INTERNATIONAL MONETARY FUND

IMF Country Report No. 25/129

IRELAND

SELECTED ISSUES

June 2025

This paper on Ireland was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on May 20, 2025.

Copies of this report are available to the public from

International Monetary Fund • Publication Services
PO Box 92780 • Washington, D.C. 20090
Telephone: (202) 623-7430 • Fax: (202) 623-7201
E-mail: publications@imf.org Web: http://www.imf.org

International Monetary Fund
Washington, D.C.

INTERNATIONAL MONETARY FUND

IRELAND

SELECTED ISSUES

May 20, 2025

Approved By
European Department

Prepared By Raphael Lam, Rossen Rozenov, Yang Yang, Yen Mooi, Zhao Zhang, and Yinjie Yu

CONTENTS

FIGURES

TABLE

ANNEX

BENCHMARKING PUBLIC SPENDING EFFICIENCY IN EDUCATION, HEALTH, AND INFRASTRUCTURE 55

FIGURES

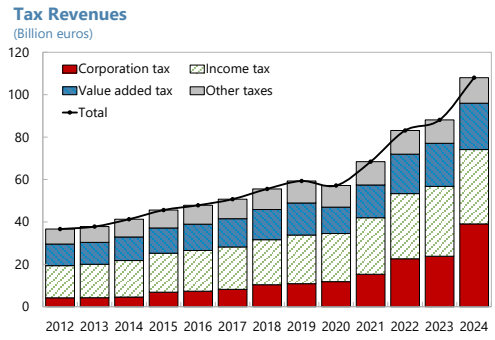
CONSIDERATIONS FOR A STRONGER FISCAL FRAMEWORK IN IRELAND[1]

Ireland's reliance on corporate income tax (CIT) receipts from multinational enterprises (MNEs), concentrated in a small number of companies, presents significant risks to the budget. The uncertain nature of this revenue calls for a robust fiscal framework to safeguard public finances from shocks. As the EU fiscal framework uses GDP, an unsuitable measure of the Irish economy given MNE activities, and the net spending rule introduced by the previous government has lapsed, this paper proposes to strengthen the national fiscal framework by establishing a prudent medium-term debt anchor and an expenditure rule to guide the annual budget process. We first establish a prudent debt anchor for Ireland by calibrating CIT shocks and simulating possible debt trajectories. Second, we propose an operational rule based on multi-year expenditure ceilings. The ceilings are calibrated such as to stabilize debt at the anchor level while accounting for the economy's cyclical positions.

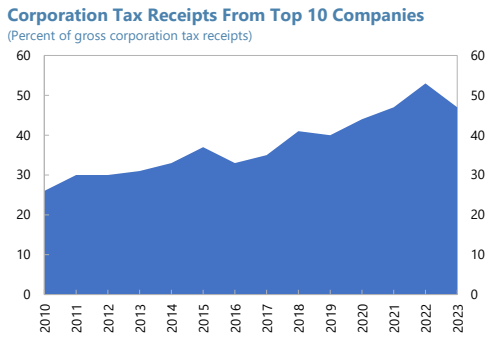
A. Introduction

1. Tax revenues in Ireland are vulnerable to external shocks that can be disproportionate to the size of the country's domestic economy. CIT from MNEs, the second largest revenue source, exhibits a high degree of concentration and is subject to substantial uncertainty. In addition to their direct impact on CIT, MNEs also contribute significantly to employment and wages, boosting personal income tax and VAT in Ireland. Firm- and sector-specific shocks, as well as global trade and tax policy shifts could pose significant risks to Ireland's fiscal outlook.

Figure 1. Ireland: Developments of CIT Revenues



Sources: Department of Finance and Haver Analytics.



Sources: Tax and Customs, Department of Finance, Haver Analytics, and IMF staff calculations.

2. The uncertain nature of CT revenue calls for a strong national fiscal framework to safeguard Ireland's public finances. While Ireland currently enjoys a relatively comfortable fiscal position thanks to large windfall CIT revenues, the situation can change quickly, as past GFC

[1] Prepared by Raphael Lam (FAD), Rossen Rozenov (EUR), Yang Yang (EUR), and Yinjie Yu (EUR Summer Intern), with research assistance by Santiago Previde (EUR). This paper benefited from valuable comments and suggestions from the Department of Finance, the Central Bank of Ireland, the Irish Fiscal Advisory Council, and participants in staff's presentations during the Article IV consultation mission.

experience with the sudden unwinding of property-related receipts has shown. The previous government introduced a spending rule stipulating that the annual growth of nominal expenditure net of discretionary revenue measures would not exceed 5 percent during 2021–25.[2] This rule, essentially linking expenditure growth to the potential growth of the economy, could have provided a reasonable guide for fiscal policy had it been adhered to. However, it was repeatedly breached without corrective actions following noncompliance. Moreover, it covered only the central government, was not legislated, and has now lapsed. Although Ireland has adopted the EU fiscal framework, Ireland-specific factors limit its effectiveness. In particular, 1) the EU framework relies on GDP as a denominator when the Modified Gross National Income (GNI*)[3] is a more appropriate measure of the domestic economy; and 2) it does not capture the disproportionately large revenue risks specific to Ireland. Against this backdrop, a national fiscal rule that ensures macroeconomic stabilization and debt sustainability and enhances the credibility of fiscal policy would help strengthen Ireland's fiscal framework.

3. At the same time, Ireland faces significant spending needs to alleviate supply constraints and address long-term pressures. In the absence of adequate fiscal buffers, the sudden reversal of property-related fortunes during 2009–2012 contributed to significant shortfalls in housing and infrastructure investments thereafter. Ireland needs substantial public investment to upgrade infrastructure, maintain public services, and increase housing supply for a growing population. Addressing these needs while staying within a sound fiscal framework would ensure that additional spending does not just lead to higher costs but delivers real output. A stable fiscal framework would also ensure certainty that is needed for both public and private investment. In addition, long-term pressures related to climate mitigation/adaptation, population aging, defense, and digital transformation also present important risks to the fiscal outlook. Therefore, it is important to take a long-term perspective when designing the framework to safeguard the well-being of future generations by building adequate buffers.

4. This paper proposes to strengthen Ireland's national fiscal framework with a prudent medium-term fiscal anchor and consistent expenditure ceilings. A fiscal anchor based on debt to output ratios can guide fiscal policy towards its objectives. It is necessary because operational rules such as expenditure limits alone do not by themselves guarantee fiscal sustainability: depending on the starting point, they may lock in perpetual structural surplus or deficits (IFAC 2021). Under the sustainability and stabilization objectives of fiscal policy, an effective fiscal rule should meet several criteria, including simplicity, operational guidance, resilience, and ease of monitoring and enforcement (IMF, 2018). The paper abstracts from discretionary revenue measures in its analysis, and defines expenditure limits as net of such measures, consistent with the definition of the previous government's net spending rule. Although beyond the scope of this paper, broadening the tax

[2] Summer Economic Statement July 2021. Department of Finance.

[3] Modified Gross National Income (GNI*) is an indicator designed by the Central Statistical Office (CSO) to measure the size of the Irish economy by excluding MNEs' globalized operations: Modified GNI - CSO - Central Statistics Office.

base will allow for higher investment spending while reducing Ireland's reliance on CIT and staying within net expenditure limits under the enhanced fiscal framework.

B. Calibrating a Prudent Debt Anchor

5. A risk-based framework is applied to calibrate an appropriate medium-term debt anchor for Ireland (IMF, 2018). Customized shocks are modelled and simulated to quantify MNE-related risks, and debt trajectories are simulated with calibrated shocks to determine a prudent debt anchor over the medium term. Specifically, the quantitative approach aims to account for potentially volatile and persistent CIT shocks in simulating a debt "fan chart" for Ireland.[4] A debt anchor can be derived within this framework for given risk tolerance and an exogenously imposed debt benchmark. However, backward-looking statistical models may not fully capture certain tail-risks such as a mass relocation of MNEs. In addition, not all risks can be mitigated, insured, or provisioned for through contingency funds in the budget. It is therefore crucial to create sufficient buffers from the debt benchmark when designing anchors.

6. Two quantitative approaches (top-down and bottom-up) are employed to derive debt anchors. The top-down approach uses a cross-country FDI panel dataset to gauge risks associated with MNE operations. This approach relies on the historical behavior of FDI in Ireland and other countries to calibrate the FDI shocks Ireland may face in the future. The bottom-up approach uses firm-level data to estimate firm or sector specific risks that could have a significant impact on Ireland's highly concentrated CIT. The two approaches aim to quantify the underlying sources of CIT volatility from two perspectives and can be compared for cross-checking and robustness.

7. Debt anchors can be specified such that they will encourage the buildup of fiscal buffers and limit the probability that debt will reach high levels that could lead to adverse consequences. The European Union's 60 percent debt to GDP benchmark, a centerpiece of the EU fiscal framework, serves as a useful upper threshold. The 60 percent benchmark is not a strict upper bound, and the maximum debt carrying capacity for Ireland, while very uncertain, is likely to be higher. However, countries with debt exceeding 60 percent of GDP run the risk of entering the Excessive Deficit Procedure (EDP)[5] and potentially triggering negative market reactions. Therefore, this paper considers that a prudent anchor should be set to keep the debt-to-output ratio below 60 percent with a sufficiently high probability to preserve strong credit ratings associated with low borrowing costs. The difference between the debt benchmark and the estimated debt anchor is the safety buffer. Simulations based on the calibration of MNE shocks form a debt distribution that provides a probabilistic assessment of how likely debt will exceed the benchmark within a given

[4] The EU fiscal framework and the IMF's DSF also rely on risk-based approaches to gauging medium-term debt sustainability. However, those frameworks do not fully account for the large uncertainty of Ireland's MNE sector. Casey and Cronin (2023) explore how the proposed new framework might look were it better tailored to Ireland. They substitute GNI* for GDP and adjust for excess corporation tax receipts when determining the stress tests.

[5] Once the EDP is launched, the European Commission will adopt a recommendation for the member state concerned to take the necessary action within six months to address excessive deficits and restore debt sustainability. If, by the deadline, no effective action has been taken, or the member state does not comply with the recommendation, the Council may impose sanctions.

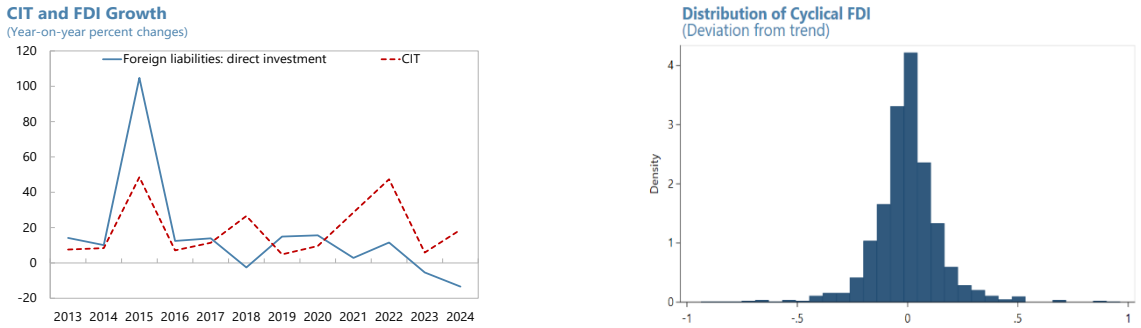
horizon. This approach can ensure that public debt stays around sufficiently prudent levels to build up fiscal buffers (Brunnermeier, Merkel, and Sannikov 2022).

8. Setting a prudent debt anchor should consider measurement choices for output (GDP vs. GNI*) and debt (gross vs. net debt). While GDP is commonly used and reported as a denominator that is consistent with cross-country comparison, in the case of Ireland it is not the appropriate metric due to MNE operations. Importantly, a significant share of GDP is generated by MNE activities that may be of transient nature and do not necessarily reflect the domestic economy (IFAC 2021). GNI*, on the other hand, is a measure of the taxation capacity of domestic national output excluding the MNEs' globalized operations, hence a more appropriate measure to capture the debt servicing capacity of the domestic economy, when excess CIT revenues become unavailable. For example, one study by IFAC finds that GNI* is statistically better able to explain historical movements in taxes, making it a superior measure for predicting future taxes and assessing public finances (Irish Fiscal Advisory Council, 2021). With GNI* as the denominator, it is essential to account for the part of CIT revenues that is saved as the government's liquid assets, by using a net debt concept (gross debt – cash balance). The following sections consider both measures in calibrating debt anchors: gross debt to GDP as used in the EU fiscal rules, and net debt to GNI*.

Top-down FDI Risk Approach

9. Risks to MNE activities are quantified using historical FDI data of similar small and open economies. Conceptually, changes in FDI capture a variety of shocks that affect both MNE output and CIT, including global factors, prospects of firm and industry profitability, and domestic and international tax policy. While FDI does not translate one-for-one into CIT in the short run, FDI should determine the levels of MNE activities and profits, and hence CIT, in the steady state. Empirically, Ireland's time series data, characterized by country-specific structural breaks, may not allow for assessing the full extent of potential FDI-related risks that Ireland may face in the future. Therefore, for the purpose of this analysis, FDI risks are calibrated by exploring the historical distribution of FDI among 58 small open economies (see Appendix I). This way, the analysis adds to the standard macro-fiscal shocks based on Ireland's historical data by using variations in other countries' FDI to simulate risks that Ireland may face in the future.

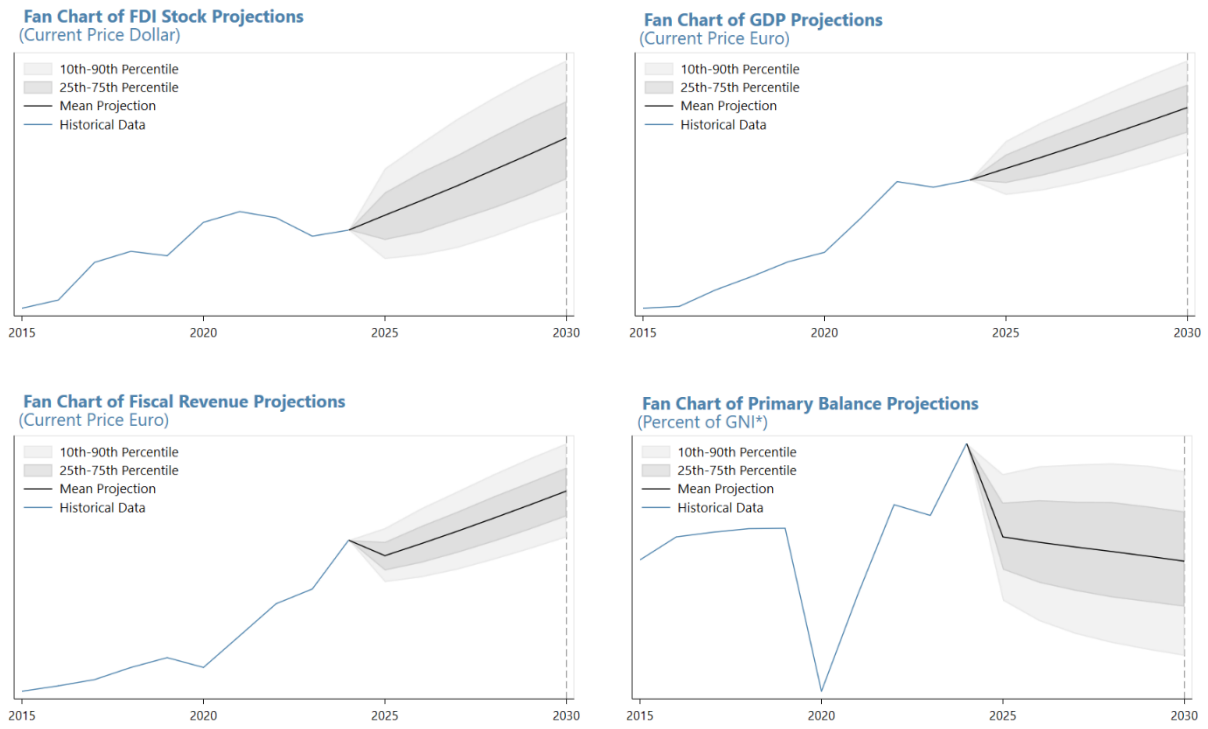
Figure 2. Ireland: CIT and FDI Variation



Sources: CSO, Haver Analytics, DFIN, World Economic Outlook, and IMF staff calculations.

10. Fan charts for key macro variables with FDI shocks are simulated to illustrate the potential uncertainty around Ireland's future debt paths. While the panel data approach mitigates the effect of the structural breaks in Ireland's data such as the large shift of intangible assets in 2015, past international capital flows were also affected by common trends including the rapid globalization. However, the variation of FDI around the trend should still be able to capture the substantial risks around any baseline projections. For this reason, assumptions on trend growth are made to link FDI, GDP or GNI*, revenue, and debt in the central scenario over the projection period. CIT is assumed to grow in line with FDI, while other revenues are assumed to grow in line with the domestic economy. In the baseline, both FDI and the domestic economy are assumed to grow by 4.25 percent in nominal terms over the medium-term (Department of Finance, 2023; Central Bank of Ireland, 2024), while nominal expenditure is assumed to grow by 5 percent annually, in line with the previous government's rule. Variations around the central scenario capture upside and downside risks, which are largely symmetric.

Figure 3. Ireland: Simulated Macro Variables



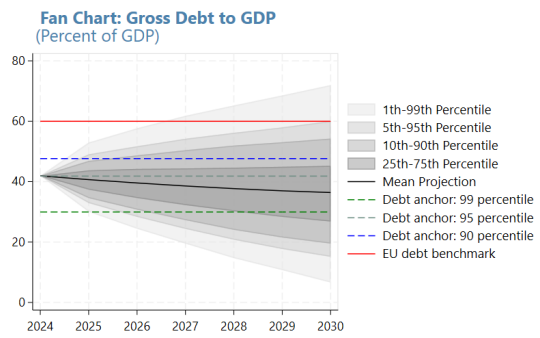
Sources: CSO, Haver Analytics, DFIN, IMF staff calculations.

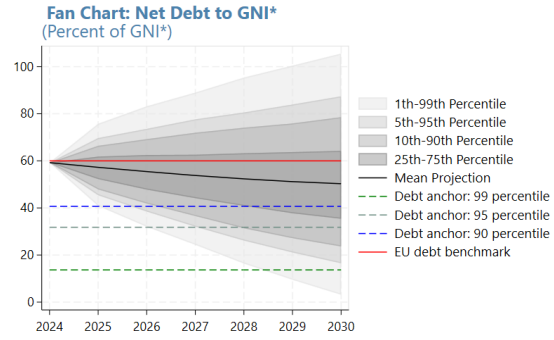
11. Simulations suggest that debt anchors ranging from 30 to 40 percent of GDP or GNI* would put Ireland on a comfortable path over the medium term. If gross debt starts at the level of about 40 percent of GDP as of end 2024, there would be 5 percent probability of exceeding 60 percent of GDP by 2030 under the output and expenditure growth path discussed earlier.

Simulated Debt Anchors			
	Risk tolerance (percent)		
	1	5	10
Gross debt/GDP	31	42	48
Net debt/GNI*	16	32	42
Sources: CSO, DFIN, and IMF staff calculations.			

With 40 percent of GDP as the medium-term anchor, the authorities' fiscal consolidation plan laid out in the 2025 budget and medium-term fiscal structural plan, in which the debt-to-GDP ratio is projected to continue to decline over the medium term, is consistent with maintaining debt at the anchor level. An anchor based on net debt to GNI*, however, would imply a greater consolidation effort. This is because the size of GNI* is significantly smaller than that of GDP as a denominator, and the same shock to revenues would have a larger impact on the debt ratio, making it more likely to exceed the 60 percent benchmark. With a risk tolerance of 10 percent, the GNI*-based net debt anchor is about 40 percent which still provides a comfortable buffer relative to the 60 percent benchmark. The budget balance path in the medium-term fiscal-structural plan entails a gradual reduction in net debt-to-GNI* ratio toward the debt anchor.

Figure 4. Ireland: Simulated Debt Fan Charts: FDI Risks

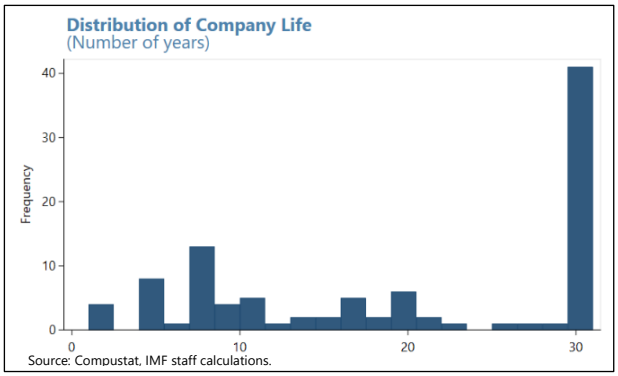




Sources: CSO, Haver Analytics, DFIN, IMF staff calculations.

Bottom-up Firm Risk Approach

12. Firm and sector-specific shocks are calibrated to account for concentration risks. The top 10 corporate taxpayers account for more than 50 percent of Ireland's total CIT (IFAC 2023). Income shocks to or operational changes by any of these large taxpayers can have a significant impact on CIT receipts (Ministry of Finance, 2022). The CIT vulnerability to sector- and firm-specific shocks is estimated using Compustat firm-level data. More specifically, the largest multinational companies in the chemical and IT sectors are selected to estimate a historical distribution of firm profits over the past 3 decades. The estimated distribution of profits is then employed to calibrate firm-specific profitability shocks for the top 10 CIT payers in Ireland, and an exit rate of 5 percent per year is assumed to account for firm exits.



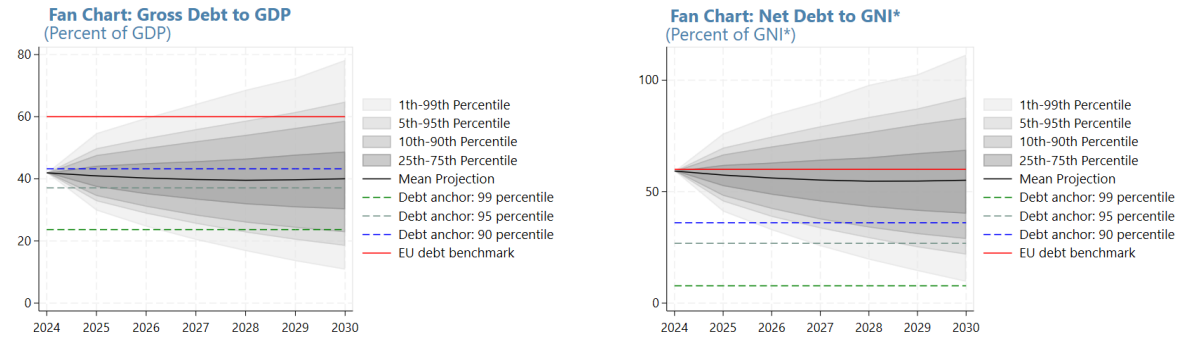
13. Simulation results from the bottom-up approach are broadly in line with the top-down approach. A gross debt to GDP ratio of 43 percent or below would ensure the probability of breaching the 60 percent benchmark by 2030 is no more than 10 percent. Using the net debt to GNI* ratio would again imply a lower debt anchor. To ensure net debt does not breach 60 percent of GNI* by 2030 with 90 percent probability, the level of net debt would need to be brought down to around 36 percent of GNI*, compared to the current level of about 60 percent. Overall, both macro panel data and firm-specific approaches suggest that a debt anchor set at 40 percent of GNI* (for net debt) would be prudent enough to ensure that the EU benchmark is not breached in most scenarios.

Simulated Debt Anchors

	Risk tolerance (percent)		
	1	5	10
Gross debt/GDP	24	37	43
Net debt/GNI*	8	27	36

Sources: CSO, DFIN, and IMF staff calculations.

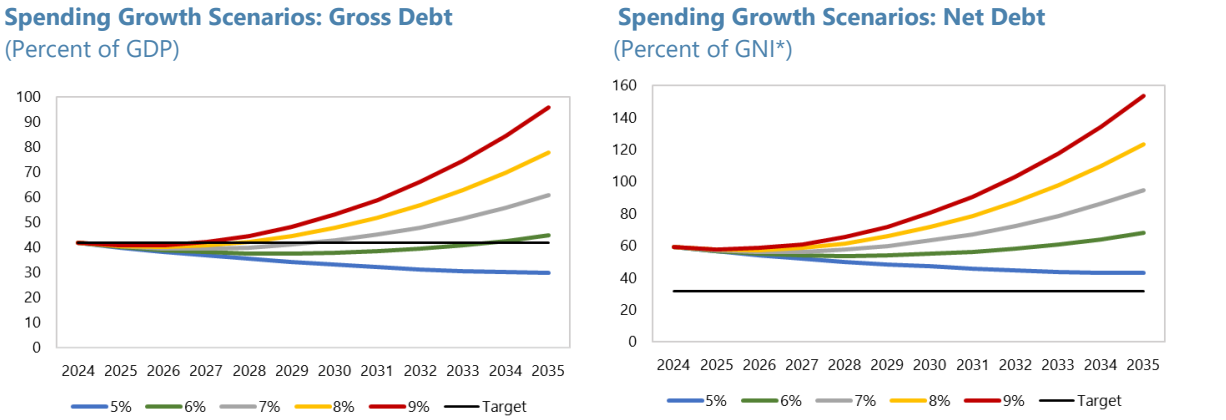
Figure 5. Ireland: Simulated Debt Fan Charts: Firm Risks



Sources: CSO, Haver Analytics, DFIN, IMF staff calculations.

14. Annual spending growth targets should be consistent with a prudent debt anchor. The 5 percent annual nominal spending growth assumed in the baseline would ensure a downward path for debt over a ten-year period. A 6-percent expenditure growth annually could still anchor debt over the medium term, although the debt trajectory would already begin to trend up toward the end of the simulation horizon. With higher growth rates this happens sooner, implying that such spending trajectories may not be compatible with long-term fiscal sustainability. Furthermore, increasing expenditure at a constant rate may not be optimal as it fails to capture the economic stabilization role of fiscal policy. And in the very long term, even a 5-percent spending growth may not be sufficient for debt stabilization under the annual revenue growth assumption of 4.25 percent.

Figure 6. Ireland: Debt Trajectories Under Different Expenditure Paths



Sources: CSO, Haver Analytics, DFIN, IMF staff calculations.

C. Calibrating an Operational Rule

15. An operational rule is needed to guide near-term fiscal policy. A debt anchor alone would generally be insufficient for effective fiscal management as it lacks a mechanism to guide short-term policy decisions and ensure compliance over time. Thus, a debt anchor must be complemented by an operational rule—such as expenditure or fiscal balance rule—to provide a clear and actionable framework. Ideally, operational rules should be designed such as to help achieve and maintain the debt objective while considering the economic conditions and implementation constraints. Without an operational rule, there are higher risks of procyclical policies and delayed adjustments which could undermine the credibility and effectiveness of the debt anchor.

16. Expenditure rules are usually considered more effective than budget balance or revenue rules. They are easier to monitor and enforce (governments have direct control on spending) and allow automatic stabilizers to operate. They are also less vulnerable to overly optimistic revenue forecasts than balance-based rules, for example. Indeed, studies have found (Belu Manescu and Bova, 2020) that the procyclical bias of fiscal policy is lower in the presence of expenditure rules. The design matters, however, including coverage, legal basis, monitoring and consequences for non-compliance.

17. For Ireland, an operational rule in the form of multi-year expenditure ceilings seems appropriate. The ceilings should ideally cover all institutions under the general government classification. Frameworks involving multi-year limits on government spending have been in place in a number of countries. For example, in the Netherlands, after elections, the new government publishes a coalition agreement which, among other things, defines expenditure ceilings for the main budgetary areas (central government, social security and healthcare) for the next four years (Vierke and Masselink, 2017). Similarly, the Danish Budget Act sets four-year expenditure ceilings for

the state, municipalities and regions.[6] Ireland could benefit from a framework that provides a clear link between the debt anchor and the annual fiscal outcomes. Given a revenue path consistent with the medium-term macroeconomic projections, the multi-year expenditure ceilings can be informed by considerations for macroeconomic stability while ensuring debt sustainability. In times of positive revenue shocks, expenditure ceilings would help prevent procyclical spending.

18. Fiscal reaction functions (FRFs) could be a useful conceptual framework to guide the calibration of expenditure ceilings. A typical fiscal reaction function sets the primary balance as a function of the cyclical position of the economy, the level of public debt and the past value of the primary balance (PB):

$$p_{t+1} = \beta_0 p_t + \beta_1 \gamma_t + \beta_2 b_t, \quad (1)$$

where p_t is the primary balance, γ_t is the output gap or some other measure of the economic cycle, and b_t stands for public debt. For a given revenue path, the above FRF determines uniquely the expenditure trajectory.

19. The specification of an FRF requires information about the economy's cyclical position. A key difficulty comes from estimating the output gap which is not measured directly. While this is a demanding task in general, it is all the more challenging in the case of Ireland where GDP is distorted by activities of the large MNE sector. GNI* could be used instead but it is available only at the annual frequency and data are published with a considerable delay. Another possible measure is modified domestic demand, but it only focuses on domestic activity and does not cover external operations. As an alternative to the output gap, one can consider the unemployment gap. While this does not circumvent the problem of estimating an unobservable quantity (natural unemployment), it offers the advantage that employment data are timely and subject to less revisions. For the purposes of this paper, natural unemployment is estimated based on a two-state Markov switching model (Appendix I).

20. FRFs can be either estimated from past data or calibrated based on theoretical frameworks. In an influential study, Bohn (1998) estimates a primary balance (PB) equation with U.S. data and finds strong evidence of a positive response of the PB to the debt ratio. This finding has been confirmed by many other studies. For example, Plödt and Reicher (2015) estimate a debt response coefficient between 0.05 and 0.08 for a panel of euro area economies and a cyclical response coefficient between 0.4 and 0.7. While the econometric approach provides an evidence-based assessment of fiscal behavior, it may be sensitive to data quality and structural changes. This is an important consideration in the case of Ireland, given the large volatility of times series around the global financial crisis and the structural break in 2015. Alternatively, FRFs can be calibrated using economic models that incorporate policy objectives, fiscal multipliers, and sustainability conditions.

[6] See https://www.retsinformation.dk/eli/lta/2012/547 (in Danish).

Calibration is particularly useful when historical data have limitations and the goal is to design forward-looking fiscal rules.

21. Optimization techniques can be used to identify parameter values that best align with the policy objectives. Based on a simple linear model of fiscal policy entailing unemployment gap, primary balance and debt equations and a quadratic cost function penalizing deviations from target values of the variables of interest, an FRF in the form of (1) is obtained as the feedback solution to an intertemporal optimization problem. To explicitly account for uncertainty in the model (misspecification, shocks, measurement errors), robust control methods have been tried as well (see Appendix I for details).

22. Optimization-based results suggest that an average nominal expenditure growth around 5 percent over the next ten years, with somewhat higher growth initially, is consistent with sustainability. Simulations are based on net debt and GNI* using the 2024 estimates as presented in the Budget 2025 documentation as initial values (outcomes are similar when gross debt and GDP are used and are not reported here).[7] Under plausible assumptions about the model parameters, the optimized FRFs are successful in stabilizing debt at the anchor (assumed at 40 percent), and the unemployment gap at zero (Figure 7). Different methodologies imply varying speeds of adjustment, reflecting differences in the FRF coefficients (text table). Qualitatively, however, they are similar and imply a gradual unwinding of the primary surplus which initially is associated with negative unemployment gaps. Given the model-based primary balance path and assuming a constant ratio of fiscal revenue to GNI*, which is broadly supported by the data (Figure 8), one can recover an expenditure growth path consistent with the policy objectives.

Fiscal Reaction Functions

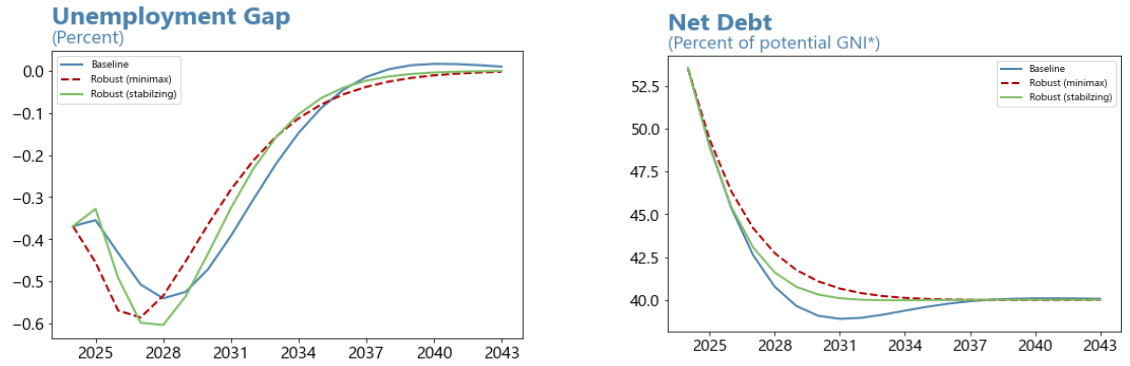
	$\hat{u}$	$\hat{p}$	$\hat{b}$
Baseline	-0.43	-0.57	0.15
Robust (minimax)	-0.73	-1.09	0.29
Robust (stabilizing)	-0.53	-0.89	0.28

23. While the time profile of spending growth varies, the average rates are similar across methods. They range between 6 ¼ and 6 ½ in the first 5 years and around 5½ percent in the first 10 years. After that, the FRFs prescribe that expenditure should grow at the same rate as nominal revenue. The higher spending growth in the initial years is primarily driven by the favorable current fiscal position. There is clearly a trade-off between the need to close the negative unemployment (positive output) gap on the one-hand, which implies tighter fiscal policy, and to reduce the substantial primary surplus on the other which requires higher expenditure. The model helps to resolve this tension based on the weights assigned to the two objectives. If cyclical considerations are of main concern, the weight on the unemployment gap can be made much larger relative to that of debt. In such a scenario, the closing of the unemployment gap would occur faster. The size of the fiscal multiplier plays a role for the speed of adjustment as well. In the illustrative simulations presented here, the weight on the cyclical position is higher than that of debt but not significantly

[7] See "Budget 2025: Economic and Fiscal Outlook", Department of Finance, October 2024

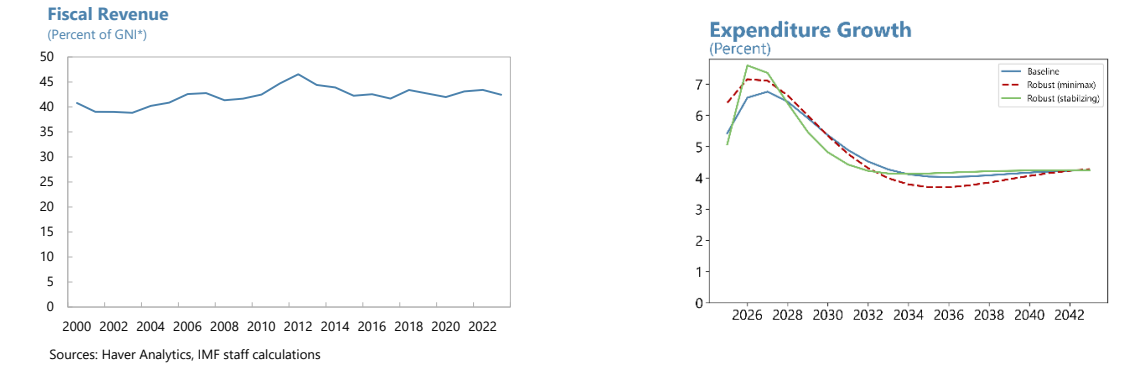
higher, resulting in a more persistent gap. This, however, offers an opportunity to step up productive public investment in the initial period.

Figure 7. Ireland: Optimal Trajectories



Source: IMF staff calculations

Figure 8. Ireland: Revenue Ratio and Expenditure Growth



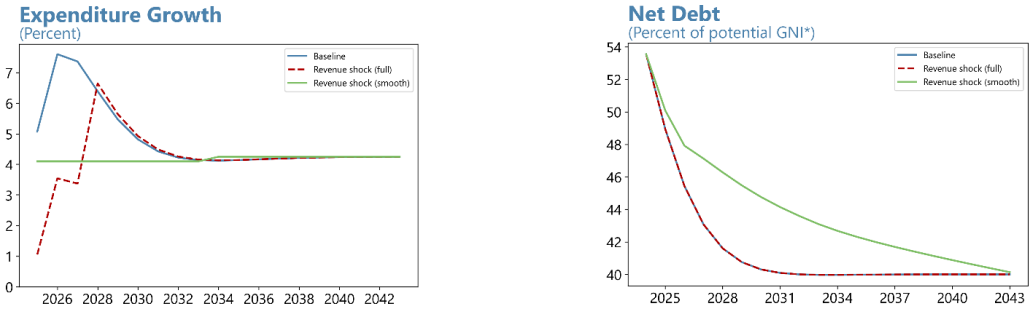
Source: CSO, IMF staff calculations

24. A permanent shock to revenue would require the use of fiscal buffers to smooth primary expenditures toward the new equilibrium. For illustrative purposes it is assumed that the CIT windfall estimated at about 4.5 percent of GNI* disappears over the course of three years, resulting in a drop in the revenue ratio which falls to about 38 percent and remains at that level afterwards. Two scenarios for expenditure are presented in Figure 9—one where spending adjusts fully to achieve the primary balance prescribed by the model-based rule and one involving smoothing of expenditure. In the first case, nominal expenditure only increases between 1 and 3 ½ percent in the first three years but the growth rate catches up later[8], while in the smoothing scenario it grows at about 4 percent per annum. This, however, comes at the cost of postponing the moment in time when debt reaches the anchor; it only happens toward the end of the simulation horizon. Intermediate scenarios are, of course, possible. It is important to note that the shock scenario presented above does not take into account the possible use of financial assets outside of

[8] In level terms though, expenditure remains lower – about 90 percent of that in the baseline.

the definition of net debt, such as those in the two savings funds, for example. Drawing on these assets would cushion the effect of the shock in the initial years while still allowing the debt anchor to be achieved within a reasonable timeframe.

Figure 9. Ireland: Revenue Shock Scenario



Source: IMF staff calculations

D. Concluding Remarks and Policy Implications

25. A well-designed fiscal framework is essential for maintaining long-term fiscal sustainability while allowing for economic flexibility. Specifically, a prudent debt anchor combined with a net spending rule as an operational target seems an appropriate choice in light of Ireland's circumstances. A debt anchor of about 40 percent provides a fiscal buffer to absorb economic shocks while maintaining a prudent level of indebtedness. In determining the appropriate debt metric, both gross debt to GDP and net debt to GNI can be considered. Given that GNI reflects the domestic economy's size more accurately, it may be a more suitable denominator for defining fiscal anchors. Setting the operational rule in terms of expenditure (net of discretionary revenue measures) has multiple advantages, including limiting procyclicality, enhancing transparency and facilitating monitoring and enforcement. In terms of design, expenditure ceilings, informed by cyclical conditions and debt levels, would provide a stable and predictable framework.

26. For the fiscal framework to be credible, flexible, and transparent, several additional elements need to be considered:

- *Escape clause and triggering conditions:* National fiscal rules should be given legislative status. An escape clause should allow for temporary deviations from fiscal rules in response to exceptional circumstances, such as severe economic downturns or natural disasters. Clear and objective conditions for activating the clause must be predefined to prevent misuse.

- *Correction mechanism:* A well-defined correction mechanism should specify remedial actions if fiscal rules are breached. This could include automatic spending adjustments or requirements for corrective budget plans.

- *Independent fiscal oversight:* The Irish Fiscal Advisory Council should play a critical role in monitoring compliance with fiscal rules, assessing budget forecasts, and ensuring that fiscal policy remains credible.

- *Periodic review:* Regular reviews should be conducted to ensure that fiscal rules remain well-calibrated to macroeconomic and fiscal conditions. Adjustments may be necessary as macro-fiscal conditions and structures evolve.

- *Link to annual budgets and medium-term fiscal framework (MTFF):* The fiscal rule should be embedded in the annual budgeting process and aligned with the MTFF to ensure consistency between short-term fiscal policies and long-term objectives. Satisfying the operational rule should imply that the fiscal anchor is achieved.

- *The two savings funds* established in 2024—the Future Ireland Fund and the Infrastructure, Climate and Nature Fund—should be integrated into this strengthened fiscal framework.

27. Implementation of multi-year expenditure ceilings entails various design choices. Some of these include:

- *Nominal vs. real:* Spending limits can be set in nominal or in real terms. Nominal ceilings offer a number of advantages such as simplicity and transparency but may fail in an unstable inflationary environment. Setting the limits in real terms ensures that expenditure retains purchasing power but can be more difficult to communicate and requires choice of an appropriate price index (e.g., HICP, CPI or GDP deflator).

- *Levels vs growth rates.* Defining the ceilings in terms of growth rates has the benefits of ease of communications and continuity, and with full compliance the two approaches are equivalent. However, if the ceiling is breached in the fiscal outturn of a given year, the growth rates in subsequent years would require an adjustment to stay on the same fiscal path, given the higher base.

- *Treatment of cyclical expenditure:* Automatic stabilizers, such as unemployment benefits, could be excluded from expenditure ceilings to prevent unintended constraints on countercyclical fiscal policy.

- *Public investment:* In times of fiscal consolidation, the burden often falls on capital outlays. For a country with significant investment needs like Ireland, this would not be an optimal outcome. Consideration could be given to an approach that defines an overall expenditure ceiling consistent with the debt anchor and separate subceilings for current and capital expenditure within the overall limit. This, along with strengthened public investment management, would help limit unintended crowding out of capital spending. Excluding public investment from the expenditure ceiling, e.g., a golden rule or a rule that covers only current expenditures is not recommended as it increases the risk of creative accounting, selection of projects with low social returns, and excessive borrowing, given the weakened link to debt sustainability (IMF, 2018).

Instead, a slower adjustment toward the debt anchor could give policy space for upfront growth-enhancing investment in a transparent manner.

- *Link to financial assets:* Ireland has substantial financial assets (about 40 percent of GNI*). Part of these assets is held in cash instruments which will be counted toward the net debt definition should a net debt anchor be adopted. Still, a significant part will remain outside of the scope of the fiscal rule and will serve as a buffer and financing source for future spending pressures, e.g., related to ageing or climate change.[9] In particular, the two savings funds should play an important role in an integrated fiscal strategy.

[9] A fiscal rule comprising explicit targets on net worth would create a number of operational and conceptual challenges. First, net worth is a volatile indicator due to frequent revisions of the discount rate used to value nonfinancial assets, making it difficult to assess confidently whether the rules are met or not. Second, the concept may not be straightforward to the public. Third, a net worth rule, on its own, would mean there are no limits on borrowing for investment and it would also risk gold plating, as the quality of investment would not be taken into account. Fourth, net worth is an imperfect indicator of fiscal sustainability since non-financial assets are mostly illiquid; they cannot realistically be sold to meet immediate financing needs. A large stock of assets that a government cannot sell will not translate into market confidence that the government can afford to borrow more without limit.

References

Belu Manescu, C. & Bova, E. (2020). National Expenditure Rules in the EU: An Analysis of Effectiveness and Compliance, *European Commission Discussion Paper* 124.

Bohn, H. (1998). The Behavior of US Public Debt and Deficits, *The Quarterly Journal of Economics*, Vol. 113, No. 3, pp. 949–963.

Boyd, S., Feron, E., Ghaoui, L. & Balakrishnan, V. (1994). Linear Matrix Inequalities in System and Control Theory, *SIAM Studies in Applied and Numerical Mathematics*, vol. 15.

Brunnermeier, M.K., Merkel, S.A. and Sannikov, Y., 2022. Debt as safe asset (No. w29626). National Bureau of Economic Research.

Central Bank of Ireland. Long-Term Growth Prospects for the Irish Economy. December 2024.

Conefrey, T., Lawless, M. & Linehan, S. (2015). Developments in the Irish Labour Market during the Crisis: What Lessons for Policy?, *Journal of the Statistical and Social Inquiry Society of Ireland*, Vol. XLIV.

Department of Finance. Summer Economic Statement. July 2021.

Department of Finance. Horizon Scanning – calibrating medium to long-term economic projections. October 2023.

Eddie Casey and Brian Cronin. Ireland's spending rule and the third wave of the EU's fiscal rules (2023).

Hansen, L. & Sargent, T. (2008). Robustness, Princeton University Press.

Hatchondo, J. C., L. Martinez, & Roch, F. (2022a). Fiscal Rules and the Sovereign Debt Premium, *American Economic Journal: Macroeconomics*, Vol. 14. No 4.

Hatchondo, J. C., L. Martinez, & Roch, F. (2022b). Numerical Fiscal Rules for Economic Unions: The Role of Sovereign Spreads, *Economic Letters*, Vol. 210.

International Monetary Fund. How to Calibrate Fiscal Rules A Primer. 2018.

Irish Fiscal Advisory Council. Fiscal Assessment Report June 2021. December 2021.

Irish Fiscal Advisory Council. Fiscal Assessment Report June 2023. June 2023.

Khlebnikov, M., (2011). Optimization of Linear Systems Subject to Bounded Exogenous Disturbances: The Invariant Ellipsoid Technique, *Automation and Remote Control*, Vol. 72, No. 11, pp. 2227–2275.

Monacelli, T., Perotti, R. & Trigari, A. (2010). Unemployment Fiscal Multipliers, *Journal of Monetary Economics*, pp. 531–553.

Plödt, M, & Reicher, C. (2015). Estimating Policy Reaction Functions: The Role of Model Specification, *Journal of Macroeconomics,* Vol. 46, pp. 113–128.

Vierke, H. & Masselink, M. (2017). The Dutch Budgetary Framework and European Fiscal Rules, *European Economy – Economic Briefs* 027, DG ECFIN, European Commission.

Appendix I. Technical Appendix

A. FDI Risks

Sample and Data

1. Ireland's relatively short historical data, coupled with a large financial crisis and one-off MNE asset relocations in 2015, may not provide a good guide for the risks the country will face in the future. Therefore, a cross-country panel dataset is used to capture the range of risks entailed in MNEs' FDI activities. The model assumes that each country has a fixed effect u_i drawn from a Gaussian distribution. The innovations ϵ_{it} are allowed heteroskedasticity but are assumed to be independent and Gaussian, which can be validated by the histogram of the cyclical FDI component below. All countries are assumed to have the same autoregression matrix B.

2. A cross-country panel dataset covering 212 countries and regions from 1990 to 2023 is constructed for this exercise. Inward FDI stock data, expressed in nominal US dollars, is sourced from countries' official external sector statistics. Domestic macroeconomic and fiscal variables, including GDP, GNI (GNI* for Ireland), GDP deflator, fiscal revenue, government spending, primary balance, and gross domestic debt are sourced from the IMF's WEO database. These variables are all measured in current prices in local currency. We estimate the model in real terms and deflate GNI of sample countries using their GDP deflators. Other variables such as revenues, spending and gross debt are only used for Ireland's debt simulations.

3. A sample of small and open economies is selected based on their pre-Covid GDP and openness. We select countries in the 30th to 90th percentiles for GDP size and the 50th to 99th percentiles for openness (measured by FDI-GDP ratio) distribution, resulting in a sample of 58 countries (Table 1). This sample selection step ensures that the countries use in the analysis are sufficiently comparable tox Ireland and that Ireland may face similar FDI risks to those experienced historically by these countries.

Appendix I. Table 1. Ireland: Country Sample for Empirical Analysis

Country	No. of obs	FDI/GDP	GDP (US bn)	Country	No. of obs	FDI/GDP	GDP (US bn)
Albania	16	0.6	23	Lithuania	27	0.5	78
Austria	18	0.6	516	Luxembourg	21	48.2	86
Bahrain	27	0.8	44	Malaysia	22	0.6	416
Belgium	28	1.4	632	Malta	24	13.6	18
Bosnia and Herzegovina	19	0.4	27	Morocco	21	0.5	141
Botswana	28	0.3	19	Mozambique	18	2.7	21
Bulgaria	25	0.7	102	Myanmar	17	0.4	69
Cambodia	27	1.2	42	Netherlands	27	4.5	1118
Chile	26	0.9	336	New Zealand	23	0.4	249
Colombia	28	0.7	364	Norway	24	0.5	486
Costa Rica	18	0.7	87	Panama	28	0.8	83
Croatia	25	0.5	83	Peru	28	0.5	267
Cyprus	20	14.3	32	Poland	28	0.5	812
Denmark	28	0.6	405	Portugal	27	0.8	287
Egypt	19	0.4	394	Romania	26	0.4	346
El Salvador	26	0.4	34	Serbia	15	0.8	75
Estonia	27	1.3	41	Singapore	22	5.2	501
Finland	28	0.5	300	Slovenia	28	0.4	68
Georgia	24	0.8	31	South Africa	27	0.3	381
Honduras	19	0.6	34	Sudan	18	0.8	35
Hong Kong	26	6.1	381	Sweden	28	1.0	593
Hungary	27	2.3	213	Switzerland	28	2.2	885
Iceland	26	0.4	31	Thailand	27	0.6	515
Ireland	18	3.4	546	Trinidad and Tobago	12	0.3	28
Israel	28	0.5	510	Tunisia	27	0.9	46
Jamaica	18	1.0	19	Uganda	23	0.3	48
Jordan	22	0.8	49	Ukraine	23	0.3	177
Kazakhstan	22	0.7	263	Uruguay	23	0.8	77
Latvia	28	0.7	44	Zambia	17	0.4	28

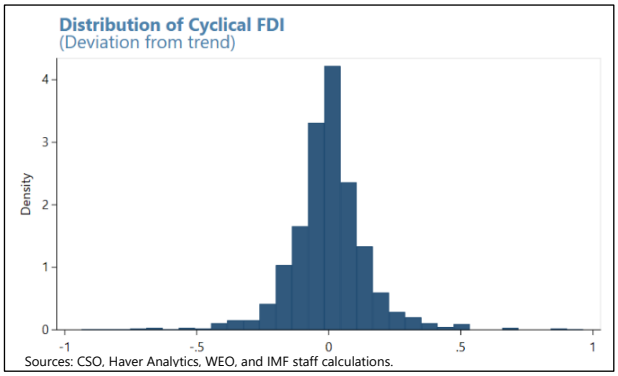
Source: IMF staff calculations

Model Specification

4. Public debt projections are generated using a two-stage approach. The first stage is to estimate the following panel VAR (1) model for GNI and FDI stock. We assume that both variables grow along a deterministic trend in the medium run, but their growth is subject to shocks and might deviate from the trends, i.e., they are trend-stationary. We estimate a model of the cyclical components of GNI and FDI, denoted as y_{it}^* and i_{it}. We pass GNI and FDI to a HP-filter for each country, and then calculate y_{it}^* and i_{it} as the percentage deviation from the filtered trends.

$$\begin{bmatrix} y_{it}^* \\ i_{it} \end{bmatrix} = u_i + B \begin{bmatrix} y_{it-1}^* \\ i_{it-1} \end{bmatrix} + \epsilon_{it}$$

5. GNI and FDI series are assumed to be trend-stationary for all selected countries in the sample. The trend GNI growth and FDI growth vary across years due to domestic or external shocks, but the VAR model assumes that the impact of shocks diminishes over time. To test the validity of the VAR model in this context, we run an Im-Pesaran-Shin panel unit root test for the FDI data and the result rejects the null hypothesis that all countries' FDI time series have unit roots. The alternative hypothesis of the IPS test only suggests that at least one country's FDI is trend-stationary. For model selection's purpose, we also run a Levin-Lin-Chu (LLC) test with the alternative hypothesis being that all countries' FDI series are stationary. The test generates a p-value of 0.00, rejecting the null hypothesis that all countries have unit roots. In addition, Dickey-Fuller (DF) unit root tests are run for individual countries. The null hypothesis of unit root is rejected at the 95 percent confidence level for most countries.



6. While the trend-stationarity property of VAR models is suitable for many countries, it may not always be appropriate for the Irish economy. Shocks to the operations of MNEs and the associated CIT revenues in Ireland could be permanent. For example, the DF test fails to reject unit root for Ireland. This is likely to be driven by the turmoil the country experienced during the Global Financial Crisis period and a large one-off transfer of intangible assets in 2015, which the model and calibrations cannot fully account for. Therefore, it is necessary to revisit parameter values of this exercise when significant structural shifts occur.

7. The second stage of the model translates the process of FDI to GDP and CIT from MNEs, and further to the evolution of fiscal revenue and debt. We start by assuming that FDI will translate to capital in domestic production one-for-one, whether in the form of physical capital or intellectual property.

- The MNEs' production function takes the Cobb-Douglas form with α being the capital income share, with the capital share close to one in the case of intellectual property.

$$Y_{it} = A_{it}K_{it}^{\alpha}L_{it}^{1-\alpha}.$$

- Labor supply is assumed to be perfectly elastic at fixed wage and matches increases in capital as FDI settles in Ireland. Changes of output are proportionate to the percentage changes of capital and labor as shown below, where the lower-case letters refer to the logarithm of the upper-case variables.

$$\Delta y_{it} = \Delta k_{it} = \Delta l_{it}.$$

- To translate changes in output to changes in taxable income, we assume that in a monopolistically competitive environment, firms' profits are in proportion to their output with their margins determined by the demand elasticity $\eta > 1$. Consequently, changes in taxable

corporate income are proportionate to changes in capital. Further, percentage changes in CIT from MNEs are also proportionate to changes in FDI. Denoting profits of firm i by Π_{it} and its corporate income tax payment by T_{it}, we have

$$\Delta\tau_{it}^{c} = \Delta\pi_{it} = \frac{1}{\eta}\,\Delta y_{it} = \frac{1}{\eta}\,\Delta k_{it}$$

- Labor is assumed to match FDI growth, which will generate more tax revenues such as personal income tax ($\Delta\tau_{it}^{p} = \Delta l_{it}$). This assumption of elastic labor might be strong in that we assume no crowding out effect to the domestic labor market. It could be partially justified by a segmented labor market whereby MNEs reallocate human resources from abroad when they expand in Ireland instead of hiring on the local labor market. Relaxing this assumption with a less than one-for-one response of labor and output to FDI would not change the main conclusions from the analysis.

- On aggregate, the percentage changes of corporate income taxes are the share-weighted sum of percentage changes of domestic CIT and MNE CIT. The percentage change of MNE CIT is the share-weighted sum of CIT contribution of individual MNEs which is proportional to their individual FDI.

$$\Delta\tau_{t}^{c} = s^{c,dom}\Delta\tau_{t}^{c,dom} + s_{i}^{c}\Delta\tau_{it}^{c} = s^{dom}\Delta\tau_{t}^{c,dom} + \frac{1}{\eta}s_{i}^{c}\Delta k_{it} = s^{c,dom}\Delta\tau_{t}^{c,dom} + \frac{1}{\eta}s^{c,FDI}\,\Delta k_{t}$$

We denote the share of domestic firms in total CIT as $s^{c,dom}$ and the share of MNEs as $s^{c,FDI}$. They sum up to one by construction. Similarly, we define $s^{p,dom}$ and $s^{p,FDI}$ as the share of the two sectors in personal income tax. The percentage changes of personal income taxes can be calculated using

$$\Delta\tau_{t}^{p} = s^{p,dom}\Delta\tau_{t}^{p,dom} + s_{i}^{p}\Delta\tau_{it}^{p} = s^{p,dom}\Delta\tau_{t}^{p,dom} + s^{p,FDI}\Delta k_{t}$$

We assume that domestic firm CIT and PIT track GNI star one for one $\Delta\tau_{t}^{p,dom} = \Delta\tau_{t}^{c,dom} = \Delta y_{t}^{*}$. Then, the total percentage change of fiscal revenue is

$$\Delta\tau_{t} = \mu\Delta\tau_{t}^{c} + (1-\mu)\Delta\tau_{t}^{p} = (\mu s^{c,dom} + (1-\mu)s^{p,dom})\Delta y_{t}^{*} + \left(\frac{\mu}{\eta}s^{c,FDI} + (1-\mu)s^{p,FDI}\right)\Delta k_{t}$$

where μ is the share of tax revenue from corporate income.

The difference between GDP and GNI star is assumed to be the value added generated by MNEs' operations, thus its growth rate is assumed to track FDI growth, i.e.,

$$\Delta\ln(Y_{t} - Y_{t}^{*}) = \Delta k_{t}$$

- Finally, given the government's budget primary balance

$$PB_{t} = T_{t} - G_{t},$$

domestic debt evolves following

$$B_t = (1 + R_t)B_{t-1} - PB_t.$$

Parameter Assumptions for Simulations

8. We simulate the cyclical component of FDI and GNI according to the VAR(1) estimates and add them to pre-determined trends that assumes a 2¼ percent real growth rate for GDP, GNI* and FDI stock. We also assume a trend growth of 3 percent for real government spending. The interest rate for government debt and inflation are both assumed to be 2 percent per annum.

B. Concentration Risks

Sample and Data

9. Firm data is from CompStat. We use the North America Fundamental Annual dataset for corporate financial information and the Index Monthly Prices dataset for delisting related information. We selected the top 100 US firms in the tech and pharmaceutical industry (GIND code 502030, 352020, 451030, 452020, 452010) in 1990 according to their average revenue in 1990. For companies that got delisted during the sample period, we only regard companies as bankrupt if their delisting reason is "bankruptcy". We treat "merger and acquisition" as survival during the whole sample period. We also collected the top 10 MNEs' revenue in Ireland in the base year from local sources. For simulations, we assume a real log trend growth of 2¼ percent for all the MNEs. The rest of the assumptions remain the same as the FDI risk model.

Appendix I. Table 2. Ireland: Company Sample

Company	No. of obs	Assets (mn USD)	Company	No. of obs	Assets (mn USD)	Company	No. of obs	Assets (mn USD)
ADC TELECOMMUNICATIONS INC	21	1475	MAXTOR CORP	16	2178	WARNER-LAMBERT CO	10	11442
ALPHARMA INC -CL A	18	1288	MEASUREX CORP	7	337	WESTERN DIGITAL CORP	35	24188
AST RESEARCH INC	7	831	MENTOR GRAPHICS CORP	27	2261	XEROX HOLDINGS CORP	34	10008
ALLEN TELECOM INC	13	530	MERCK & CO	34	106675	NOVELL INC	21	2226
AMDAHL CORP	7	1596	STREAMLOGIC CORP	6	180	GREATE BAY CASINO CORP	8	16
WYETH	19	44032	PHARMACIA CORP	13	18517	SUN MICROSYSTEMS INC	20	11232
ANDREW CORP	18	2351	MOTOROLA SOLUTIONS INC	34	13336	MICROSOFT CORP	35	512163
APPLE INC	35	364980	NCR VOYIX CORP	34	4990	ORACLE CORP	34	140976
APPLIED MAGNETICS CORP	9	300	PFIZER INC	34	226501	GENICOM CORP	9	230
AUTODESK INC	34	9912	AGILSYS INC	16	762	KASPIEN HOLDINGS INC	33	41
BBN CORP	7	249	MINOLTA-QMS INC	10	151	SILICON GRAPHICS INC	19	415
BRISTOL-MYERS SQUIBB CO	34	95159	QUANTUM CORP	9	2484	MOSLER INC	10	178
COMPAQ COMPUTER CORP	12	23689	REYNOLDS & REYNOLDS -CL A	16	956	SEQUENT COMPUTER SYSTEMS INC	9	796
CA INC	28	13060	RHONE-POULENC RORER	7	8768	KOMAG INC	17	978
CRAY RESEARCH	6	978	VALEANT PHARMACEUTICALS -OLD	20	1305	CADENCE DESIGN SYSTEMS INC	34	5669
DSC COMMUNICATIONS CORP	8	2440	SCHERER (R P)/DE	8	822	WIRELESS WEBCONNECT INC	8	85
DATA GENERAL CORP	9	1065	SCHERING-PLOUGH	19	28117	BORLAND SOFTWARE CORP	19	253
DIEBOLD NIXDORF INC	34	4162	SCIENTIFIC-ATLANTA INC	16	2590	CONNER PERIPHERALS	5	1461
DIGITAL EQUIPMENT	8	9693	SEAGATE TECHNOLOGY-OLD	11	7167	DELL TECHNOLOGIES INC	34	82089
ACTERNA CORP	13	406	STERLING SOFTWARE INC	10	1230	ENTERASYS NETWORKS INC	15	290
EASTMAN KODAK CO	34	2355	STORAGE TECHNOLOGY CP	15	2408	ALLERGAN INC	25	12416
GENERAL INSTRUMENT CORP	9	2188	STRATUS COMPUTER INC	8	750	MEMOREX TELEX NV -ADR	6	268
SALIENT 3 COMMUN INC -CL A	10	125	TANDEM COMPUTERS INC	7	1745			
HP INC	35	39909	TELLABS INC	23	1638			
INTERGRAPH CORP	16	621	3COM CORP	19	1815			
JOHNSON & JOHNSON	34	167558	TYLER TECHNOLOGIES INC	34	4677			
LILLY (ELI) & CO	34	64006	FRANKFORT TOWER INDS INC	12	132			
LOTUS DEVELOPMENT CORP	5	904	PHARMACIA & UPJOHN INC	10	10698			
M/A-COM INC	5	309	ELOT INC	9	110			
MARION MERRELL DOW INC	5	4100	WANG LABS INC	9	2249			

Source: Compustat; IMF staff calculations.

Model Specification

10. Public debt projections under firm concentration risks are generated using a two-stage approach. We assume that individual firm's cyclical component of log revenue, denoted as rev_{it}, and pre-tax income to revenue ratio, denoted as pi_{it} jointly follow the following panel VAR(1) model

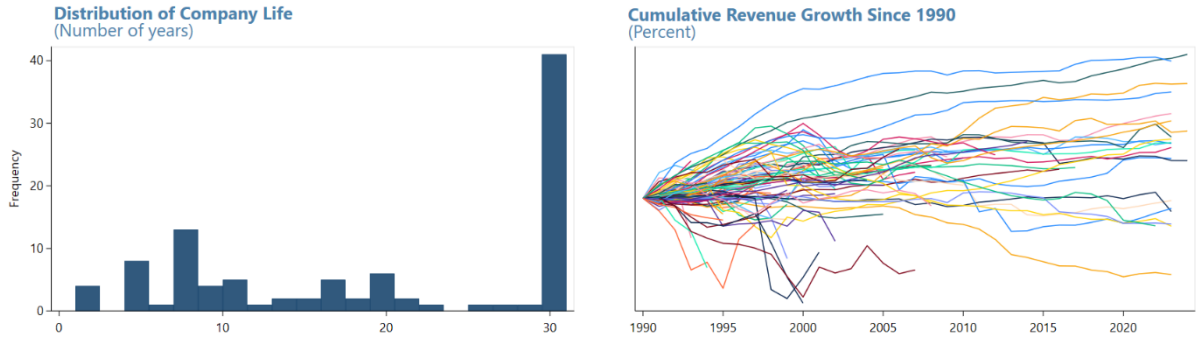
$$\begin{bmatrix} rev_{it} \\ pi_{it} \end{bmatrix} = u_i + B \begin{bmatrix} rev_{it-1} \\ pi_{it-1} \end{bmatrix} + \epsilon_{it}$$

Firm dynamics are known to be non-stationary. Top firms can exit even without a significant decline of revenue. To measure such downside risks, we add an independent Poisson exiting rule on top of the trend stationary dynamics. In the baseline model, all top firms in 1990 are prone to bankruptcy risk with a constant arrival rate λ. We then match the average duration of top firms from 1990 to 2020 in the data. With constant arrival rate λ, the average duration is

$$\mathbb{E}[min(T, 30)] = \frac{1}{\lambda}\left(1 - e^{-30\lambda}\right).$$

11. The following figure shows the revenue trajectory of the top 52 firms in the tech and pharmaceutical industries since 1990. The left panel shows that bankruptcy events are relatively evenly distributed across the 30 years, except during two major financial crises. The right panel shows that bankruptcy is more likely to happen when revenue declines, but there are also a few top firms that went bankrupt on a steadily growing revenue path. Our baseline model chooses a constant survival rate, but it could potentially be a function of firm specific and macro conditions. Our choice of $\lambda = 0.045$ matches the average duration of 17 years in the sample.

Appendix I. Figure 1. Ireland: Historical Firm Dynamics



Source: Compustat, IMF staff calculations.

12. The top 10 MNEs contributed over 95 percent of total CIT from MNEs in Ireland. We assume that the firms' pre-tax income processes are independent, simulate the paths for each firm and aggregate them. The simulated pre-tax income of individual firm i is

$$PI_{it} = (\overline{pi}_i + \widehat{pi}_{it})exp(\widehat{rev}_{it} + \overline{rev}_{it}) * exist_{it}.$$

Where $\overline{pi}_i$ is the historical average pretax income to revenue ratio, $\overline{rev}_{it}$ is pre-determined log trend of individual firm revenue growth. $exist_{it}$ indicates if the firm remains in the market. Every period, an individual firm survives with probability $1 - \lambda$ or exits with probability λ. The hat variables are simulated variables based on the VAR estimates. Total pre-tax income from MNEs is thus the sum of PI_i over the surviving top ten MNEs, divided by the top 10 pre-tax income share in all MNEs in 2024.

$$\Pi_t = \sum_{i=1}^{10} PI_{it}.$$

If we denote the growth rate of total MNE pre-tax income as $\Delta\pi_t$ and keep the same assumption that

$$\Delta\tau_{it}^c = \Delta\pi_{it} = \frac{1}{\eta}\Delta y_{it} = \frac{1}{\eta}\Delta k_{it},$$

we can calculate the percentage changes of corporate income taxes using

$$\Delta\tau_t^c = s^{c,dom}\Delta\tau_t^{c,dom} + s^{c,FDI}\Delta\pi_t,$$

and similarly, for the growth of personal income taxes. The rest of the procedure remains the same as in the FDI risk model.

Revenue Growth Model

13. While it is plausible that countries' FDI and GNI are trend-stationary, trend-stationarity may not apply to each individual firm's revenue, given the more granular and

transient nature of firm dynamics. An alternative assumption is that a firm's growth has a unit root and its revenue growth rate and income to revenue rate jointly follow a VAR process.

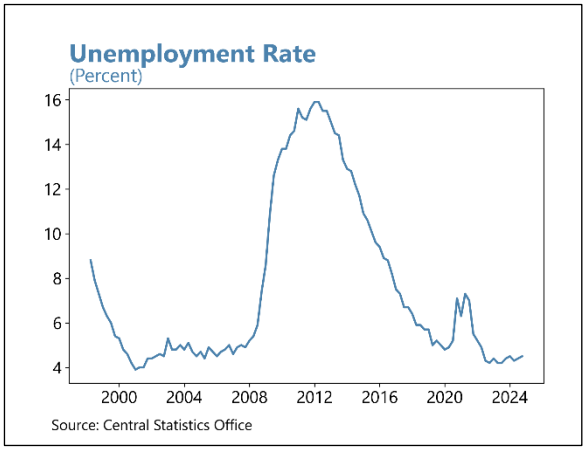
$$\begin{bmatrix} revg_{it} \\ pi_{it} \end{bmatrix} = u_i + B \begin{bmatrix} revg_{it-1} \\ pi_{it-1} \end{bmatrix} + \epsilon_{it}$$

With other assumptions unchanged, we run a simulation for Ireland's domestic debt with the unit-root firm growth model. As the model is not trend-stationary, the simulation features more extreme upside and downside risks. It is also worth noting that the asymmetry between upside and downside risks will be significant in this model. The reason is that a growing debt path is caused by the decline of top MNEs' revenues, which also cause GDP to fall, amplifying the rise of the debt to GDP ratio. Conversely, a declining debt path is consistent with top MNEs' revenue growth, which contributes to higher GDP. We run a stationarity test for top companies' revenue growth. This type of model tends to generate even wider fan charts and lower debt anchors.

C. Fiscal Reaction Function

Estimating the Unemployment Gap

14. Various tools could be used to estimate the natural rate of unemployment, ranging from univariate statistical filters (HP, bandpass) to full-fledged economic models exploiting structural relations between variables. For the purposes of this note, a simple Markov switching model of unemployment is assumed. Historically, the unemployment rate dynamics have alternated between periods of low (and relatively stable) unemployment and high unemployment during crisis episodes (text figure). This suggests that a Markov model with two states may be an appropriate representation of the data generating process. Specifically, it is posited that actual unemployment fluctuates around a constant which switches between two different regimes— "low" and "high"—with certain probabilities. Formally,



$$u_t = \bar{u}_{s_t} + \epsilon_t,$$

$$\epsilon_t \sim N(0, \sigma_{s_t}),$$

where u_t is the observed unemployment rate and $\bar{u}_{s_t}$ is a constant term (the parameter of interest) which switches between two values— u_0 and u_1, denoting the states of low and high unemployment, respectively. Thus, the model yields a constant natural unemployment rate which, while perhaps overly simplistic, offers the advantage of being straightforward to use and communicate. Regime changes occur with probabilities given by the transition matrix:

$$P = \begin{bmatrix} p_{00} & p_{10} \\ 1 - p_{00} & 1 - p_{10} \end{bmatrix}.$$

15. The Markov switching model results suggest plausible estimates of equilibrium unemployment. Table 3 displays the results from estimating the above model. The unemployment rate in the low-unemployment state is estimated at about 4 ¾ percent, while the respective value in the high-unemployment regime is slightly over 10 ½ but with a large variance (note that the model specification allows for the variances to switch). These estimates are statistically significant and appear reasonable, given Ireland's history. The transition matrix suggests 96 percent probability of staying in the low-unemployment regime in the next period if the economy in this regime in the current period.

Appendix I. Table 3. Ireland: Markov Model Estimation Results

Markov Switching Model Results

Dep. Variable:	ILO Unemployment Rates (15 - 74 years) (Seasonally Adjusted)	No. Observations:	107
Model:	MarkovRegression	Log Likelihood	-185.626
Date:	Sun, 12 Jan 2025	AIC	383.253
Time:	10:50:35	BIC	399.290
Sample:	04-01-1998	HQIC	389.754
	- 10-01-2024		
Covariance Type:	approx		

Regime 0 parameters

	coef	std err	z	P>|z|	[0.025	0.975]
const	4.7695	0.080	59.778	0.000	4.613	4.926
sigma2	0.2026	0.061	3.296	0.001	0.082	0.323

Regime 1 parameters

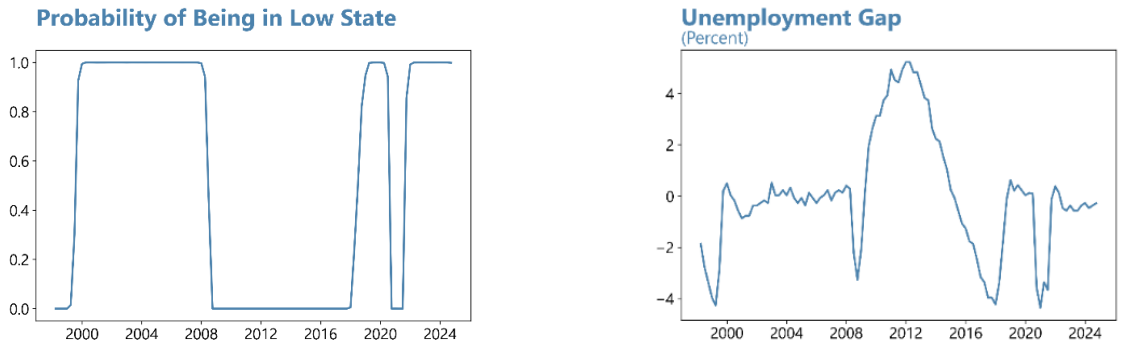
	coef	std err	z	P>|z|	[0.025	0.975]
const	10.6647	0.564	18.923	0.000	9.560	11.769
sigma2	12.0825	2.502	4.829	0.000	7.179	16.986

Regime transition parameters

	coef	std err	z	P>|z|	[0.025	0.975]
p[0->0]	0.9550	0.027	35.888	0.000	0.903	1.007
p[1->0]	0.0501	0.030	1.677	0.094	-0.008	0.109

Warnings:
[1] Covariance matrix calculated using numerical (complex-step) differentiation.

Appendix I. Figure 2. Ireland: Low-Unemployment State Probability and Unemployment Gap



Source: IMF staff calculations

Based on the probability plot (Figure 2), the economy has been in the low-unemployment regime since the recovery from the financial crisis, except for a short period during the Covid-19 pandemic

(Figure 2, left panel). The unemployment gap is defined as $\widehat{u_t} = u_t - \bar{u}_{s_t}$. Recently, it has been negative in the range of -0.3 to -0.6 percentage points which, using the Okun's law with a coefficient of -0.3 (Conefrey et al., 2015), translates into positive output gaps between 1 and 2 percent.

A Simple Model of Fiscal Policy

16. A simple model of fiscal policy which features key characteristics necessary for the derivation of a fiscal reaction function is presented below.

- *Unemployment gap.* A key assumption in what follows is that the unemployment gap can be influenced by fiscal policy. Formally, this can be expressed as follows:

  (1) $$\hat{u}_{t+1} = \rho\widehat{u_t} + \alpha\eta_t$$

  where η_t denotes the fiscal impulse, defined as the change in the cyclically adjusted balance expressed as a ratio to potential output ($\bar{Y}_t$) and ρ is an autoregressive parameter.

- *Cyclically adjusted balance.* The cyclically adjusted balance is obtained as follows (see Fedelino et al., 2009). First, the nominal primary balance PB_t is decomposed into a cyclically adjusted part which represents discretionary policy and a cyclical component which is driven by the economic cycle:

  $$PB_t = PB_t^{ca} + PB_t^c$$

  For the calculation of the cyclically adjusted balance, it is assumed that the revenue (*R*) elasticity equals one and the expenditure (*G*) elasticity equals zero, a fairly standard assumption:

  $$PB_t^{ca} = R_t \frac{\bar{Y}_t}{Y_t} - G_t$$

  and thus, the cyclical component is

  $$PB_t^c = PB_t - PB_t^{ca} = R_t - G_t - R_t \frac{\bar{Y}_t}{Y_t} + G_t = R_t \left(1 - \frac{\bar{Y}_t}{Y_t}\right) = \frac{R_t}{Y_t}(Y_t - \bar{Y}_t).$$

  After multiplying and dividing the right-hand side by potential output, and defining the output gap as

  $$\gamma_t = \frac{Y_t - \bar{Y}_t}{\bar{Y}_t},$$

  $$P_t^c = \frac{R_t}{Y_t}\gamma_t \bar{Y}_t \ .$$

  The revenue to GDP ratio is relatively stable in the case of Ireland, so a simplifying assumption is made that it is constant (further denoted by τ), subject to random fluctuations. With this,

  $$PB_t^c = \tau\gamma_t \bar{Y}_t$$

Expressing all variables in terms of potential output and using lowercase letters for the ratios yields:

$$p_t = p_t^{ca} + \tau\gamma_t.$$

Thus, the fiscal impulse can be represented as:

$$\eta_t := \Delta p_{t+1}^{ca} = p_{t+1}^{ca} - p_t^{ca} = p_{t+1} - \tau\gamma_{t+1} - (p_t - \tau\gamma_t)$$

and so, the (unadjusted) primary balance ratio in period (t+1) can be expressed as:

(2) $$p_{t+1} = p_t + \tau\gamma_{t+1} - \tau\gamma_t + \eta_t.$$

- *Public debt*. The debt evolution equation (also relative to potential output) is the standard one:

(3) $$b_{t+1} = \left(\frac{1+r}{1+g^p}\right) b_t - p_{t+1},$$

where r and g^p denote interest rate and potential growth rate, respectively. Combining equations (1), (2) and (3) yields a simple model of fiscal policy that captures the impact of government policies on economic activity and their implications for debt sustainability.

17. To derive a fiscal reaction function based on this model, it is convenient to rewrite it in a state space form. This can be done by moving the variables indexed with (t+1) to the left-hand side, forming a matrix with the respective parameters and pre-multiplying the right-hand by the inverse of that matrix. Before that, since the preferred cyclical measure is the unemployment gap rather than the output gap, the latter needs to be restated in terms of the former. This can be done by using the Okun's law: $\widehat{u_t} = \beta\gamma_t$. Finally, a disturbance vector (v_t) is added to capture, among other things, uncertainty and measurement errors in the unemployment equation, and shocks to the tax ratio and public debt in the primary balance and debt equations. Thus,

$$\begin{bmatrix} 1 & 0 & 0 \\ -\frac{\tau}{\beta} & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} u_{t+1}^g \\ p_{t+1} \\ b_{t+1} \end{bmatrix} = \begin{bmatrix} \rho & 0 & 0 \\ -\frac{\tau}{\beta} & 1 & 0 \\ 0 & 0 & \frac{1+r}{1+g^p} \end{bmatrix} \begin{bmatrix} u_t^g \\ p_t \\ b_t \end{bmatrix} + \begin{bmatrix} \alpha \\ 1 \\ 0 \end{bmatrix} \eta_t + \begin{bmatrix} v_t^u \\ v_t^\tau \\ v_t^b \end{bmatrix},$$

or in vector notation:

$$A_o y_{t+1} = A_1 y_t + B_1 \eta_t + v_t,$$

$$y_{t+1} = A_0^{-1} A_1 y_t + A_0^{-1} B_1 \eta_t + A_0^{-1} v_t,$$

and finally:

(4) $$y_{t+1} = A y_t + B\eta_t + C v_t, \;\; y_0 \; given \; .$$

18. The objective of the policymaker is to minimize the deviations of unemployment from equilibrium (or deviations of the unemployment gap from zero) and of debt from the target level. A quadratic loss function is assumed which is standard in the literature. Thus, the problem to solve is

$$\min_{\{\eta_t\}} E_0 \sum_{t=0}^{\infty} \frac{1}{2}[(y_t - \bar{y})^{\top} Q (y_t - \bar{y}) + \eta_t^{\top} R \eta_t]. \quad (5)$$

subject to the dynamics given by (4). In the above notation, $\bar{y}$ stands for the vector of target values for the variables of interest and Q and R represent the relative weights assigned to the different goals, e.g., stabilization of unemployment vs. stabilization of debt. The inclusion of the fiscal impulse η_t in the objective captures the preference for stability of fiscal policy, i.e., it is undesirable to have large swings in the primary balance from year to year due to discretionary measures. The target vector has the form $\bar{y} = [0, \bar{p}, \bar{b}]^{\top}$, where $\bar{b}$ denotes the debt anchor and $\bar{p}$ stands for the debt stabilizing primary balance. Clearly, the two are related and in what follows, a zero weight is assigned on $\bar{p}$. Thus, matrix Q has the form:

$$Q = \begin{bmatrix} w^u & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & w^b \end{bmatrix}$$

and R is a positive scalar.

19. For calculation purposes, it is more convenient to transform the state vector, so that equilibrium is at the origin. This can be done by setting $x_t = y_t - \bar{y}$. Then, the objective function becomes:

$$\min_{\{\eta_t\}} E_0 \sum_{t=0}^{\infty} \frac{1}{2}[x_t^{\top} Q \mathrm{x_t} + \eta_t^{\top} R \eta_t], \quad (6)$$

and the dynamics are given by:

$$x_{t+1} = Ax_t + B\eta_t + Cv_t + e, \; with \; x_0 = y_0 - \bar{y}\,, \quad (7)$$

where the constant term $e = (A - I)^{-1}\bar{y}$ and I denotes the identity matrix. It can be shown that for the specific choice of $\bar{y}$, this constant term is zero.

20. The following parameters are used for the scenarios presented below: the autoregressive coefficient for the unemployment gap ρ is fixed at 0.72 (an estimate consistent with the data); the fiscal multiplier for unemployment α is set at 0.2—an OLS estimate of (1) and half of the value reported by Monacelli et al. (2010);[1] the Okun's law parameter is fixed at -0.3 (Conefrey et al., 2015); and nominal potential growth and interest rate are assumed to be 4 ¼ and 2 ½ , percent respectively (2 ½ percent real potential growth, 2 percent inflation and 0.5 percent equilibrium real

[1] The estimates in Monacelli et al. (2010) are based on US data and with the assumed Okun's law parameter implies an output multiplier of 1 ¼ which appears too high for a small open economy like Ireland. While the OLS estimate of (1) may be biased, it implies an output multiplier of ¾ which is plausible. The sensitivity of results to the multiplier value is explored below.

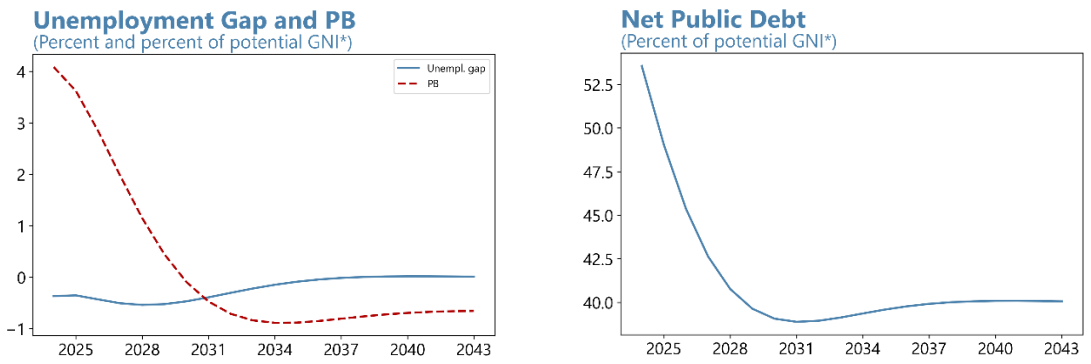
interest rate). The tax to GNI ratio is set at 43 percent. Finally, the following assumptions are made for the weights in the objective function: the weight on the unemployment gap is 1 and that on the fiscal impulse (control variable) is fixed at 10. The significantly higher weight is justified by smoothness considerations; abrupt changes in the PB from year to year are generally undesirable. The weight on the debt anchor is 0.5 in the baseline, reflecting that Ireland does not have issues with sustainability, and some deviations from the target can be tolerated. Alternative scenarios with higher and lower weights on debt are also shown.

21. The resulting fiscal reaction function responds positively to debt and negatively to the unemployment gap. With the above parametrization, and assuming that disturbances are normally distributed with zero mean, the solution to problem (6)-(7) results in the following fiscal reaction function (FRF):

$$p_{t+1} = -0.43\widehat{u_t} - 0.57(p_t - \bar{p}) + 0.15\left(b_t - \bar{b}\right).$$

The rule prescribes that the primary balance should increase (fiscal tightening) when the unemployment gap is negative (the output gap is positive) and when the debt level is above the target.

Appendix I. Figure 3. Ireland: Optimal Trajectories



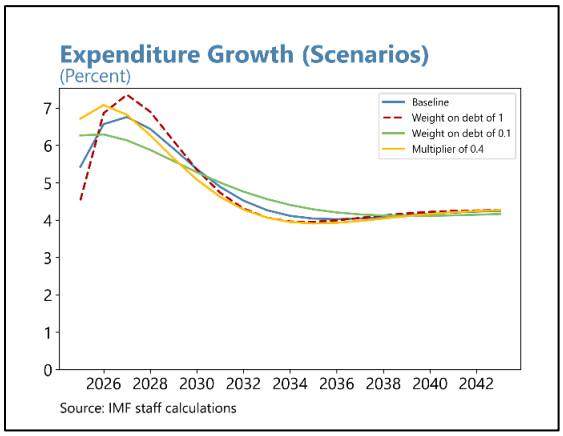
Source: IMF staff calculations

22. Application of this rule indeed stabilizes the variables of interest at the target levels (Figure 3). Primary surpluses need to be maintained for the first 5 years to allow net debt to converge to the desired level. The surpluses, however, are declining gradually which, given that the revenue ratio is kept fixed, provides initially room for higher spending. Thus, the optimal PB under the constant revenue to GDP ratio assumption implies that expenditure can increase at an average rate of about 6.2 percent in the first 5 years; and by an average of 5.4 percent in the first 10 years. Eventually, expenditure growth should converge to 4 ¼ percent in line with the potential growth rate.

Fiscal Reaction Functions

	$\hat{u}$	$\hat{p}$	$\hat{b}$
Baseline	-0.43	-0.57	0.15
Debt weight of 1	-0.46	-0.65	0.21
Debt weight of 0.1	-0.36	-0.40	0.07
Multiplier of 0.4	-0.56	-0.68	0.15

23. The sensitivity of the model results is examined for alternative parametrizations. The text figure shows expenditure paths when higher (1.0) and lower (0.1) weights are assigned to the debt stability objective and when the fiscal multiplier for employment is increased to 0.4 as in Monacelli et al. (2010). The coefficients of the FRF are shown in the text table ("hats" above the variables denote deviations from targets). As expected, when the weight on the debt objective is increased to 1, the FRF suggests a stronger reaction to the debt deviations. A higher fiscal multiplier for unemployment increases somewhat the response to the unemployment gap; the reaction to debt remains as in the baseline. The time profile of expenditure growth under the alternative assumptions varies somewhat but the differences in the average growth rates in the first 5 years are less than 0.5 ppts; these differences essentially disappear when a 10- year period is considered.



Robustness to Uncertainty

24. The results presented in the previous section are derived under the assumption of normal distribution of disturbances. It is well known that in this case the certainty equivalence principle holds and the solution to the stochastic linear quadratic control problem coincides with that of the corresponding deterministic problem using the expected value of the noise. The normality assumption, however, may not necessarily hold. Moreover, from a decision-making point of view, it is desirable that the policy actions achieve the intended results not just on average but also in a range of circumstances.

25. Two approaches to robustness are considered below.

- *Minimax optimal.* The first approach is along the lines of Hansen and Sargent (2008) and entails specification of a loss function similar to the one considered previously, with an additional term capturing the preference for robustness.

  Consider again problem (6)-(7) with the additional constraint:

$$\sum_{t=0}^{\infty} v_t^{\top} v_t \leq \delta.$$

  This problem can be turned into a related minimax problem (see Hansen and Sargent, 2008) of the form:

(8) $$\min_{\{u_t\}} \max_{\{v_t\}} \sum_{t=0}^{\infty} \frac{1}{2} [x_t^{\top} Q \mathrm{x}_{\mathrm{t}} + \eta_t^{\top} R \eta_t - \theta v_t^{\top} v_t]$$

subject to (7). Solution to problem (7)-(8) is given by the pair of linear rules:

$$\eta_t = -Kx_t, v_t = Hx_t.$$

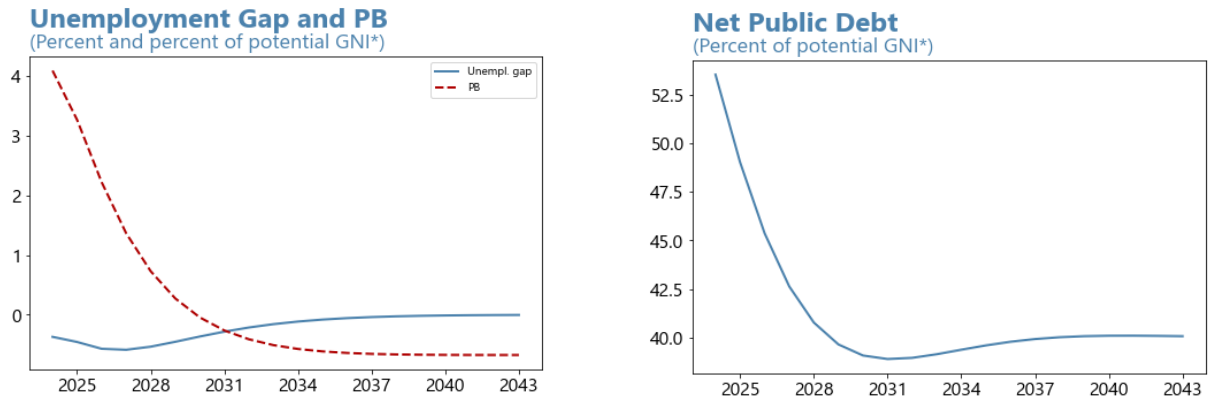
the first one of which is the fiscal reaction function of interest. The same values for Q and R are used as before. As for the new parameter θ, it needs to be chosen sufficiently high, so that it is above a threshold value to have a solution.[2] For the problem at hand, this threshold is around 62 and the value of 70 is used in the simulations below.

The FRF associated with the minimax rule is

$$p_{t+1} = -0.73\widehat{u_t} - 1.09(p_t - \bar{p}) + 0.29\left(b_t - \bar{b}\right),$$

and it prescribes a stronger response to deviations from the target values.

Appendix I. Figure 4. Ireland: Minimax Trajectories



Source: IMF staff calculations

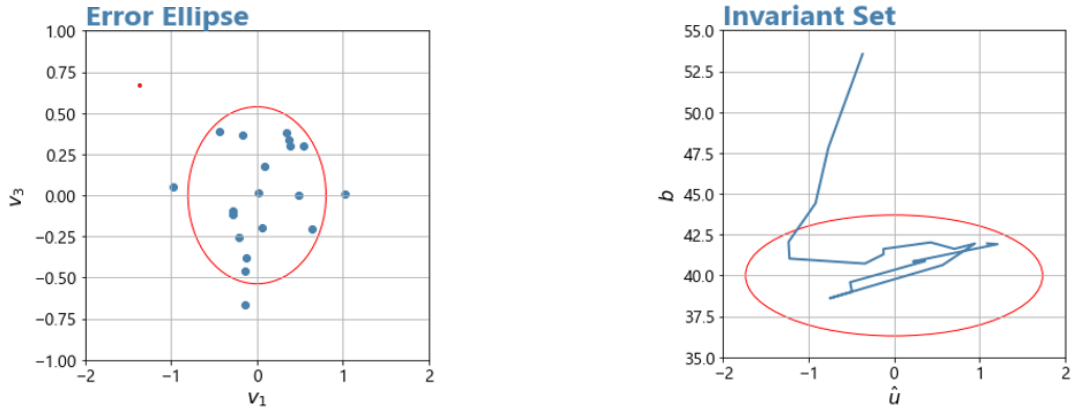
Implementing this rule suggests an average expenditure growth of about 6.3 and 5.3 percent in the first 5 and 10 years, respectively. Growth is also higher in the initial years, which causes the unemployment gap to deteriorate but over time, the differences become negligible.

- *Robust stabilization.* The second approach to robustness does not require explicit formulation of an objective and is based on stabilization techniques. In loose terms, the goal is to find a feedback rule and a region around equilibrium that ensures stability (an invariant set) in the sense that if the system state falls in this region and the rule is applied, it can be kept there indefinitely as long as the shocks are within certain bounds. Ideally, this region should be made as small as possible and if an occasional large shock throws the state outside the invariant set, consistently applying the rule should bring the state back again (see, for example, Boyd et al.

[2] Hansen and Sargent (2008) provide the criterion $\log det\,(\theta I - C^{\top}PC) < \infty$ or equivalently, the eigenvalues of $(\theta I - C^{\top}PC)$ should be positive.

1994; Khlebnikov et al., 2011). It is convenient to work with ellipsoidal sets for disturbances.[3] While no probabilistic assumptions are needed (only boundedness), one could think of these sets as confidence regions for errors drawn from an elliptical distribution (e.g., multivariate normal or t-distribution). The idea is illustrated in Figure 5. The left panel shows a scatter plot of disturbances drawn from a multivariate normal distribution and the 80 percent confidence ellipse.[4] This error set essentially requires the stabilizing rule (FRF in this case) to be robust to persistent shocks or other additive uncertainties in the unemployment equation of around 0.75 ppts and in the debt equation of around 0.5 ppts in absolute value. The right panel of the figure shows the calculated stability region and the unemployment-debt pairs obtained using the robust FRF when shocks are as in the left panel. Starting from the initial condition (-0.3 percent unemployment gap and 53.5 percent net debt to GNI*), applying the FRF steers the system to the invariant set. Because of the additive disturbances, the state cannot be exactly at equilibrium, but it is kept close to it.

Appendix I. Figure 5. Ireland: Invariant Set Example



Source: IMF staff calculations

An additional advantage of this approach is that it can accommodate parametric uncertainty as well. Parametric uncertainty can be modeled in different ways. For example, it can be represented in terms of time-varying parameters:

$$y_{t+1} = \big(A + \Delta A(t)\big)y_t + \big(B + \Delta B(t)\big)\eta_t + (C + \Delta C(t))v_t.$$

or as a set of alternative models (indexed by i):

$$y_{t+1} = A^i y_t + B^i \eta_t + C^i v_t.$$

Below, the second approach is pursued. This is motivated by a scenario where the windfall CIT from MNEs disappears and tax ratio drops from the current 43 percent to about 38 percent. In the above

[3] In the cited references and elsewhere, the disturbances are assumed to bounded by 1 in the norm. It is relatively straightforward to extend the framework to an arbitrary ellipsoidal set.

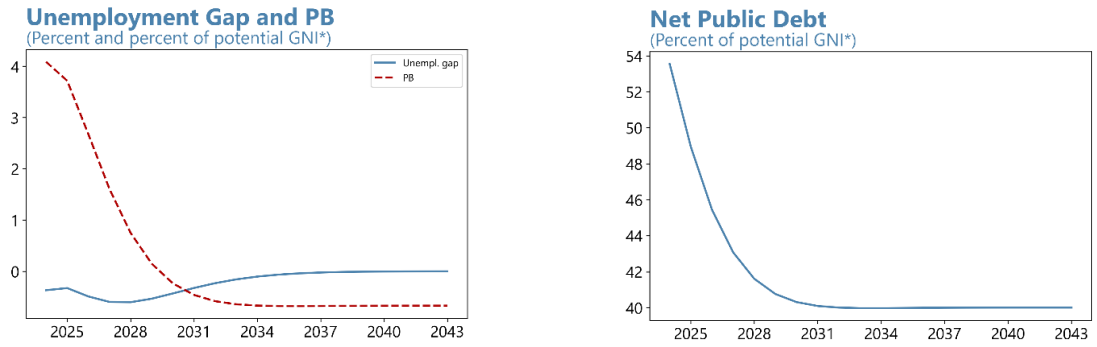
[4] Note that the system is three-dimensional, and the presented plots are 2D projections of the 3D ellipsoids.

framework, this is modeled as two separate system matrices A^1 and A^2 differing in the value of τ. The resulting FRF when applying this framework is:

$$p_{t+1} = -0.53\widehat{u_t} - 0.89(p_t - \bar{p}) + 0.28\left(b_t - \bar{b}\right),$$

unemployment gap, primary balance and debt (suppressing the additive noise) are shown in Figure 6.

Figure 6. Ireland: Robust Stabilizing Trajectories



Source: IMF staff calculations

The robust stabilizing rule implies somewhat lower expenditure growth in the first year but in terms of average, the result is not different from the optimal and minimax rules – 6.4 percent in the first 5 years and 5.4 percent in the first 10 years.

GEOECONOMIC FRAGMENTATION: IMPLICATIONS FOR IRELAND[1]

Ireland's economy is deeply connected to the global trade network and relies on foreign direct investment (FDI), notably from the US. This paper presents a framework to estimate the impact of geo-economic fragmentation through three channels: (1) supply chain disruptions, (2) trade distortions resulting from tariff increases, and (3) FDI relocation, including driven by tax policy changes. Our findings suggest that while the impact of supply disruptions and higher tariffs would be relatively contained under moderate shock assumptions, potential FDI relocations would be associated with a sizeable loss of value added but more limited impact on the indigenous economy.

A. Introduction

1. The global economy is undergoing deep changes. Growing geopolitical divisions are reshaping the international economic relations through trade and capital restrictions, contributing to the formation of regional trading blocks. Supply chain disruptions in the aftermath of the COVID-19 pandemic added to the concerns about excessive reliance on foreign suppliers and revived the interest in industrial policy to strengthen domestic manufacturing and in "friend-shoring", whereby companies move production facilities to locations based on political alignment. These policy-driven reversal of economic integration, referred to as "geoeconomic fragmentation" (GEF), can entail significant economic costs through higher prices and reduced access to goods and services.

2. Geoeconomic fragmentation can affect countries through various channels. Aiyar et al. (2023) explore several such channels and their effects: (i) trade restrictions leading to higher costs and lower efficiency; (ii) obstacles to technology diffusion limiting innovation and lowering productivity; (iii) barriers to labor flows affecting human capital; (iv) capital flows restrictions reducing options to external financing, and (v) higher uncertainty impacting negatively investment decisions. There is growing literature aiming to quantify the economic costs arising from GEF. For example, Bolhuis et al. (2023) develop a multi-country multi-sector model and focus on commodity production and trade linkages. Their results show that output losses can be sizeable, especially for low-income countries. Javorcik et al. (2022) consider the costs of "friend-shoring" modeled by assuming an additional "iceberg"-type trade cost or increase in tariffs, and estimate GDP losses up to 4.6 percent of global GDP. Cerdeiro et al. (2021) focus on the cost of technological decoupling on growth in the context of a global model and conclude that losses could be in the order of 5 percent of GDP for many countries. The effect of GEF on technological innovation is also discussed in Goes and Bekker (2022) through the lens of a general equilibrium model with sector-specific knowledge diffusion. Aiyar et al. (2024) apply a gravity model to a large dataset of bilateral greenfield FDI and show that greater geopolitical distance is associated with lower FDI flows.

[1] Prepared by Rossen Rozenov (EUR) and Zhao Zhang (RES), with research assistance by Santiago Previde (EUR). The paper benefitted from useful comments and suggestions from the authorities and seminar participants.

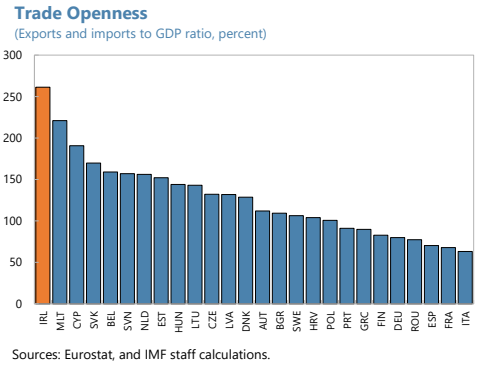
3. Deglobalization poses threats to the Irish economic model. Ireland has benefitted significantly from international economic integration, building on its comparative advantages and sound economic policies. Free trade and foreign investment have transformed the economy in the last several decades and have underpinned the remarkable growth and improvement in the standard of living. A retreat from globalization would, therefore, represent a serious headwind for the Irish economy The high dependence on export-oriented activities, dominated by a small number of multinational enterprises (MNEs), makes the economy particularly vulnerable to trade fragmentation. Certain sectors could potentially gain from "near-shoring" or "friend-shoring", but the extent of such gains would depend on a range of factors, including trading partners' policies. For instance, increased use of subsidies, especially by large countries, would make it difficult for small economies like Ireland to attract investment. Financial fragmentation could also have important implications (IMF, 2023a) through cross-border investment, international payment systems, and asset prices. Ireland's large financial sector is mostly externally-oriented but there are important domestic linkages, both direct in terms of lending by non-banks and investment in real estate, and indirect through an ecosystem of firms providing supporting services (e.g., legal, accounting, IT).

4. This paper aims to assess the main channels through which GEF can affect the Irish economy and provide quantitative estimates of the potential output losses. In particular, we identify three main sources of risk: (i) reduced access to critical imported inputs; (ii) increased import tariffs in key trading partners, and (iii) relocation of FDI, especially intangible capital, by MNEs as a result of corporate restructuring, e.g., induced by trade or tax policies. We find that aggregate losses under the first two scenarios are relatively contained under moderate shock assumptions. There is, however, significant heterogeneity across sectors, with some exposed industries incurring more substantial costs. The third scenario, which entails the relocation of FDI, could be associated with a considerable decline in gross value added, with potential spillover effects.

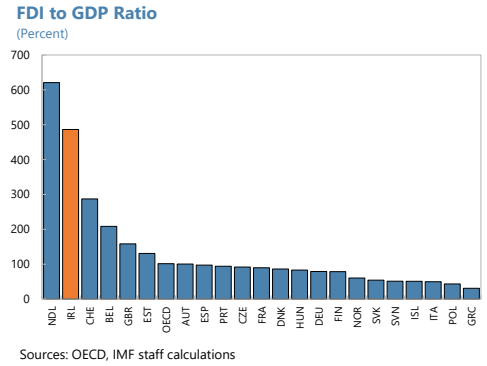
B. Ireland in the Global Economy

5. Ireland has one of the most open economies in the world. Exports and imports of goods and services exceeded 250 percent of GDP in 2024. Services trade has undergone especially rapid growth, doubling as a share of GDP in the last two decades. The degree of Ireland's integration in the global production chain is evident in the high volume of value-added trade— almost two-thirds of domestic value added is being exported. Ireland is also among the largest recipients of FDI in Europe. Foreign-owned firms represent a significant share of the Irish economy, accounting for 31 percent of NNP and 36 percent of wages in 2022 (McQuinn et al., 2024).

Figure 1. Ireland: Openness to Trade and FDI



Sources: Eurostat, and IMF staff calculations.



Sources: OECD, IMF staff calculations

6. The Irish economy is highly integrated in the global production network. Ireland is an important global player in several sectors, including manufacture of pharmaceuticals and computer programming and information services. As shown in Figure 2, most of the Irish-produced pharmaceuticals are exported to the US market. At the same time, the US is also the largest supplier to the Irish pharmaceutical sector through leasing of intellectual property.[2] The main final consumers of Irish computer programming and information services are in the US, France and China, and there are some important intermediate users, notably legal and accounting services, in Ireland, UK and Germany. As in pharmaceuticals, the key input in the production of IT services by a large margin is leased intellectual property (IP) from the US. Network centrality indicators provide useful information about the relative influence of Irish industries in the global economy. Based on the Katz centrality metric, the pharmaceutical sector achieves the highest ranking, followed by computer programming and manufacture of computers and electronics (text figure).[3] Looking at authority and hub scores to assess forward and backward linkages, it is mostly upstream sectors that determine Ireland's position in the global value chains.

Source: IMF staff calculations.

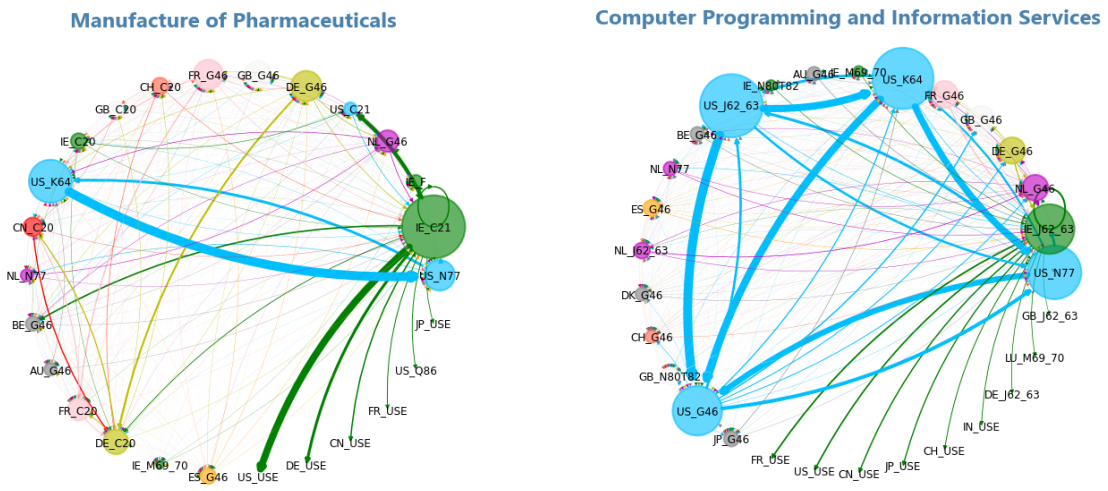
7. High product and market concentration, however, increases vulnerability. Pharmaceuticals and organic chemical products comprise over half of Irish goods exports and similarly, computer services account for more than half of services exports, reflecting Ireland's growing role as a leading digital hub in Europe. Geographic concentration is also high, with

[2] See Annex I for the sector codes and descriptions.

[3] Note that the rankings based on Katz centrality shown in the figure include the "rest of the world" category, an aggregate of countries for which no individual data are reported. Excluding this category, the Irish pharmaceutical sector's rank falls in the top 30 which places it in the highest percentile of country-sectors in terms of significance.

40 percent of goods exports going to EU countries and close to 30 percent to the US. Services imports are dominated by the US (about 50 percent of total), mostly royalties and licensing fees related to the use of IP. The significant dependence of the Irish economy on a small number of products and markets makes it vulnerable to shocks, including shifts in trade related to GEF.

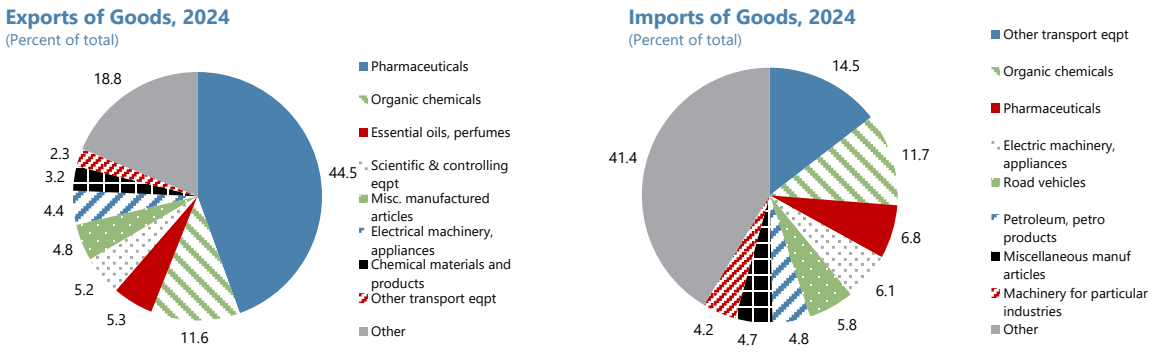
Figure 2. Ireland: Production Networks for Selected Sectors 1/



Sources: FIGARO Project, IMF staff calculations

1/ Production networks for the largest clients and suppliers of Irish sectors with significant international linkages. The labeling of nodes follows the FIGARO IO tables convention – the first two symbols represent the country code, followed by the industry code. Industry codes are listed in Annex I. Clients and suppliers falling into the "Rest of the World" category are not included.

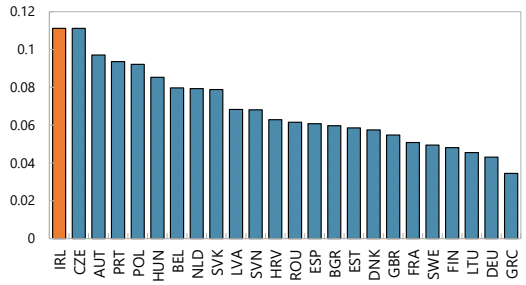
Figure 3. Ireland: Trade Structure



Sources: CSO, Haver Analytics, and IMF staff calculations.

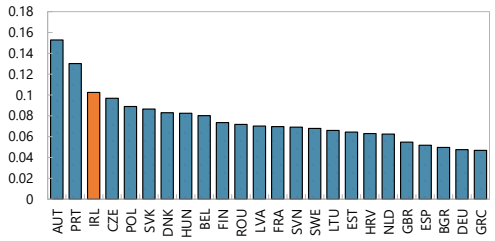
Figure 4. Ireland: Concentration of Trade

Geographic Herfindahl-Hirschman Index for Goods Exports



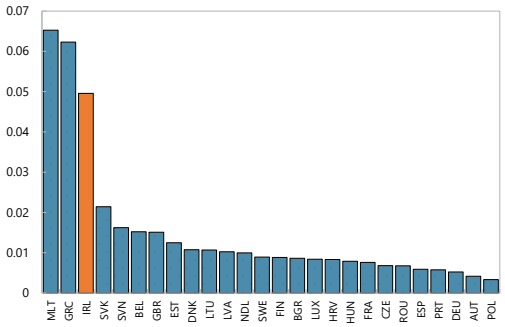
Source: BACI

Geographic Herfindahl-Hirschman Index for Goods Imports



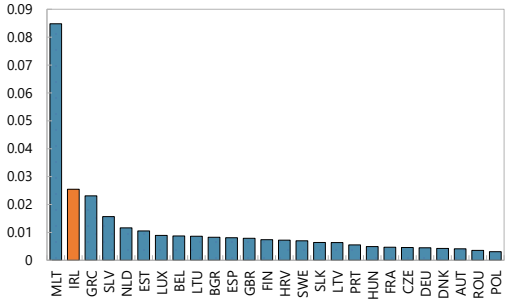
Source: BACI

Product Herfindahl-Hirschman Index for Goods Exports



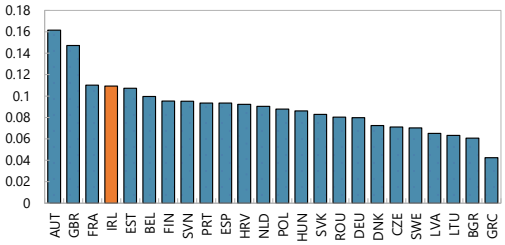
Sources: BACI, IMF staff calculations

Product Herfindahl-Hirschman Index for Goods Imports



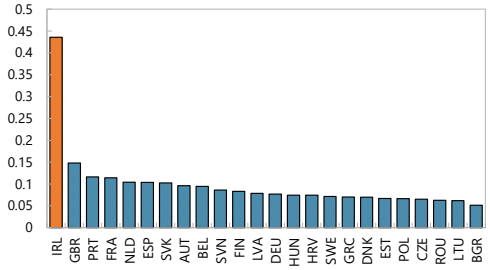
Sources: BACI, IMF staff calculations.

Geographic Herfindahl-Hirschman Index for Service Exports



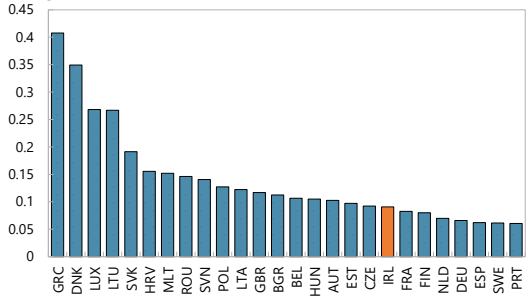
Source: UNCTAD

Geographic Herfindahl-Hirschman Index for Service Imports



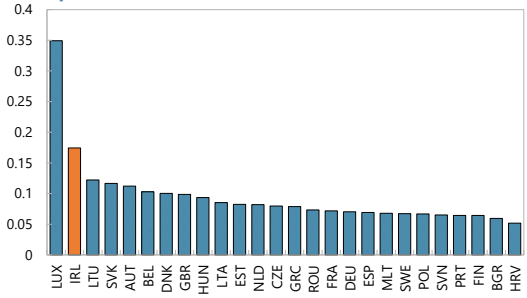
Source: UNCTAD

Product Herfindahl-Hirschman Index for Service Exports



Source: UNCTAD.

Product Herfindahl-Hirschman Index for Service Imports



Source: UNCTAD.

C. Foreign-Dependent Goods and Services

8. In an increasingly fragmented world, trade policy can be used as a tool to control access to essential goods and services. For example, export restrictions motivated by geopolitical reasons can cause major disruptions by limiting the availability of key inputs to production. Vulnerabilities arising from strategic dependencies on foreign products have become a key concern of policy makers, especially after the COVID-19 pandemic. Identifying these dependencies and assessing their impact is an important first step to building resilience. In a methodology considered by the European Commission (European Commission, 2021; see also Korniyenko et al., 2017), foreign-dependent (FD) products are determined based on several indicators: (i) concentration of EU imports from extra EU sources; (ii) importance of extra EU imports in total demand; and (iii) substitutability of extra EU imports with EU production. Thresholds are established for each of these indicators and products for which the calculated indices exceed the thresholds are classified as FD products.

9. A model-based framework can help estimate the impact of reduced access to inputs. Building on the definition of FD products, Borin et al. (2023) propose an approach to evaluate the impact on value added from export restrictions. Their model is based on a Cobb-Douglas production function with capital, labor and intermediate inputs, represented as a constant elasticity of substitution (CES) aggregate of FD and non-FD products. Combining customs data with firm balance sheet information, the authors estimate for Italy a 2 percent loss in GDP following a 50 percent cut of FD products in the baseline calibration, with large heterogeneity across sectors. We apply this framework to the case of Ireland to study the potential impact on output from losing access to critical inputs. Data limitations prevent us from carrying out the analysis at the micro level but the model can be adapted to the sectoral level by aggregating granular trade data and combining them with international input-output tables to evaluate the impact of a supply shock.[4] At the same time, the analysis can be extended to include FD services in addition to goods, given the high importances of services trade for Ireland.

10. Identification of FD goods and services that face a high risk of supply disruptions entails assumptions about the likelihood of restrictions imposed by exporters. Two illustrative scenarios are considered: (i) a relatively benign scenario (Scenario1) whereby countries classified as "high-risk" are those that did not support the United Nations General Assembly Resolution ES-11/6 on peace in Ukraine (consistent with Borin et al., 2023) and (ii) an adverse scenario in which every country outside of the EU is considered "high-risk" (Scenario 2). We use the CEPII BACI dataset for trade data and the FIGARO industry-by-industry input-output tables for 2022 (the latest available) to estimate the effects. In 2022, imports of foreign dependent goods comprised about 3.5 percent of the total Irish imports. There were about 200 such products (at the HS6 level), the largest being imports of medicaments not packaged for retail sale (Table 1). Only three categories of services could be classified as foreign-dependent based on the aforementioned methodology (Table 1), but

[4] International trade data at the HS-6 level are sourced from CEPII-BACI and the input-output tables are obtained from the EU FIGARO project database.

their import value is significantly bigger— about half of all imports—driven by licenses for use of R&D. Since the vast majority of such imports originates from the US, the share of FD services coming from "high-risk" countries is negligible in Scenario 1 and close to one in Scenario 2. For goods, the geographical distribution of imports is somewhat less concentrated and FD products from "high-risk" countries account for about 16 percent of total in Scenario 1 and 90 percent in Scenario 2.

Table 1. Ireland: Main Foreign-Dependent Goods and Services

Goods

Product	Value (€ bn)	Share of total imports (%)	Share of high-risk countries (%)	
			Scenario 1	Scenario 2
Total FDP	4.4	3.5	15.9	90.5
of which				
Medicaments (not packaged for retail sale)	0.6	0.5	0.6	70.1
Cyclic amides and their derivatives;	0.5	0.4	24.6	92.5
Oil-cake and other solid residues;	0.4	0.3	0.1	96.6
Coal; bituminous,	0.4	0.3	19.9	98.3
Photographic plates and film;	0.2	0.2	0.0	99.8
Electrical apparatus; photosensitive	0.2	0.2	74.3	86.9
Brewing or distilling dregs and waste	0.2	0.1	0.2	96.8
Aluminium ores and concentrates	0.1	0.1	58.6	100.0
Oils, essential; of lemon	0.1	0.1	0.0	96.5
Vegetable materials and vegetable waste	0.1	0.1	8.8	94.5

Services

Services	Value (€ bn)	Share of total imports (%)	Share of high-risk countries (%)	
			Scenario 1	Scenario 2
Total FDP	141.4	48.4	0.1	99.3
of which				
Licences for the use of R&D	116.2	39.7	0.1	99.5
Other R&D services	14.1	4.8	0.0	98.2
Licences to reproduce/distribute software	11.2	3.8	0.0	98.9

Source: IMF staff calculations

Note: Scenario 1 classifies countries based on the vote of United Nations General Assembly Resolution ES-11/6 of 23 February 2023 on peace in Ukraine. Countries that supported the resolution are classified as "low-risk" and the rest are included in the "high-risk" category. Scenario 2 assumes that all countries outside of the EU are in the "high-risk" group.

11. The impact of reduced supply of foreign-dependent goods and services can be significant in the short term. A key parameter driving the results in the model is the elasticity of substitution between FD and non-FD inputs in the production function. Assumptions and estimates of this elasticity vary widely in the literature—from near 0 in the short run, consistent with a Leontieff technology (Boehm et al., 2019; Corong et al., 2017) to close to 1 for some industries (McKibbin and Wilcoxen, 1999) or higher in the long run (Peter and Ruane, 2023), with more typical values around 0.2–0.5.

Overall, the elasticity of substitution can be expected to be low in the very short run, given that firms need time to adjust to a shock and restructure their supply chains. As an illustration, a 50 percent reduction of imports of FD goods and services could cause a contraction of total value added in Ireland of about 2 percent with elasticity of substitution of 0.02 under Scenario 1, and less than ½ percent for elasticity in the range of 0.1–0.2 (text figure). The impact is highly non-linear — a larger shock, e.g. 75 percent results in almost 5 percent decline in value added. In addition, Also, the elasticity of substitution can be expected to vary significantly across products.

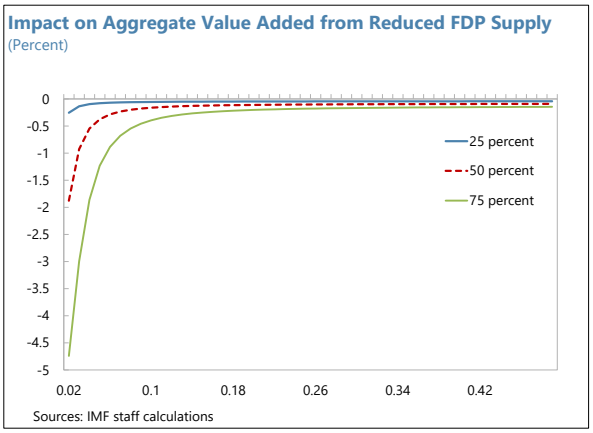
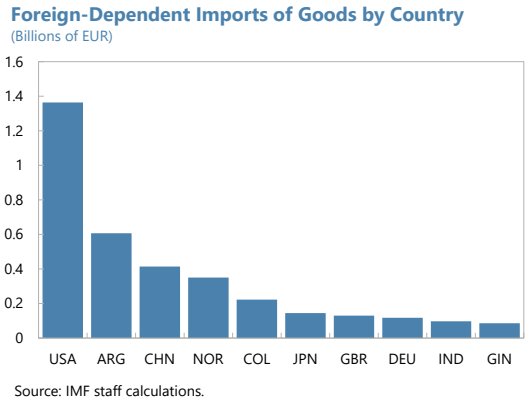
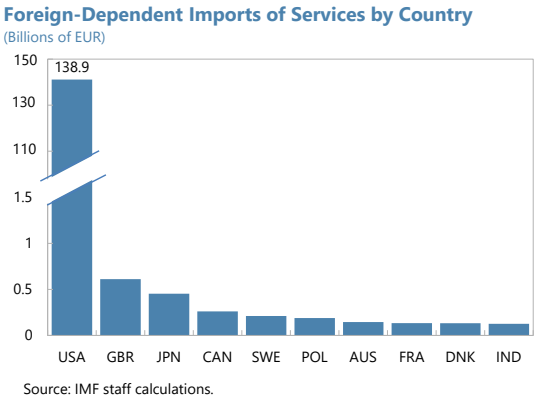


Figure 5. Ireland: Imports of Foreign-Dependent Goods and Services by Country

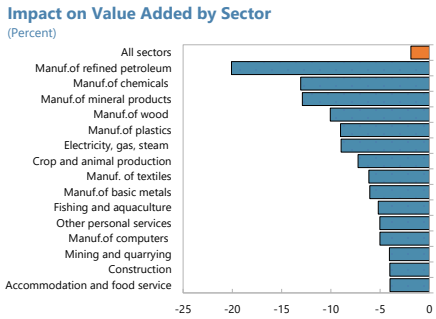




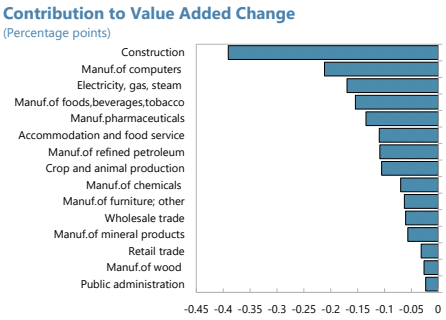
12. To assess the implications of reduced access to FD goods and services, a 50 percent cut in imports from "high-risk" countries is assumed. For the narrower definition of "high-risk" countries (Scenario 1), the elasticity of substitution between FD and non-FD inputs is set at a low value (0.02), whereas in the adverse case where only EU countries are considered "low-risk", the elasticity is assumed to be 0.2. While the overall decline in value added is similar in both scenarios (about 2 percent), there are significant differences in terms of the most affected sectors and the magnitudes of output losses. Manufacture of refined petroleum suffers the largest drop in value added in both scenarios, which is much more pronounced when the elasticity of substitution is low. Because of the sector's relatively low weight in value added, it contributes little to the overall decline. Construction and manufacture of computers, on the other hand, have the largest contributions. In Scenario 2, the main drivers of the value-added contraction are the manufacture of pharmaceuticals, publishing activities (includes software publishing) and air transport, reflecting significant dependence on imported inputs from the US.

Figure 6. Ireland: Impact on Value Added by Sector

Scenario 1 (50 percent FD Inputs Reduction, Elasticity of Substitution of 0.02)

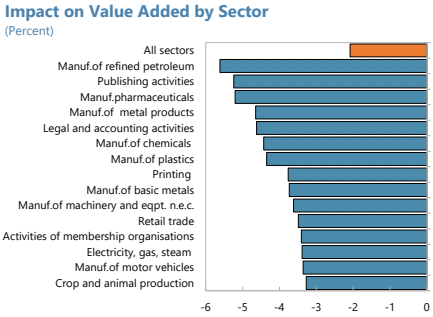


Sources: IMF staff calculations

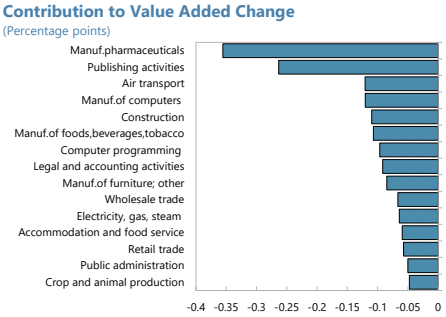


Source: IMF staff calculations

Scenario 2 (50 percent FD Inputs Reduction, Elasticity of Substitution of 0.2)



Source: IMF staff calculations



Source: IMF staff calculations

Note: Scenario 1 classifies countries based on the vote of United Nations General Assembly Resolution ES-11/6 of 23 February 2023 on peace in Ukraine. Countries that supported the resolution are classified as "low-risk" and the rest are included in the "high-risk" category. Scenario 2 assumes that all countries outside of the EU are in the "high-risk" group.

D. The Role of Foreign Direct Investment and Multinational Enterprises

13. Ireland has attracted sizeable FDI over the past few decades. The majority of these investments have been directed toward pharmaceuticals, financial services, and information and communication. Large MNEs in these sectors have established production bases and/or global headquarters in Ireland. Their presence has significantly contributed to the country's employment, gross value added, and tax revenues. In a recent study that quantifies the contributions of domestic and foreign-controlled firms to the Irish economy, O'Grady (2024) finds that the latter are typically more interconnected and have a greater-than-average influence on the broader economy.

14. The reliance on FDI exposes Ireland to geopolitical risks. To assess these risks, we use a geopolitical index which captures the idea that the greater the geopolitical distance between source and host countries, the greater the vulnerability (IMF, 2023b). The index is constructed in two steps. First, it is assumed that geopolitical preferences play a key role as a driver of FDI. The degree of

geopolitical alignment between countries is measured using the "ideal point distance" proposed by Bailey, Strezhnev, and Voeten (2017), which is based on the similarity of voting patterns at the United Nations General Assembly. Second, the geopolitical index is calculated for each host country by multiplying the share of investment from each source country by the geopolitical distance between host and source countries. Ireland has one of the highest geopolitical indices among EU countries, indicating a potential vulnerability to FDI shocks. The country relies significantly on investment from the US, which has a greater geopolitical distance from Ireland compared to the geopolitical distances among countries within the EU. Thus, exposure to geopolitical risks is a function of both geographic concentration and geopolitical differences.

15. MNE activities in Ireland exhibit high sectoral and geographical concentration. OECD's Analytical Activities of MNEs (AMNE) database provides valuable information on the operations of multinationals. Firms are classified into three types: (i) foreign affiliates (firms with at least 50 percent foreign ownership), (ii) domestic MNEs (domestic firms with foreign affiliates), and (iii) domestic firms not engaged in international investment. Their activities, however, are highly concentrated as reflected in both the sectoral and geographic distribution of the controlling entities, as measured by the Herfindahl-Hirschman Index (HHI). To gain a better understanding of the importance of MNEs operating in Ireland at sectoral level, we utilize OECD's Multinational Enterprises and Global Value Chains dataset. It combines the Analytical Activities of MNEs (AMNE) database with the TiVA and OECD Inter-country Inter-Industry Input-Output (ICIO) databases, enabling value-added analysis of MNE activities. Data suggest that MNEs, especially those from the US, play a vital role in key sectors of the Irish economy (Figure 8). In the manufacture of pharmaceuticals, US MNEs contribute 73 percent of value added in the sector, while MNEs from other countries collectively account for another 12 percent. Other sectors where US companies play a dominant role include IT services, where US MNEs generate 85 percent of value added, and IT manufacturing (66 percent). The high dependence on US MNEs leaves the Irish economy vulnerable to shocks that could slow, halt, or reverse foreign direct investment from these companies.

Figure 7. Ireland: Share of Value Added by Owners' Residency

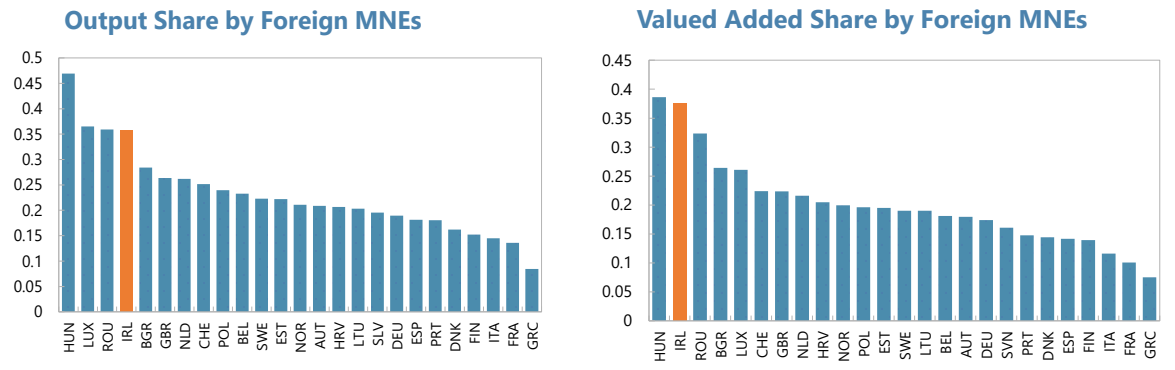
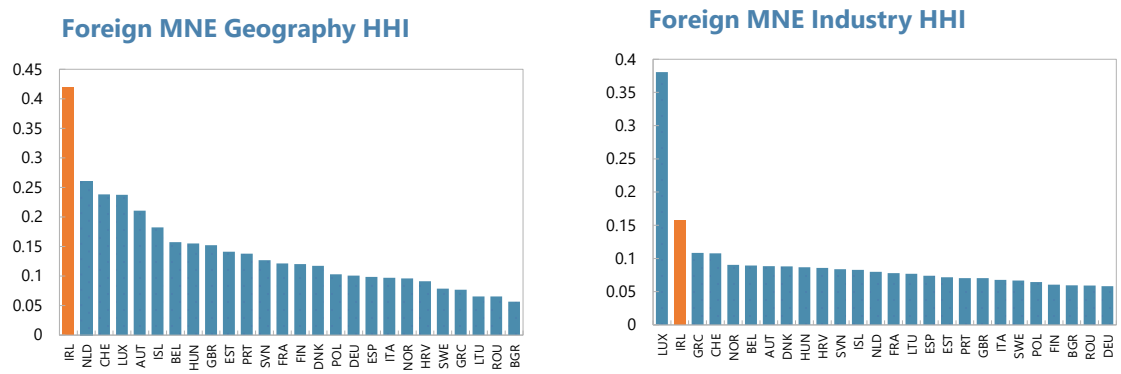


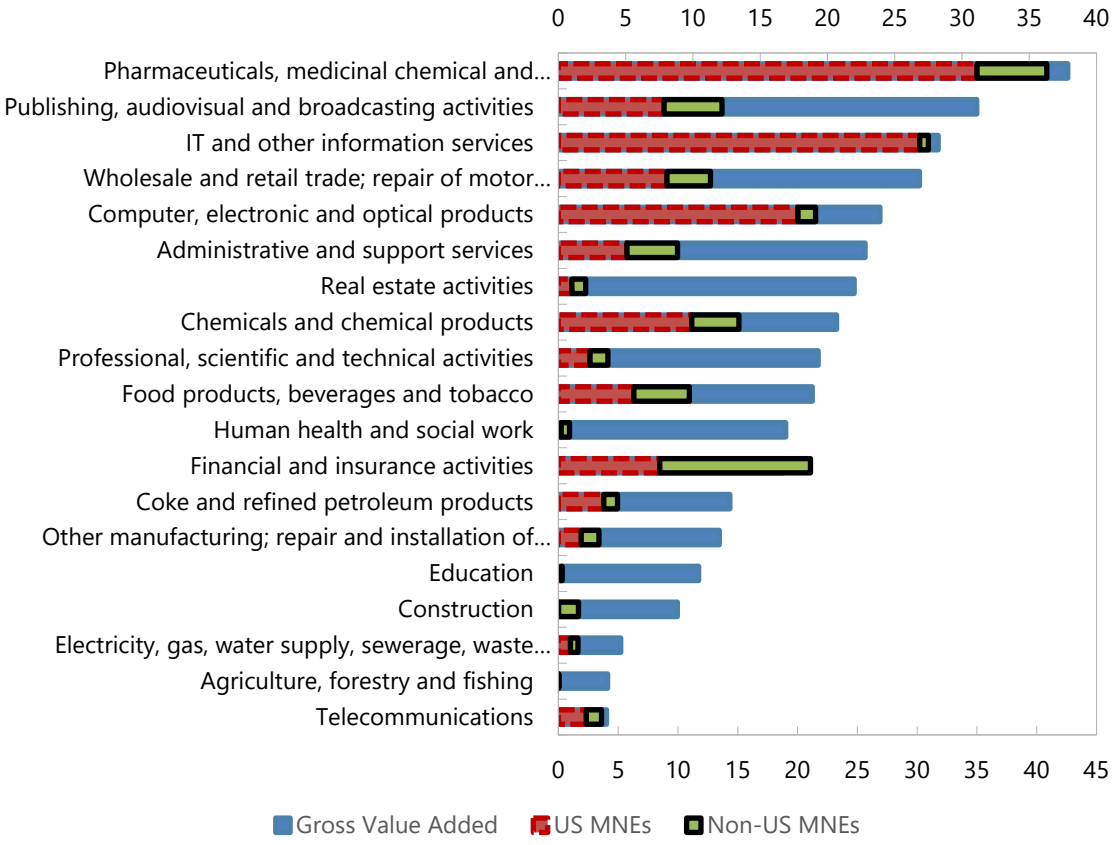
Figure 7. Ireland: Share of Value Added by Owners' Residency (concluded)



Sources: OECD's Multinational enterprises and global value chains dataset and IMF staff calculation

Figure 8. Ireland: Sectoral Importance of Multinational Enterprises

(MNE Value-added by Sector in USD billion)



Source: OECD's Multinational enterprises and global value chains dataset and IMF staff calculation

E. General Equilibrium Analysis

16. To provide a more complete account of the impact on the Irish economy of various GEF scenarios, including spillovers across sectors, a general equilibrium framework is applied. In particular, we adopt the model developed in Huo, Levchenko, and Pandalai-Nayar (2019), Bonadio et al. (2021), and Bonadio et al. (2023), henceforth BHLP model, which allows to estimate changes in the aggregate and sectoral value added in response to shocks. Key features of the model include: (i) a comprehensive labor supply formulation that incorporates traditional trade theories (such as fixed total labor supply that is fully mobile across sectors) and business cycle theories (which allow for flexible total labor supply), along with intermediate options; and (ii) a nested CES structure for both final and intermediate goods bundles, which differentiates elasticities of substitution among inputs and across sourcing countries for identical inputs (Armington assumption). Firms operate in a competitive environment and employ constant return to scale (CRS) technologies, using both domestic labor supply and intermediate inputs, aggregated from various sourcing countries. The model has a number of limitations. First, there is no capital and there is no role for uncertainty. Secondly, as in the case of the supply disruption shock, the magnitude of the impact depends on the calibrated values for the trade elasticities. The results should be interpreted as long run given the absence of frictions other than trade costs.

17. The BHLP model allows to simulate how the economy reacts to various shocks. These include productivity changes; fluctuations in trade costs; shifts in consumer preferences; and trade imbalances. Shocks can be tailored to specific countries, sectors, or combinations of country-sector pairs. To estimate the effects of GEF on the Irish economy under these scenarios, we simulate shocks to trading costs and productivity. Specifically, trade in final goods incurs iceberg costs τ^{f}_{mni} to ship good i from country m to country n. Similarly, trade in intermediate inputs is subject to iceberg costs $\tau^{x}_{mi,nj}$ to ship good i from country m to sector j in country n. A tariff increase is thus modeled as an increase in trading cost for both intermediate and final goods. For the purposes of this analysis, the global economy is divided into seven blocks—indigenous Irish firms, foreign-owned firms operating in Ireland, the rest of the European Union, the United States, the United Kingdom, China, and the rest of the world, with 41 economic sectors each. To keep the analysis simpler and more focused, the revenue from tariffs is ignored.

18. Calibration is based on the Multinational Enterprises and Global Value Chains dataset which allows to distinguish between domestic- and foreign-owned firms. The separation of domestic-owned and foreign-owned firms in the inter-country input-output tables is important for Ireland, given the large presence of foreign MNEs. For example, the same decrease in value-added in a foreign-dominated sector as in an indigenous one is likely to have different implications for employment and consumption. With regard to other key parameters, following Chetty et al. (2011), the Frisch labor supply elasticity is set to 2.8, and the sectoral labor supply elasticity is set to 1.5 following Galle, Rodríguez-Clare, and Yi (2023). We further assume that the elasticity of substitution of intermediate inputs across sectors is 0.2.

19. Two scenarios are of main interest in the case of Ireland and are explored below. These are:

- *Higher import tariffs* leading to an increase in trading costs. The underlying assumptions for this scenario are broadly consistent with the tariff announcements as of mid-April 2025.[5] In particular, it assumes a 145 percent tariff on US imports from China, a 125 percent tariff on Chinese imports from the US, a 25 percent tariff on US imports of automobiles, and a 10 percent tariff on US imports of all other goods, except for pharmaceuticals and electronics which are exempt.

- *Relocation of FDI* resulting in a decline of the FDI stock in Ireland. Such a shock can be identified, for example, with a cross-border shift of foreign-owned intangible assets, currently hosted by Ireland, as a result of trade or tax policies in the country of origin or a third country. For purely illustrative purposes, a scenario involving a 50 percent decrease in the stock of FDI in the ICT services sector is assumed. Since there is no capital in the model, this shock is represented as a 30 percent drop in productivity.[6]

20. Simulation results suggest a relatively limited effect of tariffs on value added in Ireland. In the tariff scenario, value added of the indigenous sectors declines by 0.4 percent and that of the MNE-dominated sectors decline by 1 percent. There is significant heterogeneity across industries. The largest losses are counted by the manufacture of pharmaceuticals, agriculture, foods and beverages sectors and computer and electronics sectors. These sectors are among the most exposed to the US in terms of goods trade. Although pharmaceuticals and electronics are exempt from tariffs in this scenario, the demand for these products declines due to the weaker growth in key trading partners after the tariff shock and similarly for some services. The declines are generally larger in the foreign-dominated sector which is mostly externally-oriented. We note that since the model does not have capital, these results do not take into account the effects from possible lower future investment or the impact of higher levels of uncertainty. In a dynamic setting, assuming a 10 percent bilateral (rather than unilateral) tariff on all goods, including pharmaceuticals and electronics, Egan and Roche (2025) estimate a negative impact on Irish GDP of about 2½ percent after seven years.

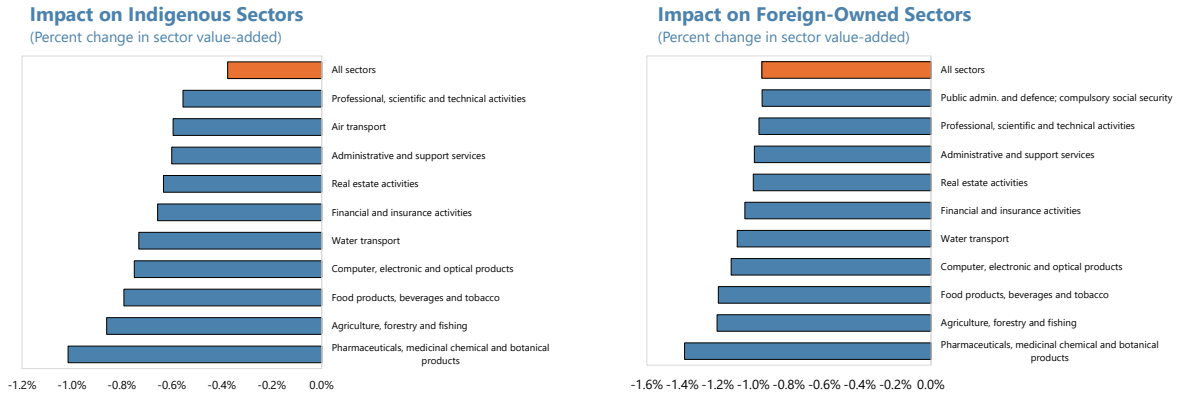
21. The impact of FDI relocation is more significant. In the second scenario, involving 50 percent reduction in the FDI stock in ICT services (simulated as a productivity shock), the foreign-dominated sector would face a 25 percent drop in value added, alongside a 0.7 percent decline in the indigenous segment. The vast difference in outcomes suggests relatively limited spillovers which in part reflects the assumption of no labor reallocation between the two segments of the Irish economy. The decline in GDP is primarily driven by the ICT services sector which is where the FDI

[5] See World Economic Outlook April 2025, p.16.

[6] Assuming a share of capital of 60 percent in a Cobb-Douglas production function, the 30 percent drop in productivity is equivalent to 50 percent decline in capital. The assumption about the capital share is broadly consistent with Eurostat's Multifactor Productivity experimental statistics. It is likely, however, that this share is higher in the MNE sector.

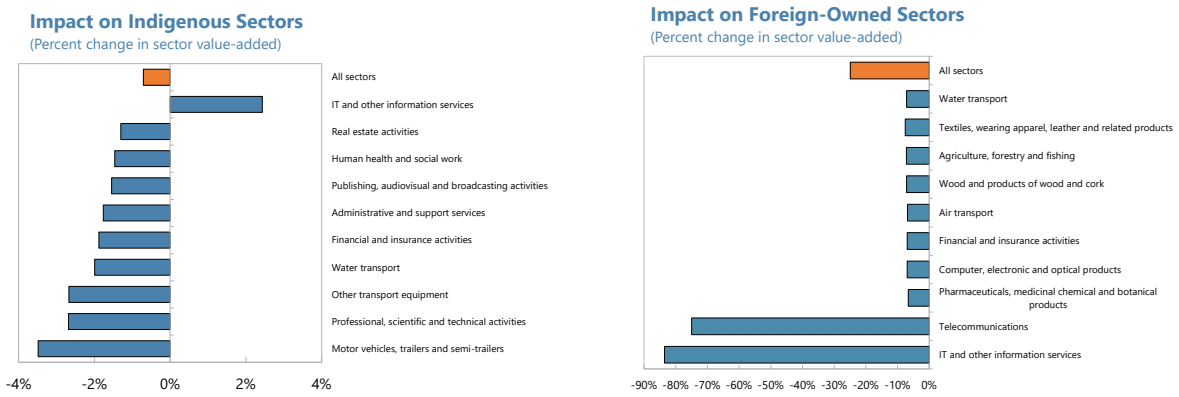
relocation is assumed to take place. The increase in the indigenous ICT services sector is driven by substitution effects, given the substantial decline in the foreign-owned segment. Most other sectors experience contractions which are relatively modest and homogeneous for non-ICT related foreign-owned industries. These are a result from an overall drop in demand because of loss of income in the ICT sector. It is important to note that the model-based results are reported in terms of value added and in Ireland, modified gross national income (GNI*) and modified domestic demand (MDD) are more relevant measures of domestic economic performance. Thus, a sizeable decline in the value added generated in the foreign-owned sector may have a limited impact on these metrics. In addition, the model excludes a fiscal sector and therefore does not capture the negative spillovers to corporate income tax revenue. One can argue that lower gross value added would reduce corporate income tax collections, particularly windfalls which cannot be explained by domestic economic fundamentals.

Figure 9. Ireland: Sectoral Impact of Higher Tariffs



Source: IMF staff calculations

Figure 10. Ireland: FDI Shock



Source: IMF staff calculations

F. Conclusion

22. The multifaceted implications of geoeconomic fragmentation highlight potential challenges to the Irish economy. As geopolitical tensions escalate and economic integration is increasingly reversed, Ireland's economic model, which has relied on free trade and investment, is at risk. Our analysis identifies various channels through which GEF could impact the Irish economy—access to critical imported inputs, increased tariffs by key trading partners, and relocation of FDI by multinational enterprises. While the output losses from the first two scenarios appear manageable on aggregate, sectoral disparities reveal that certain industries may face significant disruptions. A potential relocation of FDI, on the other hand, could be associated with a sizeable decline in gross value added in affected sectors and corporate income tax revenues that could reverberate through the economy.

23. The findings underscore the need for proactive policies aimed at enhancing Ireland's economic resilience. Building fiscal buffers in good times would help mitigate potential decline in fiscal revenue, allowing for a more flexible response to economic fluctuations. In particular, buffers would enable the government to provide focused support facilitating smoother resource reallocations in affected sectors. Promoting linkages between dynamic MNEs and the domestic economy, e.g., through innovation cooperation,[7] and improving infrastructure would bolster competitiveness and make the economy more resilient. Ireland should continue to engage in the EU to further strengthen the single market, including through advancing the Savings and Investments Union.

[7] There are already examples of such collaborations—the Tyndall National Institute brings together leading global companies and Irish SMEs in semiconductors technology and related areas, thus promoting startups and facilitating the creation of high value-added jobs.

References

Amaral, F., Dohmen, M., Kohl, S., & Schularick, M. (2024). Interest rates and the spatial polarization of housing markets, *American Economic Review: Insights*, 6(1), 89–104.

Aiyar, S., Chen, J., Ebeke, C., Garcia-Saltos, R. Gudmundsson, T., Ilyina, A., Kangur, A., Kunaratskul, T., Rodriguez, S., Ruta, M., Schulze, T., Soderberg, G. & Trevino, J. (2023). Geoeconomic fragmentation and the future of multilateralism, IMF Staff Discussion Note No. 2023/001.

Ayar, S., Malacrino, D. & Presbitero, A. (2024). Investing in friends: The role of geopolitical alignment in FDI flows, *European Journal of Political Economy*, vol 83(C).

Baum-Snow, N., & Han, L. (2024). The microgeography of housing supply, *Journal of Political Economy*, 132 (6).

Bailey, M., Strezhnev, A. & Voeten, E. (2017). Estimating dynamic state preferences from United Nations voting data, *Journal of Conflict Resolution*, Vol. 61, No. 2, pp. 430–456.

Boehm, C., Flaaen, A. & Pandalai-Nayar, N. (2019). Input linkages and the transmission of shocks: firm-level evidence from the 2011 Tohoku earthquake, *Review of Economic and Statistics*, 101(1), pp. 60–75.

Bolhuis, M., Chen, J., & Kett, B. (2023). Fragmentation in global trade: Accounting for commodities, *IMF Working Paper* WP/23/73.

Bonadio, B., Huo, Z., Levchenko, A. & Pandalai-Nayar, N. (2021). Global supply chains in the pandemic, *Journal of International Economics* Vol. 133, 103534.

Bonadio, B., Huo,Z., Levchenko, A. & Pandalai-Nayar, N. (2023). Globalization, structural change and international comovement, *NBER Working Paper* 31358.

Borin, A., Cariola, G., Gentili, E., Linarello ,A., Mancini, M., Padellini, T., Panon, L. & Sette, E. (2023). Inputs in geopolitical distress: a risk assessment based on micro data, *Banca d'Italia Occasional Paper*, No. 819.

Cerdeiro, D., Eugster, J., Mano, R., Muir, D., & Peiris,S. (2021). Sizing up the effects of technological decoupling, *IMF Working Paper* WP/21/69.

Chetty, R., Guren, A., Manoli, D. & Weber, A. (2011). Are micro and macro labor supply elasticities consistent? A review of evidence on the intensive and extensive margins. *American Economic Review*, *101*(3), pp.471-475.

Corong, E., Hertel, T., McDougall, R., Tsigas, M., & van der Mensbrugghe, D. (2017). The Standard GTAP Model, version 7, *Journal of Global Economic Analysis*, Vol. 2(1).

Egan, P. and Roche, F. (2025) "The Impact of Deglobalization and Protectionism on a Small Open Economy — The Case of Ireland", *ESRI Working Paper* No. 798

European Commission (2021). Strategic dependencies and capacities, *Commission Staff Working Document*, 352.

Huo, Z., Levchenko, A. & Pandalai-Nayar, N. (2019). International comovement in the global production network, *NBER Working Paper* 25978.

Galle, S., Rodríguez-Clare, A. & Yi, M. (2023). Slicing the pie: Quantifying the aggregate and distributional effects of trade, *The Review of Economic Studies*, *90*(1), pp.331–375.

Goes, C. & Bekker, E. (2022). The impact of geopolitical conflicts on trade, growth and innovation, *WTO Staff Working Paper* ERSD-2022-09.

International Monetary Fund. (2023a). Global Financial Stability Report: Safeguarding financial stability amid high inflation and geopolitical risks, Washington DC, April.

International Monetary Fund. (2023b). World Economic Outlook: A rocky recovery, Washington DC, April.

Javorcik, B., Kitzmueller, L., Schweiger, H., & Yildirim, M. (2022). Economic costs of friend-shoring, EBRD Working Paper No. 274.

Korniyenko, Y., Pinat, M. & Dew, B. (2017). Assessing the Fragility of Global Trade: The Impact of Localized Supply Shocks Using Network Analysis, *IMF Working Paper* WP/17/30.

McKibbin, W. & Wilcoxen, P. (1999). The theoretical and empirical structure of the G-Cubed model, *Economic Modeling*, Vo. 16, pp. 123–148.

McQuinn, K., O'Toole, C., & Hauser, L. (2024). Quarterly Economic Commentary, Spring 2024, ESRI.

O'Grady, M. (2024). Multinational enterprise integration in the Irish value chain, *Central Bank of Ireland Research Technical Paper* Vo. 2024, No.5.

Peter, A. and & Ruane, C. (2023). The aggregate importance of intermediate input substitutability, *NBER Working Paper* No. 31233.

Annex I. NACE Rev. 2 Industries and Codes

Annex I. Table 1. Ireland: List of NACE Rev. 2 Industries and Codes

Industries (NACE Rev.2)	
Code	**Label**
A01	Crop and animal production, hunting and related service activities
A02	Forestry and logging
A03	Fishing and aquaculture
B	Mining and quarrying
C10T12	Manufacture of food products; beverages and tobacco products
C13T15	Manufacture of textiles, wearing apparel, leather and related products
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17	Manufacture of paper and paper products
C18	Printing and reproduction of recorded media
C19	Manufacture of coke and refined petroleum products
C20	Manufacture of chemicals and chemical products
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
C22	Manufacture of rubber and plastic products
C23	Manufacture of other non-metallic mineral products
C24	Manufacture of basic metals
C25	Manufacture of fabricated metal products, except machinery and equipment
C26	Manufacture of computer, electronic and optical products
C27	Manufacture of electrical equipment
C28	Manufacture of machinery and equipment n.e.c.
C29	Manufacture of motor vehicles, trailers and semi-trailers
C30	Manufacture of other transport equipment
C31_32	Manufacture of furniture; other manufacturing
C33	Repair and installation of machinery and equipment
D35	Electricity, gas, steam and air conditioning supply
E36	Water collection, treatment and supply
E37T39	Sewerage, waste management, remediation activities
F	Construction
G45	Wholesale and retail trade and repair of motor vehicles and motorcycles
G46	Wholesale trade, except of motor vehicles and motorcycles
G47	Retail trade, except of motor vehicles and motorcycles
H49	Land transport and transport via pipelines
H50	Water transport
H51	Air transport
H52	Warehousing and support activities for transportation
H53	Postal and courier activities

Annex I. Table 1. Ireland: List of NACE Rev. 2 Industries and Codes (concluded)

Industries (NACE Rev.2)	
Code	**Label**
I	Accommodation and food service activities
J58	Publishing activities
J59_60	Motion picture, video, television programme production; programming and broadcasting activities
J61	Telecommunications
J62_63	Computer programming, consultancy, and information service activities
K64	Financial service activities, except insurance and pension funding
K65	Insurance, reinsurance and pension funding, except compulsory social security
K66	Activities auxiliary to financial services and insurance activities
L	Real estate activities
M69_70	Legal and accounting activities; activities of head offices; management consultancy activities
M71	Architectural and engineering activities; technical testing and analysis
M72	Scientific research and development
M73	Advertising and market research
M74_75	Other professional, scientific and technical activities; veterinary activities
N77	Rental and leasing activities
N78	Employment activities
N79	Travel agency, tour operator and other reservation service and related activities
N80T82	Security and investigation, service and landscape, office administrative and support activities
O84	Public administration and defence; compulsory social security
P85	Education
Q86	Human health activities
Q87_88	Residential care activities and social work activities without accommodation
R90T92	Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities
R93	Sports activities and amusement and recreation activities
S94	Activities of membership organisations
S95	Repair of computers and personal and household goods
S96	Other personal service activities
T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U	Activities of extraterritorial organisations and bodies

Source: FIGARO Project

BENCHMARKING PUBLIC SPENDING EFFICIENCY IN EDUCATION, HEALTH, AND INFRASTRUCTURE[1]

The paper benchmarks Ireland's public spending efficiency to peer countries in infrastructure, health, and education using a variety of indicators and maps the efficiency frontiers in these sectors using the Data Envelopment Analysis (DEA) method. It finds that while Ireland is at the efficiency frontier for education spending, there is room for potential gains in efficiency for public spending on health and infrastructure. Achieving these gains could create further fiscal space to improve Ireland's buffers for shocks in an environment of heightened global uncertainty and structural shifts.

A. Introduction

1. Enhancing public spending efficiency will help de-risk Ireland's public finances. Ireland's strong fiscal position in recent years has been supported by a large increase in corporate income tax (CIT) revenues, which are highly concentrated and vulnerable to external policy shifts as well as firm- or sector-specific shocks. It is unclear how long the windfall CIT revenue source will last, without which Ireland's underlying fiscal position would have been considerably weaker. Enhancing public spending efficiency—by enabling the same quality of outcomes and delivery of public services with less spending, or better outcomes with a given level of spending, or a mix of the two—can help improve Ireland's fiscal buffers for shocks. Furthermore, at the current juncture of the Irish economy operating at full capacity, limiting the fiscal impulse through improved public spending efficiency would help Ireland address its urgent infrastructure and housing needs while avoiding pro-cyclical fiscal policy.

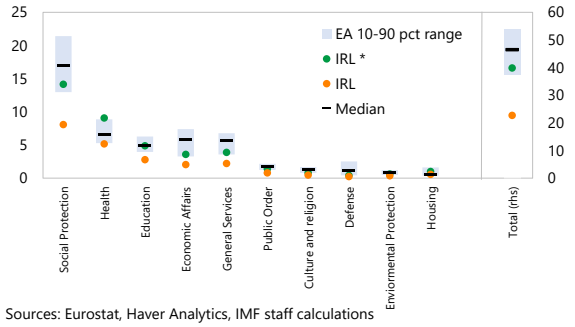
2. The overall level of public spending in Ireland is relatively low in the euro area, with the exception for health spending. Total public spending, at 40 percent of GNI* in 2023, has been below the median of EU peers (Figure 1). By functional budget, most spending categories are below the euro area medians— except for health, which as a share of GNI* is at the top range of the euro area peers, and education which is at the median (Figures 1, 2, 3).[2] In recent years, health spending has also consistently grown faster than total spending. Nevertheless, there are some limitations with the comparability of the health sector data due to different accounting approaches across countries —health spending is likely overstated in Ireland as it captures some social spending (Wren and Fitzpatrick, 2020).

[1] Prepared by Yen Mooi, with research assistance by Santiago Previde (both EUR). This paper benefitted from helpful comments and suggestions from the authorities and the participants of staff presentations during the Article IV consultation mission.

[2] Indicators for Ireland are measured as share of GNI*, compared to other EU countries where a share of GDP is employed. The modified GNI* is widely accepted as a more accurate measure of the Irish economy relative to GDP, given the large share of multinational activity.

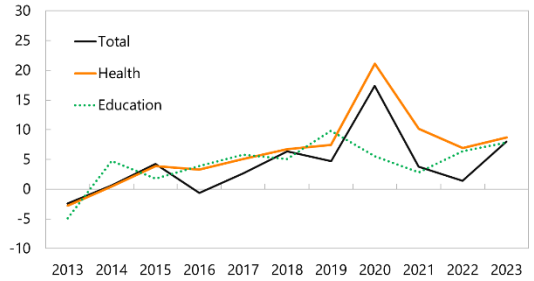
Figure 1. Ireland: Public Spending

Distribution of Public Spending, 2023
(Percent of GDP)



Sources: Eurostat, Haver Analytics, IMF staff calculations
Note: IRL* represents share of GNI*.

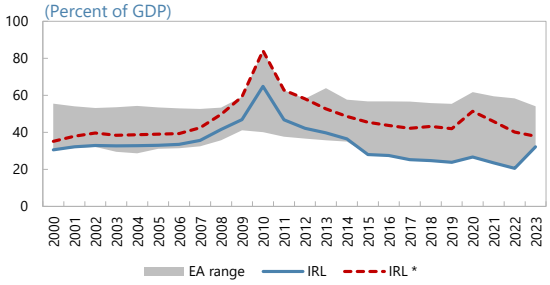
Spending Growth by Category
(Year-on-year percent changes)



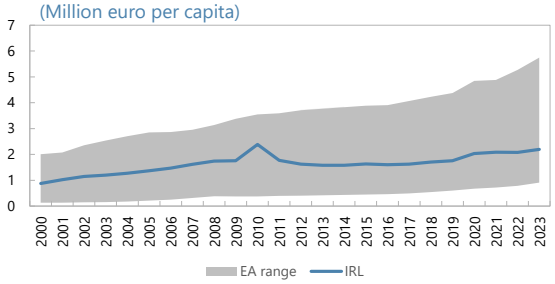
Sources: Eurostat, Haver Analytics.
Note: The spike of health spending in 2020 reflects the impact of the COVID-19 pandemic.

Figure 2. Ireland: Spending Range of Selected Expenditure Categories in Ireland and the Euro Area (2023)

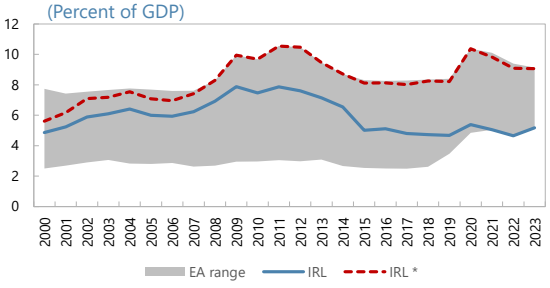
General Government Expenditure
(Percent of GDP)



Expenditure
(Million euro per capita)



Health Spending
(Percent of GDP)



Health Spending
(Percent of expenditure)

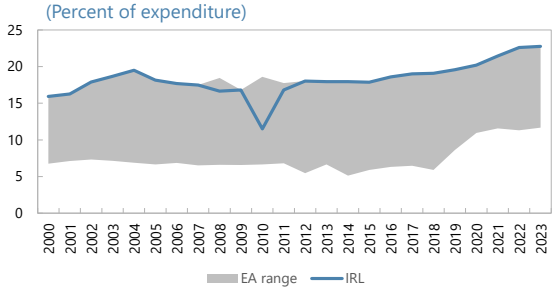
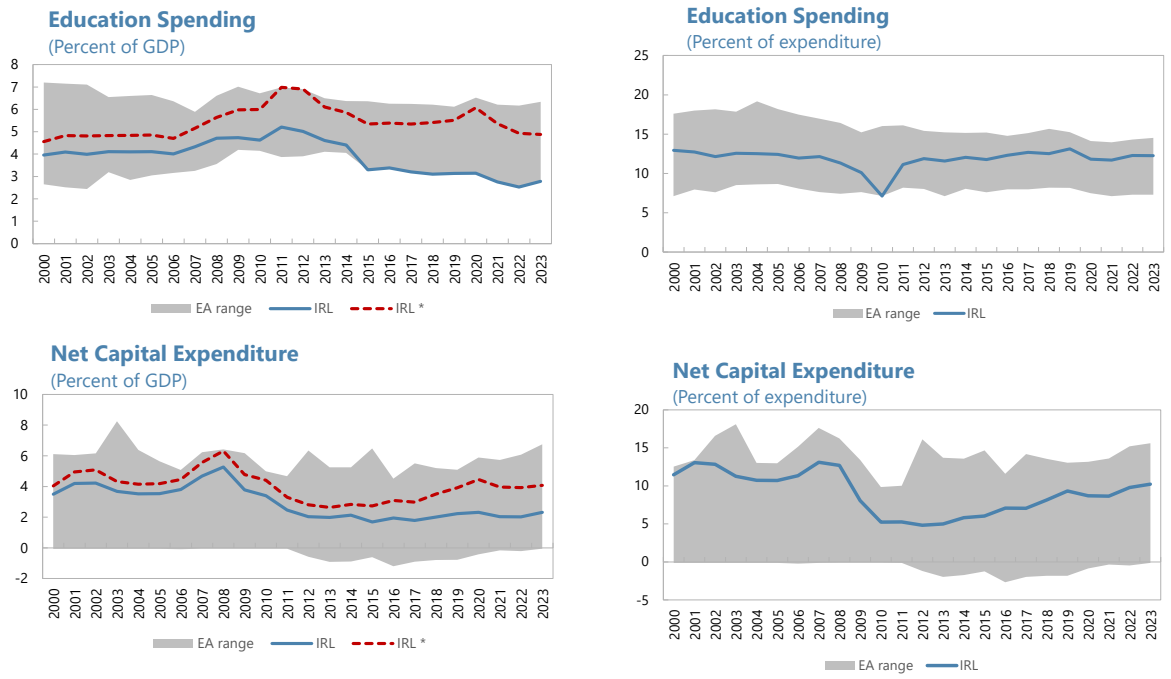


Figure 2. Ireland: Spending Range of Selected Expenditure Categories in Ireland and the Euro Area (2023) (concluded)



Sources: Haver Analytics, IMF staff calculations.
Note: IRL* refers to the share of GNI*.

Figure 3. Ireland: Gap in Major Spending Categories Between Ireland and EU Peers (2023)

Difference in share of GDP	Total Expenditure	General public services					Economic affairs				Health				Education					Social protection							
		General public services	Exec.& Legis. Organs, Fiscal, Financial & External affairs	Basic research	Public debt transactions		Economic affairs	General econ., commercial and labour affairs	Transport		Health	Medical products, appliances and equipment	Outpatient services	Hospital services	Education	Pre-primary and primary education	Secondary education	Tertiary education		Social protection	Sickness and disability	Old age	Survivors	Family and children	Social exclusion n.e.c.	Unemployment	
Total General Government Expenditure	**(9.2)**	**(2.0)**	**(0.1)**	**(0.5)**	**(0.4)**		**(1.8)**	**(0.6)**	**(0.5)**		**1.7**	**(0.1)**	**0.9**	**0.2**	**(0.2)**	**0.0**	**(0.0)**	**(0.0)**		**(5.4)**	**(0.9)**	**(4.9)**	**(0.4)**	**(0.8)**	**(0.1)**	**0.3**	
Compensation of Employees	(0.1)	(0.7)	(0.2)	(0.2)	-		(0.1)	(0.0)	(0.0)		1.7	-	0.7	0.7	0.3	0.3	0.1	(0.1)		(0.7)	(0.0)	(0.3)	-	(0.4)	(0.1)	(0.1)	
Consumption of goods and services	0.2	(0.4)	(0.1)	(0.1)	(0.1)		(0.2)	0.0	(0.3)		1.1	(0.0)	1.0	(0.0)	(0.2)	(0.1)	(0.1)	(0.2)		0.2	0.1	(0.2)	-	(0.2)	(0.1)	(0.0)	
Investment	0.1	(0.4)	(0.1)	(0.1)	-		(0.3)	0.0	(0.2)		0.4	-	0.3	0.2	(0.1)	(0.0)	0.1	(0.1)		0.5	(0.0)	(0.0)	-	(0.0)	-	-	
Other Spending	(1.9)	(0.6)	0.3	(0.0)	(0.4)		(0.2)	(0.3)	0.1		(0.1)	(0.0)	(0.2)	(0.1)	(0.5)	(0.1)	(0.0)	0.1		(0.3)	(0.2)	(0.1)	(0.0)	(0.2)	0.4	(0.1)	
Social Benefits	(6.6)	-	-	-	-		(0.0)	(0.0)	-		(1.5)	(0.1)	(0.9)	(0.5)	0.0	(0.1)	(0.1)	0.1		(5.1)	(0.8)	(4.3)	(0.4)	(0.0)	(0.2)	0.5	
Subsidies	(0.9)	(0.0)	-	(0.0)	-		(1.0)	(0.3)	(0.1)		0.1	-	-	(0.1)	0.3	-	-	0.2		(0.0)	(0.0)	-	-	-	-	-	

Data for Ireland is calculated using GNI*.

Higher (+) or lower (-) than EU14 peers average in percent of Ireland expenditure category

Higher by more than 25 percent
Higher by 15-25 percent
Higher by 5-15 percent
Higher by 0-5 percent
Lower by 0-5 percent
Lower by 5-25 percent
Lower by more than 25 percent

Sources: Eurostat and IMF staff calculations.
Note: EU14 is previously EU15 excluding the U.K.

Note: Outpatient services cover medical, dental and paramedical services delivered to outpatients by medical, dental and paramedical practitioners and auxiliaries. The services may be delivered at home, in individual or group consulting facilities, dispensaries or the outpatient clinics of hospitals.

3. This paper aims to benchmark Ireland's public spending efficiency in health, education, and infrastructure with its international peers. The analysis will focus on health and education, two key areas of the functional budget, as well as infrastructure which is an important spending priority for the government. Comparisons with a relevant peer group can be useful for

drawing examples from the experience of other countries. For this analysis, the individual country comparators used as benchmarks are Austria, Belgium, Denmark, Luxembourg, the Netherlands, and Sweden – other small, open, and high-income economies in the EU. Peer groupings that are used, subject to data availability, are the EU and the OECD. This paper does not analyze and provide recommendations on how to close any identified public spending efficiency gaps, which will require more detailed analysis.

4. The public spending efficiency measures are estimated using Data Envelopment Analysis (DEA). The DEA is a non-parametric statistical technique commonly used to estimate the relative efficiency in which inputs are turned into outputs. The DEA constructs an "efficiency frontier" – the maximum possible output that can be obtained from a given input. As the DEA does not impose a functional form on the relationship between inputs and outputs, it is not equipped to provide conclusions on the expected change in outputs to any marginal changes in inputs. Rather, it informs on the relative "distance" a country is from the maximum possible output given a certain level of input, as an illustration of potential efficiency gains. As the DEA is sensitive to sample selection, the use of an EU and OECD sample helps to ensure similar institutional features and development levels for better comparability. This analysis uses various measures of public spending per capita as the input measured against relevant sectoral outputs and outcomes. For assessing health and education macro spending efficiency, outcome indicators were used instead of outputs, as the latter might not sufficiently capture the quality and effectiveness of health and education systems. Outcome measures are thus closer to the policy objectives of social spending. Nevertheless, while outcomes can be influenced by non-spending factors that are difficult to control for, the efficiency frontier can be a useful starting point in providing broad indications of how countries are performing in terms of public spending efficiency.

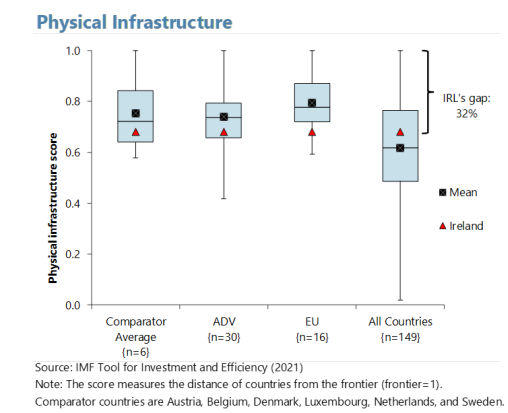
B. Infrastructure

5. Various metrics show an infrastructure gap for Ireland relative to other high-income European countries. Indicators of infrastructure stock and quality compiled using the IMF Tool for Investment and Efficiency (2021) show Ireland lagging comparators, advanced economies, and EU peers (Figure 4).[3] Relative to the frontier, Ireland faces a physical infrastructure gap of 32 percent and a quality gap of 27 percent. Other findings corroborate the gap – the Irish Fiscal Advisory Council (IFAC) finds the infrastructure per capita in Ireland and capital stock to national income to be around 25 percent and 20 percent below the average for a high-income European country, respectively (IFAC, 2024). The International Institute for Management Development (IMD) World Competitiveness index 2024 also shows that despite Ireland's overall strong performance (4th out of 67 countries, the highest in the euro area), infrastructure is a drag—ranking 17th for infrastructure

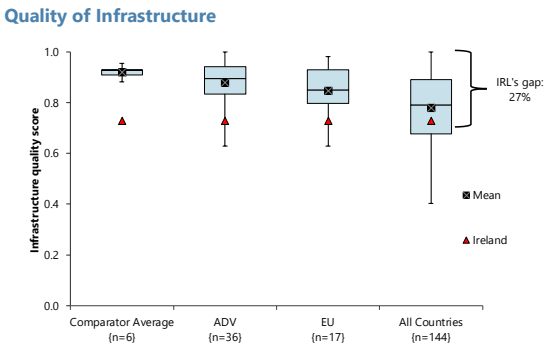
[3] The physical infrastructure indicator combines variables on five core sectors: roads, electricity, water and sanitation, education infrastructure, and health infrastructure. Ireland's gap is 32 percent relative to the frontier (compared to the global average gap of 38 percent, European Union 21 percent, peer comparators 25 percent). On quality of infrastructure, Ireland's gap is 27 percent, above the global average gap of 22 percent, EU 15 percent, and peer comparators 8 percent.

provision, with basic infrastructure having a weaker rank (38).[4] While the ranking on the infrastructure sub-pillar has increased over the years, Ireland has scored consistently low in this area and it has lagged the other sub-pillars since 2014.[5] Finally, infrastructural deficits (notably in housing, energy, water, and wastewater) are cited by the National Competitiveness and Productivity Council (2024) as a key challenge in maintaining Ireland's competitiveness and attractiveness as an FDI destination.

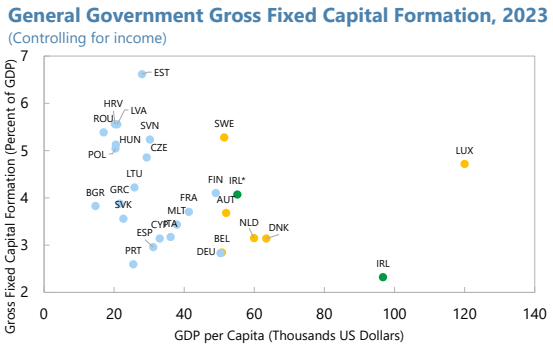
Figure 4. Ireland: Selected Infrastructure Indicators



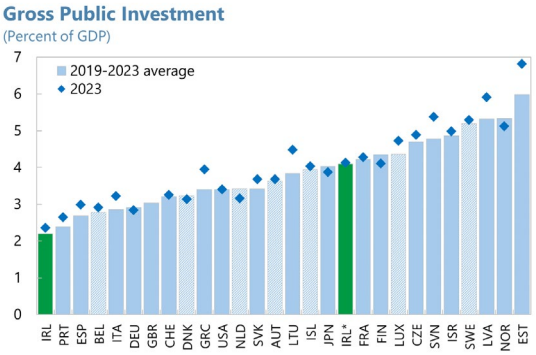
Source: IMF Tool for Investment and Efficiency (2021)
Note: The score measures the distance of countries from the frontier (frontier=1).
Comparator countries are Austria, Belgium, Denmark, Luxembourg, Netherlands, and Sweden.



Source: IMF Tool for Investment and Efficiency (2021)
Note: The score measures the distance of countries from the frontier (frontier=1).
Comparator countries are Austria, Belgium, Denmark, Luxembourg, Netherlands, and Sweden.



Sources: Eurostat, Haver Analytics, and IMF staff calculations.
Note: IRL* uses GNI*. GFCF data for France is from 2022.



Sources: OECD and IMF staff calculations.
Note: * percent of modified GNI.

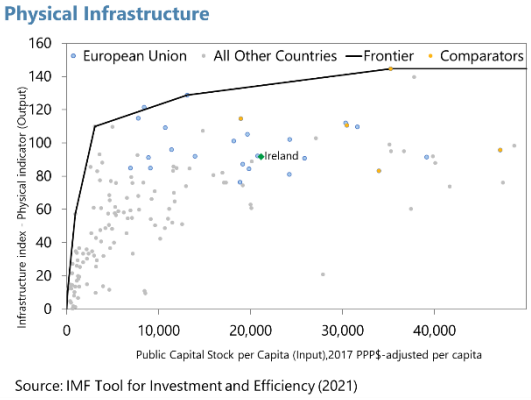
6. Spending on infrastructure has picked up in recent years after a period of underspending post-crisis (Figure 2). The general government spending on gross fixed capital formation is at about 4 percent of GNI* in 2023 and is catching up to the pre-crisis average. The Irish government is prioritizing capital expenditure and have outlined their commitment of €165 billion in capital investment over the period of 2021–2030 through the National Development Plan, which is currently being updated. Significant capital allocation in the budget has been made for infrastructure, with the Programme for Government outlining priority sectors including housing, water, energy, and transport.

[4] Basic infrastructure comprises water infrastructure, density of road and rail networks, and energy infrastructure.

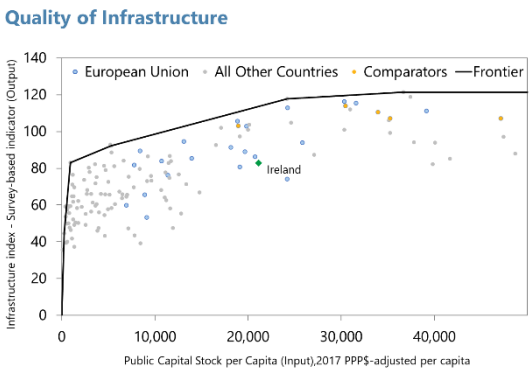
[5] The sub-pillars are economic performance, government efficiency, business efficiency, and infrastructure.

7. Investment efficiency in Ireland lags advanced economy and European comparators in both stock and quality (Figure 5). Using the physical infrastructure and quality indicators as output and mapping them against the public capital stock shows the investment efficiency frontier, which follows the path of countries that deliver the highest level of output for a given level of infrastructure investment. The position of countries relative to the frontier depicts how efficient a country is in converting infrastructure spending into infrastructure outcomes. In both measures of quality and quantity of infrastructure, Ireland sits below the frontier, suggesting potential efficiency gains. An alternate measure of quality using the Global Infrastructure Quality Index (2023) yielded similar results.

Figure 5. Ireland: Investment Efficiency Frontier



Source: IMF Tool for Investment and Efficiency (2021)



Source: IMF Tool for Investment and Efficiency (2021)

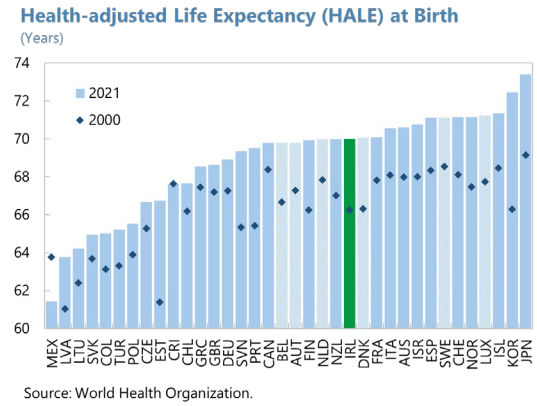
8. While significant progress has been made since the last Public Investment Management Assessment (PIMA), several challenges remain. Notable advancements since the 2017 PIMA include the alignment of investment and planning through the National Development Plan and Investment Framework, and enhanced planning, allocation, and project oversight through the establishment of the National Investment Office. The implementation of annual spending reviews has been beneficial to reallocate resources within current expenditures, while the introduction of the investment project tracker has played a crucial role in improving transparency and monitoring of expenditures. Nevertheless, several key challenges remain in the effective delivery of infrastructure – including planning delays, low construction productivity (including the need to utilize modern methods of construction), and labor shortages in the construction sector.

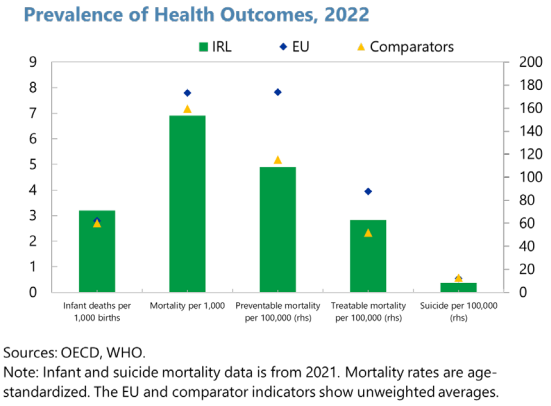
C. Health

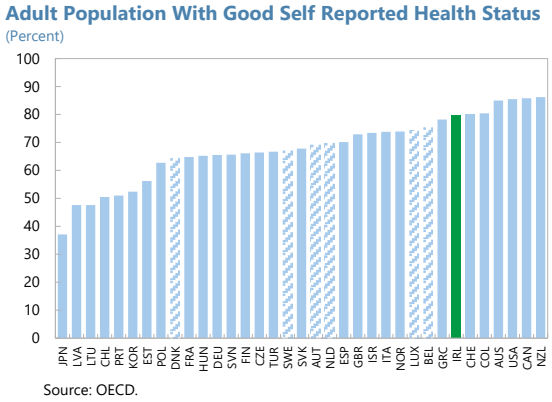
9. The health outcomes of the Irish population are generally good and have improved over time (Figure 6). The health-adjusted life expectancy (HALE) at birth is high at 70 years old, having increased from 66.25 in 2001, and comparable to European peers. Prior to the pandemic, Ireland's life expectancy increased by more than the EU average, and during the pandemic its decline was comparatively smaller (OECD, 2023). The overall age-adjusted mortality rates as well as those from preventable and treatable causes are also consistently lower than the EU average. The self-reported health status is the highest in the EU, and ranks favorably compared to other OECD

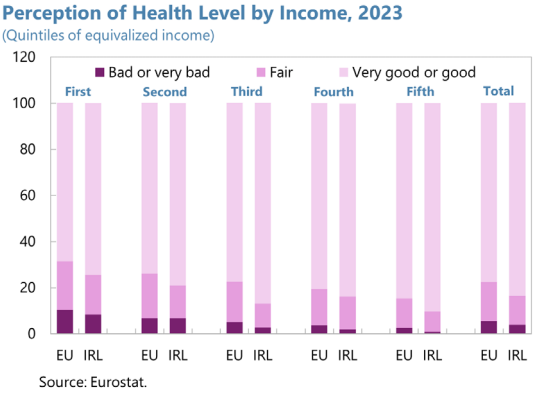
countries, although it belies widening differences between socio-economic groups.[6] In old age, both Irish men and women are likely to lead longer and healthier lives with a lower prevalence of health-related activity limitations relative to the EU average.[7]

Figure 6. Ireland: Selected Health Outcomes









10. The health system is facing capacity constraints. Extensive waitlists at public hospitals are the main reason of unmet needs for medical care, compounded by the backlog from the pandemic. A deficit in bed capacity is the likely key reason for the overcrowding in public hospitals (ESRI, 2023)—internationally comparable data show that public hospital beds per capita were at undercapacity in 2022, significantly lower than the EU average, and with high occupancy rates above the recommended threshold (Figure 7).[8] The data does not yet reflect the increase in the number of

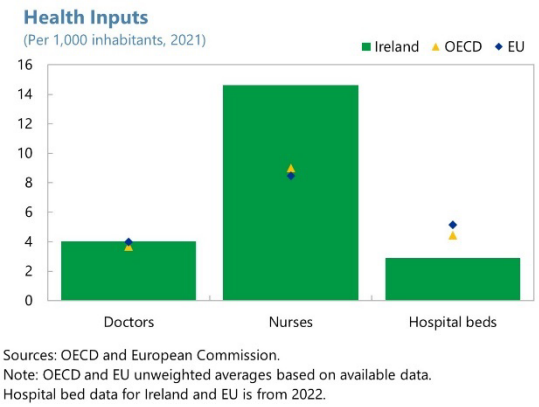
[6] In 2022, 90 percent of adults in the highest income quintile reported being in good health, relative to 66 percent in the lowest quintile. The gap is slightly larger than the EU and has increased compared to 2019, mainly due to the decline in share of people in the lowest income quintile reporting good health.

[7] State of Health in the EU, Ireland Country Health Profile, OECD (2023)

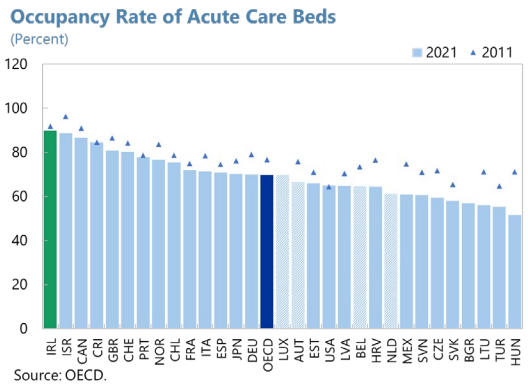
[8] Acute care hospital beds operated at 90 percent occupancy, above the recommended threshold of 85 percent for maintaining an emergency buffer (OECD, 2023).

acute beds by the government in the last few years, with further plans for expansion in the coming years.[9] Hospitalization rates for avoidable diseases such as chronic obstructive pulmonary disease (COPD) are relatively high in Ireland, a marker of the underdeveloped primary care system. The health system has also faced challenges in the recruitment and retention of permanent staff, particularly with doctor shortages in certain specializations despite the relatively high production of medical graduates per capita compared to the EU (OECD, 2023).

Figure 7. Ireland: Selected Health Inputs



Sources: OECD and European Commission.
Note: OECD and EU unweighted averages based on available data.
Hospital bed data for Ireland and EU is from 2022.



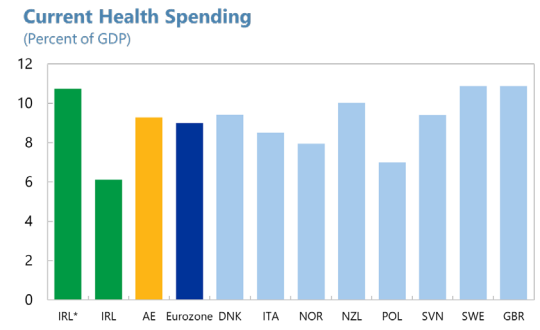
Source: OECD.
Note: Data for IRL excludes private hospitals.

11. Health expenditures in Ireland are high overall, considering its relatively young population.[10] Across several metrics, spending on health is elevated relative to comparators, OECD and EU peers (Figure 8), although this partly reflects the inclusion of some social care components of long-term care expenditure in health spending (OECD, 2025). Public sources account for two-thirds of total health spending in Ireland. As a share of government expenditure, it has shown a steady upward trend, rising from 19.6 percent in 2019 to almost 23 percent in 2023. The elevated levels of health spending could reflect the hospital-based system, relatively out-of-date clinical infrastructure from a legacy of past underinvestment, a reliance on more costly agency staff given hiring and retention challenges, and the high general wage levels in the health sector (Sicari and Sutherland, 2023; IFAC, 2024; OECD, 2022 and 2025; Wren and Fitzpatrick, 2020).

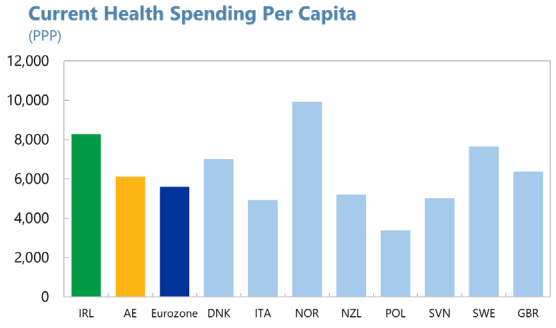
[9] Since 2020, an additional 1,218 in-patient acute beds have been added. In May 2024, the government announced the Acute Inpatient Hospital Bed Expansion Plan, which aims to deliver 4,367 acute hospital in-patient beds by 2031.

[10] The current age structure in Ireland stands favorably relative to other EU countries—it has the highest share of population below age 20 (26 percent), the second lowest median age (38.8), and the second lowest share of population aged 65 and above (15 percent).

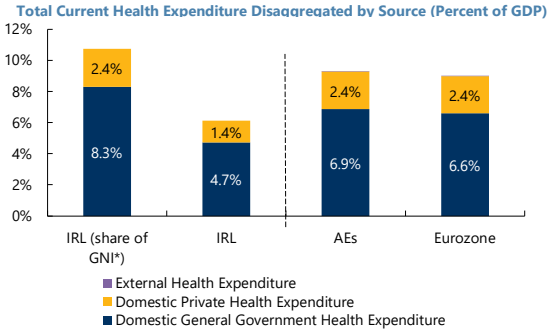
Figure 8. Ireland: Health Spending 1/



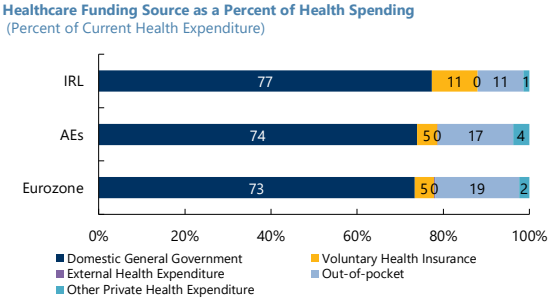
Source: WHO GHO.
Note: Includes public, private, and external expenditures. IRL* refers to share of GNI*.
Comparison countries are those in the cluster of similar health systems in OECD, 2025.



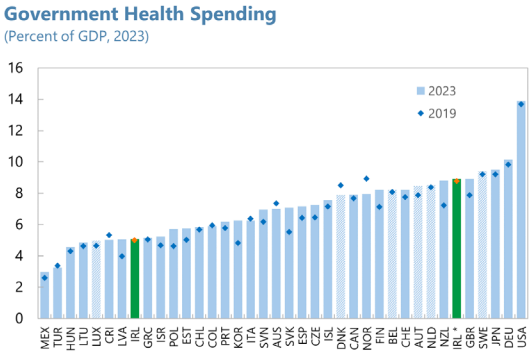
Source: WHO GHO.
Note: Includes public, private, and external expenditures.
Comparison countries are those in the cluster of similar health systems in OECD, 2025.



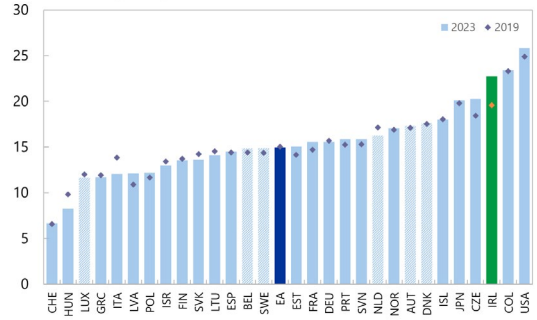
Source: WHO Global Health Expenditure Database (GHED).
Note: Estimates of current health expenditures include healthcare goods and services consumed during each year. This indicator does not include capital health expenditures.



Source: WHO GHED



Sources: OECD, and IMF staff calculations.
Note: IRL* represents percentage of GNI*



Sources: OECD, and IMF Staff Calculations.

1/ Health spending is not adjusted for population age structure

12. Expenditure overruns in health spending have been a chronic feature in recent years. Between 2016 to 2022, all acute hospitals exceeded their annual budget and costs rose disproportionately—the inflation-adjusted rise in costs was 45 percent relative to a 3.8 percent increase in activity (IGEES, 2024).[11] The wage bill accounted for two-thirds the rise of total

[11] The total nominal increase of expenditure was 68 percent in 2016–2022, with an average budget variance of 10.8 percent in the acute hospitals. The "composite" activity metric captures different types of activity (inpatient, day-case, outpatient, emergency department) to enable the comparison of activity as a single value across hospitals.

expenditure, reflecting pay increases, an expanded workforce, a higher share of consultants, and more use of agency staff and overtime.[12] Non-pay expenditure has also risen, particularly from increases in non-clinical expenditure that were out of line with general trends. The overruns in health spending could also reflect inadequate forecasting within the budget, notwithstanding a two-year expenditure agreement to boost the budget for the health sector.[13]

13. Potential efficiency gains could be reaped in health spending. Using HALE as an output and current health expenditure per capita in PPP terms as an input, the efficiency frontier suggests that there is room for substantial efficiency gains (Figure 9).[14] The results are consistent when using an alternative measure of age-adjusted mortality rates, and with total and government current health spending per capita as inputs, as well as comparing with other countries with similar health systems.[15] An OECD study (Sicari and Sutherland, 2023) also suggests that estimated potential efficiency gains could be as large as 15 percent on the input dimension (saving up to 15 percent of current health expenditures, while maintaining unchanged life expectancy) and 1 percent on the output dimension (increase life expectancy by around 1 percent while keeping level of spending constant, but adjusting composition to OECD best practice).

14. Improvements in health spending efficiency will help to ensure the continued delivery of quality healthcare in the face of growing demands. The healthcare system in Ireland will need to confront future demands from population growth and aging, and pharmaceutical cost pressures. The European Commission projects aging costs to rise substantially in Ireland, with baseline public expenditure health costs projected to grow by 1.5 percentage points of GDP between 2022 and 2070, the second largest increase at the EU level.[16] Under a risk scenario, the projected rise is 2.5 percentage points of GDP.

[12] Staffing in acute services increased by 33 percent between 2016 to 2022, alongside pay increases that were influenced by public sector pay deal agreements. The use of locum and agency staff and overtime has also increased despite the significant expansion of staff levels, raising questions on control management and expenditure compliance. (Government of Ireland Analytical Note, 2024).

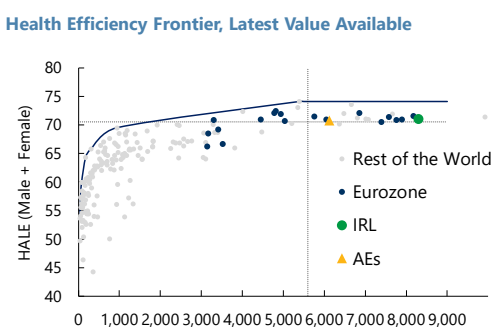
[13] Forecasts for health system spending do not sufficiently account for costs of maintaining the existing level of service delivery, resulting in below-adequate allocations that could have been anticipated in advance (IFAC, 2023).

[14] For comparisons across countries, life expectancy is a common variable used in the literature for data availability reasons.

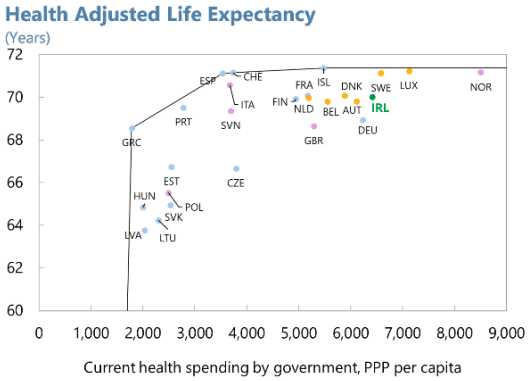
[15] Using cluster analysis, countries' health systems are grouped based on similar characteristics such as governance, financing methods, service delivery, resources, and coverage. Ireland is part of a cluster that consists of heavily regulated public health systems with an ample choice of providers. This cluster also includes Denmark and Sweden, Italy, New Zealand, Norway, Poland, Slovenia, and the United Kingdom. The analysis shows that there no single health system design is associated with the highest efficiency (OECD, 2025).

[16] The share of population aged 65 and older is projected to almost double from 15 percent in 2022 to 29 percent in 2070, with the old-age dependency ratio similarly set to more than double to 56 percent in 2070 from 26 percent in 2022 (Ageing Report for Ireland, European Commission, 2024).

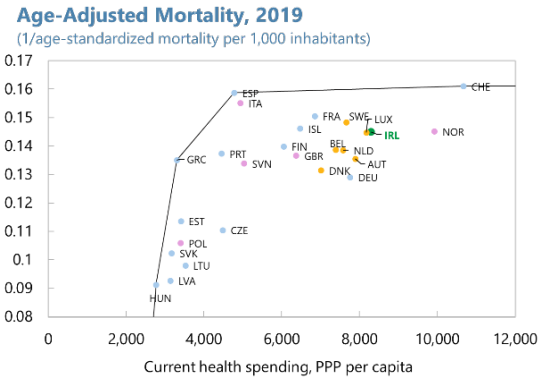
Figure 9. Ireland: Efficiency Frontier of Health Spending



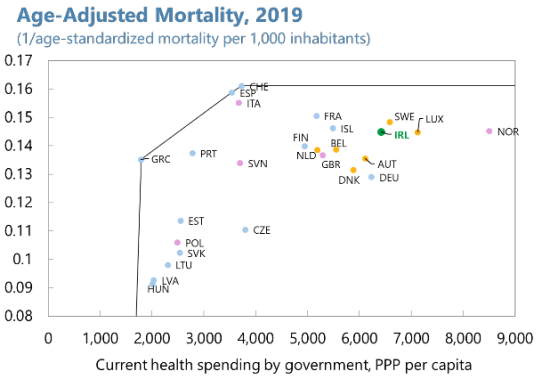
Source: WHO GHO.
Note: Includes both public, private, and external expenditures.



Sources: WHO, IMF staff calculations



Sources: OECD, WHO, IMF staff calculations



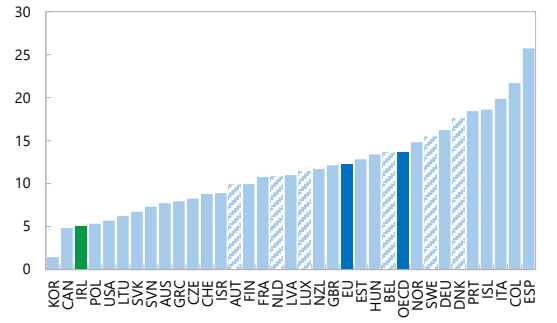
Sources: OECD, WHO, IMF staff calculations

D. Education

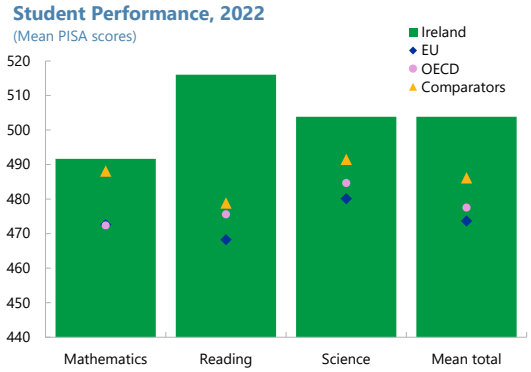
15. Ireland has strong educational outcome indicators relative to peers. School enrollment rates are high, with near-universal enrollment for 5–14-year-olds.[17] The share of 25–34-year-olds without upper secondary educational attainment is 5 percent, below the OECD average by a large margin. Student performance as measured by PISA scores have increased over time in Reading and Science and are higher than comparators, as well as EU and OECD averages, across all categories (Figure 10).

[17] Compulsory education in Ireland is from the age of 6 to 16.

Figure 10. Ireland: Education Outcomes



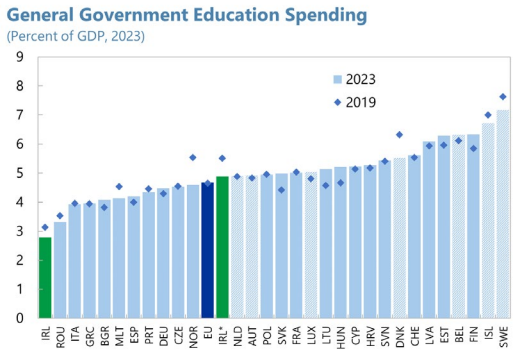
Source: OECD



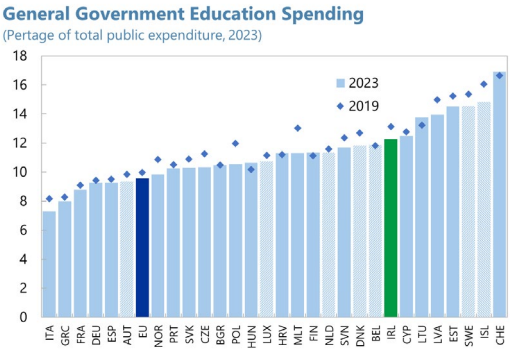
Sources: OECD, PISA 2022 database

16. These outcomes have been achieved with public expenditure on education that is comparable to or lower than peer averages across different metrics (Figure 11). In particular, government spending per student is lower than comparator peers across all levels of education.[18]

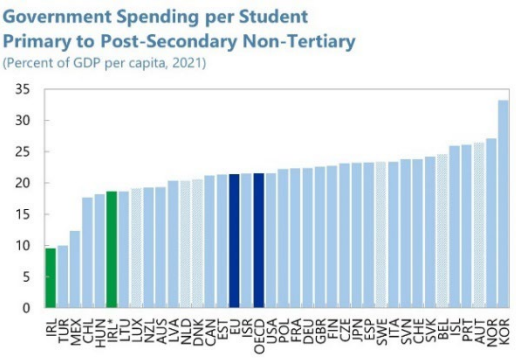
Figure 11. Ireland: Education Spending



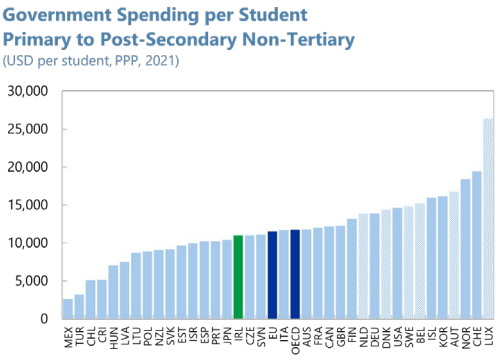
Source: Eurostat.



Sources: Eurostat.



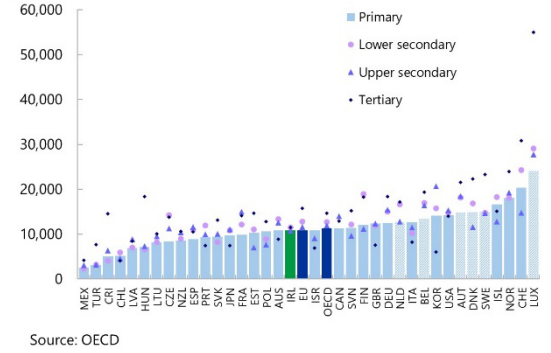
Source: OECD

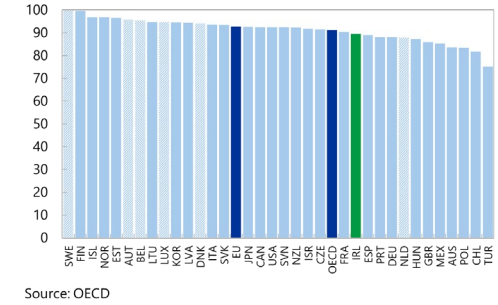


Source: OECD

[18] This is despite the slightly lower share of public financing in education in Ireland relative to peers.

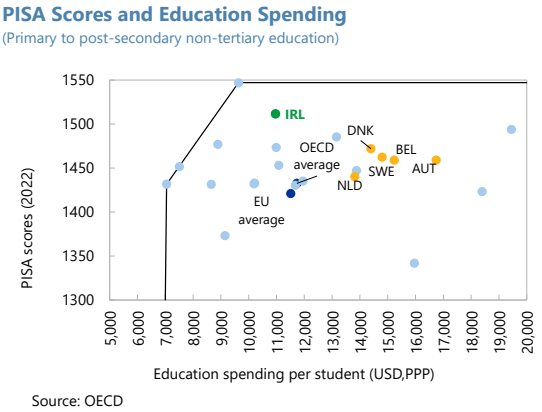
Figure 11. Ireland: Education Spending (concluded)

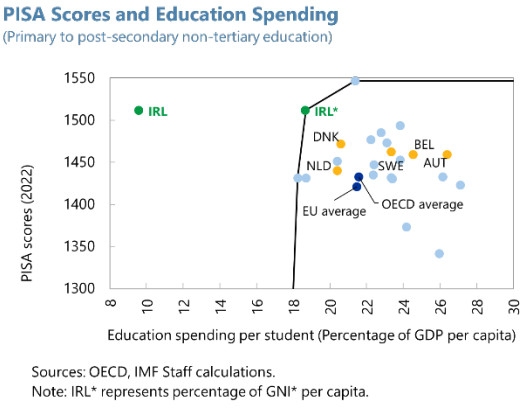




17. Public spending efficiency on education is at or close to the frontier. Mapping PISA scores and education spending per student, measured in terms of PPP or as a share of GNI* per capita, Ireland has been able to attain satisfactory outcomes at relative cost-effectiveness (Figure 12). These results hold across different levels of education. In general, the average level of education in Ireland is high, a result of previous investment which has paid off handsomely—the skilled labor force is a key pillar of Ireland's competitiveness. Continued investment in the sector is key to maintain Ireland's competitiveness. Nevertheless, while the general education system is excellent, there are issues related to the disconnect of tertiary education with labor market needs, such as skill mismatches in the labor market, high rates of overqualification, and the lack of digital and science, technology, engineering, and mathematics (STEM) skills (OECD Survey of Adult Skills, 2023; OECD Skills Strategy Ireland, 2023).

Figure 12. Ireland: Efficiency Frontier of Education Spending





E. Concluding Remarks

18. There is room for efficiency gains in public spending in Ireland:

- *Infrastructure*: Gaps remain in both stock and quality output indicators, as well as investment efficiency. Continued efforts are warranted to address concerns on the planning process, project prioritization, construction sector productivity, and labor shortages in the sector.
- *Health:* While outcomes are positive and have improved over time, there are challenges with long waitlists, high occupancy rates and staff recruitment and retention. High levels of spending and persistent budget overruns point to potential gains in spending efficiency.
- *Education:* Outcome indicators are strong and outperform peers, and public spending efficiency is at or close to the frontier. While in general the education system is excellent, there are some issues related to the disconnect of the tertiary sector with the labor market, including skill mismatches, overqualification, and a shortage of digital and STEM skills.

19. In the current environment of high global economic uncertainty, spending efficiency improvements could help improve Ireland's fiscal buffers for shocks. Significant downside risks and challenges in the global economic landscape raise uncertainties of future revenue streams in Ireland. Thus, improved public spending efficiency could create additional fiscal space to increase capital expenditure to meet Ireland's infrastructure needs. More efficient spending in health will also help to enable continued high levels of service delivery in the face of growing demands. Meanwhile, staying at the frontier for education spending is critical as a highly skilled labor force has been a strong foundation of the Irish economic model and competitiveness.

References

Archer, S., T. Featherstone (2024). *An Analysis of Funding, Expenditure and Budget Management within Acute Hospitals 2016 – 2022*. Department of Public Expenditure, NDP Delivery and Reform, Government of Ireland.

Department of Finance (2023), *Ageing Report for Ireland, 2024*.

European Commission (2024), *2024 Ageing Report*, Economic and Budgetary Projections for the Member States.

IFAC (2024), *Ireland's Infrastructure Demands,* Irish Fiscal Advisory Council.

IFAC (2023), *Fiscal Assessment Report, December 2023*, Irish Fiscal Advisory Council.

IMF (2016), *Ireland: Selected Issues Paper,* IMF Country Report No. 2016/257.

National Competitiveness and Productivity Council (2024), *Ireland's Competitiveness Challenge 2024*

OECD (2025), *OECD Economic Surveys: Ireland 2025*, OECD Publishing, Paris, https://doi.org/10.1787/9a368560-en.

OECD (2022), *OECD Economic Surveys: Ireland 2022*, OECD Publishing, Paris, https://doi.org/10.1787/46a6ea85-en.

OECD/The Health Foundation (2025). *How Do Health System Features Influence Health System Performance?*. OECD Publishing, Paris, https://doi.org/10.1787/7b877762-en

OECD (2024), *Education at a Glance 2024: Ireland Country Profile*

OECD (2024), *Survey of Adults Skills 2023: Ireland*

OECD (2023), *OECD Skills Strategy Ireland: Assessment and Recommendations*, OECD Skills Studies, OECD Publishing, Paris, https://doi.org/10.1787/d7b8b40b-en

OECD/European Observatory on Health Systems and Policies (2023), *Ireland: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, https://doi.org/10.1787/3abe906b-en.

Shine, C., and M. Hennessy (2024). *Hospital Performance: An Examination of Trends in Activity, Expenditure and Workforce in Publicly Funded Acute Hospitals in Ireland,* Irish Government Economic and Evaluation Service Research Services & Policy Unit, Department of Health.

Sicari, P. and D. Sutherland (2023), *Health sector performance and efficiency in Ireland*, OECD Economics Department Working Papers, No. 1750, OECD Publishing, Paris, https://doi.org/10.1787/6a000bf1-en.

Wren, M., and Fitzpatrick, A. (2020). *How does Irish Healthcare Expenditure compare internationally?,* ESRI Research Series 114, Dublin: ESRI, https://doi.org/10.26504/rs114