

ECONOMIC GROWTH ANALYSIS USING PENN WORLD TABLE DATA DRAFT

Name of Student

Course

Name of Professor

University

Date

# Economic Growth Analysis Using Penn World Table Data Draft 2

## Economic Growth Analysis Using Penn World Table Data Draft

### Introduction and Research Objective

A macro-econometric researcher studying the phenomena of economic growth must confront the question of the disparity between countries in terms of income, productivity, and economic development. Macro-econometric researchers attempt to tackle these questions and most of them inevitably end up utilising the Penn World Table (PWT). This case study will examine Penn World Table (PWT) 11.0, the latest version of the dataset, which provides researchers with entry-year data pertaining to output, capital, employment, and productivity. This dataset assists researchers in examining the world's long-term economic dynamics for specific countries where there is an extensive data availability (University of Groningen, 2025). Furthermore, PWT also combines National Accounts and the PPP (purchasing power parity) of the individual economies, which allows researchers to examine the economic output of countries in real terms.

While conducting a Penn World Table study, one component to consider is economic growth, which means selecting multiple variables. In this instance, the variables to estimate include real GDP along with several others for the study. It aims to identify the economic variables that explain the transformations. In this instance, the study attempts to identify the primary economic fundamentals that explain the dataset's trends through fundamental trend analysis of the dataset.

### Dataset and Variable Selection

The dataset consisting of economic activity instances across several countries collected over several decades by the Penn World Table version 11.0 has been broken down into 13,691 instances across various rows and columns (University of Groningen, 2025). The decades of economic activity instances of various countries offer the opportunity to create variables that signify and explain economic growth. Furthermore, the dataset was refined to contain only observations for

Ireland, in order to restrict the analysis to one single national economy, and its long-run growth performance. The observations spanned over five decades, which is sufficient for structural analysis of the output, utilisation of labour, and accumulation of human capital. To simplify analysis, the economy was measured by dividing the real GDP by the population, i.e. GDP per capita. The population was also employed to divide the employed rate, which illustrates changes in labour participation. The natural logarithm of GDP per capita was calculated for long-run growth analysis because it is better to use logarithms to represent proportional change in output.

### Long-Run Economic Growth in Ireland

Using GDP per capita as Ireland's only economic growth indicator for Ireland between 1970 and 2023, we can track the long-run economic growth for the Nation. As can be seen from Figure 1, in the earlier years, the income levels grew steadily, and then from the mid 1990's, the income levels grew sharply. The 1970-1990 period experienced steady but low GDP per capita growth. Divergence in the growth rate of per capita income, because of structural changes and economic integration of Ireland, the economy that was peripherally located in Europe, to the Core of Europe, was observed. The 1990's-early 2000's period was able to record a significant acceleration in growth that was referred to as the "Celtic Tiger" age. Growth in this period was attributed to several factors such as improved productivity, increased foreign direct investment, a stronger position in global networks and general improvements of the economic factors at that time. Also, the output growth from productivity was significant in the technology-related economic sectors and in the sectors of the economy that were top multinationals. Increasing levels of GDP per capita demonstrate this advancement (see Figure 1).

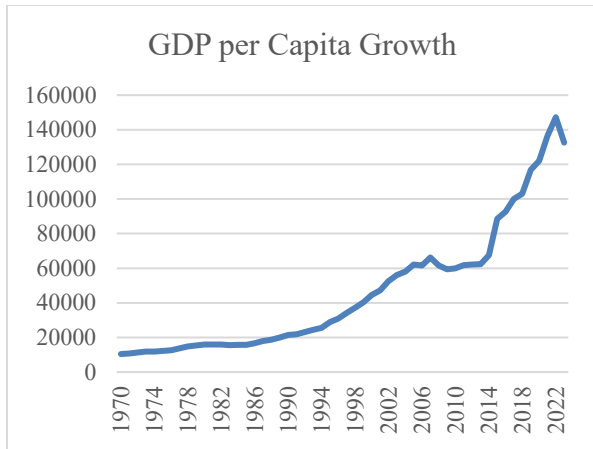


Figure 1: GDP per Capita Growth

The 2008 economic crisis pronouncedly demonstrated a decline of economic activity. Open economies demonstrated vulnerability as per capita income decreased and GDP stagnated. However, by the mid-2010s, the level of economic activity in Ireland restored once again and was once again on a high growth path. In the mid-2010s, economic activity in Ireland picked up to previous strong levels and high growth. In the years of 1970 to Present, the accumulation of human capital as illustrated in Figure 2 shows the increase in levels of education and skills of the workforce. This has likely helped increase productivity and the adoption of new technologies.

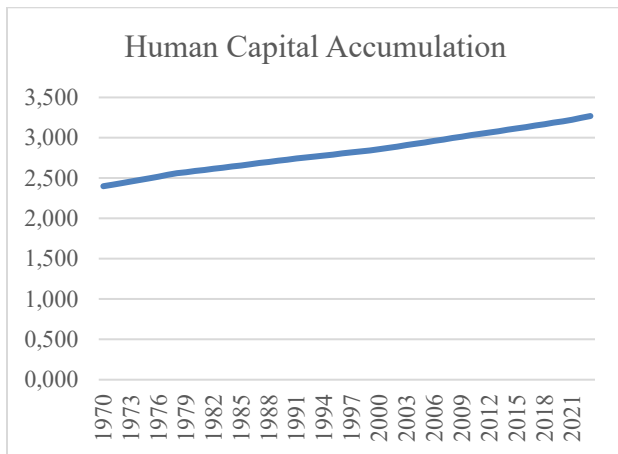
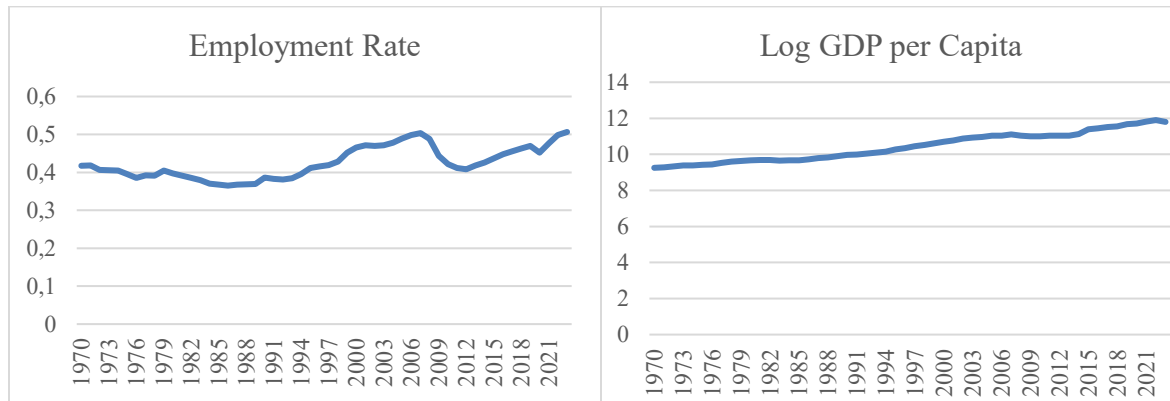


Figure 2: Human Capital Accumulation

Furthermore, Figure 3 illustrates the employment rate and the correlation with how the

labour force was utilised. In the labour force, utilisation increased with the economic boom of the 90's and 2000's, then decreased, and increased again after the financial crisis. The strong correlation between employment, labour force, and human capital is substantiated by these data (see Figures 3-4).



Figures 3-4: Employment Rate and Log GDP per Capita

### Interpretation Using Economic Growth Models

#### *Solow Growth Model*

One of the best models available for economic analysis of Ireland is Solow's growth model. It posits that economic growth can be achieved through the addition of any of the factors of production: capital, labour, or technology. In the early stages of an economy, an increase in capital will raise the output per worker and the living standards. The increase in the Solow model-based GDP per capita since the 1970s is output per person increasing on an incremental basis. The global financial crisis showed that structural long-term factors still remained positive by exhibiting a temporary increase in the slowdown.

#### *MRW Model and Human Capital*

The Mankiw-Romer-Weil (MRW) model builds on the Solow growth model by adding human capital as a separate factor of production. In the MRW model, the education and skill enhancement of the labour force is translated into a higher level of productivity, which will in the

long-term support economic growth. The MRW model is applicable to the Irish economy as Ireland's human capital index increases. The degree of education and the level of skill of the labour force of Ireland is high, and the level of productivity, as well as the rate of economic growth, is augmented by this. Such human resources are naturally important for countries with multinationals and high levels of expertise.

#### Assessment and Recommendations

With regard to Ireland, the theory of economic development based on the increase of capital and the accumulation of human resources, is likely to be almost correct. The positive relationship between GDP per capita and the investments made in the mobilisation of human capital through education and labour participation, underscores the importance of the elements of productive inputs and the integration of modern technology, for long lasting economic development. Yet, economic growth models have their limitations. The basic Solow model neglects the role of multilateral trade, multinational company investment and global techno-economic dispersion, in Ireland's economic development. Additionally, the economic recession demonstrates the effect of external shocks on the growth path.

# Economic Growth Analysis Using Penn World Table Data Draft 7

## Reference List

University of Groningen (2025) *Penn World Table version 11.0*. Available at:  
<https://www.rug.nl/ggdc/productivity/pwt/?lang=en> (Accessed: 12 March 2026).