the gross theoretical replacement ratio for Greece is estimated at 105%, the aggregate replacement ratio for men is just 49%. Only in a few countries, notably France and Germany, the aggregate replacement ratio appears to be higher than the theoretical estimate. The aggregate replacement ratio across the EU27 stood at 55% for men and 52% for women in 2011, above the ILO-recommended 45% replacement rate and in only 4 countries it is clearly above 60%.

Another indicator developed by the EU Commission, but not used in the OMC, is the benefit ratio. The latter is defined as "the average benefit of public pensions as a share of the economy-wide average wage".[40] This measure, derived from projections of pension spending and pension beneficiaries submitted to the Commission by Member States, the average public pension (found by dividing spending by the number of beneficiaries) to the output per worker in that economy. A related indicator is the gross average replacement rate, which is "the average first pension as a share of the economy-wide average wage at retirement".[41] These indicators differ substantially from the theoretical replacement rates, as can be seen in Table 4, and there is very little correlation when comparing results for different countries. Benefit ratios and gross average replacement rates tend to imply much less generous pension systems, with the average across the EU being very close to the ILO-recommended 45% replacement rate. Part of the gap between these measures undoubtedly reflects the inclusion of private pensions in the theoretical replacement rates estimates,[42] but it is more likely that the unrealistic labour market assumptions underpinning the theoretical replacement rates play more of a role in explaining differences.

40 European Commission (2012).

41 Ibid.

42 For instance, European Commission (2012) includes the benefit ratio for Denmark including private pensions, which at 59% is much closer to the theoretical replacement rate for this country.

Table 4: Different pension adequacy indicators compiled by the EU Commission (%)

	Gross theoretical replacement rate	Median relative income	Aggregate replacement ratio	Benefit ratio	Gross average replacement rate
Austria	69	92	56	42	48
Belgium	46	96	68	39	45
Bulgaria	47	77	46	46	50
Cyprus	47	80	51	43	45
Czech Rep	59	67	40	26	29
Denmark	58	83	52	36	33
Estonia	32	74	42	39	36
Finland	62	79	47	49	52
France	64	84	51	40	59
Germany	41	106	71	47	41
Greece	105	90	49	36	59
Hungary	65	88	48	31	38
Ireland	76	106	61	27	37
Italy	80	86	46	49	80
Latvia	48	94	58	24	48
Lithuania	49	82	45	39	38
Luxembourg	64	101	62	59	78
Malta	67	106	65	51	59
Netherlands	92	81	45	44	NA
Poland	59	89	53	47	49
Portugal	76	103	64	46	57
Slovak Rep	58	88	57	39	42
Slovenia	42	107	68	44	51
Spain	88	86	59	19	NA
Sweden	68	96	51	55	72
UK	61	84	61	35	35

Note: Theoretical replacement rates represent the pension entitlements of those retiring in 2008 and include income from private pensions if coverage is significant. Median relative income includes all incomes of those aged over 65, while the aggregate replacement ratio includes only pension income. The benefit ratio and the gross average replacement rate only include state pension income. The income to which these flows are compared varies from average wages (benefit ratio and, to a lesser extent, aggregate replacement ratio) to average income of the under-65s (for the median relative income ratio) to wage before retirement (gross theoretical replacement rate and gross average replacement rate).
Source: European Commission (2010), Own analysis of EU-SILC data & European Commission (2012).

Moreover the choice of the denominator of the adequacy measure is also very important. In the case of the theoretical replacement rate, pension income is compared to the individual's previous income. However, while having a very high replacement rate on a very low level of previous income ensures a good degree of consumption smoothing; it would do little to help alleviate the risk-of-poverty. By comparing pension outcomes to the average wage or income, the benefit ratio and the median relative income ratio provide a better benchmark. The OECD, in recognition of this fact, also estimates relative pension levels for its theoretical full-career workers, where pension entitlements are compared to the average economy-wide wage. To also take into account the fact that pension generosity might not be linear in relation to one's pre-retirement wage, the OECD then weights these relative pension levels for individuals across the wage distribution to arrive at an indicator for the whole distribution. These estimates, presented in Table 5, suggest that pension generosity can be significantly less pronounced when taking the average wage as the numeraire. The gap between the most generous pension system, Greece, and the least generous, the UK, is cut by a fifth. Only in very progressive pension systems operating in very equal societies, e.g. Sweden, the weighted average gross relative pension levels surpass the gross theoretical replacement rate for those on average incomes.

A change in denominator is also suggested in Borella & Fornero (2009), which proposes the use of a "comprehensive replacement (CORE) rate", defined as "the ratio between net disposable income when retired and net disposable income when active". Income includes wages, self-employment and private income, as well as cash benefits from the state. On the other hand, Hurd & Rohwedder (2008) propose what they call "the wealth replacement rate". This involves simulating consumption paths over the remaining life for a household sample observed after retirement, and then assessing whether the resources available to each household could support this consumption path. This approach not only relies on longitudinal data (very difficult to have on a consistent cross-national basis) but is also very data intensive. There have been some attempts to make this sort of adequacy assessment by means of dynamic microsimulation models.[43]

[43] Dynamic microsimulation involves a year-to-year estimation of income for each person in a survey based on their projected personal characteristics and tax/benefit systems. See Employee Benefit Research Institute (2006), Emmerson et al (2004) and Frommert & Heien (2006) for a US, UK and German example, respectively. This approach is starting to feature in cross-country research with the prime example being EUROMOD, a model meant to cover all of the EU (see Avram & Sutherland (2012)).

Table 5: Different pension adequacy indicators compiled by the OECD(%)

	Weighted average gross relative pension level	Gross replacement rate (average wage)
Austria	68	77
Belgium	38	42
Czech Rep	48	50
Denmark	80	80
Estonia	47	48
Finland	60	58
France	44	49
Germany	39	42
Greece	82	96
Hungary	71	76
Ireland	29	29
Italy	65	65
Luxembourg	83	87
Netherlands	87	88
Poland	56	59
Portugal	52	54
Slovak Rep	56	58
Slovenia	57	62
Spain	73	81
Sweden	64	54
UK	30	32

Note: Gross replacement rates and gross relative pension levels are both compiled on the basis of male full-career hypothetical cases. However the gross relative pension levels have the economy-wide average wages as the denominator, rather than the individual's own wage. The gross relative pension levels are estimated for individuals across the wage distribution.
Source: OECD (2011).

3. An alternative approach to measure pension adequacy

To summarise the previous discussion, there appear to be two lines of thought in terms of the numeraire to be used to define pension adequacy; namely someone's previous earnings and average contemporary income. Both concepts seem valid – the first reflects consumption smoothing and the latter poverty alleviation. The other major undecided point is whether a measure should capture the theoretical generosity of a system or else actual generosity. Some would argue that a measure of generosity needs to keep the metric constant and look at how a system performs for a standard person under

unchanged conditions. This is partly justified in that actual economic behaviour will be affected by generosity (so workers in Greece have shorter careers because their system provides incentives for them to do so). However it is debatable whether such a theoretical measure is useful to study the poverty alleviation function of pensions.

Interestingly the literature review reveals that there has been little discussion of one particularly major issue with replacement rates – namely their limitation to being single point-in-time indicators. Isolating pension generosity at a single point-in-time fails to take into account differences in longevity and state pension ages between generations and also ignores how pension payments change over the period in retirement. As OECD (2005) points out, these constitute very significant factors, particularly when comparing pension policy on a cross-country basis. A country with low life expectancy could 'afford' to pay higher replacement rates to its citizens while imposing the same financial burden on workers as a country with higher life expectancy but with lower replacement rates. Similarly a country where pensions lose their relative value significantly over time, can afford to pay a higher replacement rate at retirement than a country where the relative value of pension benefits remains constant throughout retirement.[44]

These issues matter. Increasing longevity is one of the reasons why pensions have become so topical for governments. Changing the eligibility age has been the most frequent parametric pension reform carried out since the 1990s.[45] At first the main change was the equalisation of pension ages between men and women (e.g. Austria, Slovakia), but increasingly countries (e.g. Germany, UK) are raising the age for both genders. At the same time, some countries (e.g. Italy, Sweden) have introduced defined contribution systems, which penalise retiring at the same age if life expectancy rises. Under these systems the same amount of contributions translates into less annual pension if the period which is meant to be covered increases. Another frequent reform has been the shift from uprating pensions in line with changes in average earnings. For instance, Austria and Germany at first moved towards linking pensions to net earnings, so that the burden of higher social security contributions would be more fairly shared between workers and pensioners. More recently, Austria adopted price uprating while Germany introduced the 'sustainability factor' to adjust pension benefits to changes in the dependency ratio. Very few countries now have in place pension systems where generosity stays constant in relative earnings terms.

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44 Indexation, of course, can reduce the generosity of all types of social benefits. See Sutherland et al (2009) for a review of how indexation has affected the British welfare system over time.

45 See Zaidi et al (2006) and OECD (2011).

The impact of indexation on generosity can be quite substantial. Table 1 includes OMC estimates of gross and net theoretical replacement rates for someone at retirement (at age 65) and ten years after (at age 75). On average, across the EU there is a drop of 11% and 10% in gross and net replacement rates, respectively. In some countries, the declines are much more pronounced (e.g. nearly a third in Latvia, a fifth in Poland and Greece). Given that life expectancy in 2010 for men and women was close to 20 years, the ten-year period constitutes just the half-life of a pension stream. If the relative value loss proceeds in a linear fashion, by the last year of life pensions would be a fifth less in earnings terms than at the beginning. This impact would be even more pronounced if earnings growth accelerates over time, for example as a result of economic convergence between EU countries.

The best way to address such concerns is by resorting to estimates of pension wealth.[46] Brugiavini et al (2005), while noting that "there is no simple and unique definition of pension wealth" argues that "for an individual, pension wealth is, broadly speaking, the present discounted value of future pension rights, taking into account of mortality prospects." In mathematical notation, this can be expressed as:

$$PW_h = \sum_{s=h+1}^{S} \beta^{s-a}\, \pi_s\, B_s(h) \ldots\ldots\ldots (1)$$

where PW_h is pension wealth at age of retirement (h), S is the age of certain death, β is the pure time discount factor, a is the age of the individual, π_s is the conditional survival probability at age (s) for an individual alive at age (a) and $B_s(h)$ is the pension expected at age (s).

Equation (1) brings out the advantages of pension wealth estimates over replacement rates. Firstly, this is a measure that expressly takes into account the period for which benefits will be received. Increased longevity increases pension wealth, but it does not impact replacement rates. Similarly an increase in pension age decreases pension wealth, while it does not show up in changes in replacement rates. The inclusion of a discount factor helps address the well-known economic fact that income streams in the future are less attractive than earlier ones. Secondly, pension wealth measures the entire income stream, rather than focusing on just one payment in time. Thus if pension benefits fall in relative value over time, pension wealth would be less than if they stay constant. A replacement rate tells you nothing about how it will evolve.[47] A reform changing indexation would not change the replacement rate at retirement, but it would clearly show up when looking at pension wealth.

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46 The concept of pension wealth was first used in applied economics in Feldstein (1974).

47 One way of conceiving pension wealth is as a replacement rate multiplied by an annuity factor, meant to capture the number of years for which the benefit will be received and the change in the replacement rate over time.

OECD (2011) suggests that pension wealth "can be thought of as the lump sum needed to buy an annuity giving the same flow of pension payments as that promised by mandatory retirement-income schemes". Take, for instance, a case where the pension benefit is equivalent to 50% of average earnings throughout a retirement period of 20 years. Assuming away time preference over when to receive the money, you would be as better off if you forgo receiving pensions in lieu of a payment equivalent to ten times average earnings. If however benefits are expected to fall in relative terms by a tenth every ten years (broadly in line with the EU average decline in replacement rates over time), you would require just a payment of nine times.

There are two ways in which pension wealth is typically calculated – the empirical and the institutional approaches. The empirical method involves using data from income and wealth surveys. As a result it tends to be retrospective in that it reflects current entitlements and past pension system rules.[48] By contrast, the institutional approach tries to calculate prospective pension entitlements by applying "the pension system's parameters – such as accrual rates, minimum pensions, indexation rules, eligibility requirements etc. – to calculate pension benefits"[49] for a number of stylised individuals and then grosses up results. In this section we present pension wealth estimates computed using this approach for ten EU countries which have undergone considerable pension reforms.[50] These countries, namely Austria, Finland, France, Germany, Hungary, Italy, Poland, Slovakia, Sweden and the UK, not only cover 70% of the EU's population, but also have very different pension systems and enacted very different reforms.[51] These pension wealth estimates were computed using the OECD's APEX cross-country pension entitlement model[52] and cover only state pensions (including minimum pensions[53]). Our

48 For a thorough discussion of this approach and how it is being integrated in national accounts see ECB (2009). There are variants of this approach which try to incorporate future entitlements by trying to project the impact of future rules.

49 See Whitehouse (2003).

50 Note that these estimates are based on the pension system rules as at 2010. The deterioration of the sovereign debt crisis led to some subsequent reforms, particularly in Hungary and Italy, where generosity was cut substantially (see European Commission (2012) for details). However for the other countries these estimates remain valid.

51 For a brief description of these reforms, see Grech (2010).

52 The APEX (Analysis of Pension Entitlements across countries) model was originally developed by Axia Economics, with funding from the OECD and the World Bank. The model codes in detail the parameters of a country's pension system (which are vetted by social security officials from that country). It is used by the OECD's biennial 'Pensions at a Glance' publication, the World Bank's 'Pensions Panorama' and forms the basis of one of the OMC indicators (the prospective change in net theoretical replacement rates).

53 To simplify matters, we assume no income other than state pensions.

estimates compare the pre-reform (i.e. the pension system rules for pensioners retiring now) with the post-reform (i.e. the rules under which people will retire in 2050) pension systems.

The OECD publishes estimates of pension wealth, but these are for the standard full-career case. By contrast, our results try to approximate reality better by adopting an alternative measure of career length based on Labour Force Survey data on labour market participation by age and gender.[54] In all ten countries, elderly women are much more at-risk-of-poverty than elderly men. Yet, by assuming full careers for women, OECD estimates of pension wealth for women are higher than those for men, as women have longer life expectancy. Also, rather than focus on the median case, our focus is on individuals in the bottom half of the wage distribution who tend to be more dependent on state pensions and less reliant on other forms of retirement income provision. Table 6 compares these estimates of pension wealth with those for someone with a full-career and on average wages.

Across the ten countries, adjusting for actual-careers and the level of wages lowers net pension wealth. The reduction is, as expected, largest for women, who get only 80% of the full-career average wage entitlement. However the reduction for men is also strong, at 85%, particularly in countries with relatively low employment rates (e.g. Slovakia). While the full-career estimates suggest women get the equivalent of one year's average wage more than men, adjusting for actual labour participation and lower wage levels reveals that they get roughly the same amount as men. Links between the level of contributions and that of benefits offset most of the impact of having a higher life expectancy. More simply, women have to make nearly the same pension entitlements last for more than men. Keep in mind that, even ignoring lesser entitlements due to lower wages and more broken careers, pension wealth estimates suggest that women are worse off than men – something that replacement rates do not show. In fact, the net replacement rates published by the OECD, and used in the EU's OMC, are the same for both genders. If pensions maintained their relative value over time, one would expect the difference in longevity between men and women to be reflected in an equivalent difference in net pension wealth. By contrast, across these ten countries while post-retirement longevity is 17.5 years for men and 23.3 years for women (i.e. a third higher for women), even with the same wage and labour participation, net pension wealth of women is just 15% higher. The worst affected are those in countries with long retirement periods where pensions are indexed to prices. For instance, in Poland while the post-retirement longevity

[54] More details on the assumptions taken can be found in Grech (2012).Note that similar to the OECD, we ignore the impact of household formation and model entitlements for single individuals. This may weaken the validity of some of our results for countries where pension entitlements depend also on the income of the individual's partner.

differential between genders is 60%, that in pension wealth is just 6%. Unsurprisingly the risk-of-poverty among elderly women is 6.9 percentage points (70%) higher than that for men. In Germany, where there is not such a differential, the gap in poverty rates is half as large.

Table 6: Net pension wealth estimates for current pension systems (multiple of average wage)

	Male full-career on average wage	Male actual-career in bottom half of wage distribution	Female full-career on average wage	Female actual-career in bottom half of wage distribution
Austria	7.8	8.1	8.6	8.2
Finland	7.5	5.3	8.9	5.8
France	8.3	6.8	9.4	5.5
Germany	6.1	5.2	7.4	4.8
Hungary	9.2	6.2	11.4	8.5
Italy	8.8	8.4	9.6	8.4
Poland	7.0	4.6	7.4	6.2
Slovak Rep	9.2	8.3	11.3	8.7
Sweden	6.6	6.2	7.5	6.1
UK	4.4	3.8	5.1	4.5
Average*	7.0	5.9	8.0	6.0

Note: Net pension wealth for actual-career case based on labour market participation by age and sex data. See Grech (2012) for details. The actual-career case reflects the pension entitlements for those earning a wage up to the 50th percentile of the wage distribution.
***** Weighted average by population.
Source: OECD (2011) and own estimates using same model used in OECD (2011).

To link better the adequacy indicator to the risk-of-poverty among pensioners, pension wealth estimates need to be compared with a quantitative benchmark.[55] For this purpose we compute that measure of total pension flows which would enable an annual income equal to the poverty threshold throughout retirement. If net pension wealth is higher than this 'net pension requirement', on average, the pension system would be preventing poverty during retirement.[56] Net

55 In this paper we focus on the poverty alleviation dimension of pension adequacy. Pension wealth can, however, be used to look at the income replacement dimension (one would need to redefine pension wealth from multiples of the economy-wide average wage to multiples of the individual's pre-retirement wage) and the intergenerational dimension (by comparing pension wealth entitlements of successive cohorts). Grech (2010) provides indicators for all three dimensions.

56 Note however that since transfers are not constant for all years, even when net pension wealth is equal to the 'net pension requirement' there may be years when one could be at-risk-of-poverty.

pension requirements for 2005 and 2050 are presented in Table 7. These suggest for instance, that given the current anticipated length of retirement, men in Austria require net pension wealth of at least 5.1 times the average wage if they are to stay out of poverty, on average, throughout their retirement. Women tend to have a higher net pension requirement than men, as they live longer. At present, in some of these countries, they also have lower pension ages.

Table 7: Net pension wealth requirement to remain out of risk-of-poverty (multiple of average wage)

	Men		Women	
	2005	**2050**	**2005**	**2050**
Austria	5.1	7.2	6.5	7.2
Finland	4.9	6.1	6.1	6.9
France	6.5	7.6	7.7	8.5
Germany	5.1	6.0	5.8	6.6
Hungary	5.3	7.5	6.6	7.2
Italy	5.3	7.4	6.3	7.2
Poland	4.2	6.7	5.9	7.7
Slovak Rep	5.3	7.1	6.2	7.0
Sweden	5.3	6.2	6.1	6.9
UK	5.0	7.0	5.3	5.7
Average*	5.3	6.9	6.2	7.1

Note: Net pension wealth requirement is the pension wealth required so that the average annual pension is enough to keep one above the risk-of-poverty (i.e. 60% of the median equivalised income).
***** Weighted average by population.
Source: Own estimates using discount rate of 2% and Eurostat life expectancy projections.

The benefit of having this benchmark is that it directly conveys information about the strength of the poverty alleviation function of the pension system. For instance, if we know that given the current life expectancy in Austria, to remain, on average, out of risk-of-poverty a man needs pension wealth equivalent to 5.1 times the average wage, this immediately suggests that current pension wealth of 8.1 is more than sufficient. By contrast knowing that the gross replacement rate for someone on the mean wage in Austria is 69% tells us little on the pension system's efficacy in reducing risk-of-poverty, especially since replacement rates are in terms of one's previous income and not the current poverty threshold.

Given current life expectancy, the lowest net pension requirement is for Polish men, while the highest is for French women. However this need not remain the case in the future. The other benefit of having a net pension requirement benchmark is that it moves in line with changing conditions, such as increasing

life expectancy. If pension wealth stays the same, the net pension requirement benchmark helps us to realise that pensioners have to spread over a larger number of years the same transfers that their predecessors had. By contrast, a replacement rate at the point of retirement is not usually affected by a change in life expectancy.[57] Since pensions lose their relative value over time, if life expectancy is higher, having the same replacement rate in the future could well imply a weaker poverty alleviation function of pensions.

Similarly having a net pension requirement benchmark improves our evaluation of the impact of pension age changes. The latter tend to leave replacement rates unchanged while reducing pension wealth. Using replacement rates, one would conclude there was no change in generosity, and vice-versa if one uses pension wealth. However by reducing the period in retirement, pension age changes also limit the net pension requirement. For instance, at present Polish men, due to their low life expectancy, have a net pension requirement considerably lower than men in the UK – who face their same pension age of 65. By 2050, the situation will be reversed, even though Polish men will still have shorter life spans than UK men. However the latter will start receiving their pensions at 68, rather than at 65 like Polish men. Table 7 shows that the net pension requirement for men is going to increase more than that for women. This reflects the fact that pension age equalisation will offset a lot of the anticipated increase in longevity for women.

Table 8 presents net pension wealth estimates for 2050 for those in the bottom half of the wage distribution computed on the basis of EU Commission forecasts of labour participation rates and Eurostat life expectancy projections. These estimates suggest that despite cuts in pension generosity and increases in pension ages,[58] net pension wealth should still rise slightly across the ten countries under review.[59] The increase in pension entitlements is lower than the expected rise in the period in retirement. Pension wealth will need to be spread more thinly, so to speak, across a longer retirement period.

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57 Unless the system has defined contribution elements, in which the annual benefit depends on the period over which the cumulative pension entitlements need to be spread. In this case, higher longevity lowers replacement rates.

58 In the absence of the pension reforms carried out since the mid-1990s, net pension wealth across these ten countries would have increased by about 47% for men and 26% for women, which coupled with the increase in the pensioner cohort size would have resulted in very high fiscal burdens.

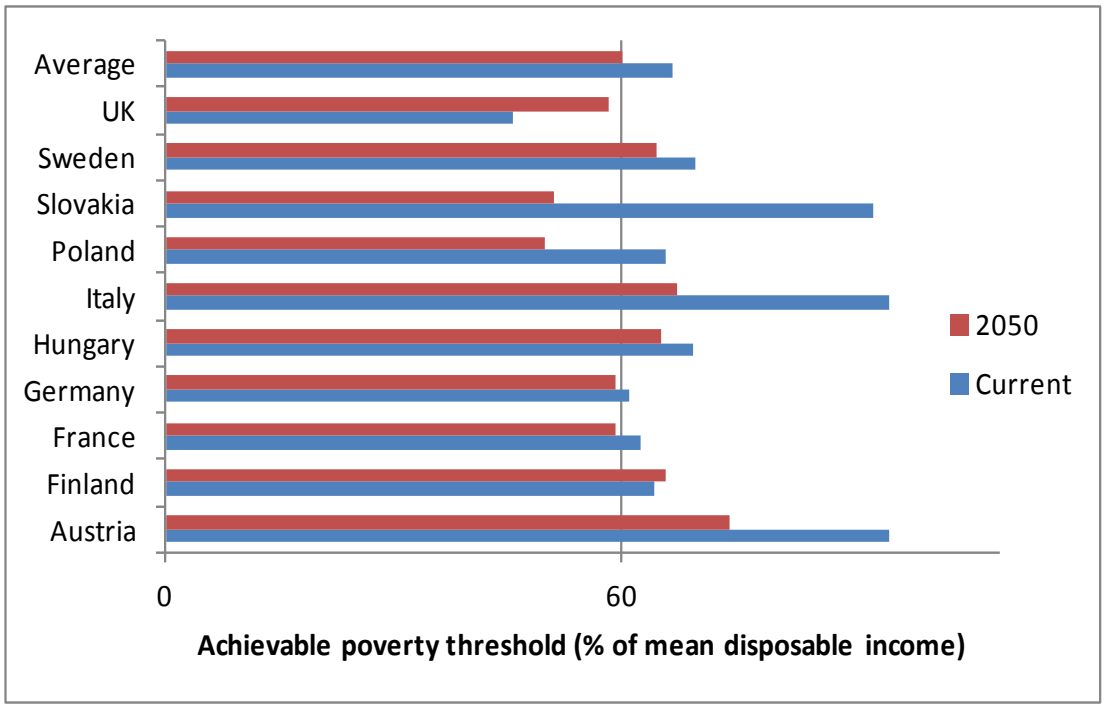
59 If instead of adjusting for actual careers, we had assumed full careers, we would report a projected increase in net pension wealth of 3% for men and a 5% drop for women. Improved labour participation should offset part of the impact of reduced pension system generosity.

Table 8: Net pension wealth estimates for those in the bottom half of the wage distribution (modelled to reflect their projected actual career) retiring in 2050 (multiple of average wage) compared to OMC indicator on replacement rates

	Men		Women	
	Net pension wealth 2050	**% Change on 2005**	**Net pension wealth 2050**	**% Change on 2005**
Austria	8.1	-1	7.3	-11
Finland	8.5	+61	8.2	+43
France	5.7	-15	6.5	+18
Germany	6.0	+16	6.4	+35
Hungary	7.2	+17	7.0	-17
Italy	7.1	-16	6.1	-28
Poland	4.9	6	4.4	-28
Slovak Rep	5.2	-37	4.8	-45
Sweden	6.7	+8	6.5	+6
UK	5.2	+36	5.3	+18
Average*	6.0	+2	6.0	+1

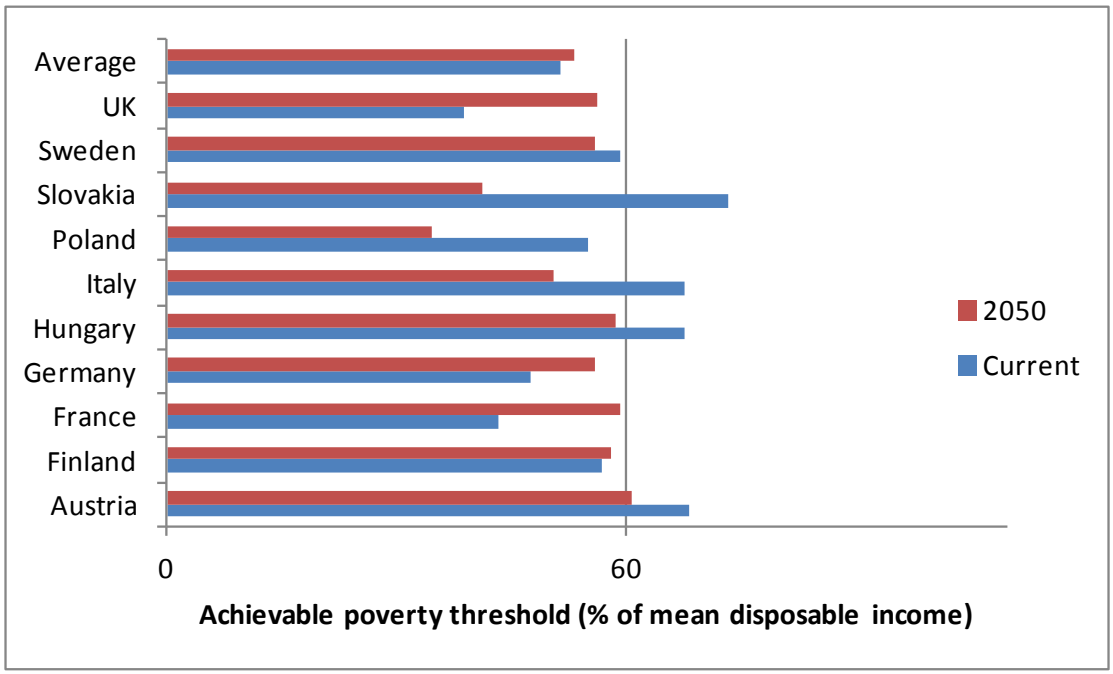
Note: Net pension wealth for actual-career case based on labour market participation by age and sex data. See Grech (2012) for details. The actual-career case reflects the pension entitlements for those earning a wage up to the 50th percentile of the wage distribution.
***** Weighted average by population.
Source: OECD (2011) and own estimates using same model used in OECD (2011).

Figure 4: Achievable poverty thresholds based on net pension wealth entitlements of men in the bottom half of the wage distribution



Source: Own estimates using same model used in OECD (2011). Net pension requirement based on discount rate of 2% and Eurostat life expectancy projections.

Figure 5: Achievable poverty thresholds based on net pension wealth entitlements of women in the bottom half of the wage distribution



Source: Own estimates using same model used in OECD (2011). Net pension requirement based on discount rate of 2% and Eurostat life expectancy projections.

Figures 4 and 5 illustrate this development. At present pension entitlements across these ten EU countries translate in an achievable poverty threshold of 67% for men and 52% for women in the bottom half of the wage distribution. By 2050, pension entitlements, if spread evenly through retirement, would enable the average man, previously in the bottom half of the wage distribution, to have an income equivalent to 60% of the contemporary median disposable income. For women, however, there would be a slight improvement, to 53%. The largest decline in achievable poverty thresholds is for low-income men in Slovakia, followed closely by low-income women in the same country. At present pension generosity in this country is at par with neighbouring Austria. Recent reforms have, however, tightened the link between benefits and contributions, and reduced the degree of progressiveness in the pension benefit formula. Moreover they introduced a mandatory private defined contribution pension[60] to partially replace the state pension. Similar reforms were carried out in Poland, and the results are expected to be quite similar. The state pension, by itself, will no longer maintain low-income individuals, particularly women, out of relative poverty. By contrast in Germany, France and the UK pension reforms have tended to strengthen or maintain the poverty alleviation function, notably by improving the generosity of minimum pensions. Weak indexation and a long retirement period interact to push people into poverty in their old age, increasing the importance of having adequate minimum pensions in place. These estimates also show that the tightening of links between contributions made and benefits received makes it more crucial to have active labour market policies, unless countries are ready to countenance an increase in pensioner poverty. Similarly countries need to have adequate crediting provisions, if they want to reduce gender income inequalities in old age.

The EU Commission's pension adequacy indicator, i.e. the change in net replacement rates, similarly to the estimates of achievable poverty thresholds suggests a decline in generosity by 2050. However there are important differences, as can be seen from Table 9. Firstly, the proposed pension wealth indicators show that there should be a slight improvement of outcomes for women – a development which is not apparent when looking at the OMC indicator as the latter is gender neutral and cannot take into account increased entitlements due to higher labour participation. Secondly, the assumption of a full career appears to hide the full impact of reforms that penalise not having a full career, for instance the changes effected in Italy, Austria and Slovakia.[61] Thirdly, by focusing on those on average wages, the OMC indicator fails to give due importance to reforms that have increased system progressiveness, such as better minimum pensions, for instance in Germany, France and the UK.

60 Since the financial crisis, the existence of this second pillar has increasingly been put under question and recent administrations appear to want to backtrack on reforms.

61 In the case of Sweden, the fact that actual careers are close to the full-career assumption results in similar developments in the achievable poverty threshold and in the net replacement rate.

Finally, and most importantly, while the OMC indicator suggests a decline in pension generosity, it does not readily convey whether this is of concern. By focusing on theoretical generosity, the OMC indicator boosts the level of pension entitlements, particularly for women. It also fails to register the increased influence that weak indexation will have on the efficacy of pensions and does not capture the impact of changes to pension age.

Table 9: Change in poverty threshold achievable in 2050 given net pension wealth estimates compared with OMC indicator on net replacement rates (percentage points)

	Change in poverty threshold by 2050 (men)	Change in poverty threshold by 2050 (women)	Change in replacement rates by 2050^
Austria	-21	-8	+5
Finland	+2	+1	-8
France	-3	+16	-17
Germany	-2	+8	-3
Hungary	-4	-9	+5
Italy	-28	-17	+2
Poland	-16	-20	-17
Slovak Rep	-42	-32	-7
Sweden	-5	-3	-7
UK	+13	+17	+2
Average*	-7	+2	-5

***** Weighted average by population.
^ Change in net replacement rates for full-career cases on average wage.
Source: OECD (2011) and own estimates using same model used in OECD (2011). Net replacement rates from European Commission (2010), except for Hungary from European Commission (2009) as estimates in this paper do not cover the most recent reform in this country.

Conclusion

As yet, there does not seem to be a broad consensus in policymaking circles and academic literature on what constitutes the best measure of pension adequacy. The most popular indicator, however, appears to be the theoretical replacement rate estimated for a full-career male on average wages.

While useful, particularly in static analysis, this measure is ill-suited for policy analysis especially when looking at increasingly common reforms like changes in pension ages or moves to make state pensions more defined contribution in nature. Theoretical replacement rates are hard to interpret as they do not have an underlying benchmark which allows their current or projected value to be

assessed as adequate or inadequate. Moreover they are a point-in-time measure which ignores the impact of benefit indexation rules and is unaffected by very important factors, such as changes in the pension age and in life expectancy after pension age. Moreover the emphasis on assumptions which are very unrepresentative of real-life labour market conditions also makes them deceptive, particularly in relation to current and future pension outcomes for women and those on low incomes. Theoretical replacement rates have little link with observed at-risk-of-poverty rates among the elderly.

This paper has suggested an alternative approach based on estimates of pension wealth (i.e. the total projected flow of benefits through retirement) calculated using more realistic labour market assumptions. These estimates are then compared to a benchmark reflecting the pension entitlement required to keep an individual out of relative poverty through retirement. By focusing on total pension flows, this approach is able to take into account changes in the relative value of pensions over time. It also focuses analysis on the expected outcome, and lets the latter be affected by changes in longevity and pension ages. When applied to study reforms enacted since the 1990s in ten major European countries, the resulting estimates suggest that these reforms have decreased generosity significantly, but that the poverty alleviation function remains strong in those countries where minimum pensions were improved. Theoretical replacement rates indicate a decline in generosity, but fail to give a precise picture of who will be worst affected and the extent, if any, of resulting concerns. By contrast the pension wealth adequacy indicators clearly show that moves to link benefits to contributions have raised adequacy concerns for women and those on low incomes which policymakers, particularly those in Eastern European countries, should consider and tackle.

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