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**POPULATION AGEING AND GOVERNMENT REVENUE: EXPECTED TRENDS AND
POLICY CONSIDERATIONS TO BOOST REVENUE**

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By David Crowe, Jörg Haas, Valentine Millot, Łukasz Rawdanowicz and Sébastien Turban

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ABSTRACT/RÉSUMÉ**Population Ageing and Government Revenue: Expected Trends and Policy Considerations to Boost Revenue**

Population ageing is expected to result in significantly higher government spending in many OECD countries in the coming decades. This paper sheds light on the macroeconomic consequences of population ageing for government revenue in a framework consistent with the OECD long-term model. If the labour and capital income shares in GDP remain constant and pension income increases in relation to GDP, the tax revenue-to-GDP ratio will increase slightly. However, this will not be enough to cover the total increase in government spending due to population ageing. If governments do not mitigate spending pressures by structural reforms or cuts in pension entitlements, they will have to boost tax revenue significantly to prevent public debt from expanding. In many countries, it will not be possible, nor advisable, to completely finance the increase in long-term spending with only one tax instrument as it would require a massive rise in the tax rate, with risks of ensuing distortions. Thus, governments will have to choose mixes of tax increases, accounting for growth, equity and political considerations. This paper reviews these considerations for several specific tax categories.

JEL classification codes: H21, H23, H24, H55, I38, J14, E17.

Keywords: population ageing, public finances, pensions, tax revenue, tax policy.

*** * * * ***

Vieillissement de la Population et Recettes Publiques : Tendances Attendues et Considérations Politiques pour Augmenter les Recettes

Le vieillissement de la population devrait entraîner une augmentation sensible des dépenses publiques dans de nombreux pays de l'OCDE au cours des prochaines décennies. Ce document met en lumière les conséquences macroéconomiques du vieillissement de la population sur les recettes publiques dans un cadre cohérent avec le modèle à long terme de l'OCDE. Si les parts des revenus du travail et du capital dans le PIB restent constantes et que les revenus des pensions augmentent par rapport au PIB, le ratio recettes fiscales/PIB augmentera légèrement. Toutefois, cela ne suffira pas à couvrir l'augmentation totale des dépenses publiques due au vieillissement de la population. Si les gouvernements n'atténuent pas les pressions sur les dépenses par des réformes structurelles ou des réductions des droits à pension, ils devront augmenter considérablement les recettes fiscales pour empêcher l'augmentation de la dette publique. Dans de nombreux pays, il ne sera pas possible, ni souhaitable, de financer entièrement la hausse des dépenses de long terme avec un seul instrument fiscal car cela nécessiterait une hausse massive du taux d'imposition, ce qui pourrait entraîner des risques de distorsions. Ainsi, les gouvernements devront choisir des combinaisons d'augmentations d'impôts, tenant compte de considérations sur la croissance, l'équité et l'acceptabilité politique. Le présent document passe en revue ces considérations pour plusieurs catégories d'impôts en particulier.

JEL classification codes: H21, H23, H24, H55, I38, J14, E17.

Mots-clés : vieillissement de la population, finances publiques, retraites, recettes fiscales, politique fiscale

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Population ageing and government revenue: Expected trends and policy considerations to boost revenue

By David Crowe, Jörg Haas, Valentine Millot, Łukasz Rawdanowicz and Sébastien Turban¹

Population ageing is a key structural trend facing advanced and many emerging market economies in the coming decades with significant implications for the economy and public finances (Rawdanowicz et al., 2021^[1]). So far, research has mainly focused on the impact of population ageing on government expenditure, in particular via higher public pensions and health care spending – e.g. Guillemette and Turner (2021^[2]) and the European Commission’s Ageing Reports. This research suggests that public spending on pensions and health care will likely need to be increased sizeably. Such spending pressures could be mitigated by structural reforms as discussed in detail in recent OECD papers (Rouzet et al., 2019^[3]; Guillemette and Turner, 2021^[2]). However, in the absence of structural reforms or cuts in pension entitlements, large increases in tax revenue would be needed to stabilise public debt according to the projections derived from the OECD long-term model (LTM). Otherwise, public debt would increase, with possibly negative implications for economic stability that are discussed in Rawdanowicz et al. (2021^[1]).

In this context, this paper has two objectives.

- First, building on the recent analysis of the consequences of ageing populations on government spending in the LTM (Guillemette and Turner, 2021^[2]), it sheds light on the macroeconomic consequences for government revenue in a framework consistent with the LTM and long-term spending projections. Consequently, simulations are based on the path of nominal GDP from the LTM, which incorporates demographic projections. In the baseline scenario, the labour share in GDP remains constant, consistent with the Cobb-Douglas production function employed in the LTM. The proposed framework, while admittedly stylised, has the advantage of ensuring accounting consistency between the assumed split of nominal GDP into labour and capital income shares (the primary allocation of income), taxes and social benefits – including pensions (which are part of the secondary distribution of income) and household consumption (uses of disposable income). Thus, the model can indicate orders of magnitude of the macroeconomic impact of selected aspects of population ageing on budget balances.

¹ The authors are economists at the OECD Economics Department. The authors would like to thank Sebastian Barnes, Orsetta Causa, Boris Cournède, Filippo Maria D’Arcangelo, Luiz de Mello, Mame Fatou Diagne, Sean Dougherty, Falilou Fall, Yvan Guillemette, Jens-Christian Høj, Mauro Pisu and Douglas Sutherland (all from the Economics Department), Piet Battiau, David Bradbury, Bert Brys, Andrew Lonsdale, Pierce O’Reilly, Sarah Perret, Yannic Rehm and Kurt van Dender (all from the Centre for Tax Policy and Administration), Pietrangelo de Biase, and participants of the Working Party No. 1 on Macroeconomic and Structural Policy Analysis meeting on 13-14 October 2022 for useful comments and inputs; and Dacil Kurzweg and Sisse Nielsen for editorial assistance.

- Second, it discusses possible mixes of tax increases that would be needed to cover higher public spending if governments were to choose this option. The discussion accounts for growth, equity and political considerations. It draws heavily on previous Economics Department's work, tax analyses by the OECD Centre for Tax Policy and Administration and on the academic literature. As structural reforms and spending cuts to deal with spending pressures and consequences of high debt have already been addressed in recent Economics Department's analyses, the paper focuses on taxes. This does not imply that raising taxes should be preferred over other options.

The main conclusions of the paper are summarised in Box 1.

Box 1. Main conclusions

Model simulation results

- If the labour and capital income shares in GDP remain constant (a hypothetical, LTM-implied but arguably justifiable assumption) and pension income increases in relation to GDP, the tax revenue-to-GDP ratio will increase slightly via higher income tax and consumption tax receipts. On average, this will cover around a quarter of the expected increase in spending on public pensions by 2060.
- The alternative assumption of a modest decline in labour income shares does not change net fiscal pressures significantly. Lower labour shares reduce labour-related revenue but increase tax revenue from gross profits of companies and self-employed income (all relative to GDP). The net effect on the tax-to-GDP ratio is expected to be negative. However, in the LTM a fall in the labour share also reduces the increase in public spending on pensions. On net, fiscal pressures are expected to be slightly higher in the scenario with a modest decline in the labour share compared with the baseline scenario in two-thirds of the analysed countries, and marginally lower in the remaining countries.

Policy options to deal with long-term spending pressures

- Higher long-term spending pressure could be addressed by reforms to lower spending and raise taxes. Choosing not to act would result in larger budget deficits and thus higher public debt. A combination of these strategies, that reflects a country's social preferences, could be desirable to limit negative effects associated with each option and given political economy considerations. Countries with very high debt and taxes would have to rely more on reducing spending and the structural reforms discussed in Guillemette and Turner (2021^[2]). In contrast, countries with low taxation and low debt could envisage some increase in tax rates and expanding tax bases and allow a limited in size and time expansion in debt.
- If governments fail to implement structural reforms to lower spending and do not allow government debt to grow, they will have to increase taxes. In many countries, it will not be possible, nor advisable, to completely finance the increase in long-term spending with only one tax instrument as it would require a massive increase in the tax rate, with risks of ensuing distortions.

Policy options to increase tax revenue

- When deciding on the mix of potential tax increases, governments would have to weigh several criteria, sometimes involving trade-offs, primarily related to efficiency; capacity to raise sufficient revenue; equity; and public acceptability. All of these factors are likely to interact with economic processes related to an ageing society.
- In all countries, broadening tax bases and improving the efficiency of tax enforcement and collection would be beneficial. As for changes in tax rates, spreading increases in tax rates

across a wide range of tax categories could prevent any one tax rate from becoming too distortive, and possibly minimise perceptions of an unfair distribution of tax burdens. Countries could also consider introducing new taxes motivated by efficiency, equity, public acceptability and administration cost considerations, which would not only increase revenue but also diversify tax bases.

- The challenges and opportunities to increase revenue from the current main tax categories, and thus the urgency to broaden tax bases and to increase revenue from underutilised taxes, differ across OECD countries.
- Increasing revenue from value added taxes (VAT) and sales taxes could be a good way to cover the long-term spending pressures given their potential to generate large revenue, their limited distortions to economic growth and impact on equity, and their potential resilience to population ageing. This option would be particularly attractive for countries where the standard tax rates are low or where the existing tax base is narrow. In contrast, countries where the standard VAT rates are high and potentially close to revenue-maximising levels appear to have less scope to boost consumption tax revenue through policy changes. To the extent that increases in VAT have adverse distributional impacts, accompanying policies may be needed to ensure that any such changes are part of policy packages that support equity objectives.
- Increasing personal income tax (PIT) rates on labour income could bring substantial tax revenues but should be considered carefully due to likely distortions, possible negative implications for other tax bases, and fairness considerations. Such concerns are likely to be large in countries where PIT rates are already high, but smaller in economies with low PIT rates. The fairness of any increases in PIT on labour incomes will also depend on the extent of progressivity in the country's PIT system at present.
- Raising effective tax rates on capital income to levels closer to those on labour income, would not only help to deal with public spending pressures but also reduce income inequality and opportunities for tax avoidance. This option would be particularly relevant if the labour share were to decline.
- Recurrent taxes on immovable property have the potential to contribute to financing long-term spending pressures given their large tax base and high efficiency. However, several political and practical challenges would have to be addressed. They relate to potential regressivity, potential problems with ability to pay the tax (especially for the asset-rich and cash poor, like many of the elderly), unpopularity, necessity to update property values frequently, as well as implications for adjusting taxation and spending arrangements across different levels of government.
- Introducing inheritance taxes or increasing the taxation collected from existing ones in countries where current revenue is low could be a promising option to diversify the financing of the expected increase in long-term spending. Inheritance taxes could raise revenue, especially as the tax base is expected to increase as the population ages, and help lower wealth inequality, with limited efficiency losses. However, tax planning and public opposition could reduce the scope for boosting inheritance tax revenue in practice.
- Recurrent taxes on net wealth could generate potentially large revenues, but the practical experience of these taxes in many OECD countries suggests that they have many drawbacks and often raise relatively low levels of revenue. However, if broad-based personal income and inheritance taxes cannot be implemented, a well-designed wealth tax could be desirable from an equity perspective even if it may not be the first-best option in terms of efficiency.
- Options to raise more revenue from corporate income taxes to meet the long-term spending challenges, as part of a broader strategy to reform the taxation of capital income, could be considered. While there are limits to increasing corporate tax rates unilaterally given the high

international mobility of parts of the corporate tax base, the recent agreement to reform the international corporate tax rules is expected to increase corporate income tax revenue and reduce opportunities for tax avoidance.

- Environmentally-related taxes could generate substantial revenue during the green transition but it is uncertain if they could help to finance the increase in public spending due to population ageing. Emission reduction pledges require significantly more stringent greenhouse gas mitigation policies. However, the role of carbon pricing in the broad policy mix – and the associated revenue potential – will likely differ across countries, and the design and timing of such policies are uncertain. In addition, the green transition and adaptation to climate change would likely require higher public spending. If this spending is not covered by revenue from carbon pricing, public finance challenges would increase, reducing the possibility to finance the costs of population ageing. Finally, if countries achieve their emissions targets, revenue from carbon pricing could drop significantly if current tax bases are not replaced.

1. Population ageing is expected to require higher government spending

The population of advanced economies and some emerging-market economies is ageing fast, and this is likely to be associated with rising public expenditure on health, long-term care and pensions. Such spending already accounts for a third to a half of government expenditure excluding interest payments (the so-called primary expenditure) in some advanced economies and their contribution to overall spending is projected to increase substantially over the next few decades.

According to the OECD long-term projections published in December 2021 (Annex A), in the median OECD country, public health and long-term care expenditure is expected to increase by 2.2 percentage points of GDP between 2021 and 2060.² This reflects population ageing and the trend increase in prices of services. Spending on public pensions is projected to rise by 2.8 percentage points of GDP. In addition, spending in other policy areas is modelled to increase by 1½ percentage points of GDP under the assumption that it will remain constant in real per capita terms (Figure 1).

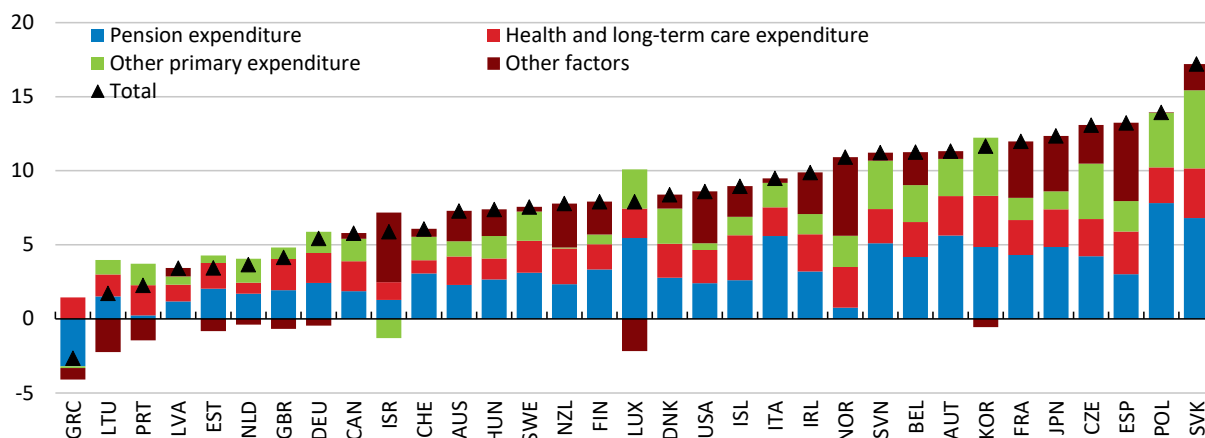
In most OECD countries, rising pension and health care expenditure account for at least half of the increase in long-term spending. The modelled total increase in government spending would require, on average, an increase in structural revenue of 8 percentage points of GDP by 2060 to stabilise public debt ratios near recent levels, compared with the underlying primary balance in 2021 (Figure 1).³

² These projections may differ from national projections of the spending pressures due to population ageing, reflecting differences in assumptions and in a modelling framework.

³ Stabilising debt at a lower level would necessitate an even larger adjustment in the near term. However, in the long run, the resulting lower debt ratio can be maintained with a smaller primary budget balance when the difference between the interest rate and the growth rate is positive, allowing to reverse part of initial fiscal consolidation (Rawdanowicz, 2012^[86]).

Figure 1. Fiscal pressures to keep government debt ratios stable are daunting

Change from 2021 to 2060 in % pts of potential GDP



Note: The chart shows how the ratio of structural primary revenue to GDP must evolve between 2021 and 2060 to keep the gross debt-to-GDP ratio stable near its projected 2022 value over the projection period (which also implies a stable net debt-to-GDP ratio given the assumption that government financial assets remain stable as a share of GDP). The underlying projected growth rates, interest rates, etc. are from the baseline long-term scenario presented in Guillemette and Turner (2021_[2]). The component “Other factors” mostly reflects the correction of any initial disequilibrium between the 2021 structural primary balance and the one that would stabilise the debt ratio, and a proxy of the permanent increase in interest payments due to the COVID-19-related increase in public debt between 2019 and 2022. The decline in pension spending in Greece reflects the assumption of a falling ratio of the average pension to the average wage given extensive pension system reforms after the sovereign debt crisis (see Guillemette (2019_[4])).

Source: Guillemette and Turner (2021_[2]), “The Long Game: Fiscal Outlooks to 2060 Underline Need for Structural Reforms”, *OECD Economics Department Policy Papers*, No. 29, <https://doi.org/10.1787/a112307e-en>.

2. Projecting tax revenues in a framework consistent with the OECD long-term model

The spending pressure projections presented above and the analysis presented in this paper rely on the OECD LTM, which is a key tool to make projections for the next four decades, analyse long-term implications of key structural challenges and to identify appropriate policy responses (Chaloux and Guillemette, 2019_[5]; Guillemette, 2019_[4]; Guillemette and Turner, 2021_[2]). The model builds on the potential output concepts derived from a standard Cobb-Douglas production function and international demographic projections (Annex A).⁴ There are no income and demand blocks in the LTM. Consequently, a stylised model of income components of nominal GDP and household consumption is proposed in this paper to analyse tax implications of population ageing.

The proposed stylised framework ensures consistency between the assumed split of nominal GDP into labour and capital income shares (the primary allocation of income); taxes and social benefits – including pensions (which are part of the secondary distribution of income); and household consumption (uses of disposable income). Thus, the model can indicate the orders of magnitude of the impact from selected aspects of population ageing on general government budget balances and debt. This approach ensures that income and spending are consistent.

⁴ These projections are taken from Eurostat for the EU countries and from the United Nations’ World Population Prospects for the remaining countries. For some economies, they may differ significantly from national demographic projections, with important implications for the expected spending pressure estimates.

The model's general approach is to project shares of the main income components (both from the primary and secondary income accounts) in GDP, which constitute the main income tax bases, and apply calibrated effective tax rates (ETRs), which are assumed to remain constant, to obtain projected government revenue from income taxes and social security contributions (SSCs) (Table 1; Annex A). The resulting disposable income of households is used to project household consumption and consumption taxes, also based on a constant calibrated ETR. Income and tax definitions are consistent with the system of national accounts. Assumptions of constant ETRs imply no changes in tax policy over the projection period.⁵ This assumption is relaxed in the policy section. The key assumptions of the model are summarised below, while details are described in Annex A.

- In line with the Cobb-Douglas production function used in the LTM to project potential output, the labour and capital income shares in GDP at factor prices are constant. This is a stylised but plausible baseline scenario. Alternative paths are possible but complex to justify (Box 2). Thus, shares of compensation of employees, operating surplus and mixed income in nominal GDP are held constant at the 2016-19 averages as long as there is no change in the share of taxes on production and imports less subsidies (proxied by indirect taxes in the model) in nominal GDP. If the ratio of these taxes to GDP moves, the labour and capital income shares are adjusted to offset this change (with the magnitude of the offset proportional to their relative sizes in 2023). This endogenous reaction ensures that all income components and taxes on production and imports add up to nominal GDP at market prices and that labour and capital income shares in GDP at factor prices are kept constant. The path of nominal GDP is taken as exogenous from the LTM.
- Property income and social benefits other than pensions are assumed to remain constant in relation to GDP at the 2016-19 averages as modelling their future trends based on economic fundamentals is not straightforward.
- Public spending on pensions is taken from the LTM. The evolution of their share in GDP depends effectively only on changes in the ratio of pensioners to total employment, as the labour share and the ratio of the average pension to the average wage are assumed constant in the LTM (Guillemette, 2019_[4]). The latter assumption is motivated by the observed stability of this ratio in the past two decades in the European Union and the complexity of making alternative projections. Private pensions, where data are available, are assumed to grow nominally at the same growth rate as public pensions.

Table 1. Overview of main tax categories and their bases included in the model

↓ Tax base	Tax category →	Current taxes on households	Social security contributions	Consumption taxes	Other
1. Compensation of employees			✓ employers		✓ payroll taxes by employers
2. Wages and salaries		✓	✓ employees		
3. Household mixed income		✓	✓		
4. Household gross operating surplus					
5. Property income		✓			
6. Pensions (public & private)		✓	✓		
7. Other social benefits		✓	✓		
8. Gross operating surplus (non-household sector)					✓ direct taxes on business
9. Household consumption				✓	
10. Nominal GDP					✓ other indirect taxes

Note: Income and tax definitions are consistent with the 2008 System of National Accounts. For more details see Annex A.

Source: OECD.

⁵ In the case of progressive personal income tax (PIT), the assumption requires additional conditions that tax brackets adjust in line with income growth and that the income distribution does not change. Similarly, in the case of value added tax (VAT), where tax rates differ across consumption items, the composition of consumption remains constant.

- SSCs paid by employers are projected using a constant macro ETR calculated from national accounts data (average for 2016-19), which is applied to compensation of employees.
- SSCs paid by households are split among three income types (wages and salaries, mixed income, and social benefits – comprising pensions and other social benefits), using constant, income-specific macro ETRs which are calibrated to match the average level of total SSCs paid by households in 2016-19.
- Current taxes on household income and wealth are calculated in an analogous way to SSCs, but also cover property income (comprising mainly interest, distributed income of corporations and rents) as the fourth tax base.⁶
- The resulting projections of income, SSCs and current taxes on households are subsequently used to calculate household disposable income by income type. The latter together with an assumed constant saving rate is used to make projections of household consumption.
- The model incorporates three types of taxes on production and exports (sometimes referred to as indirect taxes): 1) consumption taxes (VAT, sales, turnover, import tariffs and excise duties), with the constant ETR calibrated at the 2016-19 average and applied to total household consumption; 2) payroll taxes (when applicable) with the constant ETR calibrated at the 2016-19 average and applied to compensation of employees;⁷ and 3) indirect taxes other than consumption and payroll taxes that are assumed to remain constant in relation to GDP at the 2016-19 average.
- The model includes direct taxes on businesses (corporate income taxes) that are derived by applying a constant calibrated ETR (2016-19 average) to the gross operating surplus generated outside the household sector.
- SSCs received by government are assumed to grow at the same rate as SSCs paid by households (which affect household disposable income) and by employers (the latter two are usually larger than SSC-related government receipts).
- The model simulations are reported as changes in GDP ratios between 2023 and 2060, so the starting and end year are based on modelled data.

2.1. Higher pension income is likely to increase tax revenue slightly if labour income shares remain constant

In the hypothetical – though arguably justified – LTM-implied framework where labour shares are constant,⁸ population ageing is likely to affect tax revenue mainly via income taxes and SSCs on pensions and via taxes on consumption out of pension income. Given the model's baseline assumption that the labour income share remains unchanged over the projection horizon (Annex A), direct taxes on labour and capital income and SSCs on labour and mixed income stay constant in relation to GDP as long as the tax rates remain unchanged. This will be the case even in countries with shrinking employment (Figure 2), as the model assumes implicitly that lower employment is offset by higher average wages. Consequently, disposable income, and the ensuing consumption in relation to GDP under the assumption of a constant saving rate, vary only due to changing aggregate pension income. Thus, in the baseline simulations, changes in total tax revenue are driven by higher income from pensions and ensuing higher consumption.

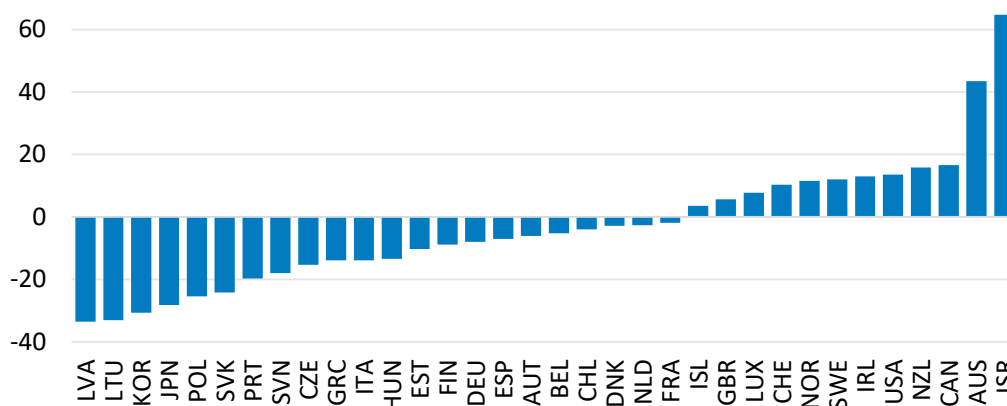
⁶ The operating surplus of households is included in the denominator for the calculation of the effective tax rate, but it is not subject to direct taxes.

⁷ Payroll taxes are part of taxes on production and imports in the classification of the 2008 System of National Accounts.

⁸ Alternative assumptions regarding the evolution of the labour share are considered in the next subsection, and modelling issues regarding labour shares are further discussed in Box 2.

Figure 2. Potential employment is projected to decline in the long term in many OECD countries

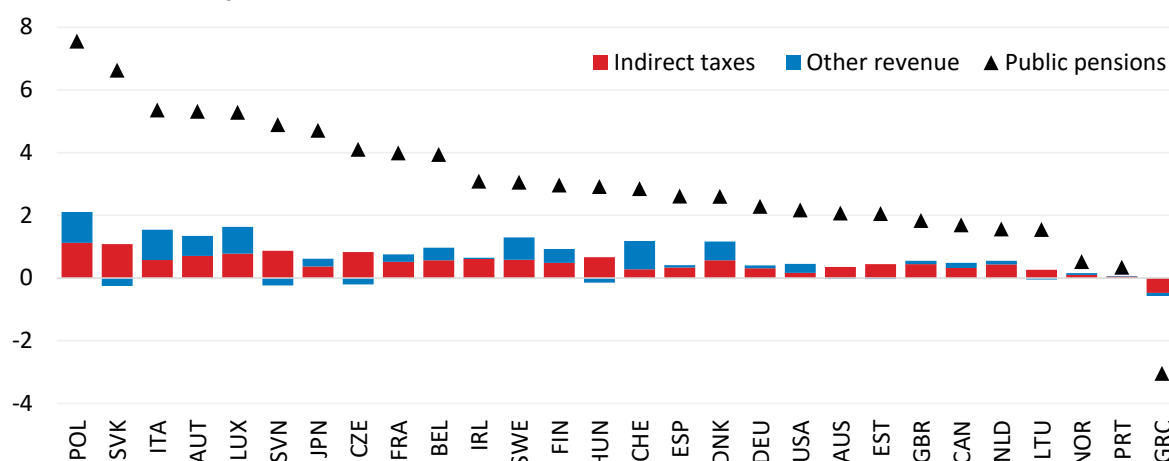
Percentage change between 2023 and 2060



Source: OECD Economic Outlook No. 109 database; and OECD calculations.

Figure 3. Tax revenue from growing aggregate pension income will likely increase

Per cent of GDP, change between 2023 and 2060



Note: Changes in indirect taxes are mainly driven by taxes related to household consumption as payroll and other indirect taxes do not change in relation to GDP in this exercise. Changes in other revenue refer primarily to changes in current taxes on household income and wealth. They include also changes in social security contributions received by government but, in most countries, this change is rather small. Spending on public pensions is consistent with the long-term model projections— see Annex A.

Source: OECD Economic Outlook No. 109 database; and OECD calculations.

The increase in government tax revenues resulting from higher aggregate pension income projected in the model is significant in relation to the size of the long-term spending pressures. On average, the extra revenue covers around a quarter of the expected increase in government spending on public pensions (Figure 3).⁹ The coverage ratio is especially large in Denmark, Finland, Luxembourg, the Netherlands, Sweden and Switzerland, where ETRs related to current taxes paid by households on social benefits are

⁹ This result is robust to alternative ETR calibrations, with lower ETRs for current taxes and SSCs on pensions, resulting in an average coverage of around one-fifth. The largest differences (above 0.6% of GDP compared with the baseline calibration) are for Italy, Luxembourg, Poland and Switzerland.

particularly high. Still, in most countries, more than half of the extra tax revenue is generated from indirect taxes due to growing consumption out of pension income and thus growing consumption tax revenue. In these countries, the coverage ratio correlates positively with the ETR for consumption taxes. The general smaller importance of direct taxes stems from the fact that ETRs for current taxes on households and SSCs on pensions are usually low and below the respective ETRs on labour income (OECD (2019^[6]); Table A.1). Lower ETRs on pensions are due to favourable treatment, exemptions from taxation and the progressivity of PIT (average pension income is usually below average wage income).

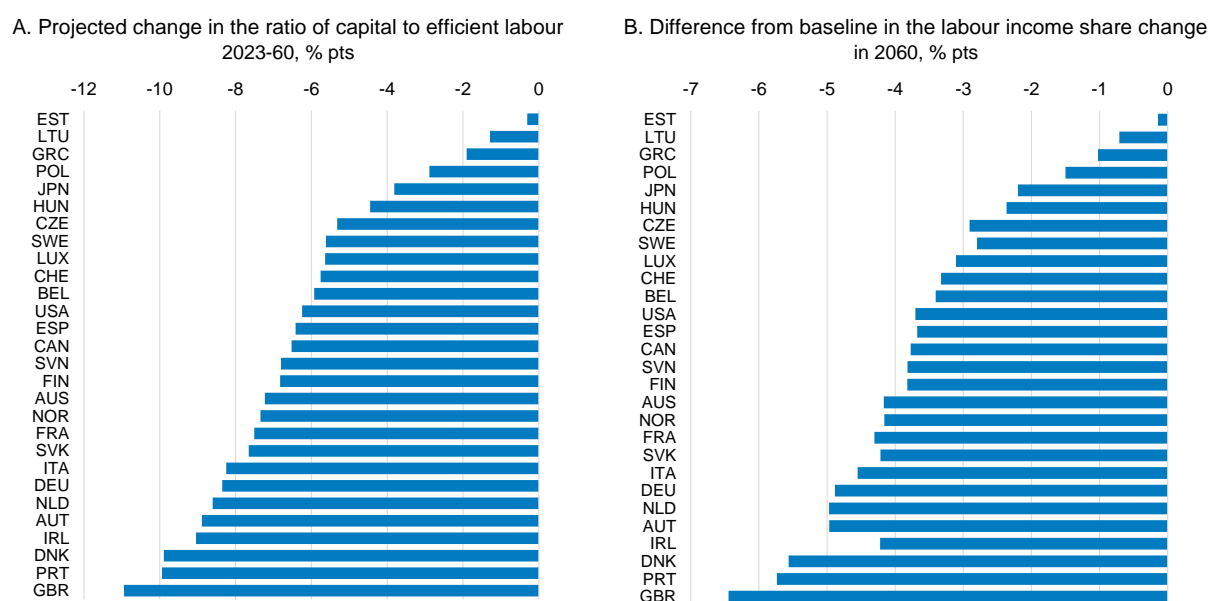
2.2. Somewhat lower labour income shares would not raise net pension spending pressure significantly

The positive impact of higher pension income on tax revenue depends on the assumption of constant labour income shares in GDP. However, in many OECD countries, labour income shares have not been stable over the recent decades. The correct measure of the labour income share and the exact driving forces of the recent changes are still debated, making their projection difficult (Box 2). To provide an indicative magnitude of possible implications of changing labour income shares on tax revenue in the context of population ageing and higher pension income, the production function of the LTM is generalised to allow for elasticities of substitution between capital and labour that differ from unity (Box 2). The ratio of capital to efficient labour in the LTM is projected to decline in almost all OECD countries.¹⁰ This, combined with the assumption that the elasticity of substitution is below one (which is in line with the recent literature), implies a decline in the share of employees' compensation in GDP – used here as a proxy of the theoretical labour income share (Figure 4).

In the framework of this paper, falling labour income shares have opposing effects on public finances. Lower compensation of employees implies lower current taxes on labour income and SSCs paid by employees in relation to GDP. At the same time, the offsetting increase in the share of other sources of income (in the model: mixed income and operating surplus in the non-household sectors) boosts revenues from related current taxes and SSCs (relative to GDP). The net effect on revenue depends on relative levels of the ETRs on those tax bases. If the ETR on labour compensation is higher than the ETR on other sources of income, which is the case in all analysed countries, a decline in the labour income share will be negative for public finances. However, according to the LTM, a lower labour income share also implies less spending on public pensions relative to GDP. This is predicated on the baseline LTM's assumption that the ratio of the average wage to the average pension remains stable (Annex A). A rising labour share would have the opposite effects. The net effect of changing labour shares on public finances therefore depends on several parameters and it is difficult to predict *a priori*.

¹⁰ In most countries, projections of the ratio of capital to efficient labour (i.e. potential labour augmented by labour efficiency) are hump-shaped, increasing initially and falling towards the end of the projection period.

Figure 4. Stylised projections of the declining labour income share



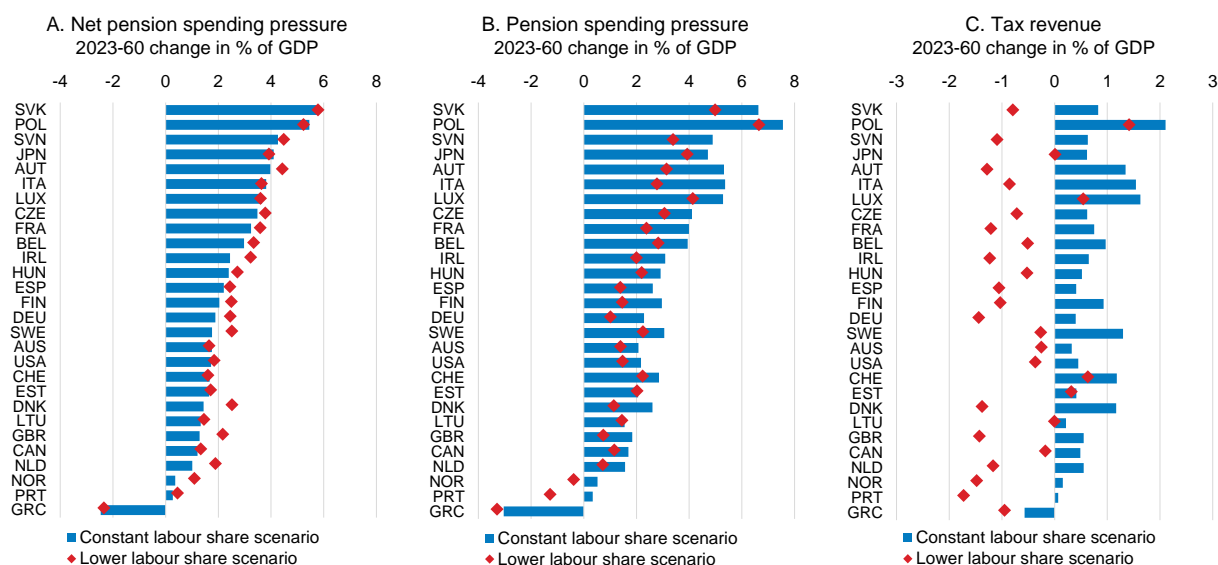
Note: The stylised projections assume the path for the ratio of capital to efficient labour (i.e. potential employment augmented by labour efficiency) as projected in the OECD long-term model (shown in Panel A) and an elasticity of substitution between capital and labour of 0.3. When the capital-efficient labour ratio declines (which is the projection for all countries) and the elasticity of substitution is below 1, the labour income share will always fall (Box 2). The implied changes in the share of employees' compensation in GDP reflect also endogenous reaction to changes in the ratio of indirect taxes to GDP – see Annex A. Excluding such a reaction would not affect the changes in the labour income shares significantly (on average the absolute difference is 0.2 percentage point). Panel B shows the difference from baseline in the change in the labour income share between 2023 and 2060 (i.e. the difference in the changes in labour income shares assuming the elasticity of substitution between capital and labour of 0.3 and assuming the elasticity of substitution of 1).

Source: OECD Economic Outlook No. 109 database; and OECD calculations.

In two-thirds of the analysed countries, the net effect of lower labour income shares – as implied by the constant elasticity of substitution between capital and labour of 0.3 and the LTM projections of capital to efficient labour ratios (Box 2) – is slightly negative for budget balances, on average 0.4% of GDP (Figure 5).¹¹ This stems from the fact that the decline in tax revenue is larger than the decline in public pension spending. Still, in the remaining seven countries, the net effect is marginally positive (on average 0.1% of GDP). The increase in the labour income share with an elasticity of substitution of 1.3, as estimated by Karabarbounis and Neiman (2013^[7]), is small for most of the countries (0.4% of GDP in the median economy) and so is the resulting reduction in the net fiscal pressure.

¹¹ Assuming an ad hoc decline in the labour income share of 10 percentage points in all countries would imply a larger negative effect on net spending pressures. In 23 countries, the net effect will be negative (on average 1.1% of GDP), and in only 5 countries positive (on average 0.4% of GDP).

Figure 5. Net pension spending pressure with lower labour income shares



Note: Net spending pressure is the difference between the increase in public spending on pensions and the resulting increase in government revenue (see the main text). If the falling labour share lowers government revenue by more than it lowers public spending on pensions, public finances deteriorate compared with the constant labour income share scenario (i.e. when red diamonds are above blue bars in Panel A).

Source: OECD Economic Outlook No. 109 database; and OECD calculations.

Box 2. Modelling labour shares

Measuring labour shares is challenging

The labour share of income could be derived from the decomposition of GDP at market prices with an income approach into the compensation of employees, gross operating surplus and gross mixed income, and taxes on production and imports less subsidies. It can then be defined as the ratio of the compensation of employees to GDP. In practice, the measurement of the labour income share is complex (Gollin, 2002^[8]).

The proposed GDP decomposition is not satisfactory in particular as part self-employed income (i.e. the “mixed income”) reflects a return on labour. There is no easy way to distinguish the return on labour and the return on capital in mixed income, and various methodologies to estimate the split have been proposed. For instance, one can assume that the split is identical as the one observed in the corporate sector, or that the per-person remuneration of labour for self-employed is equivalent to the compensation of corporate employees working in the same sector. The analysis of self-employment income is also blurred by different national account classifications of self-employed in household or corporate sectors across countries (Pionnier and Guidetti, 2015^[9]).

In view of measurement challenges, researchers have proposed to either adapt the measure depending on the research question or exclude various sectors to provide a more interpretable version of the labour income share.

- The split of GDP at factor prices is better for analysing the distribution of income between capital and labour. The same applies for the exclusion of capital depreciation by using net operating surplus and net domestic product. However, depreciation can be important in understanding changes in the structure of production.

- The value added derived from imputed rents is part of the gross operating surplus of households and is thus counted as pure capital income. Thus the increase in the share of imputed rents in income observed in the past decade in many countries reduces the labour share mechanically (Rognlie, 2015_[10]; Cho, Hwang and Schreyer, 2017_[11]; Cette, Koehl and Philippon, 2019_[12]).
- The value added by non-market producers is calculated at costs in national accounts so that the capital share of those sectors includes depreciation only. This, in turn, would arguably overestimate the measured labour income share (Pionnier and Guidetti, 2015_[9]; Cho, Hwang and Schreyer, 2017_[11]).
- Capital gains are not included in value-added, while they could arguably be part of revenue of the financial sector, justifying high compensations of employees in this sector (Pionnier and Guidetti, 2015_[9]).
- Developments in the labour income share of the primary sectors are mainly driven by variation in commodity prices (Pak, Pionnier and Schwellnus, 2019_[13]).

The main drivers of trends in labour shares are still uncertain

The measurement limitations have contributed to the uncertainty about the trends in labour shares and their main drivers. Karabarbounis and Neiman (2013_[7]) (KN) argue that labour shares in the corporate sector have fallen globally, and that they have done so due to a steady decline in the price of capital. However, Cette, Koehl and Philippon (2019_[12]) contest the KN's explanation behind the fall in labour shares. They argue that the fall can actually be explained by an increase in self-employment and in the size of the real estate sector. Besides, for the decline in the price of capital to indeed drive the fall in labour shares, the elasticity of substitution between capital and labour would have to be significantly higher than most of the estimates in the literature (see below). Similarly, Pionnier and Guidetti (2015_[9]) find that labour shares in France, Germany and Italy did not decrease when using national accounts data by industry rather than focusing on data for the corporate sector. In contrast, Pak, Pionnier and Schwellnus (2019_[13]) suggest that labour shares have indeed declined in the OECD since 1995, provided that the real estate and the primary sectors are excluded. They also find that those trends can be mostly explained by the fall in investment prices and the development of global value chains. However, most of the decline happened before the global financial crisis, and trends in labour market shares have varied widely across countries.¹

Projecting labour shares

Making projections of labour shares is complex due to the uncertainty about the main drivers of the past changes in labour shares and difficulty in assuming scenarios of their future trajectories. Thus, the paper uses stylised implications of adopting a more general form of the LTM production function, to inform possible evolutions in labour income shares.

The LTM baseline Cobb-Douglas production function is a specific case of a broader set of production functions with a constant elasticity of substitution (CES) between capital and labour (σ):

$$Y = \left[\alpha \cdot (A_L \cdot L)^{\frac{\sigma-1}{\sigma}} + (1 - \alpha) \cdot (K)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

where A_L is the labour-augmenting trend technological progress, L is the trend employment, and K is the physical capital. In the case of the Cobb-Douglas production function, as in the LTM, $\sigma = 1$, yielding a constant labour income share equal to α .

The first-order conditions assuming an exogenous real wage (w) and real interest rate (r) imply that

$$w = \alpha \cdot \left(\frac{Y}{L}\right)^{\frac{1}{\sigma}} \cdot A_L^{\frac{\sigma-1}{\sigma}} \quad \text{and} \quad r = (1 - \alpha) \cdot \left(\frac{Y}{K}\right)^{\frac{1}{\sigma}},$$

and consequently

$$\frac{\lambda}{1-\lambda} = \frac{\alpha}{1-\alpha} \cdot A_L^{\frac{\sigma-1}{\sigma}} \cdot \left(\frac{K}{L}\right)^{\frac{1}{\sigma}-1},$$

where $\lambda = \frac{w \cdot L}{Y}$ is the labour income share. Therefore, the growth rate of $\frac{\lambda}{1-\lambda}$ is proportional to the growth rate of the amount of capital per efficiency unit of labour:

$$d \ln \left(\frac{\lambda}{1-\lambda} \right) = \left(\frac{1}{\sigma} - 1 \right) \cdot d \ln \left(\frac{K}{A_L L} \right) + d(\text{constant}) = \left(\frac{1}{\sigma} - 1 \right) \cdot d \ln \left(\frac{K}{A_L L} \right).$$

Thus, labour income shares vary over time when taking the LTM projections of capital-labour ratios and assuming σ different from one.

Numerous estimates of the constant elasticity of substitution between capital and labour are available in empirical literature. A recent meta-analysis suggests an average elasticity of 0.3 across 121 studies, implying that capital and labour are highly imperfect substitutes (Geichert et al., 2021^[14]). In that case, a reduction in the capital-to-labour ratio would result in a fall in the labour income share. This conclusion contradicts the often-cited result of KN who estimate the elasticity of substitution at 1.28. With such an elasticity, the falling labour share of income must originate from an increase in the capital-to-labour ratio in the context of the observed big decline in the price of capital (see also Rognlie (2015^[10])).

1. Other papers have illustrated how different accounting conventions result in diverse labour income share trends in the United States (Elsby, Hobijn and Sahin, 2013^[15]; Koh, Santaella-Llopis and Zheng, 2020^[16]).

2.3. Caveats about model results

Given the stylised nature of the model, the results should be treated as indicative of potential magnitudes rather than precise projections. While the results are robust to alternative constant ETRs calibrations, there are other aspects of the model that could affect the results.

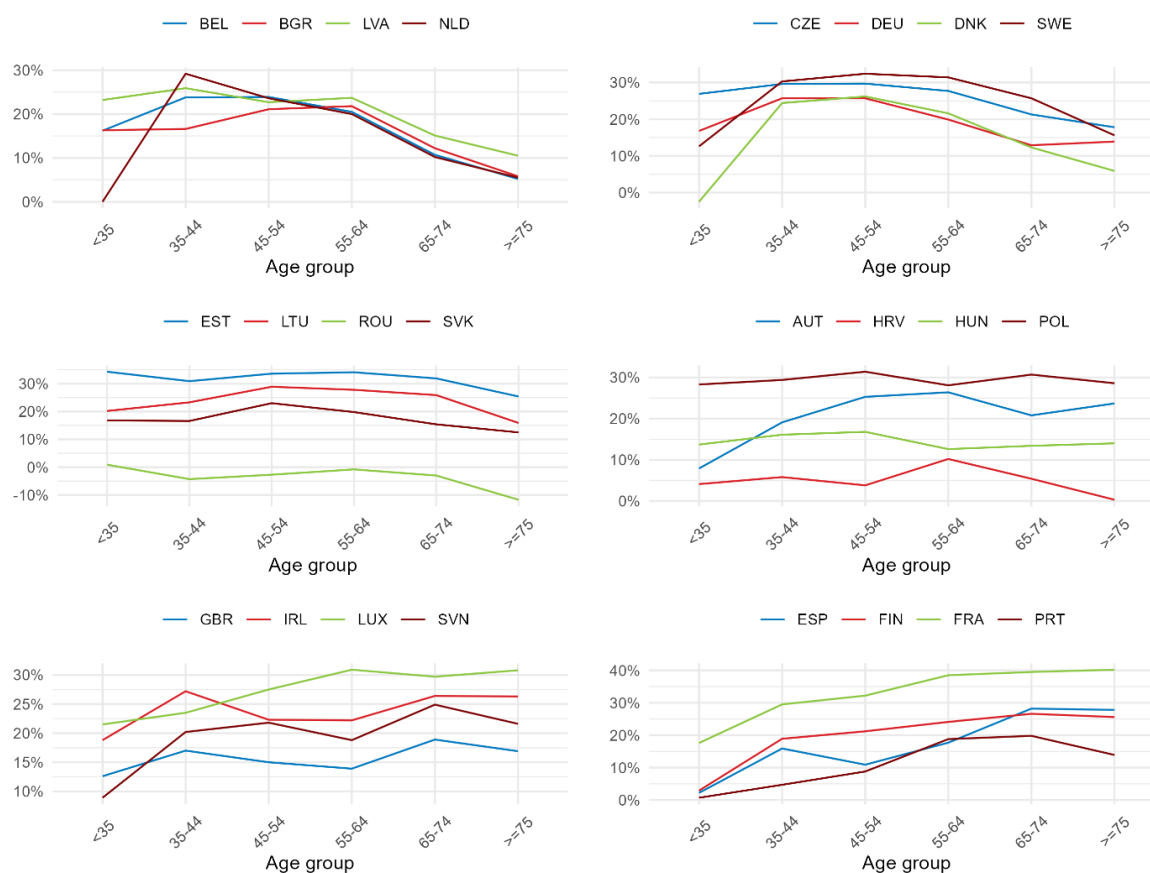
First, there is no feedback from taxes to real GDP growth and inflation, with nominal GDP being exogenous (determined in the LTM). Increases in some taxes could affect GDP growth negatively, by discouraging employment and investment or innovation (see next section). If such effects were economically significant, they would aggravate the fiscal challenges stemming from population ageing. Similarly, sustained increases in VAT rates would likely raise inflation temporarily. This, together with ensuing higher interest rates, could dampen private consumption and GDP, and related tax revenue. Moreover, if nominal effective interest rates paid on government debt would significantly exceed nominal GDP growth, which is not the case in the LTM projections, a larger primary budget surplus would be needed to stabilise debt. These limitations could be addressed in future work.

Second, while saving rates in the model are assumed to be constant across time, they are likely to differ across age cohorts, which can be related to income level and type, resulting in a time-varying aggregate saving rates given expected changes in population and income structures. For instance, the saving rate can fall for people transitioning from employment to retirement if they maintain similar consumption level and their pension income is lower than previous wage income. However, savings may not be affected if older people receive higher capital income. Similarly, if the consumption of older people declines proportionally or more than income during retirement, their saving rate could remain unchanged or

increase. Available household survey evidence suggests that saving rates tend to decrease with age in several countries, but the opposite is true in other countries (Figure 6).¹²

Figure 6. Median household saving rates differ by age

Selected EU countries in 2015



Note: The saving rate of is the ratio of disposable income minus consumption to disposable income. Both income and consumption are equivalised using the modified OECD equivalence scale. Countries have been sorted by the difference between the saving rate of the old (average of the median saving rate of 65-74 and 75+ age groups) and the saving rate of the working age population (average of the other groups).

Source: Eurostat Income, Consumption and Wealth (ICW) – Experimental Statistics (table [icw_sr_01](#)).

Reasons for these cross-country differences are not clear. A rigorous empirical assessment of the lifecycle behaviour of the saving rate is complex because it often relies on a combination of multiple sources of data for income and consumption, or on panel data on wealth where valuation effects that are not related to savings have to be imputed (Mian, Straub and Sufi, 2021^[17]). Thus, although assuming the same saving rate for all age cohorts may not be a realistic assumption, the alternative is not obvious. If the saving rate for the older population (depending mainly on pension income) would be lower than for the working-age population, consumption tax revenue would be somewhat larger than in the case of a uniform saving rate.

¹² For example, Eurostat reported median saving rates by age group in 2015 as experimental statistics based on income data from the European Union Statistics on Income and Living Conditions (EU-SILC) and consumption data from the Household Budget Survey (HBS). There is no clear pattern common to most of the countries. In the United States, Auclert et al. (2021^[85]) show that, on average, there was no dissaving at old age based on the 2016 Survey of Consumer Finances.

Sensitivity tests (not shown here) indicate that this assumption does not affect the model simulation results significantly.

Third, some ETRs could change in the future driven by changes in the composition of tax bases, including due to population ageing, which could both affect the fiscal outlook positively or negatively:

- *Consumption ETRs*: In many countries, VAT accounts for a high share of consumption taxes, and reduced rates apply to specific goods and services (often goods seen as necessities such as food, health care and housing). If population ageing results in an increase in the share of consumption of goods and services with reduced VAT rates in total household consumption, the ETR for consumption taxes will decline, with negative implications for the fiscal outlook. Household budget surveys suggest older people spend a relatively higher share of their expenditure on goods and services with lower VAT rates such as food and healthcare than younger people (European Commission, Eurostat, 2020^[18]). In the European Union, this effectively lowers the ETR for people over 60 relative to the ETR for people aged between 30 and 60, but no such differences are identified in the United States and Japan (Borrallo, Párraga-Rodríguez and Pérez, 2021^[19]). Extrapolating Banco de España's estimates of effective consumption tax rates by age cohort to 2060 suggests that this effect could lower the ETR on total consumption in Spain by half a percentage point (Banco de España, 2018^[20]).
- *ETRs for PIT*: Most OECD countries have a progressive PIT schedule. If governments do not update tax brackets in line with nominal increases in household income, as implicitly assumed in the simulations (see above), the ETRs for wages and salaries, household mixed income, property income and social benefits (including pensions) would automatically go up. Consequently, the fiscal outlook could be more positive than presented above, if there were no negative implications for household consumption and in turn consumption tax revenue.

Fourth, projections of public spending on pensions in the LTM, and the related tax revenue modelled in this paper, are based on the assumption of a constant ratio of the average pension to the average wage (the so-called average benefit ratio).¹³ This is motivated by the observed stability of this ratio in the past two decades in the European Union and the complexity of making alternative projections in a consistent framework for all OECD countries (Guillemette, 2019^[4]).¹⁴ Moreover, big and persistent changes in the benefit ratios may not be possible politically. Assuming a decline in the average benefit ratio, as it is the case in pension projections published in EU Ageing Reports, would lower public spending on pensions as well as the related tax gains. However, the net effect would clearly improve budget balances. The opposite would be true with a rising average benefit ratio.

3. Options to deal with rising spending pressures

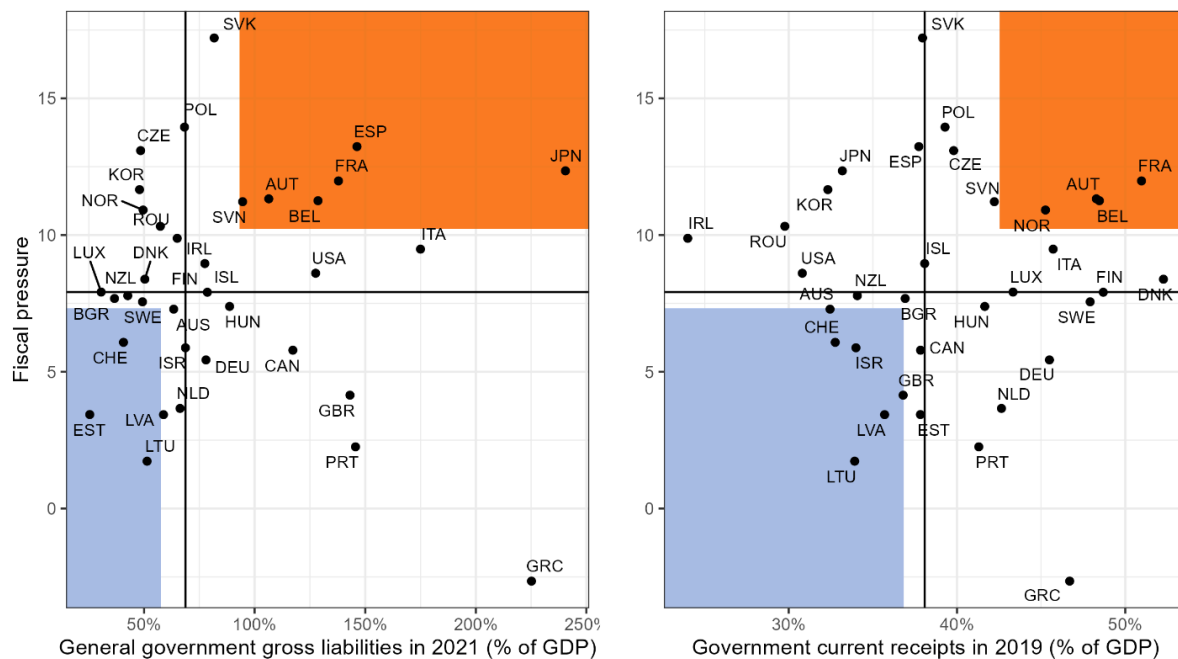
Tax revenue from higher pension income will not be enough to solve the long-term spending pressures linked to ageing populations, especially when the increases in health care and other primary spending are taken into account (Figure 7). Thus, countries have two main options to deal with the challenge if they do not want debt to increase: reduce spending or raise taxes. Choosing not to address spending pressures would result in rising government debt. Independently of the specific option chosen, structural reforms to

¹³ Not to be confused with the replacement rate, which usually refers to a new retiree's initial pension as a percentage of her/his last salary.

¹⁴ The future evolution of the average benefit ratio depends on many factors, including eligibility rules for new pension benefits, the method used to uprate past earnings in the benefit formulae of defined-benefit plans, the rate of indexation of benefits, the age structure of the population of benefit recipients, rates of return on plan assets, etc. Projecting the future evolution of benefit ratios thus requires a large amount of information, not just on current rules, but also on how they will evolve given the many reforms that have already been legislated in many countries.

boost labour force participation and growth would mitigate pressures on the public finances. Policy options will be constrained by countries' current levels of overall taxes and debt regardless of policy preferences. For instance, countries with high tax revenue and debt may need to favour spending reductions (Figure 7 and Figure 11). In contrast, countries with low taxation and debt may envisage raising taxes and increasing borrowing. In practice, a combination of these strategies, that reflects a country's social preferences, could be desirable to limit negative effects associated with each option and given political economy considerations.

Figure 7. Options to deal with spending pressures will depend on initial debt and tax levels



Note: The fiscal pressure measures how the ratio of structural primary revenue to GDP must evolve between 2021 and 2060 to keep the gross debt-to-GDP ratio stable near its projected 2022 value over the projection period. Government current receipts are net of property income received by governments and of their net operating surplus. Shaded areas correspond to regions below the first tercile (blue; lower-left) or above the third tercile (orange; upper-right) for the variables shown on the axes. The horizontal and vertical lines indicate the medians for the relevant indicators.

Source: OECD Economic Outlook No. 111 database; and Guillemette and Turner (2021^[2]), "The Long Game: Fiscal Outlooks to 2060 Underline Need for Structural Reforms", *OECD Economics Department Policy Papers*, No. 29, <https://doi.org/10.1787/a112307e-en>.

Options to constrain the increase in public spending stemming from population ageing and issues related to increasing public debt have been already discussed in recent OECD papers (Rouzet et al., 2019^[3]; Guillemette and Turner, 2021^[2]; Rawdanowicz et al., 2021^[1]). Thus, they are only briefly summarised below. The rest of this section discusses selected issues related to a mix of possible tax increases building on extensive tax reports by the OECD CTP and on academic literature, that investigate efficiency, equity and tax designs issues of individual taxes.

3.1. Accommodating long-term spending pressures by higher deficits and debt is risky

Spending pressures are going to persist for a prolonged period and dealing with them by running permanently higher structural budget deficits, and thus rising debt, is a risky strategy. When the effective interest rate paid on debt is lower than the nominal GDP growth rate (the so-called $r-g$), a deterioration in

the budget deficit can still be consistent with a stable but higher debt-to-GDP ratio. However, such stabilisation would be undermined if the interest rate became higher than nominal GDP growth, requiring a lasting improvement in the budget balance with its size positively related to the level of debt. Moreover, financing expenditure which will not generate a future return is typically not a good motivation for borrowing (Fatás et al., 2019_[21]).¹⁵

Government debt is already high in many countries and letting it grow further involves risks to economic stability (Figure 7, Panel A; Rawdanowicz et al. (2021_[1])). Even temporary bond yield increases may magnify financial stability risks with high government debt, especially when financial institutions have large exposures to sovereigns, with negative effects on the cost of borrowing for the private sector and on consumer and business confidence, and in turn on economic growth. Such developments can undermine investors' trust in sovereign debt sustainability, and subsequently amplifying negative feedback loops among bond yields, confidence and growth. In contrast, sustained high sovereign bond yields with elevated debt would imply large debt servicing costs, crowding out socially desirable public spending, even if debt was perceived sustainable. In addition, high debt raises rollover risks. It can also limit the fiscal space to accommodate future negative shocks and thus undermine the resilience of public finances (Jordà, Schularick and Taylor, 2015_[22]). In countries with low public debt, accommodating some of the increase in spending due to population ageing by higher indebtedness may be an option for a limited time. However, given uncertainties about levels at which public debt becomes destabilising for the economy and risks of undermining political consensus about fiscal prudence, the room to rely on this option could be small.

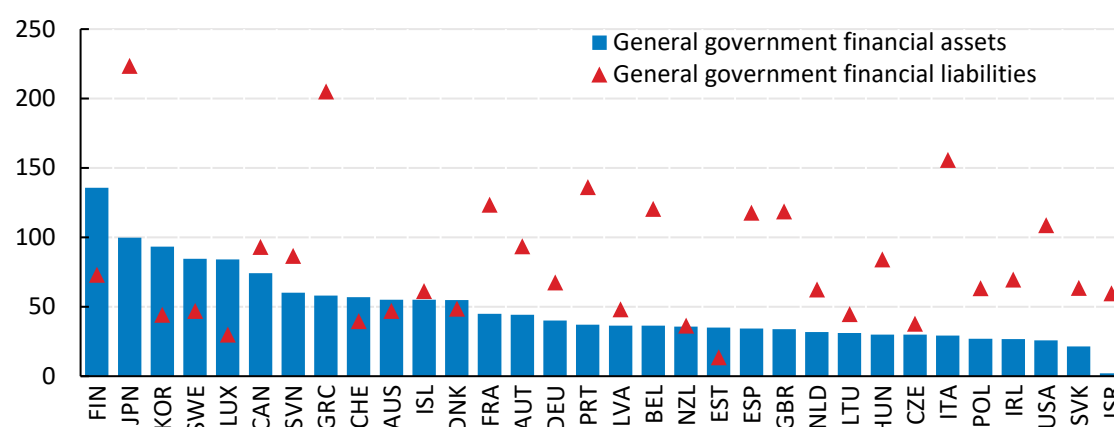
Moreover, future management of public financial assets could help mitigate pressures on public finances. Many countries have accumulated large financial assets, partly held by social security funds (Figure 8). A slower pace of financial asset accumulation than assumed in the LTM (i.e. growing by less than nominal GDP) would effectively lower the ratio of gross debt to GDP for the same path of the primary budget balance ratio (Annex B in Rawdanowicz et al. (2021_[1])).¹⁶ Governments could also liquidate some of the accumulated financial assets to effectively finance part of the long-term spending, with the same effect on the gross debt ratio.

¹⁵ There may be indirect reasons for population ageing to justify additional borrowing which are beyond the scope of this paper, for instance if ageing is linked to increases in the demand for scarce safe assets (Weil, 2008_[87]; Fatás et al., 2019_[21]).

¹⁶ According to the standard debt dynamics equation, a change in the ratio of financial assets to GDP translates in an equivalent change in the gross debt-to-GDP ratio, all other things being equal. In the LTM, the spending pressures are based on the assumption of debt stabilisation at current levels and that government financial assets grow at the same rate as GDP – both in nominal terms (Annex A). Thus, the assumed accumulation of financial assets does not add to or subtract from the gross debt-to-GDP ratio. A slower pace of financial asset accumulation or a decline in nominal levels of financial assets would lower the gross debt ratio, all other things being equal.

Figure 8. Many OECD countries have sizeable government financial assets

Per cent of GDP in 2019



Note: Norway, not shown in the figure, has general government gross financial assets worth 378% of GDP.

Source: OECD Economic Outlook No. 111 database.

3.2. Countries have options to lower spending and boost growth

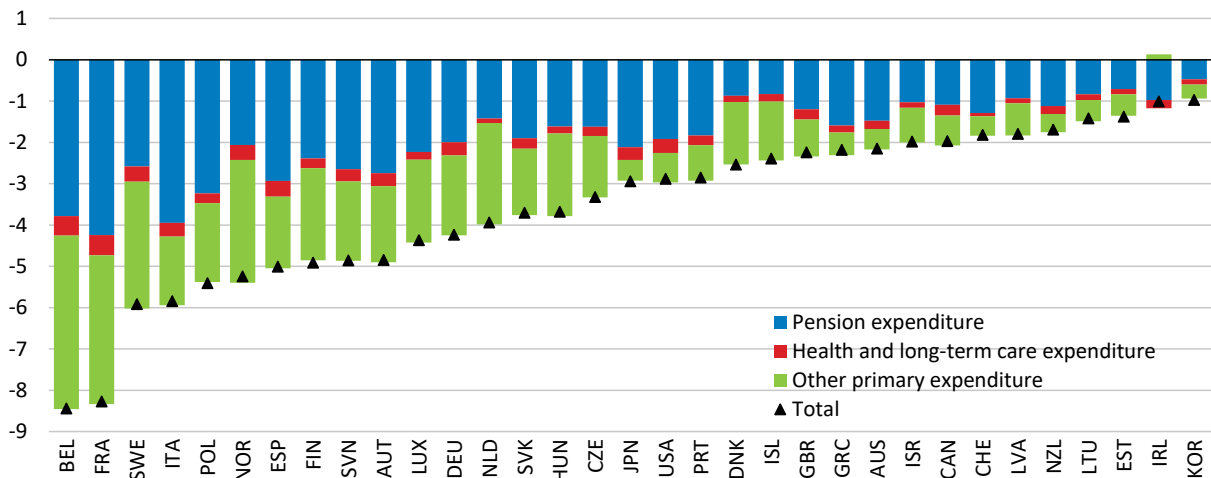
One of the most effective ways to alleviate future fiscal pressures related to population ageing is to undertake reforms to labour market policies and public pension programmes to raise employment rates and extend working lives (Rouzet et al., 2019^[3]; Guillemette and Turner, 2021^[2]). According to stylised simulations wherein OECD countries undertake ambitious labour market reforms and link statutory retirement ages to increases in life expectancy (Box 3), fiscal pressure in 2060 could be reduced substantially relative to a baseline scenario, by between 2 and 8 percentage points of GDP (Figure 9). The fiscal dividends would mostly accrue due to longer working lives reducing future pension and other primary expenditure as a share of GDP, with a smaller impact on health expenditure. Countries could also let average pensions decline in relation to average wages in line with the current legislation in some countries (European Commission, 2021^[23]). However, this could increase income inequality and be unsustainable politically, with a growing number of voters, and their dependants, relying on pension income.

Countries may also seek to adapt their immigration and fertility-related policies to help mitigate the effects of an ageing population, but the extent to which such policies can address spending pressures remains uncertain. Migration and fertility can affect population projections, and in turn public spending related to population ageing, significantly.¹⁷ However, the scale of immigration required to offset the demographic effects of population ageing would likely be difficult to manage politically and socially (Rouzet et al., 2019^[3]). Still, migration can help address skills mismatches and labour market needs provided that migrants are effectively integrated in labour markets, through recognition of appropriate qualifications and support for training or education. Governments could also support fertility through tax and benefits policies that reduce the cost of larger families as well as through investment in childcare and early-year education policies, which are also beneficial for female labour force participation (Rouzet et al., 2019^[3]). Yet, even if some of these policies are effective, it remains unclear if they could affect fertility to a sufficient extent to improve population projections and reduce ensuing spending pressures (OECD, 2011^[24]).

¹⁷ For instance, in the European Union, an increase in the cumulative migration inflows by 33% between 2019 and 2070 could lower gross public pension expenditure on average by nearly 0.4 percentage point of GDP by 2070 (European Commission, 2021^[23]). Similarly, an increase of 20% in fertility rates could lower gross public spending by around 1.2 percentage points of GDP by 2070 (European Commission, 2021^[23]).

Figure 9. Fiscal pressure could be reduced via reforms to labour market and retirement policies

Difference in fiscal pressure from the baseline scenario, in % pts of potential GDP



Note: The chart shows the difference in future fiscal pressures between a scenario with reforms to labour market and retirement policies, and the baseline scenario presented in Figure 1. The fiscal pressure metric measures how the ratio of structural primary revenue to GDP must evolve between 2021 and 2060 to keep the gross debt-to-GDP ratio stable near its projected 2022 value over the projection period (which also implies a stable net debt-to-GDP ratio given the assumption that government financial assets remain stable as a share of GDP). In the scenario with reforms, the underlying projected growth rates, interest rates, etc. are from an ambitious reform scenario combining labour market policy reforms with increases in average effective retirement ages (see Box 3), as described in Guillemette and Turner (2021_[2]). See also the note to Figure 1. Source: Guillemette and Turner (2021_[2]), “The Long Game: Fiscal Outlooks to 2060 Underline Need for Structural Reforms”, OECD Economics Department Policy Papers, No. 29, <https://doi.org/10.1787/a112307e-en>.

Box 3. Structural reforms to alleviate spending pressures in the OECD long-term economic projections

Long-term projections include an alternative scenario combining labour market policy reforms with increases in effective retirement ages that lift potential GDP (Guillemette and Turner, 2021_[2]).

Regarding labour market reforms, each country is assumed to close by 2030 half of current gaps on a number of labour market policy indicators relative to the five best-performing OECD countries. This implies: 1) raising expenditure on active labour market policies (ALMP); 2) raising expenditure on family benefits in kind; 3) increasing maternity leave; and 4) lowering tax wedges for both single earners and couples. The magnitude of each specific reform depends, for each country and indicator, on gaps relative to best practices according to the latest available data. The implied additional expenditure on ALMP and family benefits are taken into account in the fiscal projections, but the other measures are assumed to require no additional spending or to be financed by less distortionary forms of taxation.

Regarding retirement ages, governments are assumed to undertake policy measures so as to 1) close any initial shortfall between average effective and normal statutory retirement ages for both men and women; and 2) keep average effective retirement ages rising in the future at a rate equal to two thirds of projected gains in life expectancy, if not already the case in the baseline scenario as per current legislation.

These reforms alleviate the fiscal pressures mostly through their impact on GDP per capita, which increases the denominator of the expenditure-to-GDP ratio. The impact of labour market reforms on GDP per capita and labour market outcomes is based on findings in Gal and Theising (2015_[25]) and

Égert and Gal (2017^[26]). Increases in the retirement age boosts GDP per capita directly via the lengthening of working lives that increases the employment rate (it also reduces the fiscal pressure indicator by reducing pension expenditure directly). An increase in the statutory retirement age by one year could increase the average effective age of retirement by four to five months (Turner and Morgavi, 2020^[27]).

Source: Guillemette and Turner (2021^[2]), “*The Long Game: Fiscal Outlooks to 2060 Underline Need for Structural Reforms*”, OECD Economics Department Policy Papers, No. °29, <https://doi.org/10.1787/a112307e-en>.

1. See Guillemette and Turner (2021^[2]) for methodological details regarding the long-term expenditure projections.
2. This is not exactly the case for euro area members which face the same short-term rate but have different potential growth rates.

3.3. Higher public spending could be mitigated by increasing taxes

If governments do not implement structural reforms to lift GDP and lower spending to cover fully the resulting fiscal pressures due to population ageing and wish not to increase government debt, then they will need to increase taxes in relation to GDP. This is the current technical assumption in the baseline long-term projections (Annex A). This section analyses implications of such a strategy, discussing pros and cons of specific tax increases, without necessarily advocating raising taxes as the solution to long-term fiscal pressures.

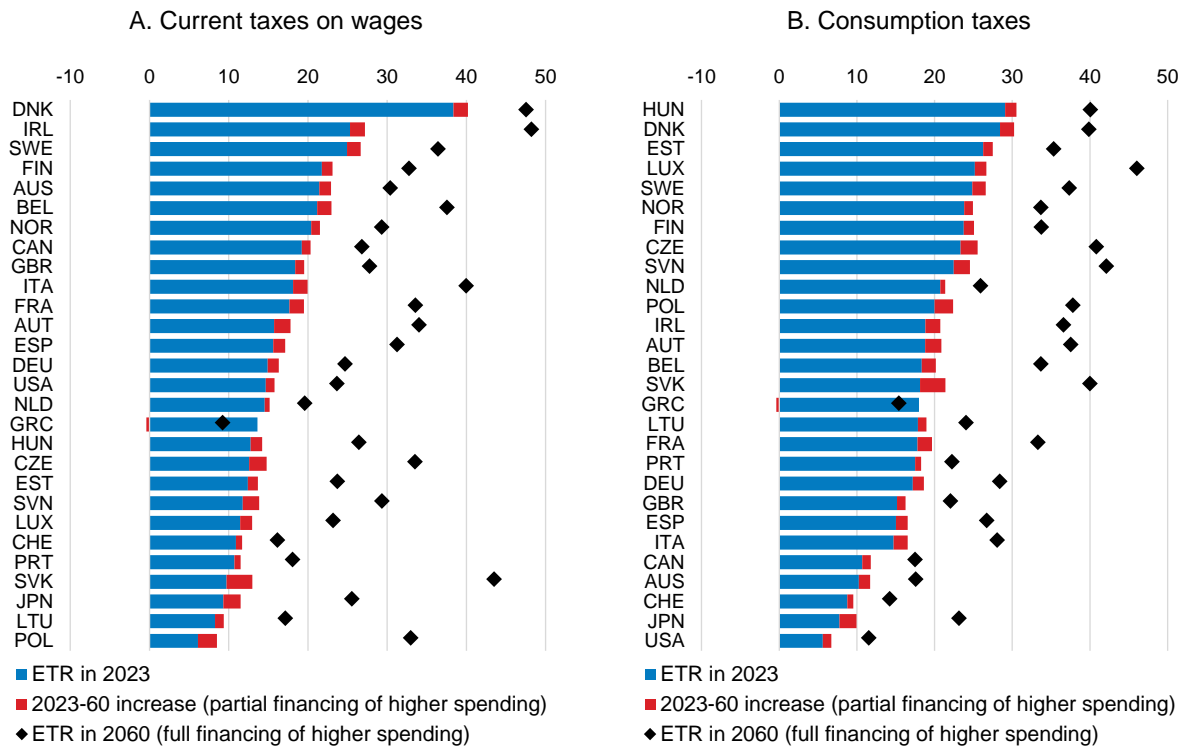
In most countries, it will not be possible to finance the total increase in long-term spending as a result of population ageing by one tax or other revenue instrument only. For instance, in many countries, financing the spending pressures related to public pensions and health care alone would require doubling the ETRs of the taxes with the largest bases (Figure 10). Such large increases would create significant distortions and likely face a high level of public resistance, undermining efforts to boost revenue.¹⁸ The required increases in ETRs would be much larger for those taxes that currently have small bases, highlighting the limits of relying upon increases of these taxes alone. Financing the increase in spending on public pensions and health care by all tax instruments – with the changes in all ETRs being proportional to the share of corresponding tax revenue in total government receipts as a simple illustrative example – would be more manageable, but the required increases in ETRs would still be high for countries with large spending pressures (Figure 10).¹⁹ These challenges would be magnified in some countries if ETRs had to be raised to also cover the expected increase in spending related to the changes in other primary expenditure and the remaining factors driving total fiscal pressures (as projected by the LTM – Figure 1), in addition to pension and health care spending pressures.

¹⁸ The increases could result in ETRs exceeding the revenue-maximising levels, which could actually reduce tax revenues (Box 4). However, such effects are not accounted for in the stylised simulations presented in this paper.

¹⁹ The calculations account for 12 tax instruments: four SSC rates (paid by employers, paid by employees, paid by self-employed and paid on social benefits); four current taxes on household income and wealth (wages, self-employment income, property income and social benefits); direct taxes on businesses; three types of indirect taxes (related to household consumption, payroll (if relevant) and others).

Figure 10. Financing the increase in government spending by one tax instrument in not realistic

Required increase in the effective tax rate



Note: Consumption taxes cover only VAT, sales, turnover, import tariffs and excise duties. The scenario of partial financing of the increase in spending on public pensions and health care accounts for increases in other ETRs so that the increase in total tax revenue matches the increase in total long-term spending. This is to incorporate feedback effects between different ETRs and income types. Each ETR increases proportionally to the share of this tax in total government revenue. [The results would not materially differ if each tax instrument would finance only a part of the increase in long-term spending (proportional to the share of this tax in total government revenue) with all other ETRs kept constant]. Current taxes on wages and consumption taxes are among the largest tax categories (on average across the analysed countries). The full financing of the increase in long-term spending assumes that the required increase in total tax revenue is generated by the indicated tax instrument (with all other ETRs kept constant).

Source: OECD Economic Outlook No. 110 database; and OECD calculations.

Given the large challenges in some countries with financing the increase in long-term spending due to population ageing, governments should consider:

- the distortions created by higher levels of taxation (efficiency),
- the capacity to raise sufficient revenue,
- the implications on the distribution of income and wealth (equity), including possible conflicting effects,²⁰
- the acceptability to the public.

²⁰ Some tax reforms can improve both growth and equity, while others can have opposing effects on the two objectives. For example, recent OECD evidence suggests that, keeping overall revenue constant, reducing the tax wedge on low-income earners or raising inheritance taxes could improve output per capita and narrow the disposable income distribution; while lowering the labour tax wedge on above-average income earners could boost economic growth but widen disposable income dispersion. (Cournède, Fournier and Hoeller, 2018^[89]).

All of these factors are likely to interact with economic processes related to an ageing society. These considerations are outlined in Box 4. Any required reform of the tax system should follow the standard principles of tax policy (OECD, 2014^[28]). They should also consider the tax system as a whole rather than focussing on its specific elements in isolation, given close interlinkages between different tax rates and tax bases (Brys et al., 2016^[29]).

Box 4. General criteria guiding decisions on tax increase mix in the context of population ageing

- *Efficiency.* Many taxes create distortions by inducing a wedge between the price a buyer pays and the amount the seller receives (deadweight loss). Such distortions can discourage employment and investment and consequently lower economic growth. Past OECD research suggests that recurrent taxes on immovable property seem to be the least harmful tax for growth, followed by consumption taxes, PIT and corporate taxes (Arnold, 2008^[30]; OECD, 2010^[31]). Taxes on inheritance are also relatively growth friendly (Akgun, Cournède and Fournier, 2017^[32]; OECD, 2021^[33]). However, these effects are likely to differ depending on a specific tax design.
- *Capacity to raise sufficient revenue.* Tax receipts could be boosted by increasing tax rates, broadening tax bases, or a combination of the two. The revenue that governments can raise from an increase in a given tax rate is limited by the endogenous response of the tax base, related to economic distortions (like disincentives to work and invest), the ease of tax evasion and avoidance, and public acceptance of taxes (Akgun, Bartolini and Cournède, 2017^[34]). Above the revenue maximising level, increases in tax rates could actually lower revenue by reducing the tax base.¹ When analysing implications of higher tax rates, governments should consider not only the effects of tax rates on their own tax bases but also effects on other tax bases. For instance, in the model of this paper, raising SSC or PIT rates reduces disposable income, consumption and eventually consumption tax revenue (other things being equal). Thus, the increase in SSCs/current taxes on household income and wealth must be sufficiently large not only to generate a required amount of additional revenue from the tax concerned but also to offset the implied decline in indirect tax revenue. Governments could also broaden the tax base. If the broadening is sufficiently large, higher revenue could be achieved even with lower tax rates, which could reduce the associated distortions.
- *Equity.* Taxes can affect the distribution of income and wealth but they are not the sole policy tool available to governments to address equity concerns. Analysis of progressivity should be carried out systematically in the context of a country's wider tax and benefits system. An increase in a tax may be regressive as a standalone measure, but it can improve progressivity if implemented as part of a wider reform which increases benefits for those on low incomes. Equity in the context of taxation refers not only to progressivity but also to the ability to pay taxes. Links between taxation and inequality are difficult to evaluate empirically given conceptual challenges with the measurement of inequality and data gaps. OECD work has focused mostly on the impact of taxation on disposable income inequality, finding that increasing inheritance taxes and lowering tax wedges on lower-middle incomes can improve equity, while cuts in wealth taxes and in tax wedges on upper-middle incomes can increase inequality (Akgun, Cournède and Fournier, 2017^[32]). The impact of taxes on wealth and consumption inequality has not been tested.
- *Public acceptability* can affect positively the willingness of policymakers to increase specific taxes but also the overall tax collection by improving participation and compliance. In general, public acceptability of government policies tends to depend on perceptions of fairness and trust in governing institutions (Bicket and Vanner, 2016^[35]). The latter is understood as confidence in

the choice of policy design and capability to implement it effectively. Trust also relates to transparency of government's motives for implementing a given policy change. Measures that are perceived to have ulterior motives tend to have lower public acceptability (Bicket and Vanner, 2016^[35]). Public opposition to taxes is also positively linked to their visibility. Thus, policymakers are more likely to choose raising taxes that are less visible to voters, like employer SSCs and indirect taxes, rather than highly visible ones, like recurrent taxes on immovable property (Brys, 2011^[36]; Alt, Preston and Sibieta, 2008^[37]). Available, though scarce, survey evidence suggests that, in some countries, taxes that voters tend to support are less economically efficient and generate small revenues.²

- *Interactions with economic processes related to population ageing.* The declining ratio of employment to population is forecast to exert downwards pressure on GDP growth in the next decades (Guillemette and Turner, 2018^[38]). Whether potential counterbalancing trends, such as automation, will neutralise the negative effect on growth remains uncertain (Colin and Brys, 2019^[39]). Thus, supporting employment among those with the desire and capability to remain in work will be a key concern for public policy as populations continue to age. Mobilising other demographics with lower levels of labour market participation, such as second earners, will also be an important concern of public policy, as was successfully done in Japan (OECD, 2021^[40]). The interplay between tax systems and pension income can also create powerful incentives for older workers to postpone retirement. In addition, population ageing could affect the composition of household income and consumption and thus PIT and consumption tax revenue as discussed above. Public acceptability of some taxes may change with the increase in the share of older voters, given different exposure to taxes across age cohorts. For instance, the elderly are likely to be more exposed to taxes on immovable property and capital income rather than to taxes on labour income.

1. As a corollary, if tax rates are currently above such a level, government could raise revenue by reducing tax rates.

2. For instance, in the context of raising state taxes in Maryland in the United States in the early 1990s, there was relatively high support for taxes on cigarettes and liquor, taxes on businesses and taxes on professional services, but strong opposition to raising taxes on property, utilities and personal income (Haynes and Florestano, 1994^[41]). In France, according to a survey, the population disliked the annual wealth tax and corporation taxes the least and inheritance taxation the most (Masson, 2015^[42]).

Given uncertainties about the exact effects of taxes on the economy, numerous equity and political considerations, and cross-country differences in tax level and composition, it is difficult to formulate a universal strategy based on the criteria discussed in Box 4 that has high chances of being implemented in practice. Assuming the required level of taxation as given, three principles could help decide the desirable and politically acceptable mix of higher taxation.

- Broaden bases of existing taxes to boost revenue. If the broadening is sufficiently large, governments could even lower tax rates, reducing associated distortions that are particularly large when tax rates are high. Past OECD work suggests that eliminating or improving the design of some tax expenditures could broaden the tax base substantially, boosting revenues (Hagemann, 2012^[43]). If a tax expenditure is regressive, removing it could also improve equity. Retirement savings incentives, favourable treatment of owner-occupied housing and tax-subsidised health insurance are examples of costly and/or inefficient tax expenditures. However, eliminating a tax expenditure may hinder meeting other policy objectives, related for instance to lowering disposable income inequality and supporting labour force participation. Besides, such measures may be difficult to implement politically given the visibility of tax reliefs to voters.
- Spread increases in tax rates across a wide range of tax categories to prevent any one tax rate from becoming too high and possibly minimise perceptions of unfair distribution of tax burdens. Smaller increases in the tax rate minimise the risk of excessive distortions, depending on the initial

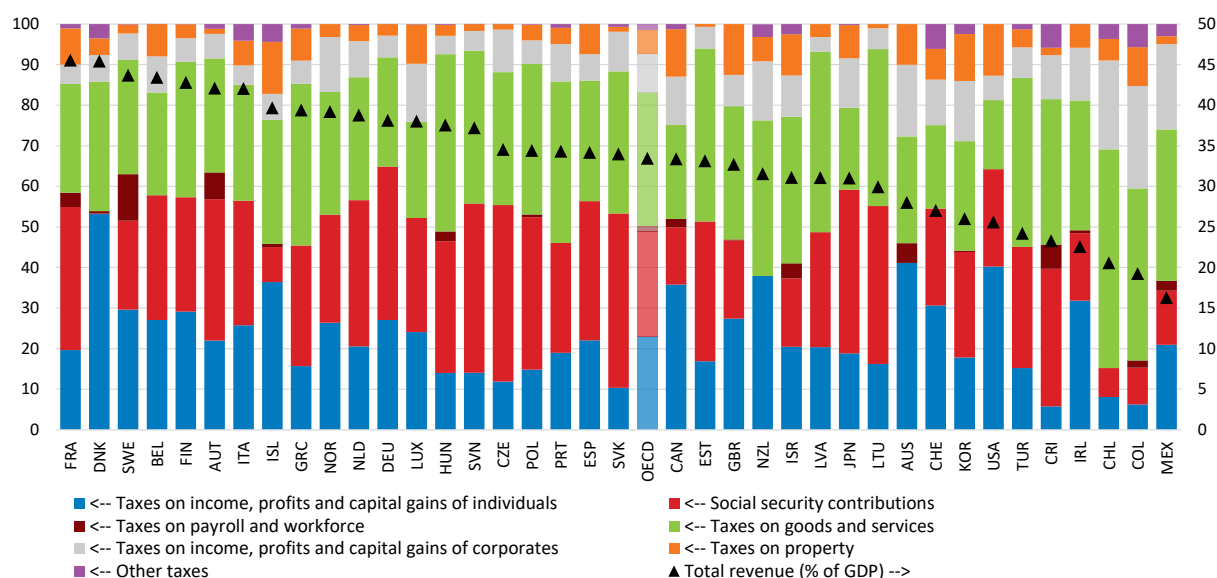
level. In addition, such increases may be more acceptable by populations and thus more likely to be implemented from the political perspective. Relying more on taxes that currently generate small amounts of revenue, due to low tax rates, could also help diversify revenue sources and make governments more resilient to negative shocks to a specific tax base.

- Introduce new taxes. New taxes would not only generate additional revenue but also diversify revenue sources. Such diversification could be desirable given the current high concentration of tax revenue (Figure 11) and uncertainty about the resilience of current taxes to structural changes, including population ageing and climate change, reflecting inherent uncertainties about the extent of these changes and their economic consequences. However, these benefits should be weighed against potential costs due to making the tax system more complex.

Independently from the particular tax mix chosen, strengthening tax collection would be desirable in many countries. A more efficient tax administration could help increase tax revenue (Brys et al., 2016^[29]; Dougherty, de Biase and Lorenzoni, 2022^[44]). It would also ensure less expensive tax collection and better quality and faster services for taxpayers (European Commission, 2015^[45]). Technological tools and digital solutions could greatly help to improve service delivery, lower administrative costs and increase compliance rates (OECD, 2022^[46]). Countries should also strive to implement international tax rules and mechanisms that prevent tax evasion and tax avoidance. The enhanced co-operation between tax authorities around the world through the automatic exchange of information thanks to the development of the Common Reporting Standard is particularly helpful in this respect.

Figure 11. The size and composition of tax revenue differ across OECD countries

2016-19 average, per cent of total tax revenue/GDP



Note: The OECD average is an unweighted average of OECD members.
Source: OECD Global Revenue Statistics Database.

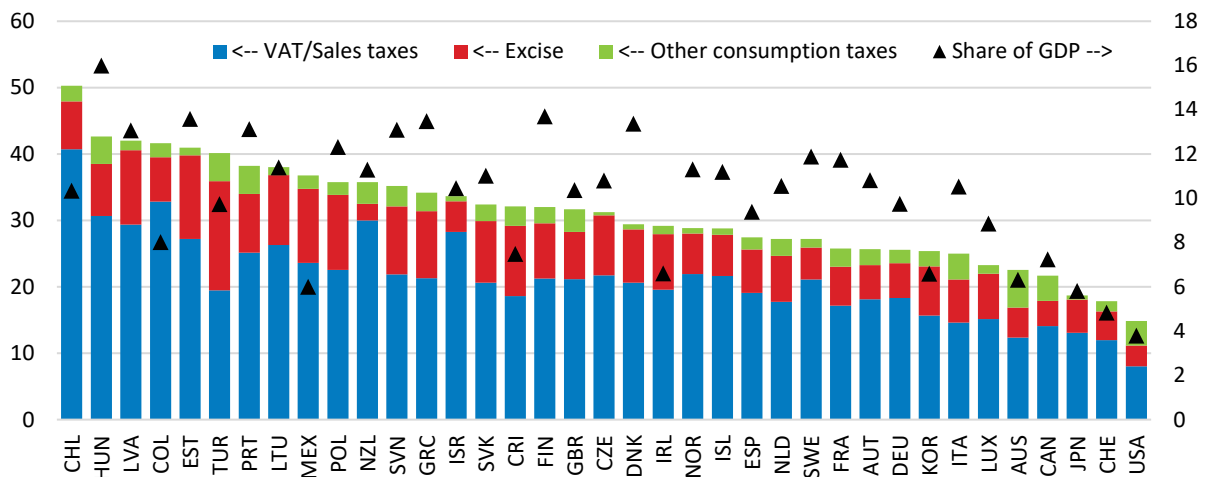
Governments could be tempted to address long-term fiscal pressures by acting on the current main tax categories (PIT, SSCs and consumption taxes), but in some countries the options to raise further revenue from these taxes may be limited.²¹ Using the current big three tax sources could seem to be practically and politically easy to be implemented. Their tax bases are large, populations are familiar with them, tax administrations are well accustomed with enforcing them and marginal increases in tax rates may be easier to accept. However, in some countries the rates of these taxes are already high and further increases could be counterproductive. Countries face different challenges and opportunities to increase revenue from the main tax categories, and thus in the urgency to broaden tax bases and to increase revenue from other more underutilised taxes. The challenges will be greater in countries where all three taxes are already high in relation to GDP, reflecting both high ETRs and broad bases (Figure 11). Several of these considerations are elaborated in the subsections below.

3.3.1. Consumption taxes

Consumption taxes, which consist mostly of general taxes on goods and services and taxes on specific goods and services, account for a significant share of government revenue in OECD countries. They represented on average 23% of tax revenue in 2018, though with significant cross-country differences (Figure 12). Their popularity is partly explained by the relative efficiency of some types of consumption taxes. For example, VAT is less distortionary than many other types of taxes as it does not discourage savings and investment. Consumption taxes do, however, reduce the after-tax real income which could lower labour supply (Johansson, 2016^[47]). Empirical studies find that this negative effect is weaker than for other taxes, so that shifting the composition of tax revenue towards VAT has been found to be relatively growth friendly (Akgun, Cournède and Fournier, 2017^[32]). The effect of VAT on equality is disputed but VAT is generally not the most effective tool to deal with inequality (OECD/KIPF, 2014^[48]; Institute for Fiscal Studies, 2011^[49]; Thomas, 2020^[50]).

Figure 12. Consumption taxes are important for total government tax revenue

2016-19 average, per cent of total tax revenue/GDP



Source: OECD Revenue Statistics; and OECD calculations.

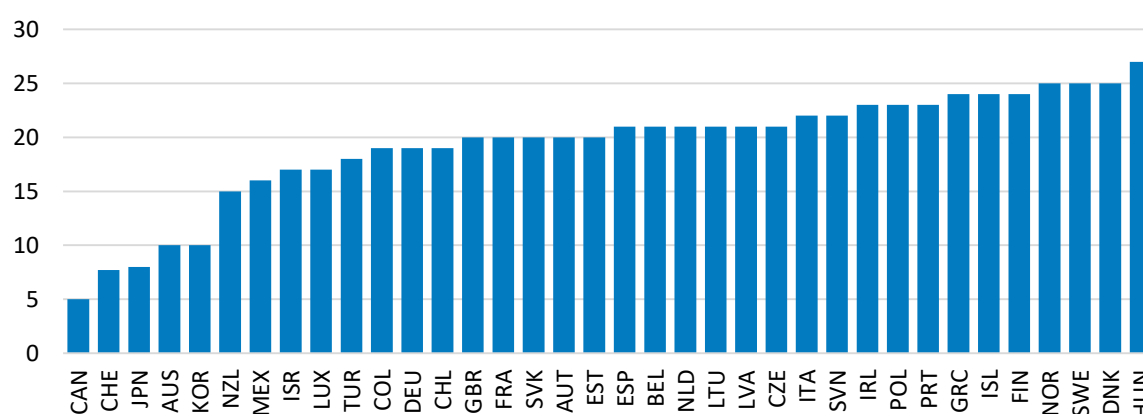
²¹ These three revenue streams are, on average, 81% of government revenues of OECD members (Figure 11).

Increasing revenue from VAT and sales taxes could be a good way to cover the long-term spending pressures also given their potential resilience to population ageing (Colin and Brys, 2019^[39]). Increasing taxes on consumption rather than labour could partly rebalance the sharing of the tax burden between people in employment (whose number is expected to decline in many countries – Figure 2) and the retired population (which is expected to increase). While there may be some concerns that this could negatively impact elderly people on low incomes, research suggests that where VAT is increased distributional aims can be better achieved through the use of targeted measures to increase the real incomes of those on low incomes (OECD/KIPF, 2014^[48]; OECD, 2020^[51]).

However, a country's scope to increase revenue via consumption taxes depends on its starting position. For instance, raising VAT or sales tax revenue would be attractive for countries where the standard tax rates are low (Figure 13). In contrast, in several countries the standard VAT rates are already high and potentially close to estimated revenue-maximising levels (Akgun, Bartolini and Cournède, 2017^[34]). Thus, raising these rates further could be counterproductive, necessitating reliance on other taxes or broadening the VAT base and strengthening VAT enforcement and compliance. Broadening the tax base could involve removing exemptions or eliminating preferential VAT rates for certain goods and services. Indeed, many countries apply lower tax rates or tax exemptions on some categories of goods and services. Differentiated tax rates and exemptions also create economic distortions and raise compliance costs. If the population-ageing-induced shift in the composition of household consumption lowers the ETR (Section 2.3), the required increase in VAT rate would be larger than in the absence of such a shift.

Figure 13. Standard VAT rates differ across the OECD countries

Standard VAT rates in 2018



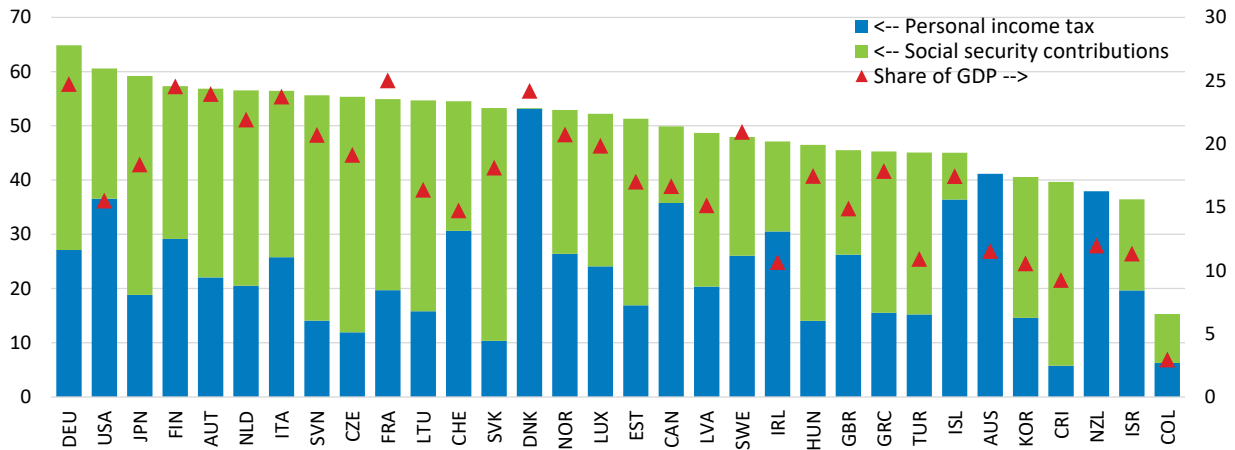
Source: OECD (2020^[51]), Consumption Tax Trends 2020, <https://doi.org/10.1787/152def2d-en>.

3.3.2. Taxes on labour income

PITs together with SSCs are one of the most important sources of government revenue. In more than half of OECD countries, revenue from these taxes accounts for at least 50% of total tax receipts (Figure 14). In many OECD countries, the average tax wedge (calculated as the sum of PIT and SSCs paid by employees and employers, minus cash benefits received as a per cent of total labour costs for employers) is above 30%, and the rate of the SSCs paid by employers is the largest component of the tax wedge in most of the countries (Figure 15).

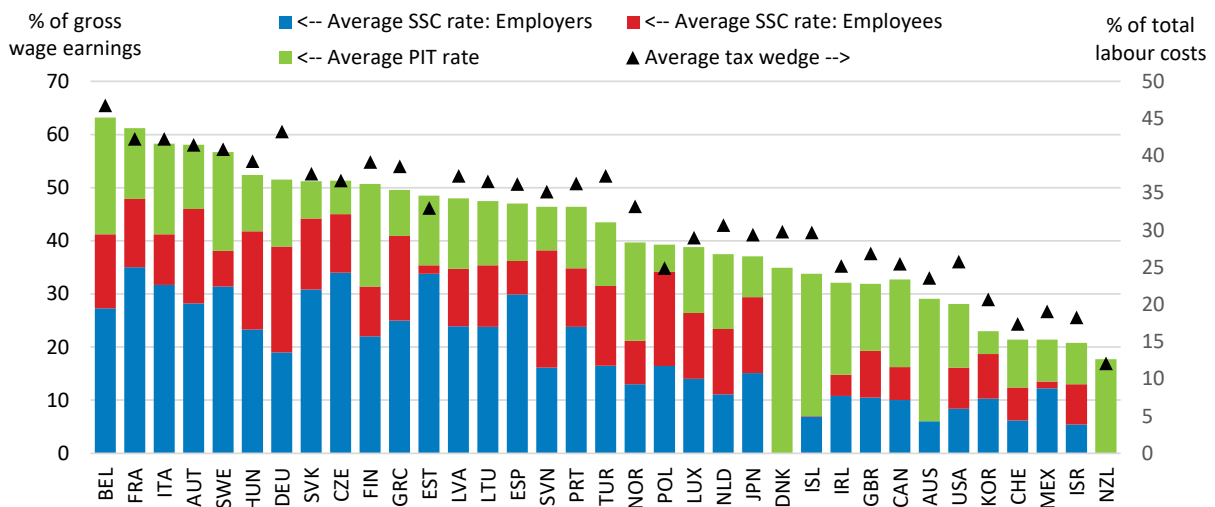
Figure 14. Personal income taxes and social security contributions are the biggest sources of government revenue in many countries

2016-19 average, per cent of total tax revenue/GDP



Note: Personal income tax includes taxes not only on income from employment.
Source: OECD Revenue Statistics.

Figure 15. Taxation of wages differs across OECD countries significantly



Note: For each country, average tax rates for the 2016-19 period based on the unweighted averages of tax rates for eight family types (single persons without children at 67%, 100% and 167% of average earnings; single person with two children at 67% of average earnings; one-earner married couple with two children at 100% of average earnings; two-earner married couples, one at 100% of average earnings and the other at 67%, with two children and without children; and two-earner married couple with two children, both at 100% of average earnings). The average tax wedge is expressed as per cent of total labour costs for employers.
Source: OECD Taxing Wages database; and OECD calculations.

Given large tax bases related to labour income, increasing PIT rates on labour income could likely bring substantial tax revenues but should be considered carefully due to their likely distortions, including their impact on labour force participation, possible negative implications for other tax bases, and fairness considerations. PIT tax rates are high in several countries (Figure 15), and raising them further across the whole income distribution, especially on workers at lower ends of the distribution, could discourage

employment.²² These concerns are likely to be smaller in economies with low PIT rates and SSCs. Moreover, higher labour taxation could lower disposable income and thus revenues from taxes on consumption. The rising share of pensioners relative to people working could add to the perception of an unfair tax burden on the working population if labour taxes were increased to help finance the ageing population. Increasing PIT revenue from labour income relative to nominal GDP, or even maintaining it, would be challenging if labour shares were to fall, necessitating a shift of the tax burden to taxes on corporates and capital income.

Possible negative labour market effects are particularly important in the context of population ageing as employment rates tend to decline with age. Thus, governments should consider measures that can help support employment levels among older workers by making continued employment attractive while in receipt of pension income (OECD, 2011^[52]). They include linking benefits to age rather than employment status and providing in-work subsidies to workers eligible for retirement to remain active in the labour market. Governments could consider reforming preferential PIT and SSC treatment of public pension incomes, which are prevalent in OECD countries (OECD, 2019^[6]), to try to boost government revenue in the context of a growing pension income in relation to GDP.

Countries that finance health care spending predominantly from earmarked SSCs could be forced to increase these contributions, possibly also on income from pensions.²³ However, such increases may affect GDP growth negatively (SSCs are part of the tax wedge on labour). If these negative effects are expected to be large, financing part of the health care system from taxes that are not related to labour income should be considered. Similar considerations may apply to the SSCs that finance public pension systems. However, in the case of SSCs where the actual and perceived link with benefits is strong – which is potentially the case for pensions, the efficiency losses due to a higher tax wedge could be alleviated even if the pass-through to current wages is likely to be very high as contributions can be seen as deferred wages (Summers, 1989^[53]; Gruber, 1997^[54]; Bozio, Breda and Grenet, n.d.^[55]).²⁴

3.3.3. *Personal income taxes on capital income*

Increasing revenue from taxes on capital income at the personal level could help finance the trend increase in government spending due to population ageing. The argument for such reform would be even stronger if the labour income share were to decline, lowering revenues from PIT on labour income and SSCs. While capital income taxes can create distortions, the recent theoretical literature suggests that optimal capital tax rates are positive (Aiyagari, 1995^[43]; Conesa, Kitao and Krueger, 2009^[44]; Gahvari and Micheletto, 2016^[45]; Gerritsen et al., 2020^[46]).

Raising ETRs on capital income at the personal level to rates that are closer to those on labour income could help increase revenue and, at the same time, reduce income inequality and tax avoidance. Taxation of capital income tends to be lower than labour income in the OECD (OECD, 2022^[56]). In some countries, the favourable tax treatment of personal capital income compared with labour income results from the fact that some types of capital income (e.g. dividends, rental income) and capital gains are taxed at lower flat tax rates, whereas labour is taxed at progressive rates. Lower ETRs on personal capital income

²² High average taxes could lower workforce participation, whereas high marginal taxes could reduce incentives for workers to work longer or harder (Johansson et al., 2008^[84]). Hours worked seem significantly less responsive to labour taxes than the decision to participate in the workforce. Participation by low-income workers, single parents, second earners and older workers is found to be particularly sensitive to changes in labour taxation (OECD, 2011^[52]). Higher labour taxes also increase the labour costs for employers and thus may reduce labour demand.

²³ Other SSC base-broadening measures could also be envisaged, for example ensuring that SSCs are levied on different forms of non-standard work (Colin and Brys, 2019^[39]).

²⁴ In the stylised model of this paper, for given compensation of employees, changes to SSC ETRs are fully passed to wages (i.e. a higher ETR lowers wages proportionally).

predominantly benefit higher-income households, as capital income is generally concentrated at the top of the income distribution. Higher taxes on capital income could also help reduce tax avoidance by narrowing the gap between labour and capital income taxation and reducing incentives for income shifting, particularly where labour and capital income may be difficult to distinguish (Brys et al., 2016^[29]).²⁵

3.3.4. Recurrent taxes on immovable property

Recurrent taxes on immovable property have potential to contribute to financing long-term spending due to population ageing but several political and practical challenges would have to be addressed. This tax revenue is currently low, in the median OECD economy, at less than 3% of total government revenue (Figure 16). The importance of recurrent taxes on immovable property could be substantially increased, even with low tax rates, given large tax bases that are likely to increase.²⁶ House prices are expected to continue rising in the long run, though at a lower rate in countries with shrinking total population (Cournède, Ziemann and De Pace, 2020^[57]).²⁷ As recurrent taxes on immovable property are among the most economically efficient forms of taxation, with careful design, few distortions should be expected.²⁸ Housing taxes could also help shape urban development and land use policy, and improve the resilience of the wider housing market (OECD, 2022^[58]). However, increasing the recurrent taxation of immovable property has some drawbacks and poses some challenges.

- Empirical analysis suggests that recurrent taxes on immovable property can be regressive as they account for a larger share of income for lower income households (Andriopoulou, Kanavitsa and Leventi, 2020^[59]).²⁹ The distributional impact of these policies ultimately depends on the structure and concentration of property ownership among households and the ensuing tax incidence (Causa, Woloszko and Leite, 2019^[60]). These characteristics tend to vary across countries. In a housing market where property owners, generally older and wealthier, can pass all the tax cost onto renters or prospective buyers, who are generally younger and less well off, the impact of the tax will be regressive. Where they cannot, the impact is more likely to be progressive (OECD, 2022^[58]). In circumstances where countries tax other forms of capital income (e.g. interest, dividends and pension savings) lightly or not at all, recurrent taxes on immovable property could also be viewed as unfair.

²⁵ These mechanisms involve for instance altering the organisational form of taxpayers' business (i.e. either incorporating or un-incorporating for tax purposes) to lower the ETR (Alstadsaeter and Thoresen, 2010^[90]; Smith et al., 2019^[91]; Smith et al., 2021^[92]; Waseem, 2018^[93]); or re-characterisation of income types, including shifts from labour to capital income (Alstadsaeter and Jacob, 2014^[94]; Miller, Pope and Smith, 2021^[98]) and vice versa (Sivadasan and Slemrod, 2008^[95]).

²⁶ Only few countries report estimates of non-financial assets of households, that include housing stock, in national accounts. Based on few available countries (Australia, the Czech Republic, France and the United Kingdom), the stocks of non-financial assets can be very large (ranging from close to 500% of GDP to 670% of GDP).

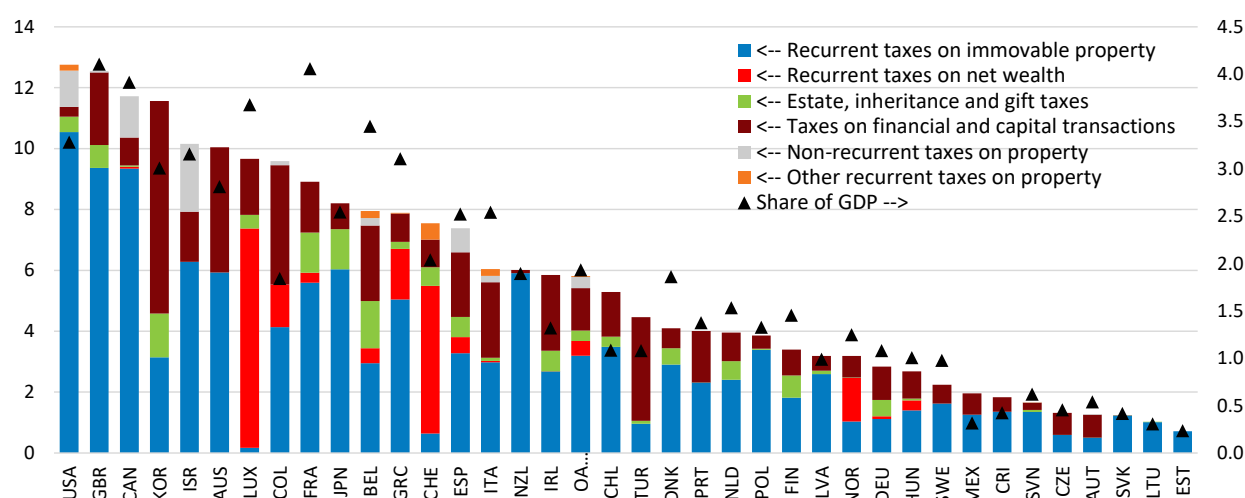
²⁷ Predicting the impact of population ageing on house prices is complex. While the ageing of population is likely to change the nature and location of housing demand, the price implications will depend also on the supply elasticity of housing, which differs widely across and within countries (OECD, 2021^[96]).

²⁸ This relates to the immobile nature of the tax base, typically land and improvements, which limits the scope for behavioural responses. OECD research suggests that a shift towards recurrent taxes on immovable property can be beneficial for improving growth without significant adverse impact on income inequality (Cournède, Fournier and Hoeller, 2018^[89]).

²⁹ These studies could overstate their regressivity. The regressive effect is the highest for the poorest households and declines significantly for lower-middle-income households. Thus, well-targeted reliefs for the less well-off population could mitigate the negative distributional effects.

Figure 16. Taxes on property generate little revenue in OECD countries

2016-19 average, per cent of total tax revenue/GDP



Source: OECD Revenue Statistics; and OECD calculations.

- Immovable property taxes tend to be unpopular, particularly due to their salience, and perceptions of unfairness and arbitrariness due to difficulties in estimating property values (Cabral and Hoxby, 2012^[61]; Slack and Bird, 2014^[62]). The high visibility of property taxes owes to the fact that they are not withheld at source and are usually paid directly by taxpayers periodically in large amounts (sometimes requiring active saving). Besides, the immovable property tax usually is not linked to a real cash flow and may not necessarily reflect the owner's current economic situation (Johannesson-Lindén and Gayer, 2012^[63]). This aspect is important in the context of population ageing. For some elderly people, the ability to pay taxes is likely to be reduced as their pension income will be lower than their income during the period they were economically active. Allowing payment in instalments can help the liquidity constrained, while deferral programmes can help people who do not have an income stream aligned with the value of their property (OECD, 2022^[58]).
- Efficient administration requires frequent reassessments of the tax base (Brys, 2011^[36]; McCluskey and Franzsen, 2013^[64]; Slack and Bird, 2014^[62]). Property prices can change significantly over time and heterogeneously across properties, reflecting location and other features. Thus, to ensure fair valuations and to limit large increases in tax liabilities, a detailed and regularly-updated database with land and property values is needed. Frequent updates would also prevent misalignments between tax revenue and property values. Indeed, in many countries house prices increased substantially over the past decades and failing to update property values has resulted in governments foregoing large revenue flows. However, the experience of many OECD countries shows that regular revaluations are rare in practice, even if digitalisation is reducing the costs of regular appraisals (OECD, 2022^[58]).³⁰

³⁰ Many OECD countries do not have provisions for regular revaluations and rely on outdated house values (OECD, 2022^[58]). For instance, property values used for tax purposes date from 1973 in Austria, 1975 in Belgium, 1970 in France, 1964 in former West Germany and 1935 in former East Germany, 1941 in Luxembourg, and 1991 in the United Kingdom. Regular updates are done only in few countries, including New South Wales in Australia (yearly; taxable values are the average of the preceding three years), Lithuania (yearly; taxable values are valid for five years), New Zealand (every three years), and Norway (yearly for municipalities using values estimated for net wealth tax purposes; every ten years otherwise).

- Recurrent taxes on immovable property are mostly used as a funding stream for local and subnational governments (Blöchliger and Kim, 2016^[65]; OECD, 2021^[66]).³¹ Increasing the yield from property taxation to finance the increase in long-term spending may require central governments to renegotiate their arrangements with local governments, either by reducing central funding streams to local governments to compensate for higher property tax revenues, by earmarking a portion of the revenues, or by increasing the spending responsibilities of subnational governments. These intergovernmental fiscal negotiations may create further barriers to implementing property tax reform (Brys, 2011^[36]; OECD, 2021^[66]).

3.3.5. *Inheritance and estate taxes*

Introducing inheritance and estate taxes or increasing the existing ones is a promising option to diversify financing of the expected trend increase in government spending. While inheritance and estate taxes have been implemented in more than half of all OECD countries, they generally raise negligible revenue, representing less than 0.12% of total tax revenue in the median OECD country (Figure 16). However, they have potential to yield more revenue, especially as the tax base is expected to increase (Krenek et al., 2022^[67]). Demographic projections imply a growing number of wealth transfers as populations age. Moreover, with a continued growth of wealth accumulation and with a lower number of children per parents, the amount of inherited wealth per heir is also expected to increase. In recent decades, annual flows of bequests have already risen more rapidly than GDP in a number of countries, and, in France, they have also risen more rapidly than wealth (Piketty, 2014^[68]; Masson, 2015^[42]).

Increasing inheritance taxation could also help lower wealth inequality, with limited efficiency losses. Inheritance taxes are seen as a useful tool for improving equality of opportunity and as having positive implications for horizontal and vertical equity, especially given that, in some countries, social mobility is limited and wealth is increasingly concentrated at the very top of the distribution (Balestra and Tonkin, 2018^[69]; OECD, 2018^[70]; OECD, 2021^[33]). Empirical evidence suggests that the effects of inheritance taxes on savings is negative but small (OECD, 2021^[33]). Moreover, inheritance taxes tend to be less distortive than recurrent taxes on the stock of wealth.³²

One possible source of new revenue relates to taxing capital gains that are passed to heirs. In just over half of the OECD countries that levy inheritance, estate and gift taxes, the capital gains that accrue to the donor are not subject to tax when an asset is transferred, and the beneficiary receives the asset at its market value (assets are so-called “stepped-up in basis”) (OECD, 2021^[33]). Passing the unrealised capital gains to the beneficiary or taxing the capital gains at death would reduce distortions and could raise revenue.³³ However, taxing unrealised capital gains at death instead of simply carrying over the asset value can pose liquidity problems and force the sale of the asset. This may be particularly challenging in the case of family-owned businesses and farms, for example.

Tax planning and public opposition could reduce the scope for boosting inheritance tax revenue in practice though. Tax legislation for inheritance tax is generally complex as it tries to address conflicting principles and social norms related to equality of opportunity, equity between generations and respect of family values

³¹ In the majority of OECD countries, the revenue fully accrues to sub-national governments, and, in only four countries, the share attributed to central governments exceeds 40% of total recurrent taxes on properties.

³² For instance, increasing the share of inheritance taxes (while keeping the overall government revenue constant) tends to boost growth, while increasing the share of wealth taxes reduces growth strongly (Cournède, Fournier and Hoeller, 2018^[89]).

³³ For example, replacing the stepped-up basis to a carryover basis in the United States could raise USD 105 billion over ten years (around 0.1% of GDP per year) (Congressional Budget Office, 2018^[99]). A more radical proposal of taxing accrued gains at death and raising the tax rate to 28% in the United States could yield USD 290 billion (1.4% of 2019 GDP) over ten years (Batchelder and Kamin, 2019^[88]).

(European Commission, 2015^[45]). Consequently, in most countries where they have been implemented, inheritance taxes have many exemptions, including for modest bequests to close family members and for passing on family businesses to ensure business continuity, which offer possibilities for tax planning and avoidance. Many of these exemptions may be politically difficult to remove or scale back. Besides, in some countries, there is strong public opposition to this type of tax (Boadway, Chamberlain and Emmerson, 2010^[71]; Bradbury, 2015^[72]). This may discourage policymakers from increasing inheritance taxation or even maintaining it (Masson, 2015^[42]).

3.3.6. Recurrent taxes on net wealth

Recurrent taxes on net wealth could also generate potentially large revenues, but the practical experience of these taxes in many OECD countries suggests that they have many drawbacks and often raise relatively low revenue. Over recent decades, revenue from net wealth taxes has declined in advanced economies, with many countries removing or scaling down these taxes or narrowing tax bases (European Commission, 2015^[45]; OECD, 2018^[73]). These changes stand in contrast with a rapid increase in wealth relative to GDP over the past decades (Piketty and Zucman, 2014^[74]). These trends are expected to continue in the future, indicating a large potential for new tax revenue. Net wealth taxes could also help redress wealth inequality but debates continue if they are the appropriate policy tool, and about the opportune circumstances to levy such a tax (Piketty and Zucman, 2014^[74]; OECD, 2018^[73]). Moreover, recurrent taxes on wealth penalise savings, especially where low return have been achieved, and do not tax excess returns.³⁴ They also do not account for fluctuations in and the level of income, with potential negative implications for the taxpayers' capacity to pay. In principle, similar tax revenues could be obtained by taxing sources of wealth (wages, capital income and inheritances) and uses of wealth (consumption), with fewer distortions and more equitable outcomes (OECD, 2018^[73]; Adam and Miller, 2021^[75]). However, if broad-based income and inheritance taxes cannot be implemented, introducing a wealth tax may be considered from an equity perspective even if it is not the first-best option in terms of efficiency.³⁵

3.3.7. Corporate income tax

Countries could also consider options to raise additional revenue from corporate income taxes to meet the long-term spending challenges associated with population ageing, as part of a broader strategy to reform capital income taxation. There are limits to increasing corporate tax rates unilaterally given the high international mobility of parts of the corporate tax base. However, the recent agreement to reform the international corporate tax rules under the auspices of the OECD/G20 Inclusive Framework on Base Erosion and Profit Shifting should boost corporate income tax revenue, reduce opportunities for tax avoidance and put an end to the “race to the bottom” on corporate tax rates.

Reform of the corporate tax base with a particular focus on the investment responses can be beneficial. Revenues could be raised without hampering investment and growth by scaling back some corporate income tax incentives when they are found to be inefficient (Brys et al., 2016^[29]). However, some base narrowing measures such as a wider use of immediate expensing and accelerated depreciation of investment costs and targeted measures may support private investment and with it increased tax

³⁴ Excess returns refer to returns exceeding a normal return to capital defined as compensation for a delay in consumption. They can result from luck in risky investments, economic rents, effort and skills (Adam and Miller, 2021^[75]).

³⁵ A recurrent tax on wealth could also be theoretically justified by the desirability to tax the normal return, wealth benefits beyond purchasing power (e.g. buffers to deal with negative income shocks, social prestige) and externalities to holding wealth (e.g. wealth confers social status and more wealth accumulation implies lower relative status of less well-off; higher wealth may also imply more political influence). However, designing fair taxation in practice to account for these theoretical cases remains challenging.

revenue.³⁶ Such measures could have significant positive effects on investment in the longer term, and consequently on income and consumption and broader tax revenue (Zwick and Mahon, 2017^[76]).

3.3.8. Environmentally-related taxes

Environmentally-related taxes could generate substantial revenue during the green transition but it is uncertain if they could help to finance the increase in public spending due to population ageing. The revenue from these taxes has fallen in most OECD countries over the past ten years and more recently accounted, on average, for 6.6% of revenue in OECD countries (Figure 17).³⁷ Environmentally-related tax revenue could be expected to increase in the future as part of the green transition, but the size, timing and duration of this increase are uncertain. This partly reflects uncertainty about the evolution of carbon prices and emissions as discussed below. In theory, a higher reliance on these taxes could support growth as they tend to be less distortionary than some other taxes. However, in practice there is no clear evidence of a positive impact on growth (Akgun, Cournède and Fournier, 2017^[32]; OECD, 2017^[77]).³⁸ The eventual political acceptability of increased environmentally-related taxation, would strongly depend on its design. Recent evidence suggests that the acceptability of climate policies in general hinges on the perception of their effectiveness and progressivity, for example, with more support for carbon taxes with a highly progressive use of revenues such as targeted cash transfers (Dechezleprêtre et al., 2022^[78]).

- There is potential to increase revenue from carbon pricing. Emission reduction pledges require significantly more stringent greenhouse gas mitigation policies, but the role of carbon pricing in the broad policy mix – and the associated revenue potential – likely will differ across countries. Current effective carbon prices are low relative to prices that would be consistent with countries' emission reduction pledges, if countries choose to use carbon pricing as the main measure to lower emissions.³⁹ Thus, in these countries, the required increase in prices of carbon emissions could boost government revenue significantly, especially if emissions remain relatively inelastic with respect to prices.⁴⁰ For instance, a EUR 60 carbon floor in a sample of 44 OECD and G20 countries

³⁶ Expensing of investment costs could theoretically reduce the cost of capital and make marginal investments irrespective to the statutory corporate tax rate (if investment is financed by equity or by debt provided that interest payments are not deductible). Consequently, the tax rates could be raised to increase tax revenue (Barro and Furman, 2018^[97]). However, these predictions have not been validated by empirical models.

³⁷ Environmentally-related taxes are defined in the System of Environmental Economic Accounting as “taxes whose tax base is a physical unit (or a proxy of it) of something that has a proven, specific, negative impact on the environment” (OECD et al., 2014^[104]). The OECD identifies such tax bases – classified between energy, transport, pollution and resources – and records all revenue derived from those bases as environmentally-related. Consequently, those revenues will often overlap with the taxes on production and imports recorded in national accounts, and the taxes on specific goods and services according to the classification by economic function in the OECD's Revenue Statistics (OECD, 2020^[100]).

³⁸ The negative impact on growth due to the potential distortions generated by carbon taxation is relative to a future without climate change. However, the growth impact of carbon taxation would be minor compared with the huge direct costs of unabated climate change (IMF, 2020^[105]; Office for Budget Responsibility, 2021^[81]). Moreover, the tax impact could be mitigated by growth-enhancing use of the additional revenues (e.g. reduction in other distortive taxes, green investment), and positive externalities from the investments it incentivises, reduction in air pollution or road congestion.

³⁹ Estimates of carbon prices aligned with global objectives vary widely but a common view is that they should be at least above EUR 40 per tonne of CO₂ today and climb far above EUR 100 by 2060 (OECD, 2021^[101]). However, on average in the OECD in 2018, two-thirds of emissions were priced below EUR 30 per tonne, and 30% of emissions were not priced at all.

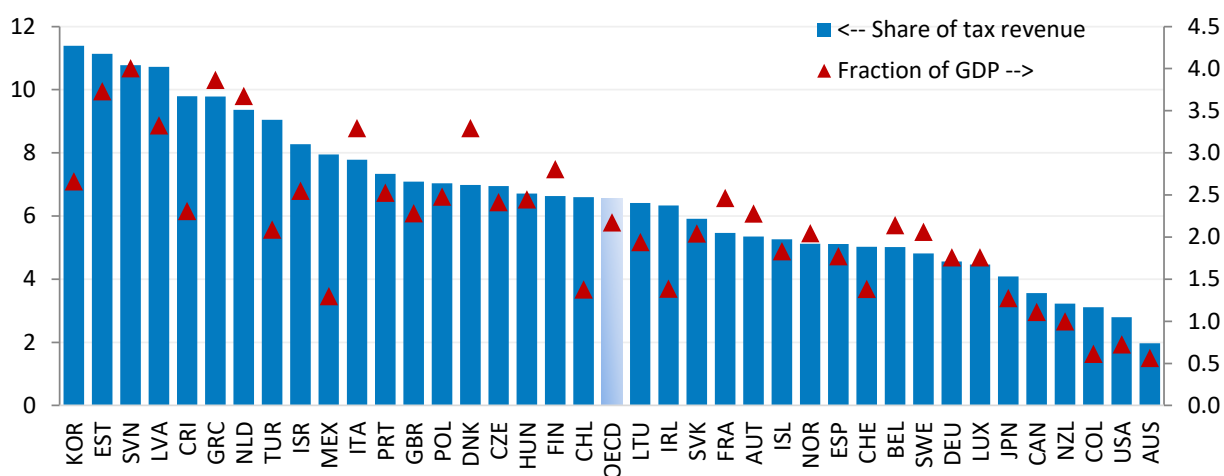
⁴⁰ Recent estimates suggest that the response of emissions to carbon prices are low in the OECD, even in the long run, with revenue-maximising rates at EUR 130-270 per tonne given current technologies and institutions (Sen and Vollebergh, 2018^[102]; D’Arcangelo et al., forthcoming^[79]).

could on average more than double carbon-related tax revenues as a fraction of GDP in the long term, with an increase of 0.6% of 2018 GDP for the median country (D’Arcangelo et al., forthcoming^[79]). Gains could be particularly big in countries with current low effective prices and large shares of unpriced emissions. Still, the extent and the pace of increases in the price of carbon emissions is uncertain.

- The facilitation of the green transition and adaptation to climate change would likely require government spending, including public green investment and financial incentives to boost private investment. In addition, support to vulnerable households and businesses affected by mitigation measures and climate change will likely be needed, including to gain the political acceptability of higher levels of environmentally-related taxation (Dechezleprêtre et al., 2022^[78]). These public expenditures, which are not taken into account in the LTM, would in general increase public finance challenges also if they are not covered by revenue from carbon pricing and would reduce the possibility to finance the costs of population ageing.
- If countries achieve their emissions targets (including via new and improved technologies, regulations and standards), revenue from future carbon taxation and already existing excise taxes on fossil fuels could vanish.⁴¹ Consequently, maintaining or increasing revenue from environmentally-related taxes would likely require taxing new bases, such as levies on motoring (OECD/ITF, 2019^[80]; Office for Budget Responsibility, 2021^[81]).

Figure 17. The importance of environmentally-related tax revenue differs across OECD countries

Revenues in 2019 or latest year available, per cent of total tax revenue/GDP



Note: The latest year available is 2019 for most countries, except for Canada and Korea (2014), the United States (2016), and Australia and Israel (2018). The OECD aggregate is an unweighted average of the country-level data shown in the chart.

Source: OECD database on Environmentally-related tax revenue.

⁴¹ Revenue from excise taxes on fossil fuels amounted to 1.3% of GDP in the OECD countries in 2018 (OECD, 2021^[103]).

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Annex A. Model of tax revenues in the long-term projections

This annex details assumptions behind the stylised model, consistent with OECD long-term model (LTM), to analyse tax implications of population ageing. The model accounts for income components of nominal GDP and household consumption, the resulting tax bases and estimates of effective tax rates (ETRs). Given that population ageing is going to imply relative changes in income sources at the macro level, the model aims to project tax revenues and calibrate ETRs by income type as indicated in Table 1 in the main text.

Key elements of the long-term OECD model

Potential output

LTM projections build on the latest short-term *Economic Outlook* projections. Output gaps at the end of the *Economic Outlook* horizon are assumed to close gradually and thereafter the projected growth rates are determined by projections of labour efficiency, employment and physical capital, aggregated with a Cobb-Douglas production function (Chaloux and Guillemette, 2019^[5]; Guillemette, 2019^[4]).

Estimates of potential output are based on an aggregate production function using trend input components. For all countries, a whole economy approach is employed using a commonly specified constant-return-to-scale Cobb-Douglas production function with Harrod-neutral labour-augmenting technical progress:

$$Y = (AL)^{\alpha} K^{1-\alpha} \quad (1)$$

Where Y is potential output, A is trended labour efficiency, L is trended total employment (the product of population aged 15-74 and the aggregate employment rate) and K is the whole economy measure of productive capital. Trend labour efficiency (A), calculated for the historical sample as the residual of a GDP equation, is projected based on a conditional convergence equation, depending on several institutional and policy indicators (including quality of institutions and governance, stock of human capital, product market regulations, openness to trade adjusted for country size, stability of macroeconomic environment, domestic and global R&D stocks, and income inequality) (Guillemette et al., 2017^[82]).¹ Population projections for European countries are based on Eurostat data. For other countries, the projections are based on the United Nations' World Population Prospects. The labour income share (α) is assumed to be 0.67 for all countries.

Interest rates

The nominal short-term interest rate depends on potential growth and inflation. In the baseline scenario, the short-term real rate gradually converges towards the real potential growth rate (while typically starting

¹ The projections do not account for possible direct effects of population ageing on productivity growth. In theory, these effects could be both negative and positive, and empirical evidence is mixed (Maestas, Mullen and Powell, 2016^[108]; Acemoglu and Restrepo, 2017^[107]; Aksoy et al., 2019^[106]).

below it) for most countries over the projection period.² The interest rate on government debt converges to a weighted average of short-term and long-term interest rates (with weights based on the maturity structure). The long-term interest rate is a convolution of the future short-term rates plus a term premium, and additional risk premia linked to government debt levels. In most cases, the long-term interest rates are very close to the growth rate of nominal GDP.

Fiscal block

The fiscal block of the OECD long-term model incorporates a fiscal rule which ensures that the structural primary balance adjusts so that the gross debt-to-GDP ratio eventually stabilises at its initial level (Guillemette and Turner, 2021^[2]). Expenditure for different spending categories is projected, using simple reduced-form equations with either estimated (for health care) or calibrated (for public pensions and other primary expenditure) coefficients.

- Government spending on public pensions in relation to GDP is determined by the changes in the ratio of pensioners to total employment, the ratio of average pension to the average wage (the so-called average benefit ratio), and by changes in the ratio of compensation of employees to GDP (a proxy of the labour share; Guillemette (2019^[4])).

$$d \log \left(\frac{PENSIONS}{GDP} \right) = d \log \left(\frac{POP_{RET}}{ETPT} \right) + d \log \left(\frac{AP}{AW} \right) + d \log \left(\frac{Compensation\ of\ employess}{GDP} \right) \quad (2)$$

With the exception of four countries, the last two shares are held constant in the LTM projections. Thus, the evolution of the pension-to-GDP ratio is, effectively, driven by population and potential employment projections. The assumption of a constant average benefit ratio is motivated by the observed stability of this ratio in the past two decades in the European Union and the complexity of making alternative projections on a consistent basis for all countries. For Greece, Norway, Portugal and Spain, the average benefit ratio is exceptionally assumed to decline over the projection horizon as a function of the labour productivity growth. This implies that pensions are not fully indexed to wages, as assumed for other countries.³

- Public health expenditure per capita (including long-term care) is modelled as a function of real GDP per capita, the share of total population aged 65 or above, growth in the GDP deflator and an indicator of the excess of health care price inflation over general inflation proxied by labour productivity growth in the total economy. The coefficients of this function are calibrated based on the estimates from the literature.
- The ratio of other primary expenditures to GDP is projected to effectively evolve in line with the ratio of total population to potential employment. This stems from the assumptions that real provision of services per capita remains unchanged, and that the deflator of public services relative to GDP deflator changes at the same rate as the real average wage, which in turns follows productivity growth.

Structural revenue is then determined endogenously to satisfy the fiscal rule, and so their change provides a convenient summary indicator of future fiscal pressure which can be decomposed by the expenditure which generated it.

LTM projections of public health care, other primary expenditures and, in the scenario with constant labour income shares, public spending on pensions are taken as exogenous in the model simulations of this paper.

² This is not exactly the case for euro area members that face the same short-term rate but have different potential growth rates.

³ See Guillemette (2019^[4]) for more details about projections of people in retirement and public pensions.

Projection of income shares and tax bases

The tax projections are based on nominal GDP paths from the LTM. GDP is assumed exogenous. LTM projections of potential employment and people in retirement, derived from the age-gender cohort projections and assumptions about employment-to-population ratios by age, determine projections of public pensions – see the previous section.

Main GDP income components

In line with the Cobb-Douglas production function used in the LTM to project potential output (see above), the shares of compensation of employees, operating surplus and mixed income in nominal GDP are held constant, at their 2016-19 average levels, as long as there is no change in the share of taxes on production and imports less subsidies (indirect taxes in the model). Given that nominal GDP is exogenous (taken from the LTM), any changes in taxes on production and imports that are not offset by changes in other components of GDP would violate the national accounts identity:

$$GDP = \frac{\text{Compensation of employees } (D1)}{D1} + \frac{\text{Mixed income \& operating surplus } (B2\&B3)}{B2\&B3} + \frac{\text{Taxes on production \& imports } (D2)}{D2} - \frac{\text{Subsidies } (D3)}{D3} \quad (3)$$

The identity implies that changes in the shares in GDP of GDP main components (denoted with “Q”) must sum to zero:

$$0 = \Delta D1Q + \Delta B2\&B3Q + \Delta D2Q - \Delta D3Q \quad (4)$$

Thus, to ensure that the above identities are satisfied, the model assumes an endogenous reaction of the compensation of employees and mixed income and operating surplus to changes to the indirect tax ratio, in proportions to their relative shares in 2023:⁴

$$\Delta D2Q = -\frac{D1_{2023}}{D1_{2023}+B2\&B3_{2023}} * \Delta D1Q - \frac{B2\&B3_{2023}}{D1_{2023}+B2\&B3_{2023}} * \Delta B2\&B3Q. \quad (5)$$

This is equivalent to assuming constant labour and capital shares in GDP at factor prices.

Household income

Household primary and secondary income comprises wages (of employees), self-employment income (assumed to be equal to mixed income in the national accounts), property income and transfers (benefits), including public and private pensions as well as social benefits other than pensions.

- Wages are calculated as the difference between compensation of employees received by households (a national concept which is part of household disposable income) and social security contributions (SSCs) paid by employers (see below). Compensation of employees received by households are calculated as the difference between compensation of employees (a domestic concept which is part of the GDP by income approach) and net compensation of employees received from the rest of the world.⁵ The former is defined above and the latter is assumed to remain at the 2016-19 average (in relation to GDP).
- Household mixed income, operating surplus and property income are assumed to generally remain constant as a share in GDP at their respective 2016-19 averages. For mixed income and operating

⁴ Mixed income, operating surplus of households and operating surplus of the remaining sectors are modelled individually. The ratio of subsidies to GDP is assumed to remain constant ($\Delta D3Q = 0$).

⁵ Net compensation of employees received from the rest of the world is the compensation of employees received from abroad net of the compensation of non-resident employees by domestic firms.

surplus, their shares can evolve with changes in the share of taxes on production and imports less subsidies in GDP – see the discussion about compensations of employees above.

- Projections of public pensions use the same formula as in the LTM and are determined by the ratio of pensioners to total employment (in four countries also by labour productivity growth – see above).
- Historical data on private pensions are taken from the OECD Social Expenditure database, as the sum of expenditures of mandatory and voluntary private old age and survivors programmes. For countries for which data are not available, no private pensions are accounted for.⁶ Where data on private pensions are available, private pensions are assumed to grow nominally at the same rate as public pensions.
- Social benefits other than pensions are defined as the difference between total transfers received by households (based on national accounts data) and public and private pensions received by households. Their share in GDP is assumed to remain constant at the 2016-19 average.

Social security contributions and current taxes paid by households

Calibrating income-specific ETRs for current taxes on household income and wealth and SSCs paid by households for the OECD countries is challenging and involves trade-offs given data limitations. Estimates of income-specific ETRs exist for some income types and countries, but their underlying methods and assumptions may differ. Moreover, in some cases, they result in implausible levels of ETRs, and the country coverage is frequently limited. Using such estimates may also result in discrepancies with specific tax revenue as reported in national accounts, which is problematic for the stylised macroeconomic model of this paper. In this context, the baseline calibration of ETRs favours consistency with the macro data, standardisation of the approach across countries, a wide country coverage, minimisation of “outliers”, and – to the extent possible – the use of country and income-specific information. Some modifications to this baseline calibration are made to check the robustness of the model results and are indicated in the main text where relevant.

Given the importance of taxation of pensions for the focus of the model, estimates of personal income tax (PIT) and SSCs on pensions based on the OECD’s Social Expenditure Database (SOCX) are used (Box A 1).⁷ One important drawback of the estimates from the SOCX is that it is not clear if they cover PIT only or PIT and SSCs. Given the lack of detailed information, we apply an ad hoc assumption that 80% of the ETR is assigned to PIT and 20% of the ETR is assigned to SSCs.

$$ETR_B^{PIT} = 0.8 * ETR_B^{SOCX} \quad \text{and} \quad ETR_B^{SSC} = 0.2 * ETR_B^{SOCX} \quad (6)$$

where ETR_B^{SOCX} is the ETR from the SOCX database, and ETR_B^{SSC} and ETR_B^{PIT} are PIT and SSC ETRs for social benefits, respectively.

⁶ This applies to: Estonia, Hungary, Luxembourg, Latvia, Poland and Slovenia.

⁷ Alternatively, SSC and PIT ETRs for benefits could be derived based on relative ETRs as explained below.

Box A 1. Available estimates of income-specific ETRs

This box discusses selected sources of income-specific effective tax rate (ETR) estimates.

Split of personal income tax revenues

The Directorate-General for Taxation and Customs Union at the European Commission reports estimates of the split of personal income tax (PIT) revenues by sources of income for 27 EU members, Norway and the United Kingdom for 2007-19 (European Commission, 2021^[83]). The split is estimated by national authorities based on micro-data. The methodology used to construct the split is not fully harmonised across countries. Most countries aggregate the PIT paid by individuals, in proportion to each individual's source of income, implicitly assuming the same effective tax rates for all income sources for a given individual. Differences in ETRs across income types are then explained by the correlation between individuals' tax rates and the structure of their income. The revenue split also takes into account potential deductions and allowances, which are assigned to specific income sources when possible, or which need to be distributed proportionally across income sources when they are not specific. Accounting for those deductions and allowances reduces the tax base on capital. Thus, this can result in the corresponding negative share of personal income tax. For example, in 2021, the tax relief for mortgage interest payments led to a negative share of capital in PIT revenues in Denmark and the Netherlands.

These data can then be used to compute an effective tax rate for PIT by income source, in line with the definition of income sources in this paper. For example, if s_{labour}^{PIT} is the share of PIT revenues linked to labour income according to the *Taxation Trends* report, PIT is the income taxes paid by households in national accounts and INC_{EE} is the labour income of employees used in this paper, the effective tax rate on labour income is computed as:

$$ETR_{labour}^{PIT} = \frac{s_{labour}^{PIT} \cdot PIT}{INC_{EE}} \quad (7)$$

The ETR for PIT on self-employment income, social benefits and property income can then be defined in the same way.

Split of social security contributions (SSCs) paid by households

SSCs by income type can be calculated based on detailed national accounts data (European Commission, 2021^[83]). In particular, data available at Eurostat distinguishes four subcategories of households' SSCs (coded D613 in the European System of Accounts):

- Employees' social contributions (D613CE)
- Contributions by the non-employed (D613CN)
- Contributions by the self-employed (D613CS)
- Household's voluntary social contributions (D613V)

Therefore, one can calculate the share of households' SSCs paid on labour income (s_{labour}^{SSC}) as:

$$s_{labour}^{SSC} = \frac{D613CE}{D613CE + D613CN + D613CS + D613V} \quad (8)$$

Similar shares can be computed for self-employment income and for social benefits (using respectively $D613CS$ and $D613CN$ in the numerator), while social security contributions on property income are assumed to be zero.

Given SSCs paid by households ($D613^{HH}$) and the relevant tax base, it is then possible to compute an "effective tax rate" for SSCs. For example, the ETR for labour income is given by:

$$ETR_{labour}^{SSC} = \frac{SSC_{labour} \cdot D613^{HH}}{INC_{EE}} \quad (9)$$

The SSC ETR on self-employment income, social benefits and property income can then be defined in the same way (the ETR on property income is 0 in this particular case).

Estimates of ETRs for social benefits in the OECD Social Expenditure database

The OECD's Social Expenditure (SOCX) database provides detailed information on the level of social expenditures and the breakdown between categories of social expenditure. In addition, the database contains net social expenditure which accounts for the effect of the tax system on social benefits in 2017 (the latest available year), either through calculating the Average Itemised Tax Rate (AITR) on benefits or the amount of revenue raised by taxing benefits. These are estimated on the basis of a variety of national sources including administrative data on the basis of tax records (e.g. Spain) and "microsimulation-models" and micro data sets used to generate itemised tax rates (e.g. Australia). By comparing the overall tax yield of taxes on a category of expenditure to the overall size of the expenditure, it was possible to calculate the ETR on that category of benefit. Although SOCX contains data on public and private benefits, the ETRs used were limited to those on public benefits due to concerns about the comparability of data on private pensions between countries. In some countries, the ETRs generated using this method are relatively high relative to the aggregate ETRs. This may be driven by the use of differing methodologies, such as micro-simulation models or administrative data, to calculate the ETR compared to the aggregate data used to estimate the overall ETR.

The estimates of ETRs on social benefits differ among the countries with respect to the inclusion of SSCs. When the SOCX data did not specify whether these SSCs were included in the AITR or receipts, the OECD's *Pensions at a Glance* was consulted for guidance on interactions between the social security system and pensions.

Social security contributions paid by households

For SSCs paid by households, we assume three income types on which SSCs are levied: wages (EE), self-employment income (ES) and benefits (B). Consequently, the aggregate ETR is given by:

$$ETR_A^{SSC} = \frac{SSC}{INC} = \frac{SSC_{EE} + SSC_{ES} + SSC_B}{INC_{EE} + INC_{ES} + INC_B} \quad (10)$$

where SSC is total SSCs paid by households and INC is the sum of three income types on which SSCs are levied. Consequently, income-specific SSC ETRs are defined as:

$$ETR_{X=\{EE,ES,B\}} = \frac{SSC_X}{INC_X} \quad (11)$$

In order to calibrate the remaining two ETRs (for wages and self-employment income; the ETR for benefits is taken from the OECD SOCX database – Box A 1) so that all three ETRs are consistent with the aggregate one (i.e. to have the correct level of SSCs paid by households when ETRs are applied to national accounts aggregates of wages, self-employment income and benefits), we assume a constant ratio of the two ETRs:

$$\frac{ETR_{ES}^{SSC}}{ETR_{EE}^{SSC}} = r_{SSC_{EE}^{ES}} = 0.67 \quad (12)$$

This ratio is calibrated as the median ratio for European countries for which data on income-specific ETRs are available (Box A 1), of 2016-19 averages, excluding outliers (negative values and values above 2.6 times the cross-country average).⁸

Combining information about the aggregate SSC ETR, the SSC ETR for benefits and the relative ETRs for wages and self-employment income, the SSC ETR for wages is given by:

$$ETR_{EE}^{SSC} = \frac{ETR_A^{SSC} * INC - ETR_B^{SSC} * INC_B}{INC_{EE} + r_{SSC_{EE}^{ES}} * INC_{ES}} = \frac{SSC - SSC_B}{INC_{EE} + 0.67 * INC_{ES}} \quad (13)$$

and thus the SSC ETR for self-employment income is:

$$ETR_{ES}^{SSC} = r_{SSC_{EE}^{ES}} * ETR_{EE}^{SSC} = 0.67 * ETR_{EE}^{SSC} \quad (14)$$

Current taxes on income and wealth paid by households

ETRs for current taxes paid on income and wealth by households (annotated as PIT) can be derived in an analogous way to ETRs for SSCs paid by households (see above). For the calculation of the aggregate PIT ETR, we distinguish five income types, though the last is not actually taxed: wages (EE), self-employment income (ES), benefits (B), property income (YPE) and operating surplus (OS):⁹

$$ETR_A^{PIT} = \frac{PIT}{INC} = \frac{PIT_{EE} + PIT_{ES} + PIT_B + PIT_{YPE} + PIT_{OS}}{INC_{EE} + INC_{ES} + INC_B + INC_{YPE} + INC_{OS}} \quad (15)$$

Thus, given the PIT ETR for benefits and calibrated based on the EC data relative ETRs:

$$\frac{ETR_{ES}^{PIT}}{ETR_{EE}^{PIT}} = r_{pit_{EE}^{ES}} = 0.59, \quad \frac{ETR_{YPE}^{PIT}}{ETR_{EE}^{PIT}} = r_{pit_{EE}^{YPE}} = 0.93, \quad \text{and} \quad \frac{ETR_{OS}^{PIT}}{ETR_{EE}^{PIT}} = r_{pit_{EE}^{OS}} = 0 \quad (16)$$

the PIT ETR for wages is given by:

$$ETR_{EE}^{PIT} = \frac{ETR_A^{SSC} * INC - ETR_B^{SSC} * INC_B}{INC_{EE} + r_{pit_{EE}^{ES}} * INC_{ES} + r_{pit_{EE}^{YPE}} * INC_{ES}} \quad (17)$$

and subsequently for self-employment income, property income and operating surplus:

$$ETR_{ES}^{PIT} = 0.59 * ETR_{EE}^{PIT}, \quad ETR_{YPE}^{PIT} = 0.93 * ETR_{EE}^{PIT} \quad \text{and} \quad ETR_{OS}^{PIT} = 0. \quad (18)$$

Constant ETRs

In the baseline simulations, all ETRs are assumed to remain constant at recent level as it would be difficult to convincingly justify the direction and the magnitude of any change (Table A.1). This assumption implies no changes in tax policy over the projection period (this is relaxed in the policy section). In addition, in the case of progressive personal income tax (PIT), it implies two additional conditions: that tax brackets adjust in line with income growth and that the income distribution does not change. Similarly, in the case of value added tax (VAT), where tax rates differ across consumption items, the composition of consumption remains constant.

⁸ A possible modification of this assumption is to use country-specific ETRs for countries with available data, and for the remaining countries use the median, with the obvious drawback of different treatment between the two sets of countries.

⁹ Operating surplus for the household sector is mostly an estimate of imputed rents which, in most countries, are not taxed.

Table A.1. Calibrated model's ETRs

	SSCs paid by/on:				PIT paid by/on:				Indirect taxes			Direct
	Emplo- yers	Emplo- yees	Self-em- ployed	Bene- fits	Emplo- yees	Self-em- ployed	Property income	Bene- fits	Consum- ption	Payroll	Others	taxes on business
Australia	10.6	-9.5	-6.3	0.1	21.4	12.7	19.9	0.5	10.3	2.8	4.7	17.6
Austria	17.6	16.1	10.7	3.0	15.7	9.3	14.6	12.1	18.8	5.2	1.8	9.9
Belgium	25.8	13.7	9.1	2.8	21.2	12.6	19.6	11.1	18.4	0.0	4.0	14.1
Canada	13.9	8.8	5.8	1.5	19.2	11.4	17.8	5.8	10.7	1.4	5.4	16.7
Czech Republic	23.2	16.3	10.9	0.0	12.6	7.5	11.7	0.0	23.3	NA	1.1	9.0
Denmark	7.8	4.5	3.0	5.7	38.4	22.8	35.5	22.6	28.4	1.3	2.0	12.6
Estonia	25.7	3.7	2.5	0.6	12.4	7.4	11.5	2.6	26.2	NA	1.0	4.9
Finland	17.6	8.4	5.6	3.8	21.8	12.9	20.2	15.4	23.8	NA	1.4	10.2
France	26.3	14.9	9.9	2.0	17.7	10.5	16.4	8.0	17.8	3.2	5.1	13.2
Germany	17.7	23.5	15.7	1.6	14.9	8.9	13.8	6.4	17.2	NA	1.6	11.8
Greece	22.9	15.0	10.0	1.5	13.6	8.1	12.6	6.0	18.0	0.0	5.0	13.5
Hungary	16.9	16.4	10.9	0.0	12.8	7.6	11.8	0.0	29.1	2.1	2.6	4.4
Ireland	16.1	6.8	4.6	0.7	25.3	15.0	23.4	3.0	18.8	0.6	2.1	5.4
Italy	26.7	9.7	6.4	4.0	18.1	10.8	16.8	15.9	14.7	0.0	5.5	8.7
Japan	15.2	15.5	10.4	1.2	9.3	5.5	8.6	4.8	7.8	NA	4.0	14.2
Lithuania	21.6	25.6	17.0	0.0	8.3	4.9	7.7	0.0	17.8	NA	0.5	4.5
Luxembourg	13.7	6.1	4.0	3.8	11.5	6.8	10.6	15.2	25.2	0.0	2.8	22.3
Netherlands	21.3	30.1	20.1	1.8	14.5	8.6	13.5	7.2	20.8	0.1	2.5	12.2
Norway	20.0	12.6	8.4	3.0	20.4	12.1	18.9	12.2	23.8	0.1	1.7	15.6
Poland	16.2	17.4	11.6	3.2	6.1	3.6	5.7	13.0	20.0	0.6	1.9	9.2
Portugal	22.0	9.0	6.0	1.6	10.7	6.4	9.9	6.5	17.5	NA	3.6	13.4
Slovak Republic	23.8	17.6	11.7	0.0	9.7	5.8	9.0	0.0	18.1	NA	1.6	11.0
Slovenia	14.0	20.8	13.9	0.1	11.8	7.0	10.9	0.5	22.5	0.1	2.2	7.4
Spain	22.2	7.4	4.9	1.1	15.6	9.3	14.5	4.5	15.0	0.0	2.9	7.6
Sweden	16.6	3.6	2.4	4.7	24.9	14.8	23.1	19.0	24.9	19.6	1.6	10.8
Switzerland	15.6	22.3	14.9	4.4	10.9	6.5	10.1	17.7	8.8	0.0	0.9	13.3
United Kingdom	17.5	12.1	8.1	1.3	18.4	10.9	17.1	5.1	15.2	0.2	2.9	11.5
United States	18.7	6.9	4.6	1.8	14.7	8.7	13.6	7.2	5.6	0.0	3.2	7.5

Note: See Table 1 in the main text for indications about the respective tax bases for each of the ETRs.

Source: OECD calculations.

Household disposable income, saving rates and consumption

Household disposable income is calculated as the difference between the projections of gross household income, and SSCs and current taxes paid by households, in line with the national accounts convention. SSCs and current taxes are subtracted from wages, mixed income and benefits, while only current taxes are deducted from property income. No SSCs and current taxes are applied to household operating surplus. Subsequently, private consumption is given by applying a constant saving rate (the 2016-19 average) to household disposable income.

Taxes on production and exports (indirect taxes)

The model incorporates three types of taxes on production and exports (sometimes referred to as indirect taxes):

- *Consumption taxes.* They comprise only VAT, sales, turnover, import tariffs and excise duties. The ETR is calculated with total household consumption from the national accounts as the tax base and calibrated at the 2016-19 average.
- *Payroll taxes* are part of taxes on production and imports in the national accounts classification (indirect taxes). For countries where they exist, the ETR is calculated with respect to compensation of employees and calibrated at the 2016-19 average.
- *Remaining indirect taxes* are calculated by subtracting consumption and payroll taxes from total indirect taxes. They are assumed to remain constant in relation to GDP over the projection period at their 2016-19 average.

Other taxes and government revenue aggregates

SSCs paid by employers are projected using a constant ETR calculated from the national accounts data (with respect to compensation of employees at the average for 2016-19). The sum of SSCs paid by households (which affect household disposable income) and SSCs paid by employers is usually larger than SSCs received by government as some countries' mandatory social security systems are managed privately or by NGOs. Thus, it is assumed that SSCs received by government grow at the same rate as SSCs paid by households and employers (nominally).

The model also includes direct taxes on businesses that are derived by applying a constant calibrated ETR (2016-19 average) to the operating surplus generated outside the household sector.

The model simulations are reported as changes in GDP ratios between 2023 and 2060. The starting year is chosen to be based on modelled data. Given the stylised nature of the model, for some variables, there is a level shift between model-implied variable in 2023 and the corresponding value in the Economic Outlook (EO) No. 109 database in 2022 (which is the end year of this database). Choosing a year before 2023 would affect the reported changes in the tax-to-GDP ratios and this effect would not be related to the mechanisms of the model.

Country coverage

The country coverage depends on the availability of the long-term projections of public spending on pensions and health care and the availability of data to calculate tax implications of population ageing (model of this paper). Tax simulations are possible for 28 OECD countries. The unavailability of the long-term projections of public spending prevents model simulations for Chile, Colombia, Costa Rica, Mexico and the Republic of Türkiye. Whereas the lack of data prevents setting up the tax model for Iceland, Israel, Korea, Latvia and New Zealand.