Demographics, Higher Investment, and the Potential Growth Rate of the Irish Economy

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0 Irish Economic Performance Post 1995

- Significant fluctuations but underlying growth
- Growth post-2013
  - Follows the substantial decline from 2008 to 2012
- Which emerged after the excesses of the “Celtic Tiger” era
- Post-1995 export-led growth
  - Gave way to a credit bubble and unsustainable housing activity
- Economy in 2023 transformed from 1995

0 Ireland: 1995 - 2023 (in a snapshot)

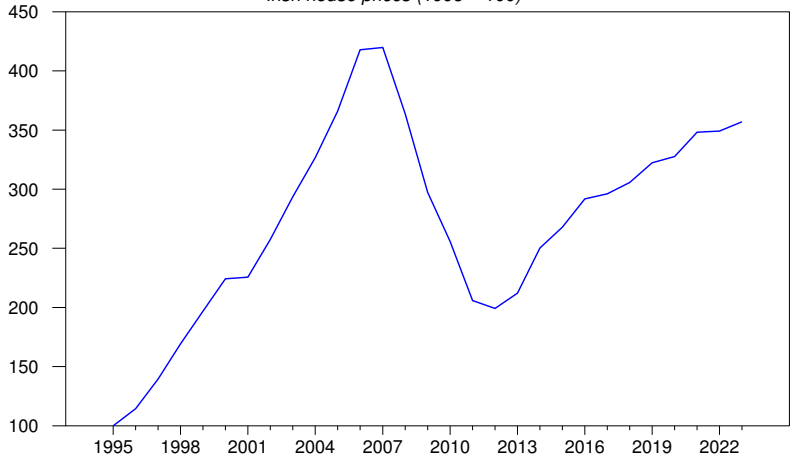
Year	1995	2023
Population	3.6m	5.3m
Employment	1.3m	2.7m
Output per capita	100	174
Exchequer receipts per capita (€)	3,850	16,543
Life Expectancy	34th	9th

Note: output per capita is in real terms with 1995 = 100

o Ireland: 1995 - 2023 (another snapshot!!)

Figure 1

Irish house prices (1995 = 100)



What Do We Do?

- Ireland at a crossroads?
- Strong persistent growth giving way to more subdued rates?
- Controlling for distortions in the Irish national accounts and
- Using a traditional Solow growth model
  - Growth accounting calculations
- We generate long-term forecasts for the Irish economy
- Under specific assumptions
  1. Around future total factor productivity (TFP) growth
  2. Around investment rates and weekly work hours
- All subject to the latest demographic forecasts
  - With baseline, high and low migration rate assumptions

What Do We Find?

- Irish growth rate looks set to modify over the coming years
- Rapid growth at an end?
  - Celtic tiger and post-2013 era
- Declining rate of productivity growth has important longer-term implications
- Scenario analysis confirms
  1. Plausible increases in both TFP and investment rates
  2. Can improve the outlook
  3. Recent European Commission (2024) report
- Population dynamics set to give rise to “demographic drag”

o Standard Growth Accounting Framework

- Cobb-Douglas production function
  - $Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$
- Which implies the following growth accounting equation
  - $\frac{\dot{Y}_t}{Y_t} = \frac{\dot{A}_t}{A_t} + \alpha \frac{\dot{K}_t}{K_t} + (1-\alpha)\frac{\dot{L}_t}{L_t}$
- We set the capital share $\alpha = \frac{1}{3}$
- Using the perpetual inventory method
  1. Generate a capital stock with a depreciation rate of 6 per cent
  2. Assume capital-output ratio equals steady-state value in 1995

o National Accounting Issues

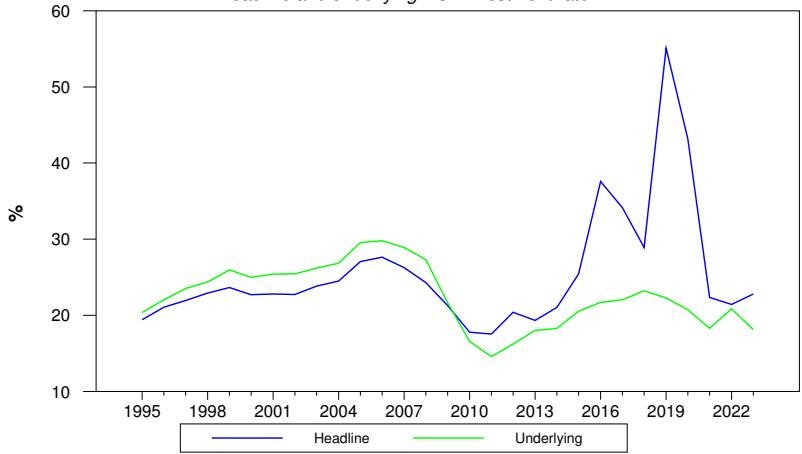
- For Y_t
  - Follow Fitzgerald (2023, 2020)
  - Use Net National Product (NNP) at market prices
  - Mainly as it excludes depreciation

- For I_t
  - We use modified investment series from the CSO
  - Note it doesn't remove all multi-national related distortions

o Irish Investment Rate: Headline and Underlying

Figure 2

Headline and underlying Irish investment rate



o Irish Government Expenditure

Figure 3

Gross voted current and capital expenditure normalised by output

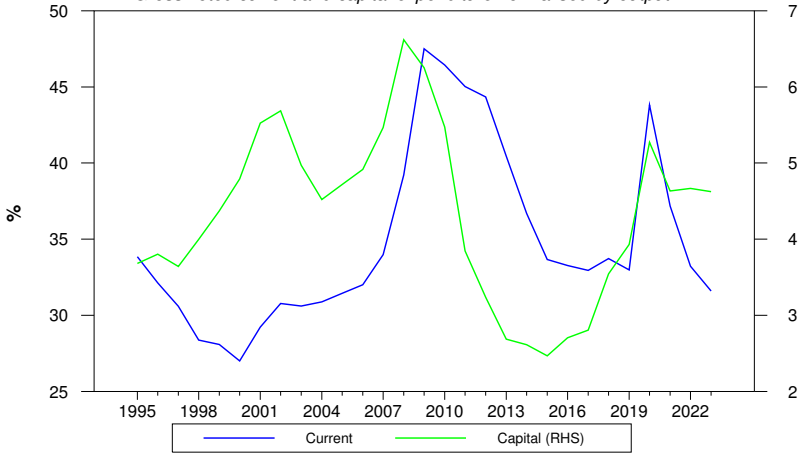


Table: Decomposition of Irish and EU Output Growth Rates (%)

	Ireland				European Union			
Period	$\triangle y$	$\triangle a$	$\triangle k$	$\triangle l$	$\triangle y$	$\triangle a$	$\triangle k$	$\triangle l$
2001 - 2007	4.0	0.1	1.8	2.1	2.1	0.7	1.0	0.4
2008 - 2013	-1.3	0.4	0.14	-1.8	-0.3	-0.2	0.6	-0.7
2014 - 2019	2.2	-0.8	0.6	2.4	2.2	0.8	0.5	0.8
2020 - 2023	7.3	-0.2	0.6	6.9	3.2	1.7	0.6	1.0
2001-2023	2.3	0.4	0.9	1.1	1.3	0.3	0.7	0.3

Note: The table shows the contribution of growth in labour inputs, capital inputs and TFP to total output growth.

Table: Decomposition of Irish and EU Output per Hour Growth Rates (%)

	Ireland			European Union		
Period	$(\triangle y - \triangle l)$	$\triangle a$	$(\triangle k - \triangle l)$	$(\triangle y - \triangle l)$	$\triangle a$	$(\triangle k - \triangle l)$
2001 - 2007	0.9	0.1	0.8	1.5	0.7	0.8
2008 - 2013	1.4	0.4	1.0	0.7	-0.2	1.0
2014 - 2019	-1.4	-0.8	-0.6	0.9	0.8	0.1
2020 - 2023	-3.1	-0.2	-2.9	1.8	1.7	0.1
2001 - 2023	0.7	0.4	0.3	0.9	0.4	0.3

Note: The table shows the contribution of capital deepening and TFP to the growth rate of labour productivity.

o Labour Input

- In our framework, total labour supply is generated as follows:
- For each C_i = 15-19, 20-24, ... 60-64, 65-69, 70-74, 75 up

$$\text{Total Employment} = \sum_{i=15-19}^{75up} \Big[(\text{1-urx}) \times \left(\text{Activity Rate}_{C_i}\right) \times \left(\text{Fraction Population}_{C_i}\right) \times (\text{Population}) \Big]$$

- Total Hours Worked = Total Employment x Average Hours Worked Per Emplo

Table: Decomposition of Growth in Hours Worked (%)

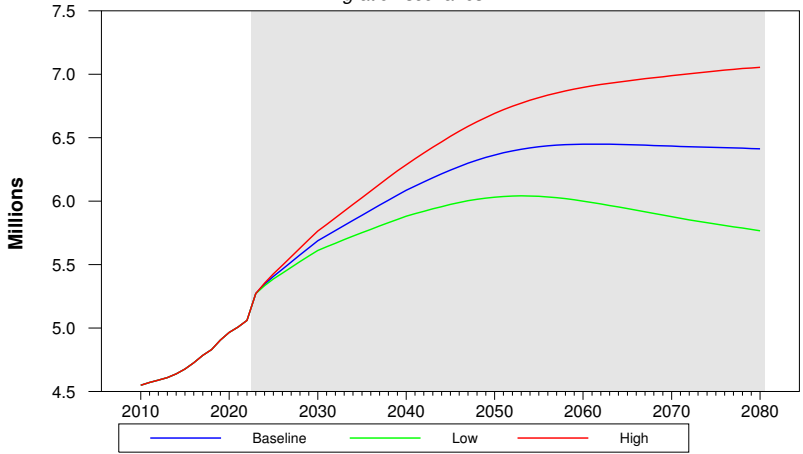
	Ireland				
Period	Total	Pop.	P. Rate	Emp. Rate	Workweek
2001 - 2007	3.1	2.1	1.7	-0.1	-0.5
2008 - 2013	-2.7	0.7	-1.6	-1.6	-0.2
2014 - 2019	3.6	1.1	0.6	1.5	0.3
2020 - 2023	10.4	2.0	8.7	0.9	-1.2
2001-2023	1.6	1.4	0.4	0.0	-0.2
	European Union				
Period	Total	Pop.	P. Rate	Emp. Rate	Workweek
2001 - 2007	0.6	0.3	0.4	0.2	-0.3
2008 - 2013	-1.0	0.1	0.2	-1.0	-0.3
2014 - 2019	1.2	0.2	0.2	0.9	-0.1
2020 - 2023	1.4	0.2	0.9	0.5	-0.2
2001-2023	0.4	0.2	0.3	0.1	-0.2

Note: *Pop*. refers to population, *P*. is the participation rate, *Emp*. is employment and *Workweek* is average hours worked by employees.

o Future Irish Population Levels - Bergin and Egan (2024)

Figure 4

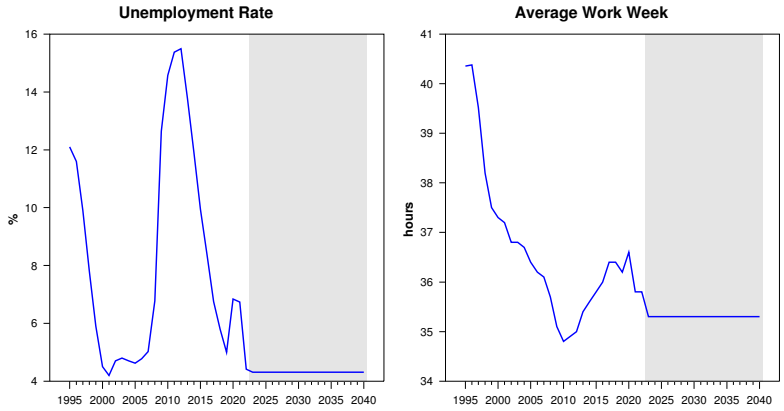
Migration scenarios



o Key Labour Market Assumptions

Figure 5

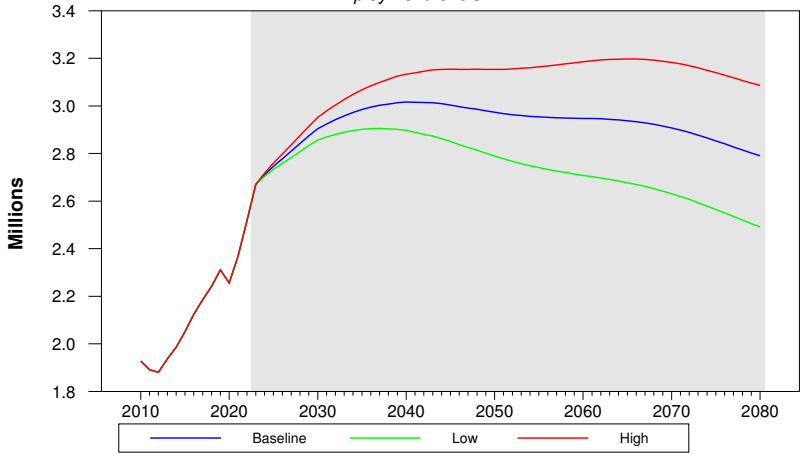
Baseline Labour Market Assumptions



o Future Irish Employment Levels

Figure 6

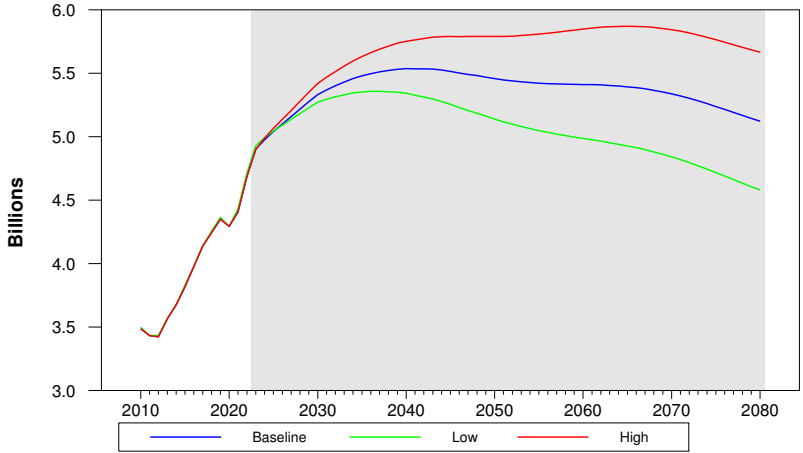
Employment levels



o Future Irish Hours Worked

Figure 7

Hours worked



o Longer-Run Outlook

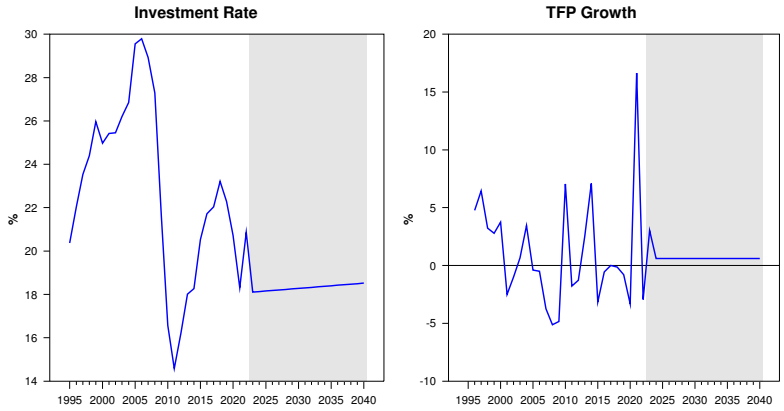
- Model and underlying assumptions:

$$
\begin{aligned}
Y_{it} &= A_{it} K_{it}^{\alpha} L_{it}^{1-\alpha} \\
K_{it} &= (1-\delta) K_{t-1} + I_{t-1} \\
L_{it} &= (1-U_{it})(PART_{it} \times WorkPop_{it}) \times H_{it} \\
I_{it} &= s_{it} Y_{it} \\
\Delta \log A_{it} &= g
\end{aligned}
$$

o Investment Rate and TFP Assumptions

Figure 8

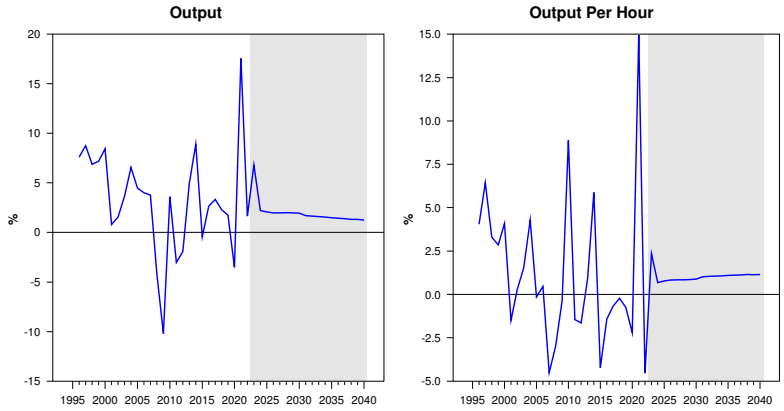
Baseline Investment and TFP Assumptions



o Key Baseline Outcomes

Figure 9

Baseline Output Growth Rates



o Baseline Irish Growth Forecasts (%)

Table: Baseline Irish Growth Forecasts (%)

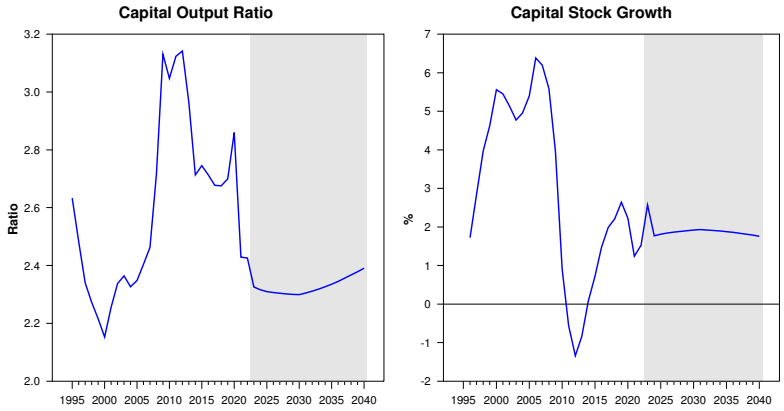
	2024-2030	2030-2040	2040-2050
Output	2.0	1.5	1.1
Output Per Hour	0.8	1.1	1.2

Note: Average annual growth rate for the period in question.

o Key Baseline Capital-Output Outcomes

Figure 10

Baseline Capital-Output Convergence



o Scenario Analysis

- Impacts of future different population forecasts?
- Different migration levels have implications for labour supply
  $L_{it} = (1 - U_{it})(PART_{it} \times WorkPop_{it}) \times H_{it}$
- Along with baseline forecast,
  - High and low migration scenario

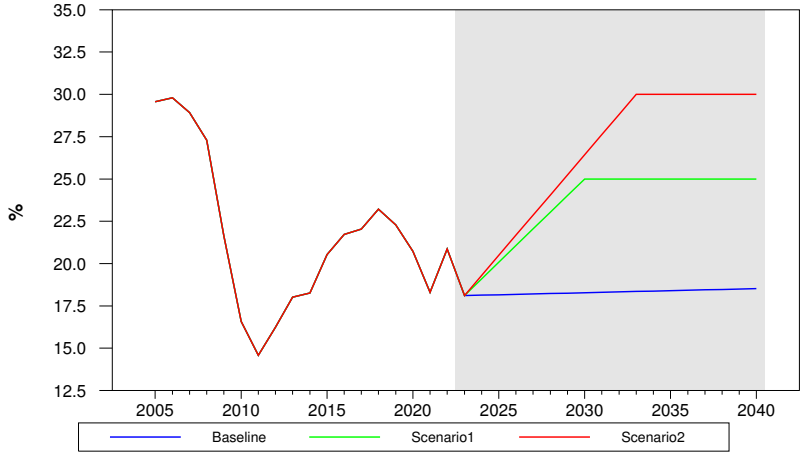
o Investment Scenario analysis

- Greater rates of investment in the Irish economy?
- Significant fall-off in capital investment between 2009 - 2017
- Barrett and Curtis (2024) highlight infrastructural deficits
- Recent EU level report (European Commission (2024))
  1. Additional investment of EUR 750 to 800 billion is needed
  2. 4.4-4.7 per cent of EU GDP in 2023
- Increase EU investment rates from
  - 22 per cent of GDP today to around 27 per cent
- Therefore, we propose two scenarios:
  1. investment rate grows to 25 per cent of output by 2030 and
  2. to 30 per cent of output by 2033

o Scenario Investment Rates

Figure 11

Scenario Investment Rates



o Resulting Impacts on Capital Stock

Figure 12

Capital Stock Growth

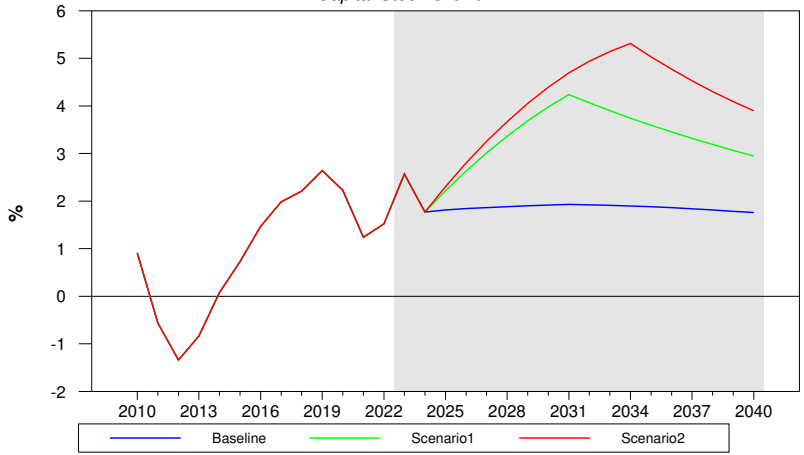


Table: Change in Output and Hours Worked due to Migration Scenarios (%)

	Low Migration		
	2024-2030	2030-2040	2040-2050
Output	-0.2	-0.2	-0.2
Output Per Hour	0.1	0.0	0.0
Hours worked	-1.0	-2.9	-5.4
	High Migration		
	2024-2030	2030-2040	2040-2050
Output	0.2	0.2	0.2
Output Per Hour	-0.1	0.0	0.0
Hours worked	0.9	2.7	4.7

Note: For output it is the change in the average annual growth rate with respect to the baseline growth rate for the period in question, while for hours worked it is the average annual percentage change in the total hours worked with respect to the baseline level for the period in question.

Table: Change in Output Growth Rates due to Investment Scenarios (%)

	2024-2030	2030-2040	2040-2050
Scenario 1	0.4	0.6	0.3
Scenario 2	0.4	0.9	0.5

Note: Change in the average annual growth rate with respect to the baseline growth rate for the period in question.

Table: Output Growth Rates under Baseline, Migration and Investment Scenarios (%)

	Baseline Investment		
	Baseline Migration	Low Migration	High Migration
2024 - 2030	2.0	1.9	2.2
2030 - 2040	1.5	1.3	1.7
2040 - 2050	1.1	0.8	1.2
	Investment Scenario 1		
2024 - 2030	2.4	2.2	2.6
2030 - 2040	2.1	1.9	2.3
2040 - 2050	1.3	1.1	1.5
	Investment Scenario 2		
2024 - 2030	2.5	2.3	2.6
2030 - 2040	2.4	2.2	2.6
2040 - 2050	1.6	1.3	1.7

Note: Average annual growth rate for the period in question.

Key Results and Policy Implications

- Lower growth rates seem more likely over the coming period
- Scenarios indicate that increasing population and investment
  1. Could increase output by over 1 per cent per annum
  2. Higher investment could add up to 1 per cent itself
- Lower pace of total factor productivity growth a concern
  - Acts as a significant drag on output per worker
- Policies should address the following
  1. Boost productivity amongst domestic indigenous firms
  2. Consistent rates of investment in the domestic economy
  3. Policies should offset the implications of “demographic drag”
- Policies not necessarily mutually exclusive

o Some Final Thoughts

- Historic growth rates mainly driven by
  1. Increased population and hence
  2. Greater labour input
- Strong labour demand
  - Provided by multinational (MNE) sector
- In the future:
  - Maintaining constant growth and improved living standards
- Will be challenging and require imaginative policy response
- As other jurisdictions have struggled with these
  - Low TFP growth
  - McQuinn and Whelan (2008, 2016, & 2018)

o Intangible Investment

- Kostarakos, McQuinn and Varthalitis (2024) examine
  - Role of intangible investment in Irish growth story
- Ireland one of the most intangible intensive economies
  - Ratio of intangible to tangible went from 0.14 in 1995 to 2.33 in 2016
- Carrado et al. (2005, 2013, 2016)
  - Classified certain expenditure items as inputs
  - INTAN-invest database
- In an Irish context
  - NA intangible assets related to distortionary transactions
  - Official intangible intensity in Ireland closer to EU averages
- Non-NA intangible assets
  - Training, organizational capital and branding
  - Have a non-trivial impact on labour productivity

Future Extensions?

- Conceptual framework
  - Incorporate human capital into the production function
  - Human capital augmented Solow model
    - (Mankiw, Romer and Weil (1992))
  - Big part of the Irish story
  - Further disaggregation of the capital stock?
  - Augment Solow model to allow for climate change?

- Empirical perspective
  - Other labour market scenarios?
  - In particular participation and employment rates
  - Also potential changes in the working week
  - Develop stochastic work

References

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Thank you

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0 Sensitivity Analysis 1: Unemployment Rate forecast

- Baseline model assumes that the prevailing unemployment rate of 4.2 per cent will continue into the future
- Test sensitivity to unemployment assumption

- ECM of unemployment with exogenous UK unemployment, NiGEM forecast for UK unemployment out to 2050

$$d\log(URX)_t = \alpha + \beta_1(\log(URX_{t-1}) - \beta_2 \log(UKURX_{t-1})) + \beta_3 d\log(UKURX_{t-1})$$

Results: Sensitivity Analysis 1

- Figures show historical unemployment rate series, along with the median and quantile forecast series (left) and corresponding output paths for high and low

Figure: Unemployment Fan Chart

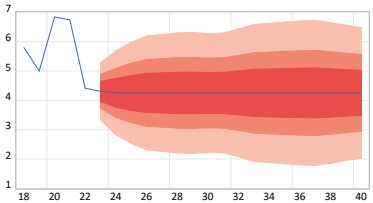
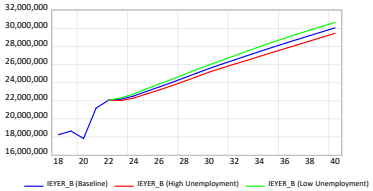


Figure: Output Paths



- Output sensitive to unemployment: $\pm 2\%$ deviation from baseline level by 2040

o Sensitivity Analysis 2: Total Factor Productivity forecast

- Baseline model assumes that the average TFP growth rate over the period 1995-2023 will apply
- Test sensitivity to TFP growth assumption
- ECM of TFP with exogenous global labour augmenting technical progress

$$d\log(TFP)_t = \alpha + \beta_1(\log(TFP_{t-1}) - \beta_2 \log(LAT_{t-1})) + \beta_3 d\log(TFP_{t-1})$$

0 Results: Sensitivity Analysis 2

- Figures show historical TFP series, along with the median and quantile forecast series (left) and corresponding output paths for high and low

Figure: TFP Fan Chart

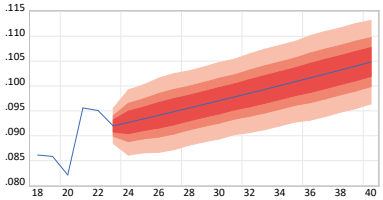
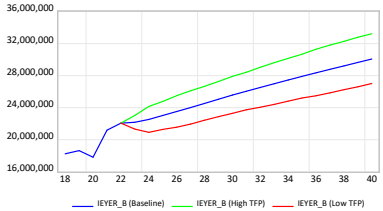


Figure: Output Paths



- Output sensitive to TFP: $\pm$10% deviation from baseline level by 2040

0 Sensitivity Analysis 3: Capital Stock

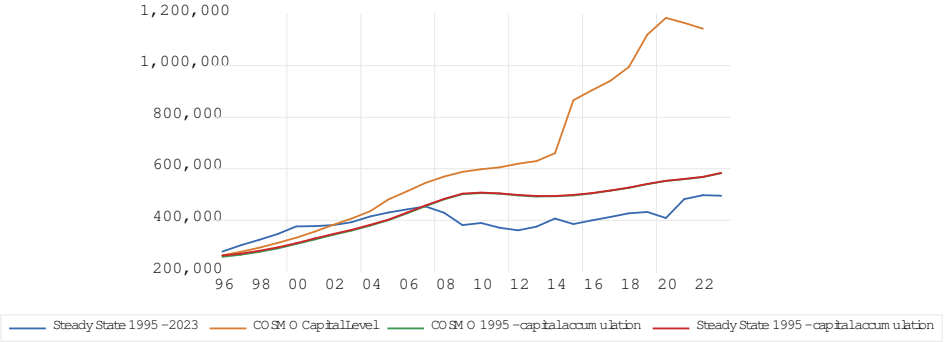
- Baseline model assumes that capital stock in 1995 is equal to its steady state level:

$$K_{1995} = \frac{I_{1995}}{\delta + g}$$
$$K_t = (1 - \delta)K_{t-1} + I_{t-1}$$

- We test the effect of setting capital stock in 1995 equal to the value given in the ESRI's Core Structural Model COSMO and rolled forward using the same capital accumulation equation

Results: Sensitivity Analysis 3

- Measured capital in the period 1995-2005 was similar to its steady-state level. Output forecast not sensitive to choice of initial capital stock



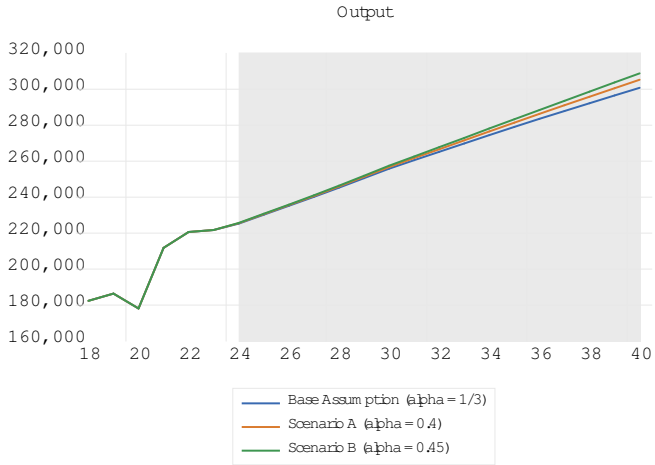
o Sensitivity Analysis 4: Labour Share

- Baseline model assumes that the labour share of income is equal to two-thirds
- We test two alternative, lower, values for the labour share, i.e. higher values for α
- Output is increasing in α provided capital is larger than labour

$$
\begin{aligned}
Y &= A \cdot K^{\alpha} \cdot L^{1-\alpha} \\
\frac{\partial}{\partial \alpha}[\ln(Y)] &= \frac{\partial}{\partial \alpha}[\ln(A) + \alpha \ln(K) + (1-\alpha)\ln(L)] \\
\frac{1}{Y}\frac{\partial Y}{\partial \alpha} &= \ln(K) - \ln(L) \\
\frac{\partial Y}{\partial \alpha} &= Y \cdot (\ln(K) - \ln(L)) \\
\frac{\partial Y}{\partial \alpha} &= A \cdot K^{\alpha} \cdot L^{1-\alpha} \cdot (\ln(K) - \ln(L))
\end{aligned}
$$

Results: Sensitivity Analysis 4

- Using alpha = 0.45 leads to 2.7 per cent cumulative increase in output by 2040



0 Sensitivity Analysis 5: Activity Rates

- We model convergence to Swiss activity rates over a 10-year period for those aged 50-64

Figure: Activity Rate 50-54

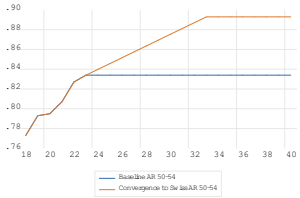


Figure: Activity Rate 55-59

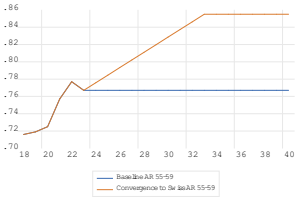
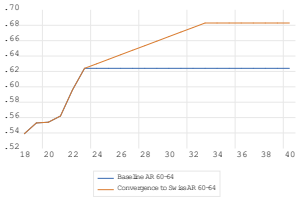


Figure: Activity Rate 60-64



0 Results: Sensitivity Analysis 5

- Higher activity rates contribute to modest increase in output forecast - 2 per cent difference in output by 2040