Replication of Mankiw, Romer, and Weil (1992): Evidence from OECD Countries (1960–2019)

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Abstract

This paper replicates the study by Mankiw, Romer, and Weil (1992) to test the Solow growth model using extended data for 28 OECD countries from 1960 to 2019. Using data from the Penn World Table 10.0 and World Development Indicators, we test both the textbook Solow model and the human capital-augmented model. The results indicate that the augmented model explains cross-country income differences better ($R^2 \approx 0.46$) than the textbook model ($R^2 \approx 0.28$). Furthermore, we find strong evidence of unconditional convergence ($\beta \approx -0.64$) among these OECD nations, suggesting that lower-income countries in the sample have grown faster than richer ones over the last 60 years.

1 Introduction

The Solow growth model (Solow, 1956) is a foundational framework for understanding economic growth. Mankiw et al. (1992) (hereafter MRW) augmented this model by including human capital, which significantly improved its empirical performance. This paper replicates MRW's analysis using a more recent dataset covering 1960–2019 for 28 OECD countries. We aim to verify whether the original findings—specifically the importance of human capital and the convergence hypothesis—hold for a modern, longer time series.

2 Data and Methodology

We use data from the **Penn World Table (PWT) 10.0** (Feenstra et al., 2015) and **World Development Indicators (WDI)**. The sample includes 28 OECD countries.

- **Output (Y/L)**: Real GDP per working-age person (15-64).

- **Investment (s_k)**: Average share of investment in GDP ('csh$_i$').

- **Human Capital (s_h)**: PWT Human Capital Index based on years of schooling.

- **Population Growth (n)**: Annual growth rate of working-age population(WDI). We assume $g + \delta = 0.05$.

2.1 Model Specifications

Textbook Solow Model:

$$\ln(Y/L) = \beta_0 + \frac{\alpha}{1-\alpha}\ln(s_k) - \frac{\alpha}{1-\alpha}\ln(n+g+\delta) + \epsilon \tag{1}$$

Augmented Solow Model:

$$\ln(Y/L) = \beta_0 + \frac{\alpha}{1-\alpha-\beta}\ln(s_k) + \frac{\beta}{1-\alpha-\beta}\ln(s_h) - \frac{\alpha+\beta}{1-\alpha-\beta}\ln(n+g+\delta) + \epsilon \tag{2}$$

Convergence: We test for unconditional convergence by regressing the average growth rate (1960–2019) on the initial log income in 1960.

3 Empirical Results

3.1 Cross-Country Income Differences

Tables 1 and 2 present the regression results for the level of income per capita in 2019.

Table 1: Estimation of the Solow Model (Dependent Variable: $\ln Y_{2019}$)

Variable	Textbook Model Coef. (Std. Err.)	P-value	Augmented Model Coef. (Std. Err.)	P-value
Constant	-1.561	0.392	-1.676	0.297
$\ln(s_k)$	1.238	0.006	1.041	0.010
$\ln(n+g+\delta)$	-0.179	0.756	0.234	0.657
$\ln(s_h)$	-	-	0.999	0.008
R^2	0.277		0.464	
Implied α	0.460		0.275	
Implied β	-		0.230	

Note: p-values are from OLS regressions. Implied shares are calculated from restricted models.

The textbook model (Table 1 columns) shows that physical capital investment is significant, but the model only explains 28% of the variation. The implied capital share ($\alpha = 0.46$) is high compared to the standard 1/3 share.

Adding human capital (Augmented Model) improves the fit ($R^2 = 0.46$). The human capital coefficient is statistically significant ($p = 0.008$), supporting MRW's conclusion that human capital is a key driver of growth. The implied physical capital share ($\alpha = 0.28$) aligns better with economic theory.

3.2 Convergence

We examine whether poor countries tend to grow faster than rich countries.

Table 2: Unconditional Convergence

Variable	Coefficient	P-value
Constant	-1.195	0.011
$\ln(Y_{1960})$	-0.640	¡0.001
R^2	0.606	

Table 3 shows a strong negative relationship between initial income and subsequent growth ($\beta = -0.64, p < 0.001$). This indicates strong unconditional convergence among these 28 OECD countries, likely driven by the rapid catch-up of economies like South Korea.

4   Conclusion

This replication confirms that the augmented Solow model remains a robust framework for explaining income differences. Human capital is a significant factor, and its inclusion resolves parameters that appear biased in the textbook model. Additionally, we find strong evidence of convergence within the OECD group over the last six decades.

References

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