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A Micro-Macro Economic Analysis of Pension Auto-Enrolment Options

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1 Introduction

Like many other countries, Ireland faces challenges in relation to the adequacy and sustainability of pensions. These challenges have been examined in detail in a series of reports (Government of Ireland, 2007; OECD, 2014; Government of Ireland, 2018a). All of these reports identify pension coverage in the private sector as a key issue. Burke and Gilhawley (2018) estimate that only 30% of the private sector in Ireland had a supplementary pension¹ in 2017. As the State Contributory Pension (SCP) is paid at a flat rate, almost 70% of private sector workers are therefore set to retire without an earnings-related pension. For many of them, this will result in a sharp fall in living standards, as confirmed in our analysis. With the ageing of the Irish population, over time, pensioners will account for a greater proportion of the population and such income losses would represent a further macroeconomic risk of a fall in aggregate consumer spending (Government of Ireland, 2018a, p. 15).

Almost all OECD countries have some form of a mandatory earnings-related component to their pension systems.² The review of Ireland's pension system by OECD (2014) identified an urgent need to increase pension coverage, through the introduction of a mandatory or quasi-mandatory scheme or by improving financial incentives, or both. Existing levels and patterns of pension coverage incorporate the impact of substantial existing tax reliefs, which provide greater financial incentives for those on the high rate of income tax. The Government has turned towards auto-enrolment as having greater potential efficacy in raising pension coverage from existing levels, particularly for those on the standard rate of income tax. Evidence from Cribb and Emmerson (2016) tends to support that view, with strong increases in coverage and pension savings arising from the UK's auto-enrolment scheme.

The Government's roadmap for pension reform (Government of Ireland, 2018a) provides for the introduction of a new auto-enrolment retirement savings system by 2022. There are many important decisions to be made in the design of such a scheme, including the minimum income level at which auto-enrolment would begin and the contribution rates. In order to facilitate the design and development of a system for Ireland the Government published a draft or 'Strawman' proposal for an automatic enrolment retirement saving system as the basis for a public consultation process (Government of Ireland, 2018b). Under this proposal employees aged between 23 and 60, who earn over €20,000 a year and do not already contribute to a supplementary pension would be auto-enrolled into the retirement savings system. It is proposed that members will initially contribute a minimum of 1% of gross earnings, rising to 6% after six years. Employers will match these contributions up to an eventual maximum of 6%, and the State will contribute €1 for every €3 saved by the member. Automatic Enrolment will be a 'quasi-mandatory' scheme where eligible employees will be enrolled but may choose to opt out (and forfeit employer and State contributions) within a two-month period after 6 months of mandatory participation.

This report provides both microeconomic and macroeconomic evidence relevant to the design and impact of the auto-enrolment scheme. Section 2 begins by setting out the methods used in both the microeconomic and macroeconomic elements of the study, as there are linkages between the two. The microeconomic issues are discussed, and results of microeconomic analyses are reported in Section 3. We turn to the macroeconomic aspects of the pension auto-enrolment proposals in Section 4. The main conclusions are drawn together in Section 5.

¹ The term "supplementary pension" is used here, as in the Green Paper on Pensions (Department of Social and Family Affairs, 2007), to refer to pensions which supplement the State pension. These are provided through a variety of arrangements (e.g., including pensions provided by employers – including the State as an employer – and pensions arranged by the self-employed).

² OECD (2014) noted that Ireland was one of only two member countries without a mandatory earnings-related pillar for retirement saving. The other was New Zealand, which introduced an automatic enrolment saving scheme (KiwiSaver) in 2007.

2 Methodology

2.1 Micro-Analysis

2.1.1 Data

The CSO's Survey on Income and Living Conditions (SILC) is a nationally representative annual household survey and the source of official data on income and poverty indicators. It provides information on most of the key variables of interest from the point of view of auto-enrolment e.g., employment status, earnings, age, and whether or not an individual is already covered by an occupational or personal pension scheme. While other household surveys contain some of this information, SILC has the key advantage of combining all this information in a single survey.

We use the input data for SWITCH, the ESRI's micro-simulation model of the Irish tax-benefit system, to derive estimates of the population that would be subject to auto-enrolment and some of its characteristics. It is constructed from the 2013, 2014 and 2015 waves of SILC: this pooled data provides an increased sample size which helps to improve the precision of the estimates and also permits finer breakdowns than a single year would permit. The SWITCH database also updates monetary values (employment income, self-employment income, etc.) to 2019 levels and adjust the weights to match key characteristics of the 2019 population (e.g., employment levels, the number of tax units by taxable income band, social welfare receipts by scheme). More information on SWITCH's input data and weights can be found in Appendix 1.

2.1.2 Definitions

The proposed auto-enrolment scheme is intended to target employees aged between 23 and 60, who earn over €20,000 a year and do not already contribute to a supplementary pension. While employment status, age and income are readily available, we only have indirect information on supplementary pension coverage. In particular, to account for the fact that civil servants hired before 1995 will be entitled to a supplementary pension when they retire but do not pay contributions themselves, we define someone who does not currently contribute to a supplementary pension scheme as someone who had no pension contributions deducted from their last wage or salary payment *and* will not receive a supplementary pension paid for by themselves or their employers when they retire³.

2.1.3 Measuring Pension Adequacy

We start our micro-economic analysis by an examination of pension adequacy, a key consideration behind the auto-enrolment proposal. Pension adequacy is most often measured by the 'final earnings replacement rate' (McDonald et al., 2016, p. 630). However, a number of studies point to limitations of this metric (Vanderhei, 2006; Scholz and Seshadr, 2009). A well-known issue is that replacement rates can vary substantially when calculated on the basis of gross or net income. In OECD countries, for example, average earners' gross and net replacement rates from mandatory pension scheme differ by an average of 10 percentage points (OECD, 2017, p. 106). The extent of this difference varies across countries, but across individuals with different income levels too. In this regard, our individual-level analysis goes one step further and provides a detailed picture of the distribution of replacement rates on both a gross and net income basis.

McDonald et al. (2016) define a broader 'Living Standards Replacement Rate' to address further issues with *earnings* replacement rates. This takes into account, for instance, net income rather than gross, differences in housing costs before and after retirement, a longer time period for in-work earnings (rather than a snapshot of final earnings), saving patterns and expenditure needs over the life cycle (e.g., costs associated with raising children in the middle years, medical expenses in later years) and household-level factors (e.g., changes in household size and composition before and after

³ These conditions are identified with the variables *Wage_PenD*, *Pen_Cont* and *Pension_C* of the SILC questionnaire. However, some of this information was missing in 211 cases, or 3 per cent of all employees sampled. For these cases, pension coverage was imputed using a simple linear probability model of the likelihood to be covered based on gross employment income, age and a public sector dummy variable.

retirement). Using a dynamic micro-simulation model, they find that the relationship between the conventional earnings replacement rate and continuity in living standards is relatively weak. This suggests a need to examine the sensitivity of replacement rates to some of the key factors identified above. In this paper, we examine:

- Gross and net replacement rates; and
- Replacement rates before and after housing costs, due to the redemption of mortgages at or before retirement, as compared with mortgage repayments during the pre-retirement period.

While the use of auto-enrolment to boost pension saving is expected to improve outcomes by overcoming inertia and myopic decision making, it may also lead for some individuals to what McDonald et al. (2016) refer to as ‘unnecessary “scrimping and saving” during young and healthy years when the welfare of children is possibly involved’. The fact that opt-out provisions form part of the scheme help to reduce, but not to eliminate this issue: the power of the default option (Beshears et al., 2009; Choi et al., 2004) and the automatic re-enrolment provisions can be expected to have an impact on some individuals for whom the appropriate decision might be to rely on the SCP for their retirement income.

The income threshold provided for in the proposal is partly aimed at addressing this issue. The proposed figure (€20,000) comes from an analysis of the net replacement rate of the SCP and secondary old-age benefits at various income levels, which falls from 78% at €20,000 to 65% at €25,000 (Government of Ireland, 2018b).

While the final earnings replacement rate is ‘the most widespread metric for evaluating the adequacy of retirement savings’ (McDonald et al., 2016), this cannot be observed for those currently in employment at younger or middle ages. Our calculations, like those in the proposal, can be regarded as ‘snapshot’ replacement rates: the replacement rate that would be obtained if the individual moved from their current employment income to the SCP at the maximum rate. The final earnings replacement rate and the snapshot rate will coincide if the following three assumptions hold true:

- Individual earnings grow in line with average earnings between the snapshot date and retirement;
- The SCP rate also increases in line with average earnings; and
- The individual qualifies for the maximum SCP rate upon retirement.

The second of these assumptions seems reasonable, given government commitments on the intended strategy for uprating of pensions (Government of Ireland, 2018a) and past practice. The first and third assumptions, however, are more problematic.

In relation to the first assumption, earnings trajectories over the life cycle vary substantially, as wages tend to rise with age, potentially with a plateau. For example, the average wage of individuals with a Leaving Certificate is 50% higher for the 50-60 age group than for the 20-30 age group; but the corresponding figure for those with a university degree is close to 90%. Further investigation of this phenomenon is desirable but is outside the scope of the present study. This speaks for caution in the interpretation of replacement rates, particularly for those in the 20-40 age group. Broadly, we might distinguish between two types of low-income earner at younger ages: those who will remain at low incomes, with wages rising in line with wage growth, and those who are on an upward wage trajectory. Snapshot replacement rates are a good proxy for final earnings replacement rates in the former case, but not for the latter.

The third assumption, that the individual qualifies for the maximum SCP, is also questionable: currently about one-third of recipients receive a rate which is between 10% and 15% below the maximum rate. This is subject to change for two main reasons. Trends towards increased labour market participation will strengthen PRSI contribution records. Qualification conditions are also set to change, with a move to a ‘total contributions approach’ envisaged for 2020. This is likely to increase numbers on the full rate, but will also involve reductions in payment rates for some future pensioners.

Taken together, these factors suggest that ‘snapshot’ replacement rates may be viewed as providing an approximate upper bound on the likely final earnings replacement rates.

2.2 Macro-Analysis

2.2.1 COSMO

COSMO has been used to develop a medium-term baseline projection for the Irish economy and in different scenario analyses such as examining the impact of various potential Brexit scenarios on Ireland (see Bergin et al., 2016, Bergin et al., 2019). Similar to existing models for Ireland, COSMO models the behaviour of the economy in a small open economy framework and has a theoretically-founded structure and specification. The key mechanisms of the model are described in Appendix 4.

It is worth noting that, as a representative-agent model, COSMO does not allow for distributional analysis. The macro-economic analysis therefore focuses on the *aggregate* effects on the Irish economy.

2.2.2 Modelling Auto-Enrolment

The proposed supplementary pension contributions for employees and employers are essentially modelled as an increase in labour taxes with the exception that the revenue raised will not accrue to the public finances but rather to a pension fund. In relation to the government’s contributions, we assume that the government pays into the fund and that this adds to the deficit and national debt.

Much of the scheme’s macroeconomic impact will depend on how the labour market reacts. From the employers’ perspective, paying the matching contributions will ultimately increase their price of labour and therefore reduce their demand for labour. For employees, there is some uncertainty regarding the impact of the introduction of auto-enrolment. There have been no empirical studies examining the impact of auto-enrolment on labour supply in countries that have introduced this type of system that we can draw on for this analysis. Therefore, we consider two approaches. The first approach incorporates the standard mechanism in most macroeconomic models: employees bargain for their real after-tax wages in the labour market. In this sense, the contributions, which pre-empt a proportion of every euro earned, will reduce the incentive for some workers (particularly those at the margin of participating in the labour market) to stay in the labour market and therefore reduce overall labour supply. The second approach assumes that employees may view these contributions as deferred income that will lead to a deferred benefit, in which case the introduction of auto-enrolment may be more similar to a negative shock to income in the short to medium term. In particular, as employees can choose to opt-out, for those who choose to stay in the scheme this is similar to a reduction in their current income. Ultimately, considering both approaches facilitates a more complete understanding of how the introduction of auto-enrolment may affect the macro-economy.

The incidence or burden of the new contributions may not necessarily fall on the groups (employees and employers) on whom it is imposed. The standard result on (tax) incidence is that the burden will be shared by employees and employers, depending on their relative elasticities of supply and demand (how responsive labour supply and demand are to changes in wages). In Ireland, labour supply is very elastic (responsive to changes in wages) because of the possibility of migration. As a result, for the employee contributions, in the extreme case, if after-tax wages were to fall labour supply could fall substantially and firms may be willing to bear part or all of the burden of the increase in contributions by paying higher wages. Even though the employee contributions are formally levied on employees, part or all of the effective burden may be borne by the employer. In a competitive labour market, it makes no difference in the long run whether the contributions are imposed on employees, employers or some combination of both because the labour market will adjust to share the burden between them according to the relative elasticities of labour demand and supply.

Overall, in the short to medium term with labour demand expected to be lower and with either labour supply or household income expected to be lower, we would expect overall employment to be below where it otherwise would be. It is important to note that employees have the option to opt out, which

would reduce the short to medium term cost associated with paying into the scheme. However, it would also reduce the long-run benefits associated with auto-enrolment.

2.2.3 Scenarios

We assume a 30% employee opt-out rate⁴ and incorporate a matching contribution from employers consistent with the employee contribution from each scenario and a government contribution, which is equivalent to a third of the employee contribution in each scenario. These assumptions are outlined in Table 1.

Table 1: Description of the Scenarios Considered (changes with respect to Scenario A1 in bold)

| Scenario | Features |
|-----------------------------------|--|
| <i>Main scenarios</i> | |
| A1 | Earnings limit for auto-enrolment: €20,000 per year Employee contribution: 6% of all earnings Matching contributions: employers and State (up to earnings of €75,000 per year) Opt-out rate: 30% Labour supply response: allowed |
| A2 | Earnings limit for auto-enrolment: €20,000 per year Employee contribution: 6% of all earnings Matching contributions: employers and State (up to earnings of €75,000 per year) Opt-out rate: 30% Labour supply response: not allowed (negative income shock only) |
| <i>Contribution rate variants</i> | |
| B1 | Earnings limit for auto-enrolment: €20,000 per year Employee contribution: 1% of all earnings Matching contributions: employers and State (up to earnings of €75,000 per year) Opt-out rate: 30% Labour supply response: allowed |
| B2 | Earnings limit for auto-enrolment: €20,000 per year Employee contribution: 2% of all earnings Matching contributions: employers and State (up to earnings of €75,000 per year) Opt-out rate: 30% Labour supply response: allowed |
| B3 | Earnings limit for auto-enrolment: €20,000 per year Employee contribution: 3% of all earnings Matching contributions: employers and State (up to earnings of €75,000 per year) Opt-out rate: 30% Labour supply response: allowed |
| B4 | Earnings limit for auto-enrolment: €20,000 per year Employee contribution: 4% of all earnings Matching contributions: employers and State (up to earnings of €75,000 per year) Opt-out rate: 30% Labour supply response: allowed |

⁴ As a sensitivity exercise, we include a scenario with an opt-out rate of 10% (scenario E).

B5 Earnings limit for auto-enrolment: €20,000 per year
Employee contribution: 5% of all earnings
Matching contributions: employers and State (up to earnings of €75,000 per year)
Opt-out rate: 30%
Labour supply response: allowed

Other variants

C **Earnings limit for auto-enrolment: €14,000 per year**
Employee contribution: 6% of all earnings
Matching contributions: employers and State (up to earnings of €75,000 per year)
Opt-out rate: 30%
Labour supply response: allowed

D1 Earnings limit for auto-enrolment: €20,000 per year
Employee contribution: 6% of all earnings in **firms of at least 50 employees**
Matching contributions: employers and State (up to earnings of €75,000 per year)
Opt-out rate: 30%
Labour supply response: allowed

D2 Earnings limit for auto-enrolment: €20,000 per year
Employee contribution: 6% of all earnings in **firms of less than 50 employees**
Matching contributions: employers and State (up to earnings of €75,000 per year)
Opt-out rate: 30%
Labour supply response: allowed

E Earnings limit for auto-enrolment: €20,000 per year
Employee contribution: 6% of all earnings
Matching contributions: employers and State (up to earnings of €75,000 per year)
Opt-out rate: 10%
Labour supply response: allowed

It is important to note that all of these assumptions refer to the costs of the proposed auto-enrolment scheme. One limitation of the analysis is that we have no estimates of how much such a scheme would benefit employees in the longer-term by providing additional income in retirement. As such, we cannot capture the scheme's potential long-run benefits and this is an important consideration to bear in mind when examining the results. For this reason, we only report impacts over the short-to-medium term: five years after fully implementing the proposal.

To examine the potential long-term benefits, we would need to follow individuals over their life course and estimate how much their income would fall by in retirement and how this would be mitigated by paying into a pension scheme now. Specifically, we would need projections on the number of people retiring in each year and their earnings over their life course, which we could then aggregate and implement as a positive income shock in COSMO. As this type of model does not currently exist for Ireland, we can only provide a qualitative assessment of the potential long-run impact of auto-enrolment. Auto-enrolment would eventually result in a positive income shock, which would raise household incomes above where they otherwise would be. This would lead to higher consumption and domestic demand, which would in turn lead to higher output and employment in the non-traded sector. It is projected that those retiring in 20 years' time after participation in the scheme could have, approximately, an additional 11% of their pre-retirement average career earnings in

retirement. These gains could rise to around 17% after 30 years, 24% after 40 years and 27% after 45 years.⁵

3 Micro-Analysis Results

3.1 Pension Adequacy

We first examine snapshot replacement rates (i.e., calculated as if earnings rose simply in line with overall wage growth and were not influenced by career progression, as described in Section 2.1.3). These calculations use the maximum SCP rate as the numerator and three alternative denominators. The first of these is simply gross labour income, giving a *snapshot gross replacement rate*. The second is labour income net of income tax, PRSI and USC, leading to a *snapshot net replacement rate*. A third calculation tries to take account of differences in housing costs before and after retirement, as mortgages tend to be fully repaid by or around the time of retirement. Thus, we consider labour income net of income tax, PRSI, USC *and* mortgage costs as an alternative denominator⁶.

We focus on the population potentially eligible for auto-enrolment but consider all income ranges, given the issues raised in the proposal about the selection of an income threshold. As those earning over €75,000 per year are almost all covered by supplementary pensions already, there are very few cases of non-covered employees in this income bracket and these must be excluded from the analysis.

Table 2 shows the distribution of snapshot gross replacement rates of the maximum SCP rate (€248.30) across income brackets.⁷ While some two-thirds of pensioners receive the maximum rate or one very close to it (98% of the maximum rate), the remaining one-third receive lower rates (typically 85% to 90% of the maximum rate). For these cases, the gross replacement rates would be correspondingly lower than those shown here.

Table 2: Snapshot Gross Replacement Rates of the Maximum Rate of the State Pension (Contributory) by Gross Annual Pay

| Replacement rate range (%) | Gross annual pay (€000) | | | | |
|----------------------------|-------------------------|-------|-------|-------|-------|
| | 0-14 | 14-20 | 20-30 | 30-50 | 50-75 |
| 0-10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10-20 | 0.0 | 0.0 | 0.0 | 0.5 | 34.2 |
| 20-30 | 0.0 | 0.0 | 0.1 | 23.3 | 65.8 |
| 30-40 | 0.0 | 0.0 | 0.8 | 62.8 | 0.0 |
| 40-50 | 0.0 | 0.7 | 46.8 | 13.5 | 0.0 |
| 50-60 | 0.1 | 4.5 | 42.5 | 0.0 | 0.0 |
| 60-70 | 0.6 | 36.0 | 9.9 | 0.0 | 0.0 |
| 70-80 | 0.2 | 34.9 | 0.0 | 0.0 | 0.0 |
| 80+ | 99.1 | 23.8 | 0.0 | 0.0 | 0.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: own analysis of the 2013, 2014 and 2015 waves of the Survey on Income and Living Conditions (uprated monetary values and adjusted weights). Notes: due to rounding error column totals may not sum to 100. The maximum rate of the State Pension (Contributory) is €248.30 per week.

⁵ These projections use the Pensions Authority's retirement income calculator and assume a contribution rate of 14% of gross earnings. The assumptions used are compliant with the Society of Actuaries in Ireland's Actuarial Standard of Practice PEN-12 (Society of Actuaries in Ireland, 2017). It should be noted that the Pensions Authority's calculator does not have the specific design features of the Strawman proposal; however, it provides an indication of the increase in retirement income one could reasonably expect to receive based on the relevant actuarial standards. See Appendix 2 for more details.

⁶ If continued, declining ownership rates would make this factor less of an issue in the future.

⁷ Snapshot gross replacement rates of the maximum SCP rate and secondary old-age benefits show somewhat higher replacement rates; see Appendix 3 for more details. Given that only a minority of pensioners will receive all secondary benefits, we focus on the SCP only.

A clear pattern emerges. The maximum SCP yields high gross replacement rates at low levels of income, with almost all of those earning less than €14,000 having a snapshot gross replacement rate above 80%. As income rises, gross replacement rates fall. For example, 90% of those earning between €20,000 and €30,000 have snapshot gross replacement rates between 40% and 60%.

As noted in the previous section, living standards depend on net rather than gross income. Thus, comparisons of net income from employment and from retirement provide a more accurate guide. Exemption limits for income tax implies no deduction from those wholly dependent on the SCP, and PRSI and USC are not levied on this benefit. Thus, net income in retirement is simply given by the SCP amount. The change occurs on the in-work income side, where now we use income after tax, PRSI and USC as the best indicator of resources available when in work, and use this as the replaced income.

The results are summarised in Table 3. Now 75% of those earning between €14,000 and €20,000 have snapshot net replacement rates of over 70%⁸ – an increase of 16 percentage points from the gross replacement rates shown in Table 2. From €20,000 the net replacement rates are somewhat higher than the gross figures but remain at levels between 20% and 70%.

Table 3: Snapshot Net Replacement Rates of the Maximum Rate of the State Pension (Contributory) by Gross Annual Pay

| Replacement rate range (%) | Gross annual pay (€000) | | | | |
|----------------------------|-------------------------|-------|-------|-------|-------|
| | 0-14 | 14-20 | 20-30 | 30-50 | 50-75 |
| 0-10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10-20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 20-30 | 0.0 | 0.0 | 0.0 | 0.6 | 46.1 |
| 30-40 | 0.0 | 0.0 | 0.1 | 36.3 | 53.9 |
| 40-50 | 0.0 | 0.3 | 10.2 | 62.9 | 0.0 |
| 50-60 | 0.1 | 4.5 | 53.3 | 0.3 | 0.0 |
| 60-70 | 0.6 | 20.1 | 35.9 | 0.0 | 0.0 |
| 70-80 | 0.2 | 48.2 | 0.5 | 0.0 | 0.0 |
| 80+ | 99.1 | 26.9 | 0.0 | 0.0 | 0.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: own analysis of the 2013, 2014 and 2015 waves of the Survey on Income and Living Conditions (uprated monetary values and adjusted weights).

Notes: due to rounding error column totals may not sum to 100. The maximum rate of the State Pension (Contributory) is €248.30 per week.

House purchases can represent a form of saving for retirement. While a mortgage is typically paid during an individual's working life, by retirement many individuals own their homes outright. The associated reduction in housing costs can contribute to maintaining living standards during retirement. We adopt a simple approach to explore the extent to which this phenomenon may contribute to a higher replacement rate, net of tax and mortgage costs. We calculate the ratio of the maximum SCP to in-work income net of income tax, PRSI, USC and mortgage costs⁹.

These calculations depend on current patterns of home ownership for those of pension age. In interpreting the results (Table 4), we should therefore bear in mind that future home ownership rates for those of pension age may be lower than at present.¹⁰

⁸ 70% is commonly chosen as the threshold for pension adequacy in this literature.

⁹ This means that we focus on *cash flows*. Another approach would be to use mortgage interests only, leading to somewhat lower replacement rates. Note that mortgage costs are measured net of the tax relief at source on mortgage interest.

¹⁰ For example, Norris (2013) discusses the drop in home ownership rates in Ireland from 80% in 1991 to 70% in 2011. Census 2016 figures published by the CSO show a further decline to 67.6%.

Table 4: Snapshot Net Replacement Rates of the Maximum Rate of the State Pension (Contributory) by Gross Annual Pay, Adjusted for Mortgage Costs

| Replacement rate range (%) | Gross annual pay (€000) | | | | |
|----------------------------|-------------------------|-------|-------|-------|-------|
| | 0-14 | 14-20 | 20-30 | 30-50 | 50-75 |
| 0-10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10-20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 20-30 | 0.0 | 0.0 | 0.0 | 0.0 | 32.6 |
| 30-40 | 0.0 | 0.0 | 0.1 | 25.2 | 63.3 |
| 40-50 | 0.0 | 0.0 | 8.4 | 64.8 | 3.2 |
| 50-60 | 0.1 | 4.0 | 48.0 | 6.6 | 0.9 |
| 60-70 | 0.6 | 18.6 | 36.6 | 1.6 | 0.0 |
| 70-80 | 0.3 | 44.4 | 3.2 | 1.4 | 0.0 |
| 80+ | 99.0 | 32.9 | 3.8 | 0.4 | 0.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: own analysis of the 2013, 2014 and 2015 waves of the Survey on Income and Living Conditions (uprated monetary values and adjusted weights).

Notes: due to rounding error column totals may not sum to 100. The maximum rate of the State Pension (Contributory) is €248.30 per week.

Changes in the distribution of net replacement rates are quite limited, particularly below €20,000. They increase somewhat for some individuals at higher incomes but remain below 70% for the vast majority of those earning €30,000 or over. Several factors contribute to this result. First, few of those with earning below €20,000 are paying for a mortgage: many are renting, or in the case of young adults, living with their parents. Second, even at higher income levels, those with a supplementary pension, associated with more stable employment, are more likely to be purchasing a home, while those without a supplementary pension are more likely to be renting. Third, where a couple is paying a mortgage, the potential saving for each individual is not the full mortgage cost but half of this. Taken together these features explain why savings arising from outright home ownership tend to have a limited impact on the distribution of net replacement rates of the target population.

The approach adopted here does not take account of the fact that some of those who are currently renting will later purchase a home and benefit from outright home ownership in retirement (replacement rates would be higher in this group). On the other hand, there have been falls in home ownership rates not just among those in their 20s and early 30s, but also in the 35-44 age group. While the former is compatible with a phenomenon of delayed purchase, falls in ownership rates for those in the latter age groups suggest that ownership rates by age 65 will be lower than they are now. On balance, these factors suggest that home ownership has a limited impact on net replacement rates currently, and that this impact is not likely to increase.

Overall, these results reinforce concerns about pension adequacy in the target population. Snapshot replacement rates for these individuals are typically low, and for reasons stated earlier, final earnings replacement rates are likely to be no higher.

What of those individuals with low earnings? Snapshot replacement rates for those earning between €14,000 and €20,000 tend to be above 60% on a gross basis and improve further on a net basis. There are two important caveats concerning these results. Firstly, these calculations do not take account of individual wage growth related to age, experience and qualifications between now and retirement¹¹. Secondly, these calculations are based on the maximum SCP rate. A substantial minority of individuals qualify for payments that are 10 or 15% lower, leading to a proportionate fall in their replacement rates compared to this maximum benchmark.

The choice of an income threshold for auto-enrolment must balance different objectives. On the one hand, inclusion in the auto-enrolment scheme is designed to encourage individuals to overcome the

¹¹ General growth in wages, and increases in pensions which are targeted to match that, can be accounted for in this framework, as both can be assumed to rise at the same rate, leaving the ratio unchanged.

inertia that can otherwise lead to under-provision for retirement. On the other hand, without an income threshold, the default option of auto-enrolment would include individuals for whom the SCP provides an adequate retirement pension. Such individuals would, of course, have the right to opt-out of the scheme, but the proposal does include a compulsory six-month membership period, during which the loss of up to 6% of earnings could pose serious difficulties for low-income earners.

The question also arises as to whether there could be ‘inertia’ leading to sub-optimal decisions to remain in the scheme¹². Thus, setting too high an income threshold might lead to too few individuals benefiting from the ‘nudge’¹³; but setting too low a limit might lead to some low-income individuals ‘scrimping and saving’ for a supplementary pension when the SCP would be adequate to their needs.

The balance suggested by the proposal is a relatively low income threshold of €20,000, but with consideration being given to a lower amount. Alongside affordability concerns, the main motivation for the €20,000 figure appears to come from snapshot replacement rates calculations. The figures shown above indicate relatively high snapshot replacement rates for those with earnings below €20,000; however, final earnings replacement rates are likely in many cases to be lower than these snapshot figures. This is because, as discussed earlier, earnings tend to rise over the life cycle. The pension fund created by auto-enrolment is based on a fixed percentage of earnings. Thus, the overall fund and the pension it finances does not reflect final earnings, but something more like career average earnings, though due to compound interest/investment returns contributions based for earlier years have a disproportionate influence. Given this, it could be argued that an income threshold lower than €20,000 might be more appropriate. For example, the earnings of university graduates are on average 90% higher by age 50-60 than at 20-30.¹⁴ Thus, final gross earnings replacement rates could be close to half of the snapshot levels. This is due to the fact that the pension fund arising from auto-enrolment will reflect career average earnings. For those with a relatively flat earnings profile over their lifetime (for example, those with lower educational attainment) career average earnings will be more similar to final earnings prior to retirement. However, for those whose earnings potential have a sharper gradient over their lifetime (for example, those with higher education), final earnings could be substantially higher than career average earnings, pushing their final replacement rates down.

Earnings dynamics are a key issue here. Some individuals may experience low earnings at a point in time but progress above the €20,000 threshold and be auto-enrolled, while others may remain on low earnings throughout their life. Analysis of individual earnings could help to establish the composition of the low-income population¹⁵. How many make a sustained transition to higher earnings, and over what time period? How many are in stable, low-paid jobs over a long period? Answers to these questions could help to guide the setting, and revision, of a low income threshold for auto-enrolment.

3.2 Target Population

3.2.1 Factors influencing the likelihood of being in the auto-enrolment target group

Before we look at the size and characteristics of the target population, we examine the factors of influencing the likelihood of being in the auto-enrolment target group, i.e. characteristics that are linked to supplementary pension non-coverage: age, gross annual pay, sex and firm size.

Table 5 shows that the incidence of non-coverage decreases with both age and income: older workers and higher earners are more likely to be covered. Non-coverage is particularly prevalent among

¹² Inertia may play less of a role when withdrawing from an auto-enrolment scheme compared to joining a pension scheme; in the former case the gain is immediate, while in the latter the gain from saving is in the long term.

¹³ Even on an ‘opt-in’ basis, the proposal does provide incentives to sign up for a pension with an employer contribution and State support that more than match the employee’s own contribution.

¹⁴ For other educational levels, this effect is smaller (e.g., for those with a Leaving Certificate, the average wage in the 50-60 age group is about 50% higher than at age 20-30). These effects are over and above wage inflation over time; they relate instead to individuals experiencing wage increases through their careers, which are unrelated to wage inflation.

¹⁵ For example, see Kennedy et al. (2016) for an analysis of administrative data.

employees aged between 23 and 30, as well as those earning under €30,000. In other words, the proposed scheme would cause coverage to rise the most among younger employees and lower earners (assuming no difference in opt-out rates). As a result, the relative fall in current disposable income would be larger in these groups. This would likely affect younger employees' ability to save for a mortgage, and affect consumption, as less well-off individuals typically consume a higher proportion of their current disposable income.

Table 5: Supplementary Pension Non-Coverage Rates of Employees by Gross Annual Pay and Age (%)

| Gross annual pay (€000) | 23-30 years | 31-40 years | 41-50 years | 51-60 years | Total |
|-------------------------|-------------|-------------|-------------|-------------|-------|
| 14-20 | 98.3 | 85.1 | 76.0 | 71.2 | 85.9 |
| 20-30 | 91.1 | 79.8 | 74.6 | 52.8 | 79.8 |
| 30-40 | 68.0 | 57.7 | 38.6 | 26.0 | 51.7 |
| 40-50 | 37.7 | 33.1 | 29.9 | 13.1 | 30.0 |
| 50-75 | | 13.8 | 16.1 | 6.3 | 16.2 |
| 75+ | | 17.3 | 4.6 | 3.9 | 9.1 |
| Total | 75.3 | 51.5 | 42.5 | 31.3 | 52.3 |

Source: own analysis of the 2013, 2014 and 2015 waves of the Survey on Income and Living Conditions (uprated monetary values and adjusted weights).

Note: proportions based on a total of less than 100 cases in this age-income groups not shown. Both public and private sector employees included.

Next, are men and women equally likely to face auto-enrolment? Focusing on the 23-60 age group, we find that a greater proportion of female employees contribute to a supplementary pension than their male counterparts: 59.2% compared to 52.7% for those earning over €20,000, and 52.7% compared to 49.7% if we also include those earning between €14,000 and €20,000¹⁶. This is partly explained by the fact that a greater proportion of female employees work in the public sector, where supplementary pension coverage is much higher than in the private sector. Consistent with this, 56.5% of employees qualifying for auto-enrolment are men, or 51.6% if the income threshold were set at €14,000¹⁷.

Due to the nature of the data (a household survey), we have focused our attention to individuals. However, some information on respondents' places of work allows us to say something about firms' adjustment costs. Taking the size of these places of work as a proxy for firm size, we find that between 54% (€20,000 threshold) and 59% (€14,000 threshold) of employees working in firms of up to 50 people would be automatically enrolled, compared to 36 to 38% of employees working in firms above this size. This suggests that smaller firms would face larger average costs than bigger firms in their transition to the new system. However, it is natural to assume that some of these workplaces belong to larger firms (e.g., retail companies), so it is not clear how much of these adjustment costs would fall on small businesses.

3.2.2 Size and Characteristics of the Target Population

Here we provide an estimate of the size of the target population (employees aged between 23 and 60, who earn over €20,000 a year and do not already contribute to a supplementary pension) and examine its characteristics.

Noting that 'employees who are existing members of a pension scheme/contract which meets prescribed minimum standards and contribution levels will not be automatically enrolled' (Government of Ireland, 2018b, p. 27) and without further detail on these minimum standards and contribution levels, we assume that none of those currently covered would be automatically

¹⁶ Over the entire income distribution, these proportions are virtually the same: 47.8% (females) and 47.6% (males). This is in line with the last pension module of the Labour Force Survey (Q3 2018), which found coverage rates in the employed 20-69 population of 47.6% (females) and 46.7% (males).

¹⁷ Female employees earning below the income threshold will, of course, be able to join the scheme but will not be automatically enrolled.

enrolled¹⁸. However, it should be noted that recent estimates put the median total contribution rate (employee and employer) at between 8% and 11%, and below 10% for over one-third of schemes (Collins and Hughes, 2017; IAPF, 2015), well under that envisaged in the proposal (14%). Thus, if the standard for exclusion from auto-enrolment were set at its own target rate, the target population could be substantially bigger, or alternatively it may lead to a required increase in contribution rates in existing schemes.

With that caveat in mind, we estimate that 584,000 employees aged between 23 and 60 would be automatically enrolled, or 44.2% of employees in that age group with gross annual earnings of over €20,000. If auto-enrolment were to start at €14,000, the target population would grow by an additional 139,700 employees to 723,700, or 48.8% of the relevant population¹⁹.

Table 6: *Estimated Size of the Target Population by Threshold*

| Threshold | N | % |
|--------------------------------------|---------|------|
| €14,000 | 723,700 | 48.8 |
| €20,000 (as per “Strawman” proposal) | 584,000 | 44.2 |

Source: own analysis of the 2013, 2014 and 2015 waves of the Survey on Income and Living Conditions (uprated monetary values and adjusted weights).

Note: employees aged 23 to 60, who earn over the threshold and do not already contribute to a supplementary pension.

The Strawman proposal’s estimate of 410,000 is lower than our comparable figure of 584,000. This discrepancy arises from methodological differences. Firstly, we project data from 2013, 2014 and 2015 to 2019. The Strawman proposal’s estimate, on the other hand, is based on employment and income figures from 2017 and 2016, thereby not taking into account the employment and wage growth that has taken place since then. Secondly, these figures are based on raw weights, which we adjust to match key characteristics of the current population using official projections of the income distribution. We find that this adjustment significantly improves the income representativeness of the data (see Appendix 1). As a result, our estimate of the number of employees for 2019 is substantially higher than for 2016, and wage growth over this period implies that more employees are found to earn over the €20,000 and €14,000 thresholds²⁰. Different data sources (QNHS and SILC vs. SILC alone), assumptions for comparability across them and ways of capturing pension coverage also play a role in these variations.

Table 7 summarises the main characteristics of the target population. The age profile is very similar under either threshold. The target population is slightly older under the lower threshold because more part-time workers, who are on average slightly older than full-time workers²¹, would qualify for auto-enrolment. Close to 40% of the target population are under 30, and a further 30% % would be under 40. These results do not depend on the level of the annual earnings entry point and so apply regardless of whether the annual earnings entry point is set at €14,000 or €20,000, due to the fact that supplementary pension coverage is lower for younger employees..

¹⁸ This seems to be the assumption underlying the proposal’s own estimate.

¹⁹ Were the lower age limit brought down to 18, 635,000 would be automatically enrolled from €20,000, or 835,000 from €14,000.

²⁰ We do not attempt to project to 2022, when auto-enrolment will begin, due to inherent difficulties in obtaining reliable estimates of factors such as income growth and the unemployment rate beyond 2019. On current trends, further growth in employment and wages (unless the €20,000 threshold were to rise in line with this) would be expected to raise the size of the target population. A recession or ‘hard Brexit’ could work in the opposite direction. However, the structure of that population, as examined here, would not be substantially altered.

²¹ Younger people are less likely to be concerned by activities such as rearing children or caring for a dependent, which are frequent reasons for taking up part-time employment.

Table 7: Summary Statistics of the Target Population by Auto-Enrolment Threshold

| <i>Income threshold for auto-enrolment</i> | €14,000 | €20,000 |
|--|---------|---------|
| <i>Age (years)</i> | | |
| Mean | 35.0 | 34.9 |
| Median | 33.0 | 32.0 |
| 23 to 30 | 42.2 | 41.7 |
| 31 to 40 | 28.9 | 30.1 |
| 40 to 50 | 18.9 | 19.6 |
| 51 to 60 | 10 | 8.6 |
| <i>Sex (%)</i> | | |
| Female | 48.4 | 43.5 |
| Male | 51.6 | 56.5 |
| <i>Education level (%)</i> | | |
| Primary | 3.7 | 2.9 |
| Lower secondary | 7.2 | 6.9 |
| Upper secondary and non-tertiary higher education | 44.8 | 42.6 |
| Tertiary | 41.8 | 44.8 |
| <i>Marital status (%)</i> | | |
| Married, in civil partnership or cohabiting, partner auto-enrolled | 10.1 | 9.3 |
| Married, in civil partnership or cohabiting, partner not auto-enrolled | 23.9 | 26.6 |
| Single | 66.0 | 64.1 |
| <i>Gross annual pay (€)</i> | | |
| Mean | 31,783 | 35,293 |
| Median | 27,389 | 29,836 |
| €14,000 to €20,000 | 19.3 | 0 |
| €20,000 to €30,000 | 40.8 | 50.6 |
| €30,000 to €50,000 | 32.3 | 40.1 |
| €40,000 to €75,000 | 5.9 | 7.3 |
| €75,000 and over | 1.7 | 2.1 |
| <i>Employment sector (%)</i> | | |
| Agriculture, forestry and fishing | 1.3 | 1.4 |
| Mining, quarrying and utilities | 1.1 | 1.4 |
| Manufacturing | 13.1 | 14.4 |
| Construction | 4.2 | 5.0 |
| Wholesale and retail | 22.4 | 21.8 |
| Transport and storage | 5.6 | 5.6 |
| Accommodation and food | 8.4 | 6.5 |
| Information and communication | 5.4 | 6.3 |
| Financial and real estate services | 4.1 | 4.7 |
| Professional, scientific and technical activities | 10.4 | 11.5 |
| Private administration and support | 3.9 | 3.6 |
| Public administration and defence | 1.5 | 1.7 |
| Education | 3.1 | 2.5 |
| Health and social work | 10.1 | 9.3 |
| Arts, entertainment and recreation | 2.2 | 2.1 |
| Other | 3.2 | 2.3 |
| <i>Size of the workplace (%)</i> | | |
| < 50 people | 60.8 | 57.6 |
| ≥ 50 people | 39.2 | 42.4 |

Source: own analysis of the 2013, 2014 and 2015 waves of the Survey on Income and Living Conditions (uprated monetary values and adjusted weights).

Notes: firm size and education level were missing in approximately 3% of cases. Employment sectors are based on the NACE Rev.2 nomenclature and amalgamated for sectors with less than 30 observations.

As seen in the previous section, female employees have better supplementary pension coverage than their male counterparts at both threshold levels. This is explained by the high proportion of women working in the public sector (which has much wider coverage than the private sector), even though they have lower coverage than men in the private sector. Thus, 57% of the target population are men

under the Strawman proposal's threshold. Since women are over-represented at lower income levels, this gap is reduced (52% men, 48% women) under the €14,000 threshold.

One of the concerns of auto-enrolment is the negative impact on consumption during working life. A potential factor mediating this effect is a person's marital status. In particular, given that Irish couples tend to pool the majority of their income (Watson et al., 2013), reductions in disposable income due to auto-enrolment may be less severe when only one partner is in the target population. That is the case for around 25% of the target population, leaving 75% (singles and couples where both would be facing auto-enrolment) without this potential cushioning effect.

As regards the education level, under the Strawman proposal's threshold of €20,000 45% of the target population have a tertiary degree and 43% have an upper secondary or non-tertiary higher education qualification. As university graduates' earnings profile is steeper, auto-enrolment has the potential of improving final earnings replacement rates significantly for just short of a half of the target population. However, the likelihood of contributing to a supplementary pension increases with earnings, so auto-enrolment can be seen as a push for this group to start contributing earlier. While those with an upper secondary or non-tertiary higher education level may have a flatter earnings profile, they would also likely benefit from auto-enrolment given the relatively low replacement rates for earnings over €20,000.

Naturally, mean gross annual pay is higher under the Strawman proposal's threshold of €20,000, but slightly lower than the national estimate of €38,871 for all employees in 2018²². This suggests lower earnings in the target population compared to those who already contribute to a supplementary pension, in line with our analysis above. Median gross annual pay is also higher under the proposal's threshold but the difference is less marked. In the scenario proposed in the Strawman document, an entry point at €20,000 per annum, half of the target population would earn between €20,000 and €30,000 a year and 90% would have incomes less than €50,000. Above that level, most employees already have a supplementary pension. A lower entry point, at €14,000 per annum, would imply a substantial increase in the numbers included in auto-enrolment, with close to 20% having incomes between €14,000 and €20,000, and the proportion under €30,000 would go up to 60%.

While the current system of tax relief and the proposed State contributions (33% of the employee's contributions) are not strictly comparable (the tax relief does not go into a pension pot, for instance), the latter would see the financial incentive to save for a pension improve for those paying income tax at the standard rate of 20%, but worsen for those over the standard rate threshold, who face a marginal rate of 40% (assuming relief is offered on the full contribution amount). The income figures imply that more than a half of the target population would benefit from this change, given the current standard rate threshold of €35,300 for single adults without children, and higher still for lone parents and couples. Moreover, recent research by McGowan and Lunn (2019) shows that the tax relief is poorly understood, suggesting that the simpler matching contributions design may also strengthen *perceived* incentives.

An important consideration for auto-enrolment is the cost to employers. This cost would be higher in more labour-intensive sectors. Under both thresholds, over 20% of the target population work in wholesale and retail, followed by around 15% in manufacturing, both relatively labour-intensive sectors. It may also be noted that around 60% of the target population are based in workplaces of less than 50 people. While some of these workplaces are part of larger firms, small independent businesses are likely to have less administrative capacity. However, it is natural to assume that some of those smaller employment units are shops and branches of larger firms, such as retail companies, so it is not clear how much of the employer cost will fall onto small enterprises.

4 Macro-Analysis Results

We now turn to the macro-economic impacts that auto-enrolment can be expected to have in the medium term. These results, which refer to the scenarios described in Table 1, are derived from the

²² Earnings, Hours and Employment Costs Survey.

estimates of the total of annual contributions shown in Table 8. The opt-out rate is 30% in scenarios A1 to D2, and 10% in scenario E.

Table 8: Total Annual Contributions by Scenario & Contributor in € million per year

| Scenario | Employee | Employer & State | Total |
|----------|----------|------------------|-------|
| A1 & A2 | 823 | 1,098 | 1,921 |
| B1 | 137 | 183 | 320 |
| B2 | 274 | 366 | 640 |
| B3 | 412 | 548 | 960 |
| B4 | 549 | 732 | 1,281 |
| B5 | 686 | 915 | 1,601 |
| C | 923 | 1,231 | 2,154 |
| D1 | 363 | 483 | 846 |
| D2 | 461 | 614 | 1,075 |
| E | 1,058 | 1,412 | 2,470 |

Source: own analysis of the 2013, 2014 and 2015 waves of the Survey on Income and Living Conditions (uprated monetary values and adjusted weights).

4.1 Scenario A

Table 9 shows the impact of scenario A1 on key macro variables five years after the proposal's full implementation. Overall, the level of GDP is around 0.5% below baseline. The new contributions reduce disposable income and hence purchasing power, so the volume of consumption is 0.9% below baseline after five years. Lower consumption means that domestic demand is below where it otherwise would be and this has a knock-on effect on the demand for output from the non-traded sector.

Table 9: Macroeconomic Impacts of Auto-enrolment 5 Years After Full Implementation (Scenarios A1-A2)

| Scenario | A1 | A2 |
|---|------|------|
| <i>Percent deviation from baseline</i> | | |
| Gross domestic product at basic prices | -0.5 | -0.3 |
| Gross value added at basic prices (non-traded sector) | -0.8 | -0.6 |
| Gross value added at basic prices (traded sector) | -0.4 | -0.2 |
| Personal consumption of goods and services | -0.9 | -0.8 |
| Employed persons | -0.6 | -0.4 |
| Average wages | 0.9 | 0.4 |
| Real personal disposable income | -1.1 | -1.0 |
| Financial assets of households | 0.1 | 0.1 |
| <i>Deviation from baseline</i> | | |
| Net immigration (000) | -9.5 | -6.8 |
| Unemployment rate | 0.3 | 0.2 |
| Labour force participation rate | -0.2 | -0.1 |
| General government balance (% GDP) | -0.3 | -0.2 |
| <i>Deviation from baseline (end of simulation period)</i> | | |
| General government debt (% GDP) | 1.0 | 0.9 |

Source: COSMO.

The model assumes that workers bargain for their real after-tax wages, accounting for pension contributions. The new contributions therefore reduce the incentive to work and have a negative effect on labour supply. As a result, participation in the labour market is 0.2 percentage points below baseline after five years and net immigration ends up below where it otherwise would be.

Furthermore, some of the contributions are passed on to employers in terms of higher wage demands. At the end of the period of analysis, wages are around 0.9% above baseline. Higher wages result in a loss of competitiveness in the Irish economy and consequently output in the traded sector is around 0.4% lower than baseline.

Lower levels of activity in both the traded and non-traded sectors lead to lower labour demand and consequently, in this scenario, total employment is 0.6% below baseline and the unemployment rate is around 0.3 percentage points higher after five years. Although the fall in labour demand would tend to put downwards pressure on wages, the fall in labour supply has the opposite effect. The results suggest that the supply effect dominates. However, the wage increase is not sufficient to offset the increase in contributions, so real personal disposable income is below baseline after five years. However, the saved contributions raise the financial assets of households above where they otherwise would be.

The lower level of activity in the economy has a negative impact on tax revenue and government transfer payments increase as a result of the unemployment rate being above baseline. Together with the funding of the government contribution, these factors have a negative impact on the public finance position.

Table 9 also reports the simulation results from scenario A2, a variant of scenario A1 where labour supply is assumed to be unchanged and the contributions are purely treated as a negative income shock. In this scenario, the impact on real personal disposable income is similar to scenario A1. However, the overall macro-economic impact is more muted. In this case, there is less pressure to pay employees higher wages as we have assumed that workers do not let the fall in current income affect their decision to participate in the labour market. As a result, the impact on competitiveness and output in the traded sector is smaller. Likewise, the impact on net immigration and participation is smaller as it is no longer driven by workers' reaction to lower income but by lower economic activity and labour demand than they otherwise would be.

To put the simulation results in context, the overall labour market participation rate in 2018 was 62.2%; applying the results to the labour market participation rate in 2018 implies the rate would be slightly lower at 62% in scenario A1 and 62.1% in scenario A2. In the remainder of this section, we focus on the general case where labour supply response is allowed.

4.2 Scenario B

The next set of scenarios examines a range of contribution rates. It is possible that the auto-enrolment scheme will be phased in over time, so here we examine separate scenarios where the contribution rates for employees is varied from 1% to 5% with proportionate adjustments to the employer and government contributions.

The results are reported in Table 10. The policy change is transmitted through the economy in exactly the same manner as before. The overall macro-economic impact increases across the scenarios as the contribution rates increase. Overall, the impact on GDP ranges from -0.1% in the scenario with the lowest contributions (scenario B1) to -0.4% in the scenario with the highest contribution rate (scenario B5). If employees did not adjust their labour market behaviour in response to lower current net pay (as in scenario A2) the overall impacts would be more muted (see Table 15 in Appendix 5).

Table 10: Macroeconomic Impacts of Auto-enrolment 5 Years After Full Implementation (Scenarios B1-B5)

| Scenario | B1 | B2 | B3 | B4 | B5 |
|---|------|------|------|------|------|
| <i>Percent deviation from baseline</i> | | | | | |
| Gross domestic product at basic prices | -0.1 | -0.2 | -0.2 | -0.3 | -0.4 |
| Gross value added at basic prices (non-traded sector) | -0.1 | -0.3 | -0.4 | -0.5 | -0.6 |
| Gross value added at basic prices (traded sector) | -0.1 | -0.1 | -0.2 | -0.3 | -0.3 |
| Personal consumption of goods and services | -0.1 | -0.3 | -0.4 | -0.6 | -0.7 |
| Employed persons | -0.1 | -0.2 | -0.3 | -0.4 | -0.5 |

| | | | | | |
|---|------|------|------|------|------|
| Average wages | 0.1 | 0.3 | 0.4 | 0.6 | 0.7 |
| Real personal disposable income | -0.2 | -0.4 | -0.6 | -0.7 | -0.9 |
| Financial assets of households | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| <i>Deviation from baseline</i> | | | | | |
| Net immigration (000) | -1.6 | -3.2 | -4.7 | -6.3 | -7.9 |
| Unemployment rate | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| Labour force participation rate | 0.0 | -0.1 | -0.1 | -0.1 | -0.2 |
| General government balance (% GDP) | 0.0 | -0.1 | -0.1 | -0.2 | -0.2 |
| <i>Deviation from baseline (end of simulation period)</i> | | | | | |
| General government debt (% GDP) | 0.2 | 0.3 | 0.5 | 0.7 | 0.9 |

Source: COSMO.

4.3 Varying other parameters

Following the micro-economic analysis, we also examine the macro-economic impacts of varying the income threshold and firm size. We also look at the effect of a lower opt-out rate. These results are presented in Table 11. The impacts associated with broadening the income limit to include those earning from €14,000 a year (scenario C) are very similar to scenario A1. This is not surprising as the micro estimates of the contributions are relatively similar.

Table 11: Macroeconomic Impacts of Auto-enrolment 5 Years After Full Implementation (Scenarios C-E)

| Scenario | C | D1 | D2 | E |
|---|-------|------|------|-------|
| <i>Percent deviation from baseline</i> | | | | |
| Gross domestic product at basic prices | -0.5 | -0.2 | -0.3 | -0.6 |
| Gross value added at basic prices (non-traded sector) | -0.8 | -0.3 | -0.4 | -1.0 |
| Gross value added at basic prices (traded sector) | -0.5 | -0.2 | -0.2 | -0.5 |
| Personal consumption of goods and services | -1.0 | -0.4 | -0.5 | -1.1 |
| Employed persons | -0.6 | -0.2 | -0.3 | -0.7 |
| Average wages | 1.0 | 0.4 | 0.5 | 1.1 |
| Real personal disposable income | -1.2 | -0.5 | -0.6 | -1.4 |
| Financial assets of households | 0.1 | 0.0 | 0.0 | 0.1 |
| <i>Deviation from baseline</i> | | | | |
| Net immigration (000) | -10.6 | -4.2 | -5.3 | -12.2 |
| Unemployment rate | 0.3 | 0.1 | 0.2 | 0.4 |
| Labour force participation rate | -0.2 | -0.1 | -0.1 | -0.3 |
| General government balance (% GDP) | -0.3 | -0.1 | -0.2 | -0.4 |
| <i>Deviation from baseline (end of simulation period)</i> | | | | |
| General government debt (% GDP) | 1.2 | 0.5 | 0.6 | 1.4 |

Source: COSMO.

The two scenarios based on the micro estimates for those working in larger businesses (scenario D1) and smaller businesses (scenario D2) are also shown in Table 11. The macro impact is slightly larger when considering the employees who work in smaller businesses as the total amount of contributions is larger in this case. Broadly speaking these two scenarios add up to scenario A1. Finally, scenario E considers a lower opt-out rate of 10% and the impacts are essentially a scaled up version of scenario A1 as the opt-out rate applies to the entire target population.

Simulation results for each scenario without labour supply response are shown in Table 13 in Appendix 3.

5 Conclusion

This study provides new microeconomic and macroeconomic evidence relevant to the design and implementation of the auto-enrolment pension scheme described by the “Strawman” document. Our microeconomic analysis is done using SWITCH data, which is itself based on data drawn from SILC. This survey contains a broad range of information relevant for this task, including data on incomes, employee pension coverage, and demographic characteristics. The first task for this report was to construct a database for the analysis using this information. We use pooled data from SILC for 2013, 2014 and 2015 in order to have a larger sample size. Incomes are uprated to 2019 levels, and sample weights are estimated to ensure that the database is representative of the 2019 situation in terms of employment and unemployment, income distribution and demographic characteristics. Crosschecks against other data sources (which contain some but not all of the relevant information) indicate that our unique dataset is broadly representative of the population in terms of income, demographics and pension coverage.

Adequacy of pensions is a key driver for the auto-enrolment proposals. The measure of adequacy most often used is the “final earnings replacement rate”. McDonald *et al.* (2016) find that the correlation between the conventional earnings replacement rate and continuity in actual living standards is relatively low and outline a number of reasons why this may be so. We examine two of these reasons in our exploration of replacement rates: the differences arising from the use of net, rather than gross incomes, and the potential differences in housing costs due to the redemption of mortgages at or before retirement, as compared with the payment of mortgages during working ages.

Using microsimulation techniques, we construct what we term “snapshot” replacement rates – the extent to which the SCP replaces the income *currently* gained from employment. Two main caveats are needed when interpreting these results. Pension replacement rates usually aim to assess pensions in relation to incomes near retirement: the snapshot only does so if incomes and pensions rise at the same rate over the time to retirement. Age-earnings profiles suggest that earnings typically rise with age before plateauing, so that final pension replacement rates would typically be lower than the snapshot. Secondly, the calculations are based on the maximum SCP, while significant numbers receive rates of 10 to 15% below that rate.

Overall, the results on snapshot replacement rates, taking account of net as well as gross incomes, and of potential savings from outright home ownership in retirement, reinforce concerns about retirement provision for the potential target group for auto-enrolment, with incomes above €20,000 per year. Very few with incomes above €30,000 have a relatively high snapshot replacement rate of 70% or more, even if calculated on a net basis and adjusted for mortgage costs. For those with incomes between €20,000 and €30,000, 93% have net replacement rates, adjusted for mortgage costs, below the 70% level.

The results also shed light on the snapshot replacement rates for low-income groups. We examine both the threshold currently suggested by the Strawman document (€20,000 per annum) and a lower threshold of €14,000 per annum. Snapshot replacement rates for a majority of those in the €14,000 to €20,000 bracket, tend to be above 70% on both a gross and net basis. As noted, however, expected pension replacement rates in relation to final incomes would be below these levels for many individuals, due to individual wage progression and/or lower than maximum state pension. Auto-enrolment will, of course, provide a boost to replacement rates based on both the State and supplementary pensions and this benefit is likely to be between one-fifth and one quarter of income²³.

²³ Assuming full participation in the autoenrolment scheme over a 45 year period

Our analysis also provides a profile of the size and nature of the auto-enrolment population, based on two potential cut-offs (€14,000 and €20,000). We estimate that some 584,000 employees aged 23 to 60 would be covered by the Strawman proposal if the earnings threshold were set at €20,000 per annum. If instead, the €14,000 level were used, the target population is estimated at close to 724,000.

What is the composition of this target population? In the scenario proposed in the Strawman document, an entry point at €20,000 per annum, half of the target population would earn between €20,000 and €30,000 a year and 90% would have incomes less than €50,000. Above that level, most employees already have a supplementary pension. A lower entry point, at €14,000 per annum, would imply a substantial increase in the numbers included in auto-enrolment, with close to 20% having incomes between €14,000 and €20,000, and the proportion under €30,000 would go up to 60%.

In terms of age, around 40% of the target population are under 30, and a further 30% would be under 40. These results do not depend on the level of the annual earnings entry point, unlike the gender balance. With the €20,000 earnings threshold, our estimates suggest that about 57% of those auto-enrolled would be men. This arises because women with incomes above €20,000 have higher pension coverage than men – largely due to higher numbers of women in public sector jobs. If the lower threshold of €14,000 were used, the proportion of those auto-enrolled who were men would fall to 52%, as more low-paid women would be included. The wholesale/retail and manufacturing sectors are the single sectors containing the largest proportion of workers who will be auto-enrolled. Smaller employment units (less than 50 staff) will also be more affected by auto-enrolment than firms employing 50 and more staff.

The decision regarding the appropriate level of the earnings threshold is a complex one. The Strawman document indicates that the two key considerations in setting the earnings trigger level are “the affordability of contributions for people on very low incomes and the target retirement income replacement rate”. Our analysis provides some further detail on income replacement rates to inform this decision. As noted, however, these are “snapshot” income replacement rates, as per the Strawman calculations, based on current earnings and a maximum SCP. Typically individual income growth, related to experience and career progression, will mean that replacement rates with respect to final earnings will be lower than this, particularly given that over 40% of the target population have third level education. For those with fewer PRSI contributions, the actual rate of the State pension that they receive will be below the maximum SCP rate, also reducing replacement rates. This points towards possible inclusion of some of those with incomes below €20,000 within the auto-enrolment scheme.²⁴ By comparison, the UK design (which currently incorporates an earnings disregard of £6,136) has a much lower income threshold (£10,000) for auto-enrolment, and allows an opt-out. If individuals regard the contributions as unaffordable, they have the ability to opt out.²⁵ Overall, opt-out rates in the UK have remained low (below 10%), even after an increase in employee contribution rates from 1% to 3% in April 2018. The exact structure of the system is likely to differ in Ireland, however, so it is not possible to estimate opt-out rates in advance of roll-out of the scheme.

Our analysis of the macroeconomic impact builds on the profile of contributors and contributions under the auto-enrolment scheme provided by SWITCH. The macroeconomic analysis uses the COSMO model, which, like most macroeconomic models, is concerned with average and total effects and not their distribution. We use the microeconomic analysis to establish the size of the target population and the likely scale of contributions. We then examine the macroeconomic impact of such

²⁴ Those on income below the autoenrolment level can, of course, opt in to the scheme voluntarily.

²⁵ In the UK system those autoenrolled can opt out immediately while in Ireland it is proposed to have a minimum 6 month contribution period before being able to opt out.

a scheme, incorporating employee contributions, matching employer contributions and a government contribution equivalent to a third of the employee contribution. We consider a range of scenarios based on different contribution rates and with variants of other features of the ‘Strawman’ proposals and compares them to a ‘no policy change’ baseline.

Overall, the introduction of contributions to retirement savings schemes leads to lower levels of economic activity in the short to medium-term as they leave households with lower disposable income and have a negative impact on labour demand. However, it is reasonable to assume that the negative impact would be somewhat alleviated over time as there will be a future increased income stream for households. It is important to re-iterate one of the major caveats of this study, which is that we are modelling the cost associated with an auto-enrolment scheme. We have no estimates for how much such a scheme would benefit employees in the longer-term by providing additional income in retirement and so this effect could not be included in this analysis. Furthermore, in terms of employee behaviour, there is some uncertainty regarding the impact of the introduction of auto-enrolment. There have been no empirical studies examining the impact of auto-enrolment on labour supply, in countries that have introduced this type of system, that we can draw on for this analysis so we consider two alternative approaches in this study. The results here show that where employees do not adjust their labour market behaviour in response to lower current net pay (as in Scenario A2), the overall macro impacts would be more muted.

Auto-enrolment is likely to have a positive effect on the economy over the longer term. From the perspective of individuals, an auto-enrolment scheme allows them to smooth consumption over the life course. Although they will have less income and consumption now, the key point is that by deferring income they will have higher income in retirement than otherwise would have been the case. This is equivalent to saying there will be a positive income shock in the future which would raise household incomes above where they otherwise would have been. This will have a positive impact on key macro variables like consumption, domestic demand employment and output.

6 Appendix 1 – Technical note on SWITCH (construction and validation)

The input data for SWITCH is a database compiled from the 2013, 2014 and 2015 waves of the SILC and made representative of the current (2019) population. To this end, we make two types of adjustments. Firstly, we uprate monetary variables using the CSO's actual growth figures and the ESRI's latest forecasts. In doing so we distinguish between earnings growth in the public and private sectors, and within the latter between employees and the self-employed. We then adjust the SILC weights using a rich set of population characteristics, including estimates of employment levels, households' incomes and welfare receipts of most welfare schemes, ensuring good representativeness of the income distribution²⁶. Reweighting is partly motivated by the need to project the data to the relevant year, but also by the fact that the raw weights do not provide a very representative picture of the income distribution (Callan *et al.*, 2011). Here we show some important validation results.

Table 12 shows the ratio of our population estimates to control totals (ESRI projections for 2019 based on Census and LFS data). Apart from a slightly lower number of unemployed women, the adjusted weights for 2019 provide a close fit for work status and the age profile of the population.

Table 12: Ratio of Population Estimates to Control Totals Using Adjusted Weights (%)

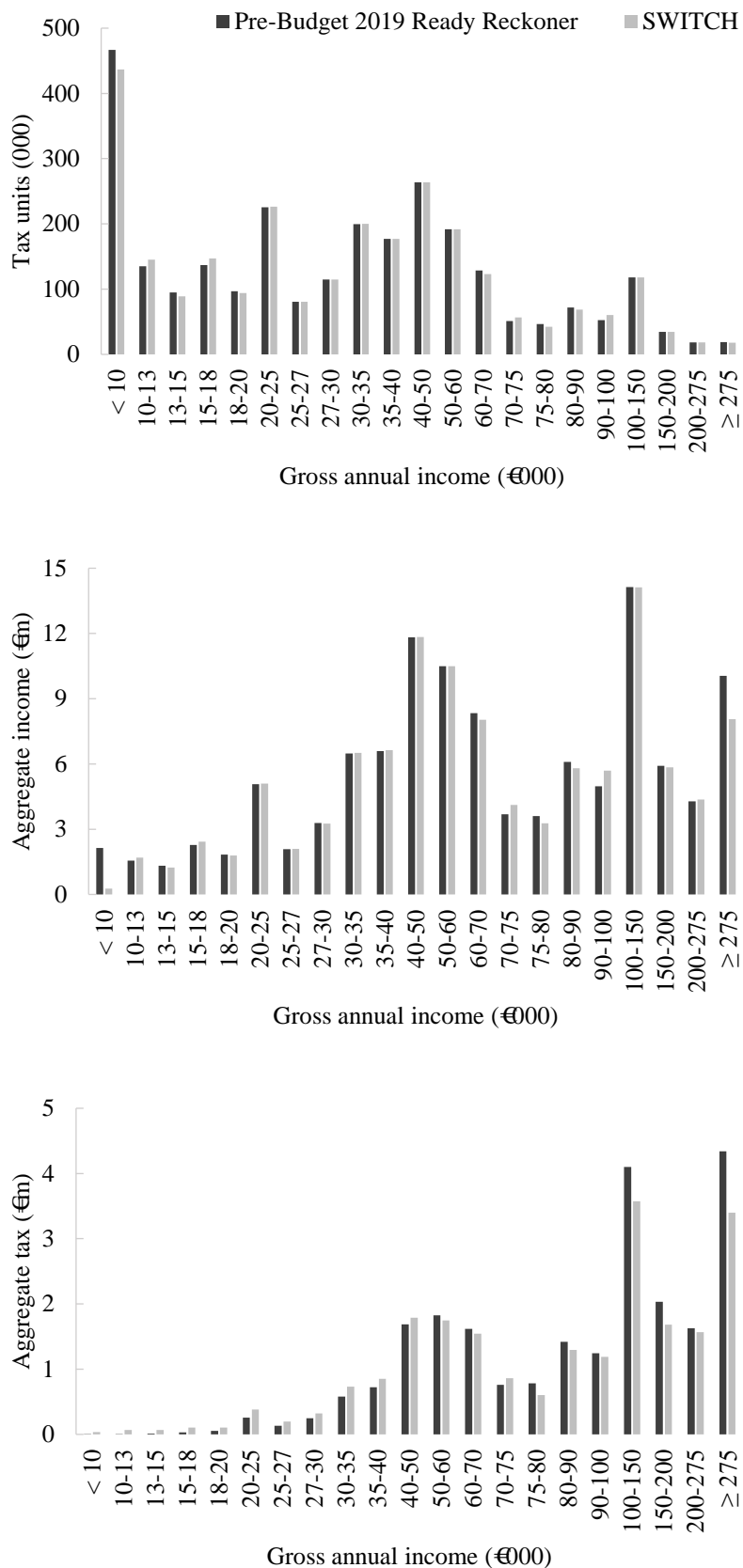
| | Men | Women |
|------------------------|-----|-------|
| <i>ILO work status</i> | | |
| At work | 101 | 103 |
| Unemployed | 105 | 91 |
| <i>Age</i> | | |
| 0-4 | 100 | 100 |
| 5-12 | 100 | 100 |
| 13-18 | 100 | 100 |
| 19-24 | 100 | 100 |
| 25-44 | 100 | 100 |
| 45-64 | 100 | 100 |
| 65+ | 100 | 100 |

Source: own analysis of the 2013, 2014 and 2015 waves of the Survey on Income and Living Conditions (uprated monetary values and adjusted weights).

Figure 1 compares the number of tax units, aggregate income, income tax and USC by annual gross income from the Revenue Commissioner's Pre-Budget 2019 Ready Reckoner and SWITCH's input data. Again, the data provides a remarkably close fit to the benchmark.

²⁶ We use the CALMAR program developed by INSEE.

Figure 1: Number of Tax Units, Aggregate Income and Aggregate Tax (Income Tax and USC) by Gross Annual Income: Revenue Commissioner's Pre-Budget 2019 Ready Reckoner and Input Data for SWITCH (2019)



Source: own analysis of the 2013, 2014 and 2015 waves of the Survey on Income and Living Conditions (uprated monetary values and adjusted weights).

7 Appendix 2- Supplementary Pension Estimates

Table 13: Snapshot gross replacement rates based on the maximum SCP and secondary benefits

| Earnings | Contribution Rate | Supplementary Pension €p.a. | Supplementary Pension % of Earnings | Contribution Period (Years) | Gross RR (SCP + Supplementary) |
|------------|-------------------|-----------------------------|-------------------------------------|-----------------------------|--------------------------------|
| €3,000.00 | 14% | €9,038.00 | 27.4% | 45 | 67% |
| €5,000.00 | 14% | €9,588.00 | 27.4% | 45 | 64% |
| €10,000.00 | 14% | €10,958.00 | 27.4% | 45 | 60% |
| €50,000.00 | 14% | €13,688.00 | 27.4% | 45 | 53% |
| €60,000.00 | 14% | €16,438.00 | 27.4% | 45 | 49% |
| €70,000.00 | 14% | €19,188.00 | 27.4% | 45 | 46% |

Source: DEASP calculations using the Pensions Authority Calculator, available at https://www.pensionsauthority.ie/en/Calculators/Pension_Calculator/.

8 Appendix 3 - Secondary Benefits

Table 2 examined gross replacement rates based on the maximum SCP. How are these results affected by the inclusion of the value of secondary benefits associated with the SCP? These benefits (the Living Alone, Telephone Support and Fuel allowances, Household Benefits Package and Free TV Licence) amount to a little over €1,800 for the year 2019, and are given to everyone here for simplicity. Table 14 shows that this brings the snapshot gross replacement rate for 95 per cent of those with incomes in the range €14,000 to €20,000 above 70 per cent. Gross replacement rates for higher income levels are also somewhat increased, but more than 90 per cent of those with incomes in the €20,000 to €30,000 range have snapshot gross replacement rates below 70 per cent.

Table 14: Snapshot gross replacement rates based on the maximum SCP and secondary benefits

| Replacement rate in % | Gross pay in thousand euros per year | | | | |
|-----------------------|--------------------------------------|------------|------------|------------|------------|
| | ≥ 0, < 14 | ≥ 14, < 20 | ≥ 20, < 30 | ≥ 30, < 50 | ≥ 50, < 75 |
| ≥ 0, < 10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ≥ 10, < 20 | 0.0 | 0.0 | 0.0 | 0.5 | 3.9 |
| ≥ 20, < 30 | 0.0 | 0.0 | 0.0 | 6.0 | 96.1 |
| ≥ 30, < 40 | 0.0 | 0.0 | 0.2 | 48.3 | 0.0 |
| ≥ 40, < 50 | 0.0 | 0.0 | 9.2 | 45.2 | 0.0 |
| ≥ 50, < 60 | 0.0 | 4.5 | 48.9 | 0.0 | 0.0 |
| ≥ 60, < 70 | 0.1 | 0.9 | 34.4 | 0.0 | 0.0 |
| ≥ 70, < 80 | 0.6 | 36.0 | 7.4 | 0.0 | 0.0 |
| ≥ 80 | 99.3 | 58.6 | 0.0 | 0.0 | 0.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: authors' calculations based on SWITCH data.

Note: due to rounding error column totals may not sum to 100.

While indicative of the sensitivity of lower earners' gross replacement rates to the inclusion of secondary benefits, only a minority of pensioners will qualify for all four of these secondary benefits²⁷ as entitlement will depend on means and household composition. The results shown here, therefore, can be seen as a potential maximum gross replacement rate.

²⁷ For example, in 2018 there were 411,660 in receipt of the SCP while only 76,731 received the Living Alone Allowance. All 2018 numbers provided by Department of Employment Affairs and Social Protection.

9 Appendix 4 – Technical Note on COSMO

The COSMO macroeconomic model initially focuses on production relationships, and then examines the downstream expenditure and income consequences.²⁸ On the production side, COSMO distinguishes between the traded sector, the non-traded sector and the government sector. Each production sector is governed by an underlying production function that ultimately drives medium-term growth. Output in the traded sector is driven by world demand and cost competitiveness. The non-traded sector is driven by domestic demand. The public sector is policy-driven, and includes the treatment of borrowing and debt accumulation. Demand is disaggregated along standard national accounting lines, i.e. household consumption, public consumption, investment, exports and imports. Tensions between supply and demand feed back into the economy through the price system.

Households make consumption decisions based on the current income and holdings of wealth (financial and non-financial). They also supply labour, with the supply of labour dependent on after-tax wages and migration, as well as demographic assumptions. The labour market is open and through migration is influenced by conditions in alternative labour markets. Firms employ labour and make investment decisions, with their factor demands derived from the underlying production functions. Wages are determined in a bargaining model, and influenced by the factors that affect the supply and demand for labour (e.g. prices, taxes).

The government sector raises taxes, transfers income to households, employs labour and invests in capital. Any deficit accumulates onto the government debt stock, and interest must be paid on this debt. While monetary policy is exogenously set by an external ECB, borrowing rates include an endogenous margin, which depend on the state of the economy and the health of the banking system.

²⁸ See Bergin et al (2017) for a full description of the mechanisms and behaviour of the model.

10 Appendix 5 – Additional macro-economic analysis

Table 13: Macroeconomic Impacts of Auto-enrolment 5 Years After Full Implementation, Assuming No Labour Supply Response (Scenarios B1-E)

| Scenario | B1 | B2 | B3 | B4 | B5 | C | D1 | D2 | E |
|---|------|------|------|------|------|------|------|------|------|
| <i>Percent deviation from baseline</i> | | | | | | | | | |
| Gross domestic product at basic prices | -0.1 | -0.1 | -0.2 | -0.2 | -0.3 | -0.4 | -0.1 | -0.2 | -0.4 |
| Gross value added at basic prices (non-traded sector) | -0.1 | -0.2 | -0.3 | -0.4 | -0.5 | -0.7 | -0.3 | -0.4 | -0.8 |
| Gross value added at basic prices (traded sector) | 0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.2 | -0.1 | -0.1 | -0.2 |
| Personal consumption of goods and services | -0.1 | -0.3 | -0.4 | -0.5 | -0.6 | -0.9 | -0.3 | -0.4 | -1.0 |
| Employed persons | -0.1 | -0.1 | -0.2 | -0.3 | -0.3 | -0.5 | -0.2 | -0.2 | -0.5 |
| Average wages | 0.1 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.2 | 0.2 | 0.5 |
| Real personal disposable income | -0.2 | -0.3 | -0.5 | -0.7 | -0.9 | -1.2 | -0.5 | -0.6 | -1.3 |
| Financial assets of households | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 |
| <i>Deviation from baseline</i> | | | | | | | | | |
| Net immigration (000) | -1.1 | -2.2 | -3.3 | -4.5 | -5.6 | -7.5 | -2.9 | -3.7 | -8.6 |
| Unemployment rate | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.1 | 0.1 | 0.3 |
| Labour force participation rate | 0.0 | 0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.2 |
| General government balance (% GDP) | 0.0 | -0.1 | -0.1 | -0.1 | -0.2 | -0.2 | -0.1 | -0.1 | -0.3 |
| <i>Deviation from baseline (end of simulation period)</i> | | | | | | | | | |
| General government debt (% GDP) | 0.1 | 0.3 | 0.4 | 0.6 | 0.7 | 1.0 | 0.4 | 0.5 | 1.1 |

Source: COSMO.

11 References

- Bergin, A., Garcia-Rodriguez, A., McInerney, N. and E. Morgenroth (2016). Baseline: Methodology, Assumptions and Projections in Bergin, A., Morgenroth, E. and K. McQuinn (eds.), *Ireland's Economic Outlook: Perspectives and Policy Challenges*, Dublin: ESRI
- Bergin, A., Conroy, N., Garcia-Rodriguez, A., Holland, D., McInerney, N., Morgenroth, E. and D. Smith (2017). *COSMO: A new COre Structural MOdel for Ireland*, ESRI Working Paper no. 553.
- Bergin, A., Economides, P., Garcia-Rodriguez, A. and G. Murphy (2019). Ireland and Brexit: modelling the impact of deal and no-deal scenarios. Special Article in *Quarterly Economic Commentary*, Spring Edition.
- Beshears, J., Choi, J.J., Laibson, D., & Madrian, B.C. (2009). The importance of default options for retirement saving outcomes: Evidence from the United States. In *Social security policy in a changing environment* (pp. 167-195). University of Chicago Press.
- Burke, R., & Gilhewley, T. (2017). *Private pension tax relief: a paper on the Irish pensions taxation lanscape. Society of Actuaries in Ireland.* https://web.actuaries.ie/sites/default/files/2018-11/181115%20Private%20Pension%20Tax%20Relief%20Paper_0.pdf.
- Callan, T., Keane, C., Walsh, J.R., & Lane, M. (2011). From data to policy analysis: Tax-benefit modelling using SILC 2008. *Journal of the Statistical and Social Inquiry Society of Ireland*, 40, 1-10.
- Choi, J.J., Laibson, D., Madrian, B.C., & Metrick, A. (2004). For better or for worse: Default effects and 401 (k) savings behavior. In *Perspectives on the Economics of Aging* (pp. 81-126). University of Chicago Press.
- Crawford, R., Keynes, S., & Tetlow, G. (2014). *From me to you? How the UK state pension system redistributes* (No. W14/20). IFS Working Papers.
- Cribb, J., & Emmerson, C. (2016). *What happens when employers are obliged to nudge? Automatic enrolment and pension saving in the UK* (No. W16/19). IFS Working Papers.
- Central Statistics Office (2016). *QNHS Module on Pensions Q4 2015*. CSO Statistical Release, 30 May 2016. https://pdf.cso.ie/www/pdf/20160530084332_QNHS_Module_on_Pensions_Q4_2015_full.pdf.
- Collins, M.L., & Hughes, G. (2017). Supporting Pension Contributions Through the Tax System: Outcomes, Costs and Examining Reform. *The Economic and Social Review*, 48(4), 489-514.
- Department of Employment Affairs and Social Protection (2017a). *Actuarial Review of the Social Insurance Fund 2015*. <https://www.welfare.ie/en/downloads/actrev311215.pdf>.
- Department of Employment Affairs and Social Protection (2017b). *Statistical Information on Social Welfare Services 2017*. https://www.welfare.ie/en/downloads/Annual_Statistics_Report_2017.pdf
- Government of Ireland (2018a). *A Roadmap for Pension Reform: 2018 - 2023*. <https://www.welfare.ie/en/pressoffice/pdf/PensionsRoadmap.pdf>.
- Government of Ireland (2018b). *A Strawman Public Consultation Process for an Automatic Enrolment Retirement Savings System for Ireland*. https://www.welfare.ie/en/downloads/Automatic_Enrolment_Strawman_Proposal.pdf.
- Government of Ireland (2007). *Green Paper on Pensions*. Dublin: The Stationary Office.
- Kennedy, S., Jin, Y., Haugh, D., & Lenain, P. (2016). Taxes, Income and Economic Mobility in Ireland: New Evidence from Tax Records Data. *The Economic and Social Review*, 47(1), 109-153.
- MacDonald, B.J., Osberg, L., & Moore, K.D. (2016). How accurately does 70% final employment earnings replacement measure retirement income (in) adequacy? Introducing the Living Standards Replacement Rate (LSRR). *ASTIN Bulletin: The Journal of the IAA*, 46(3), 627-676.
- McGowan, F., Lunn, P. (forthcoming). Supporting decision-making in retirement planning: do diagrams on pension benefit statements help? *Journal of Pension Economics & Finance*.
- Norris, M. (2013), *Varieties of home ownership: Ireland's transition from a socialised to a marketised policy regime*, UCD Geary Institute Working Paper 2013/06.

- OECD (2014). *OECD Reviews of Pensions Systems: Ireland*. Paris: OECD Publishing. <http://dx.doi.org/10.1787/9789264208834-en>.
- OECD (2017). *Pensions at a Glance 2017: OECD and G20 Indicators*. Paris: OECD Publishing. http://dx.doi.org/10.1787/pension_glance-2017-en.
- Scholz, J. & Seshadri, A. (2009). *What replacement rates should households use?* (No. 2009-214). Michigan Retirement Research Center Working Papers.
- Watson, D., Maitre, B. and Cantillon, S. (2013) *Implications of Income Pooling and Household Decision-making for the Measurement of Poverty and Deprivation: An Analysis of the SILC 2010 Special Module for Ireland*, Department of Social Protection Social Inclusion Technical Paper No. 4.
- Vanderhei, J. (2006). *Measuring Retirement Income Adequacy: Calculating Realistic Income Replacement Rates* (No. 297). Employee Benefit Research Institute Issue Briefs.