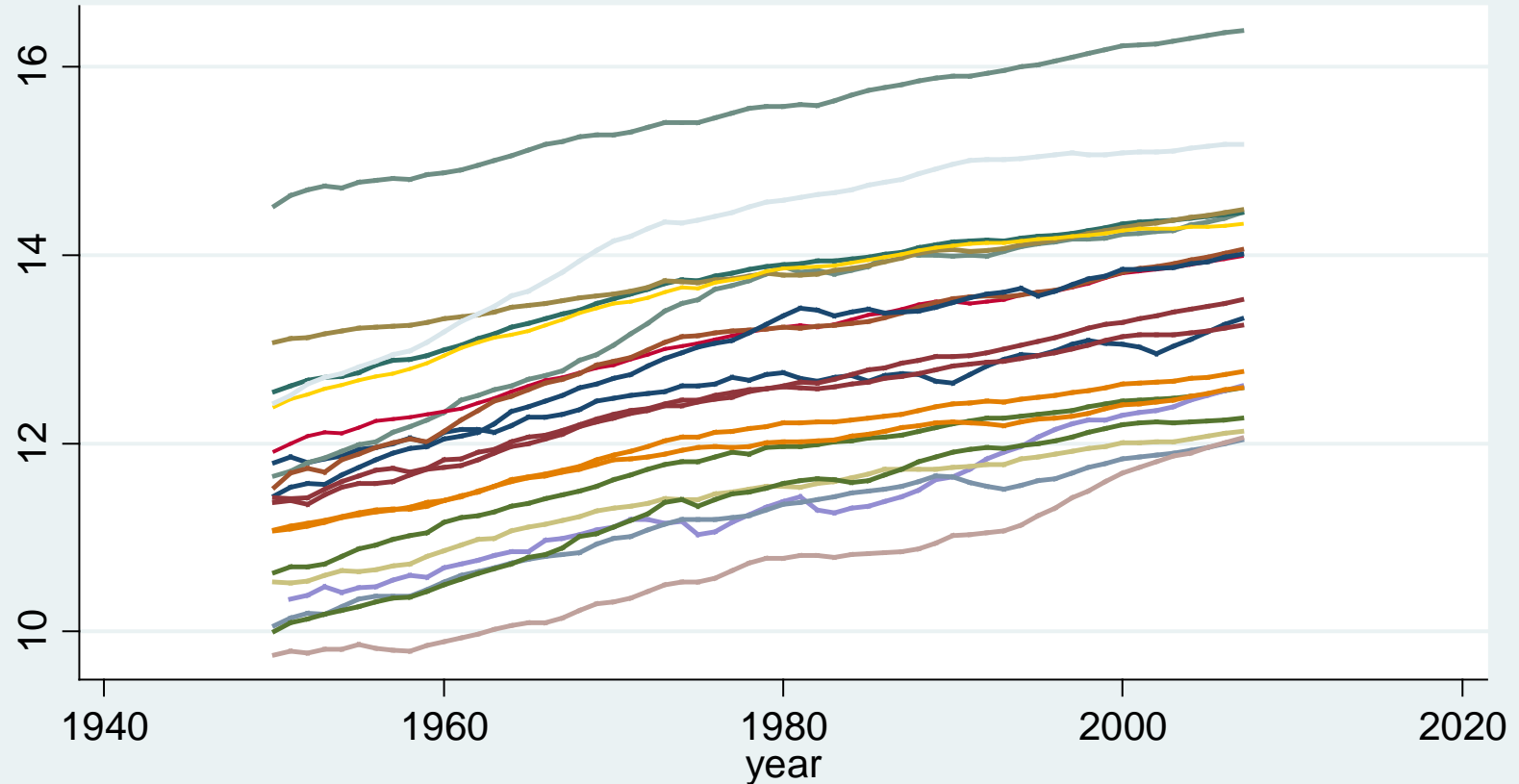Answers and Questions

Econ 314: Project 1

Trends, Cycles, and Turning Points
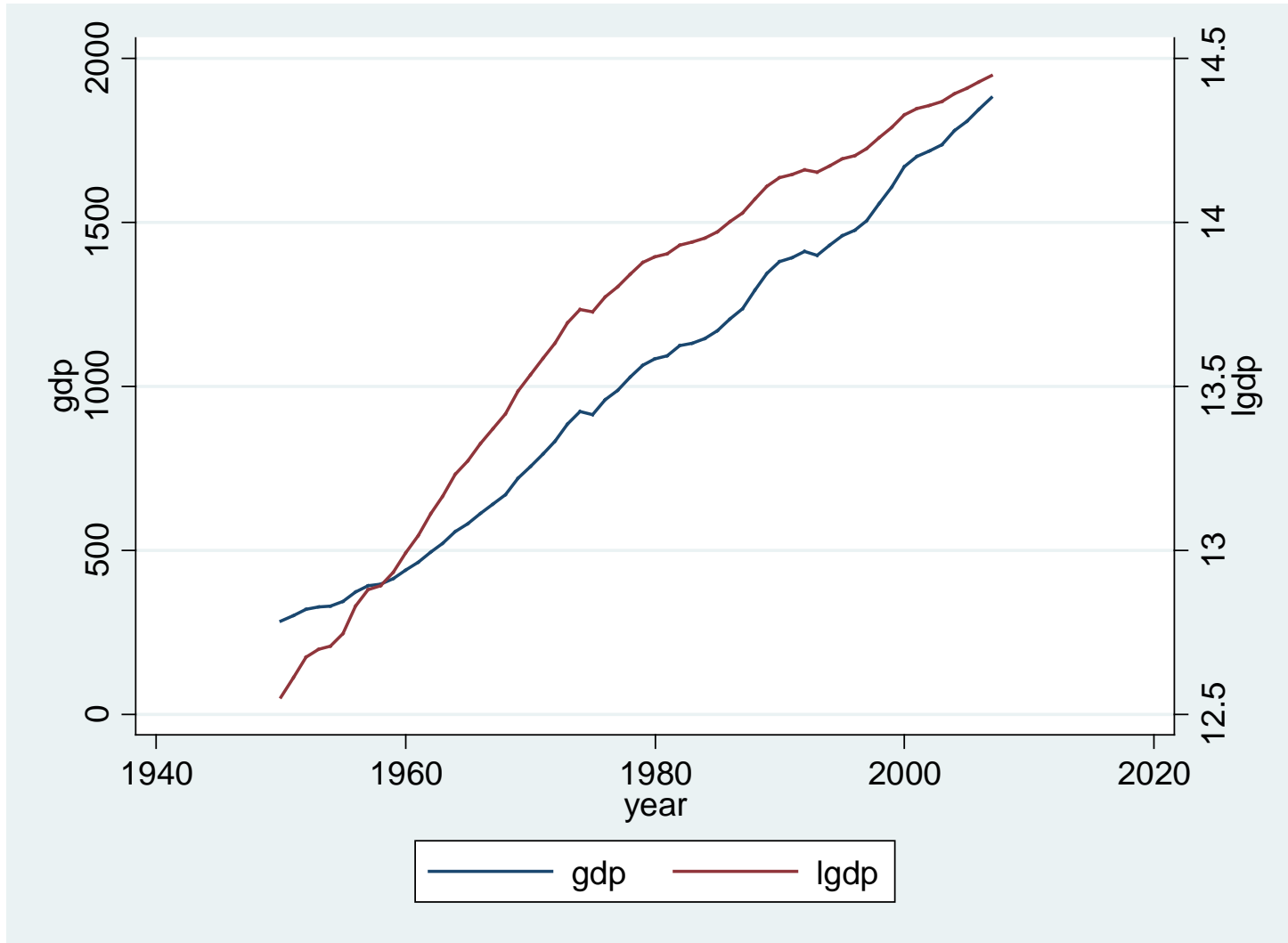
Examining the Growth Data

The Growth Experience
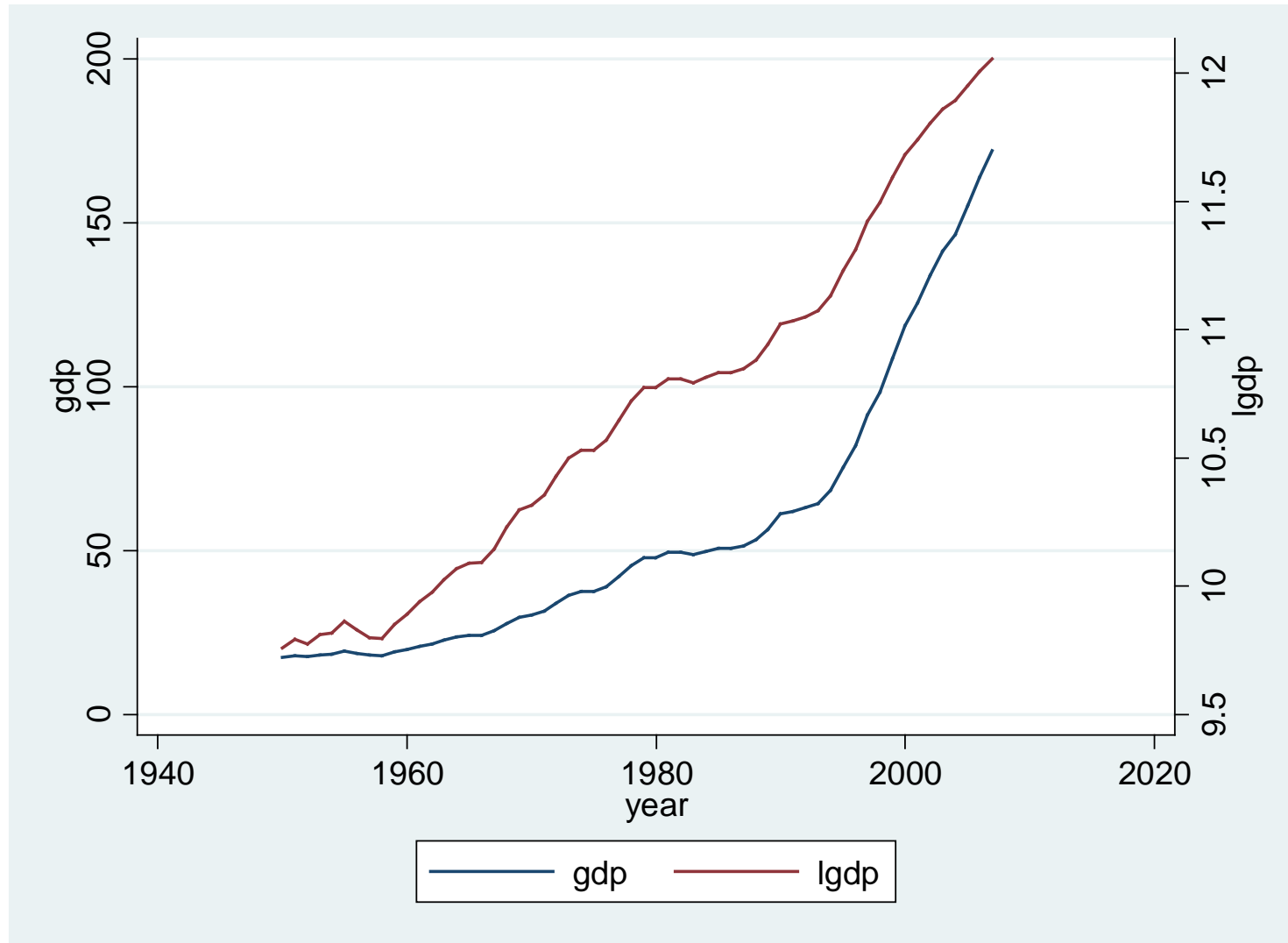

GDP Growth in 20 Countries

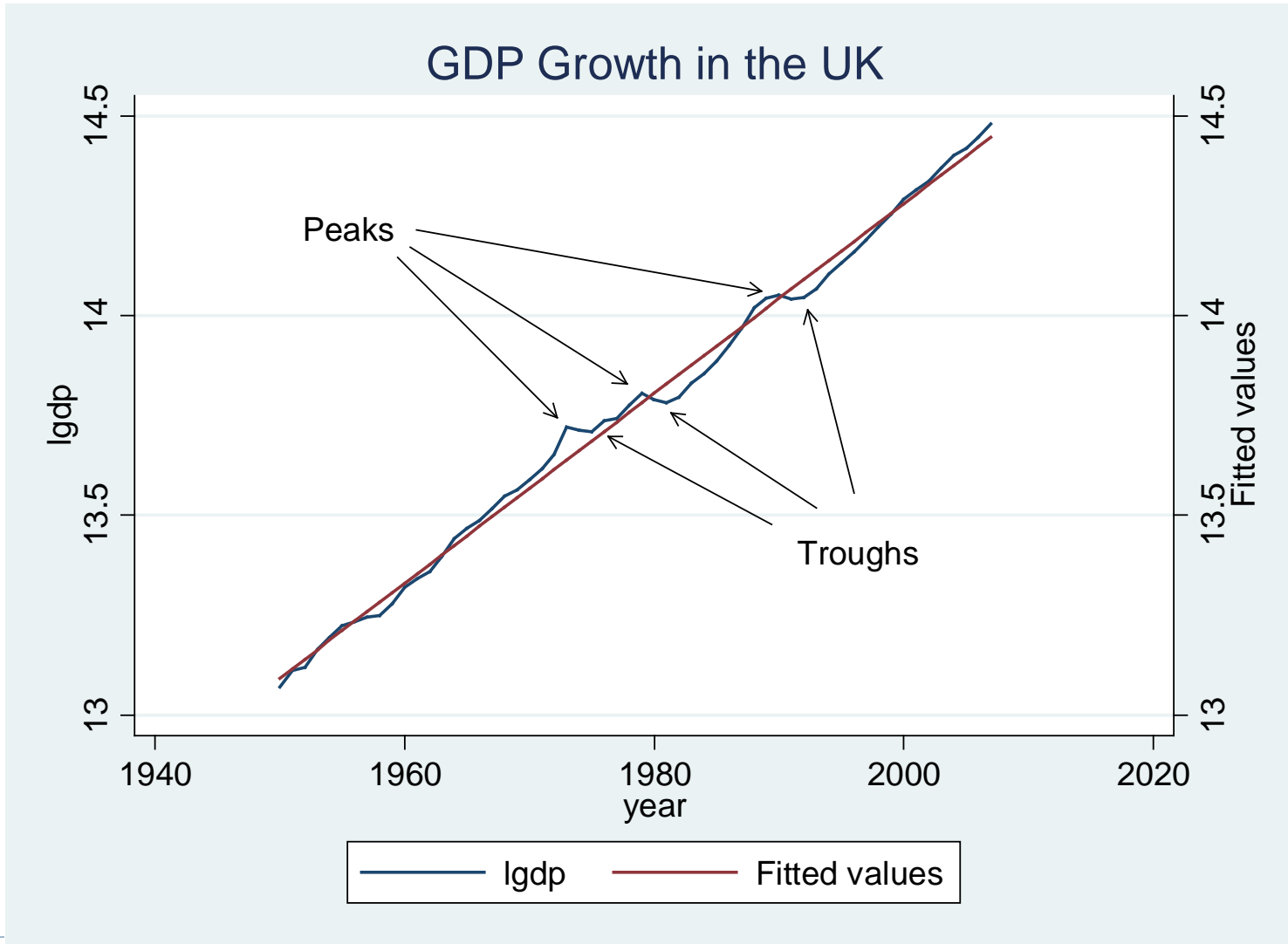# Linearity in levels or logs: France

Linearity in levels or logs: Ireland

Cycle Turning Points

GDP Growth in the UK

Compounding and Growth Rate Formulas

Measuring Growth Rates

Trend growth vs. average growth

▸ Trend rate is slope of best-fit line

▸ What is average growth rate?

From period 0 to 2:

$$\bar{g} = \frac{\left(\ln GDP_2 - \ln GDP_1\right) + \left(\ln GDP_1 - \ln GDP_0\right)}{2}$$

$$= \frac{\ln GDP_2 - \ln GDP_0}{2}.$$

Trend growth vs. average growth
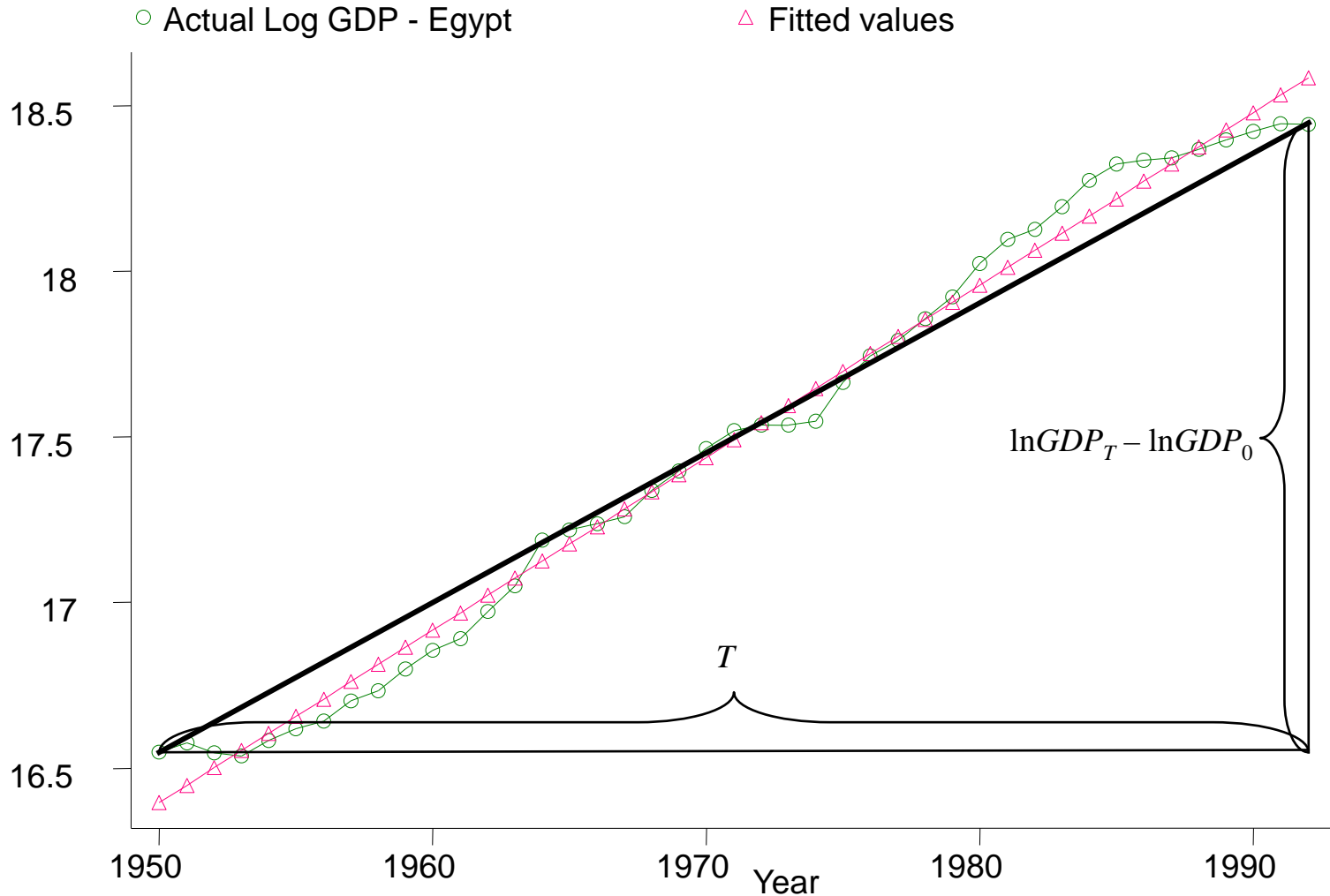
▸ Trend rate is slope of best-fit line

▸ What is average growth rate?

From period 0 to T:

$$\bar{g} = \frac{\left(\ln GDP_T - \ln GDP_{T-1}\right) + \ldots + \left(\ln GDP_1 - \ln GDP_0\right)}{T}$$

$$= \frac{\ln GDP_T - \ln GDP_0}{T}.$$

Trend growth vs. average growth

Trend and average growth rates

Country	Trend growth	Average growth	
		Annually comp	Continuously comp
Argentina	2.40%	2.84%	2.69%
Australia	3.79%	3.88%	3.78%
Brazil	4.90%	5.11%	4.90%
Canada	3.53%	3.72%	3.63%
Chile	3.87%	4.26%	4.05%
Finland	3.28%	3.57%	3.47%
France	3.31%	3.40%	3.33%
Ireland	4.02%	4.17%	4.03%
Italy	3.39%	3.49%	3.40%
Japan	4.87%	5.01%	4.82%
Mexico	4.47%	4.69%	4.51%
Spain	4.10%	4.60%	4.43%
United Kingdom	2.38%	2.52%	2.47%
United States	3.18%	3.34%	3.26%

Is Trend Growth Stable?

Is the trend stable?

Single Trend for Japan
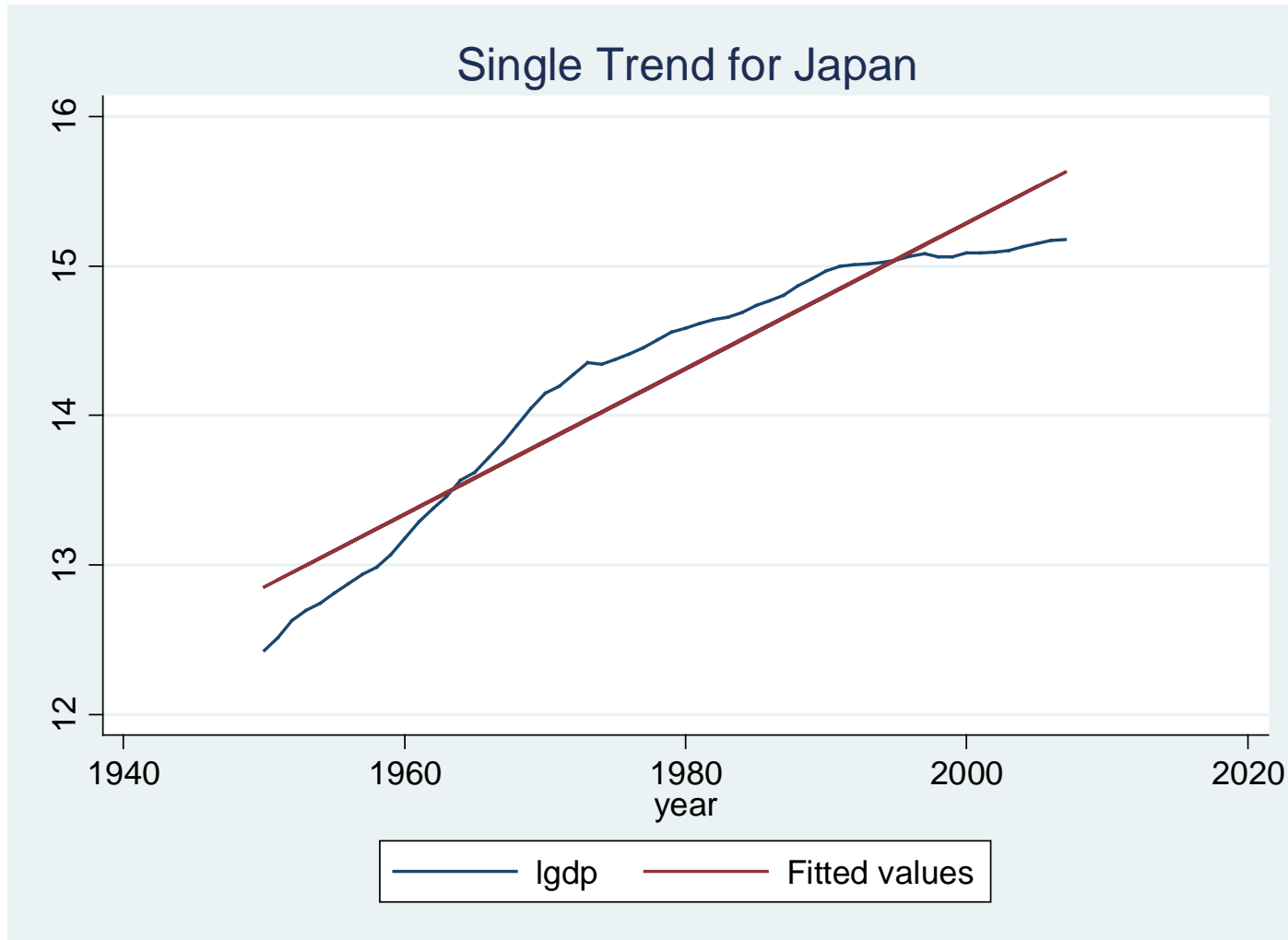
Is the trend stable?

Stability Test for Japan

```
      Source |       SS          df       MS              Number of obs =        58
-------------+----------------------------------          F(  3,    54) = 3803.57
       Model | 42.0122524         3  14.0040841           Prob > F      =  0.0000
    Residual | .198818807        54   .00368183           R-squared     =  0.9953
-------------+----------------------------------          Adj R-squared =  0.9950
       Total | 42.2110712        57  .740545109           Root MSE      =  .06068


------------------------------------------------------------------------------
        lgdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        year |   .0848916   .0017893    47.44   0.000     .0813043    .0884789
           d |   117.6017   4.095852    28.71   0.000      109.39    125.8133
       dyear |   -.059565   .0020801   -28.64   0.000    -.0637353   -.0553948
       _cons |  -153.1541   3.509732   -43.64   0.000    -160.1907   -146.1175
------------------------------------------------------------------------------
```
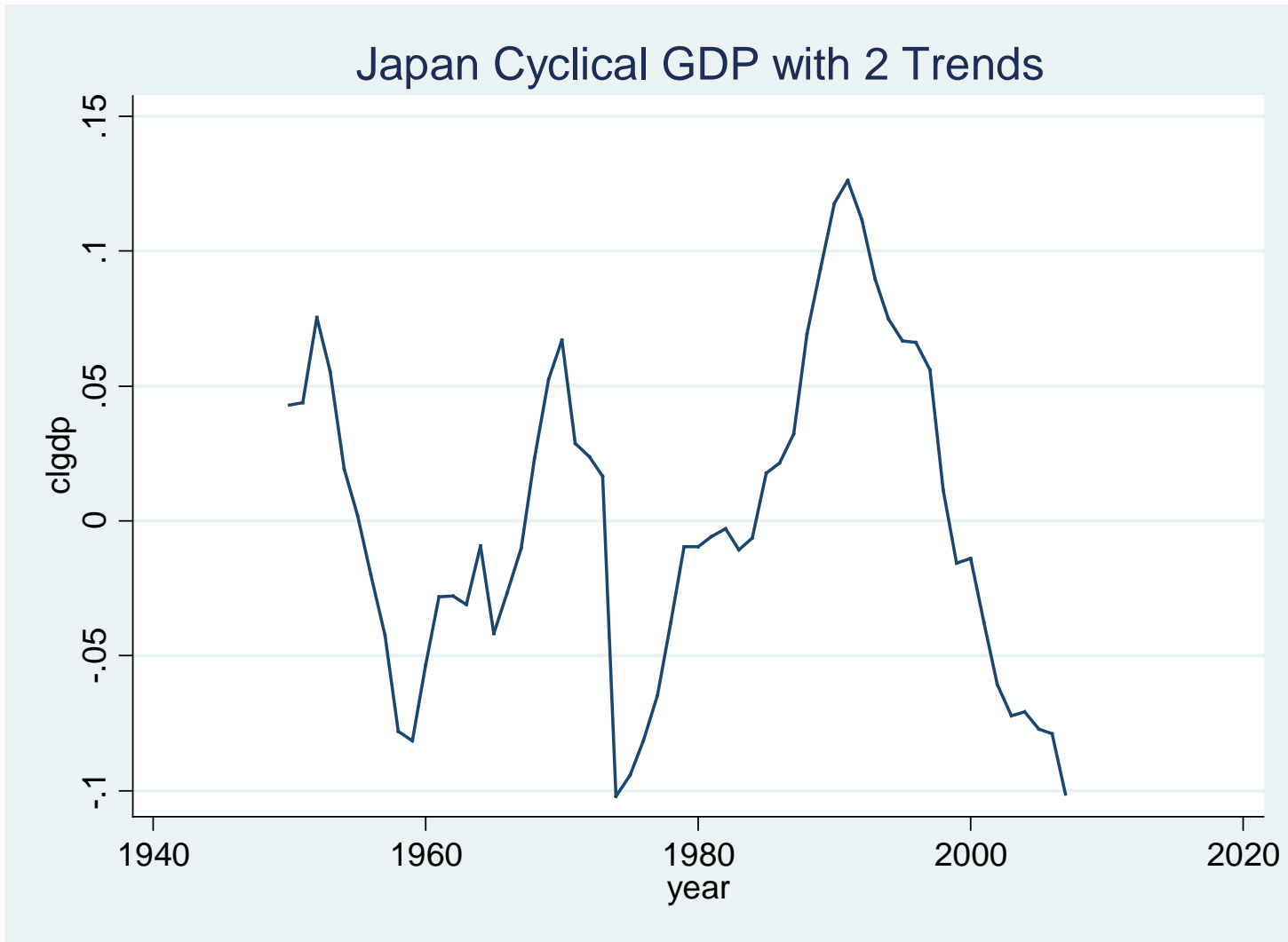
Is the trend stable?

Two-Piece Trend for Japan
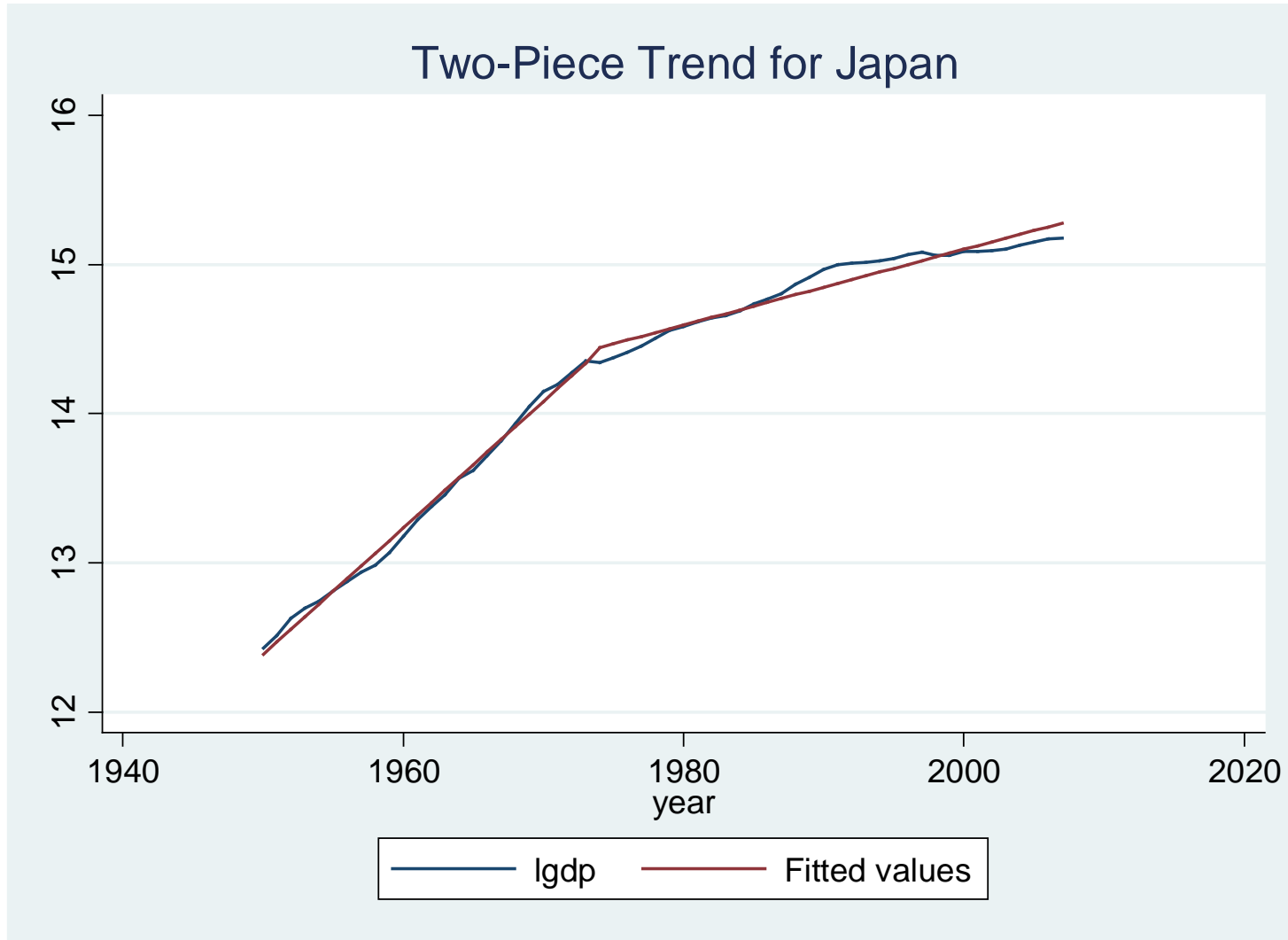
Cyclical series with unstable trend

Cyclical GDP with single trend
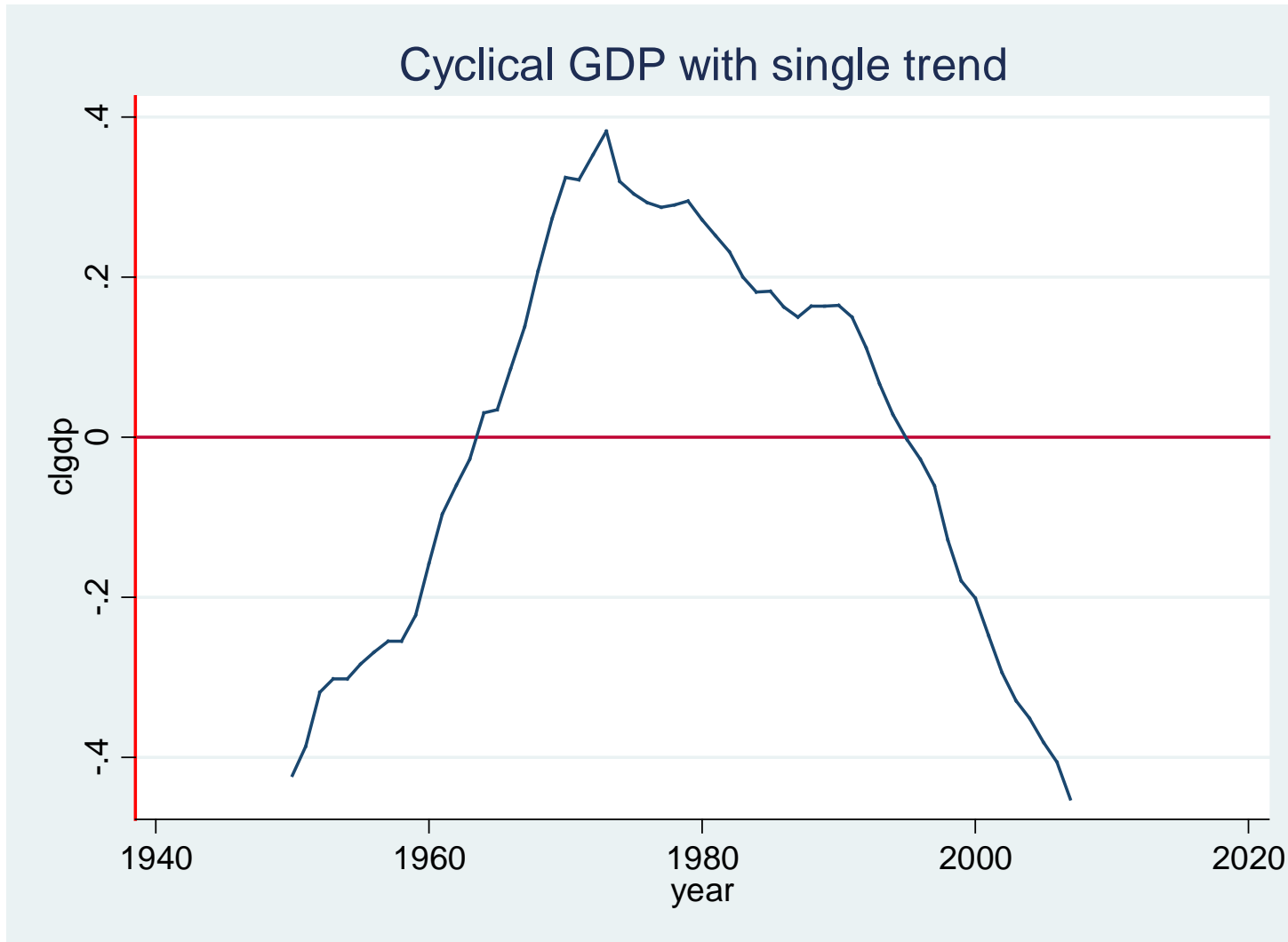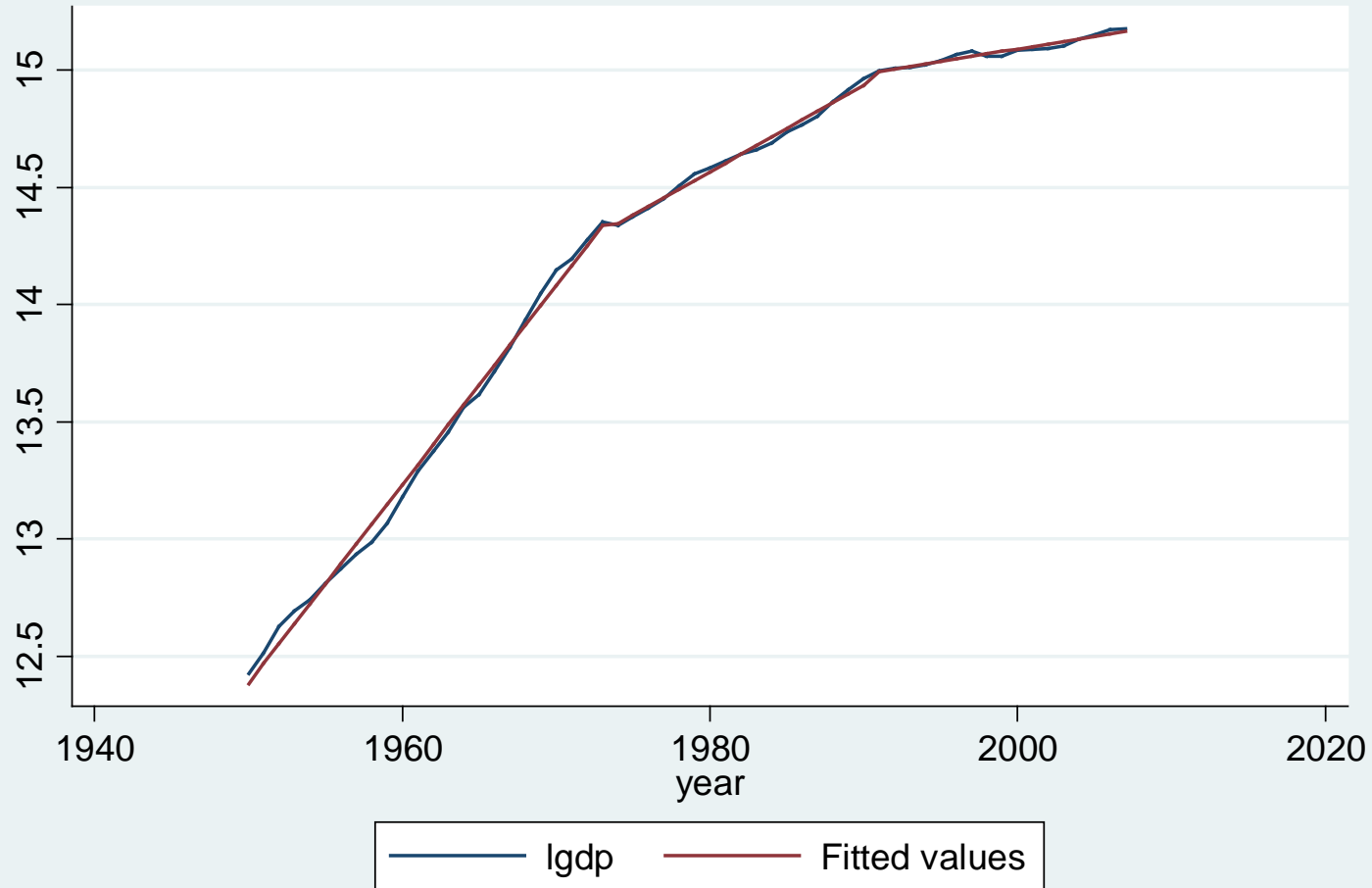
Cyclical GDP: Split trend

Japan Cyclical GDP with 2 Trends

Are there two breaks?

Three-Piece Trend for Japan

Cyclical series with two breaks

Japan Cyclical GDP with Three-Piece Trend
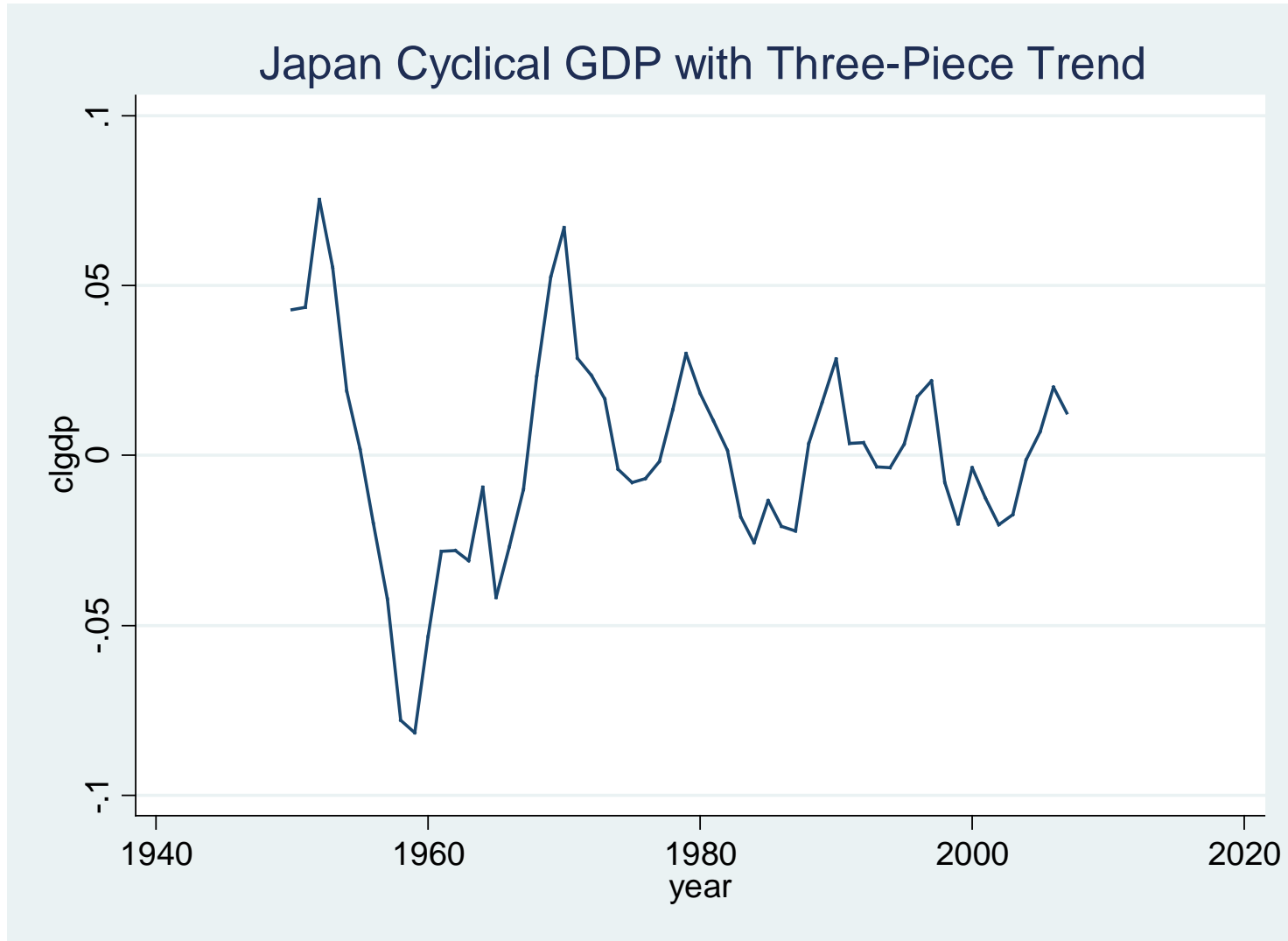
Pre- and post-1973 trend growth rates

Country	1950-1973 trend growth rate	1973-2000 trend growth rate	Difference
Argentina	3.45%	1.88%	-1.57%
Australia	4.69%	3.39%	-1.30%
Brazil	7.24%	2.37%	-4.87%
Canada	4.49%	2.82%	-1.67%
Chile	4.09%	4.96%	+0.87%
Finland	4.49%	2.43%	-2.06%
France	4.97%	2.16%	-2.81%
Ireland	3.12%	4.63%	+1.51%
Italy	5.34%	2.06%	-3.28%
Japan	8.49%	2.53%	-5.96%
Mexico	6.32%	2.80%	-3.52%
Spain	6.63%	2.87%	-3.77%
United Kingdom	2.64%	2.41%	-0.23%
United States	3.60%	3.01%	-0.59%

Hodrick-Prescott filter: Japan

HP Filter (lambda=100) for Japan
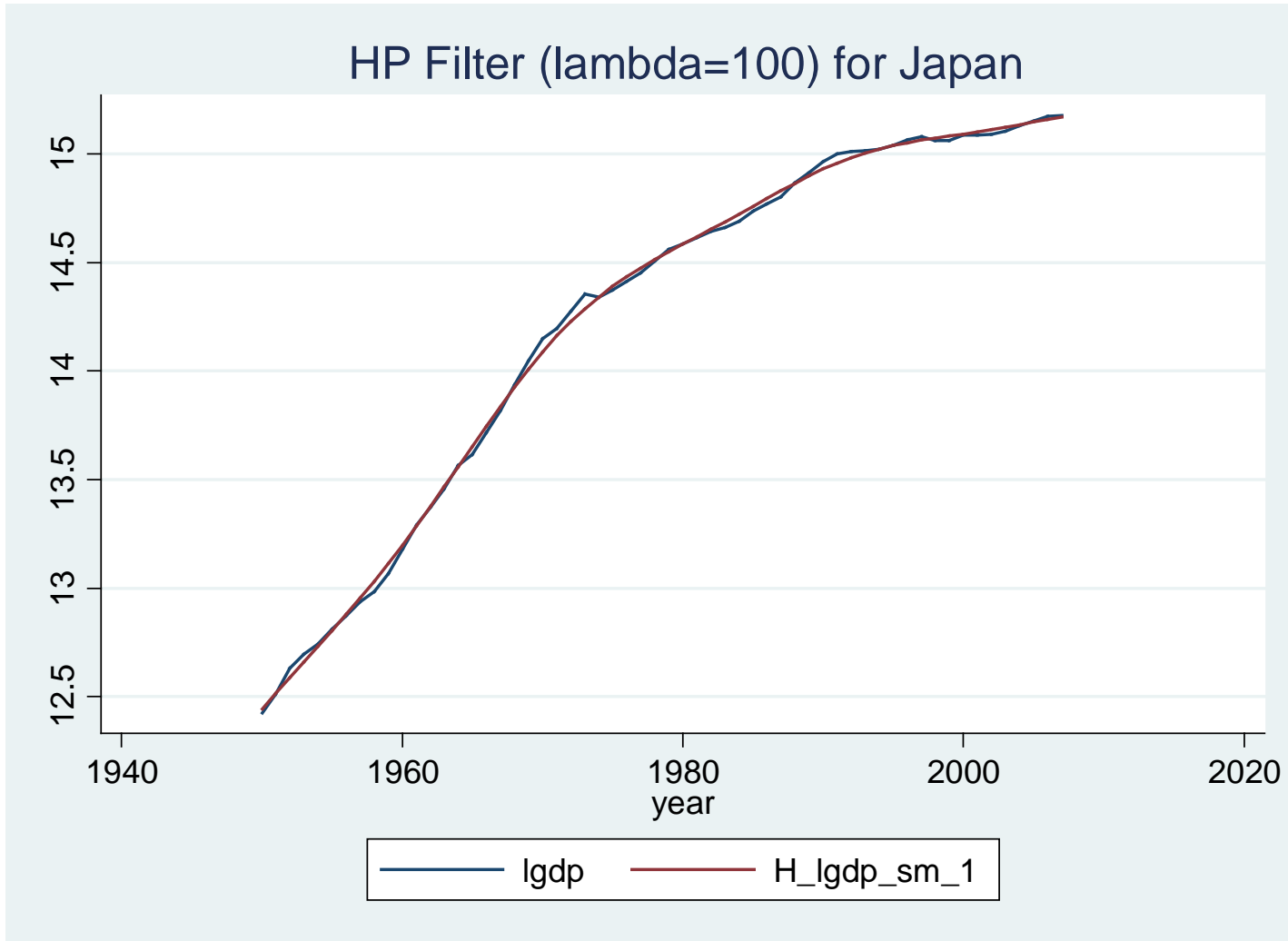
Hodrick-Prescott filter: Ireland

HP Filter for Ireland
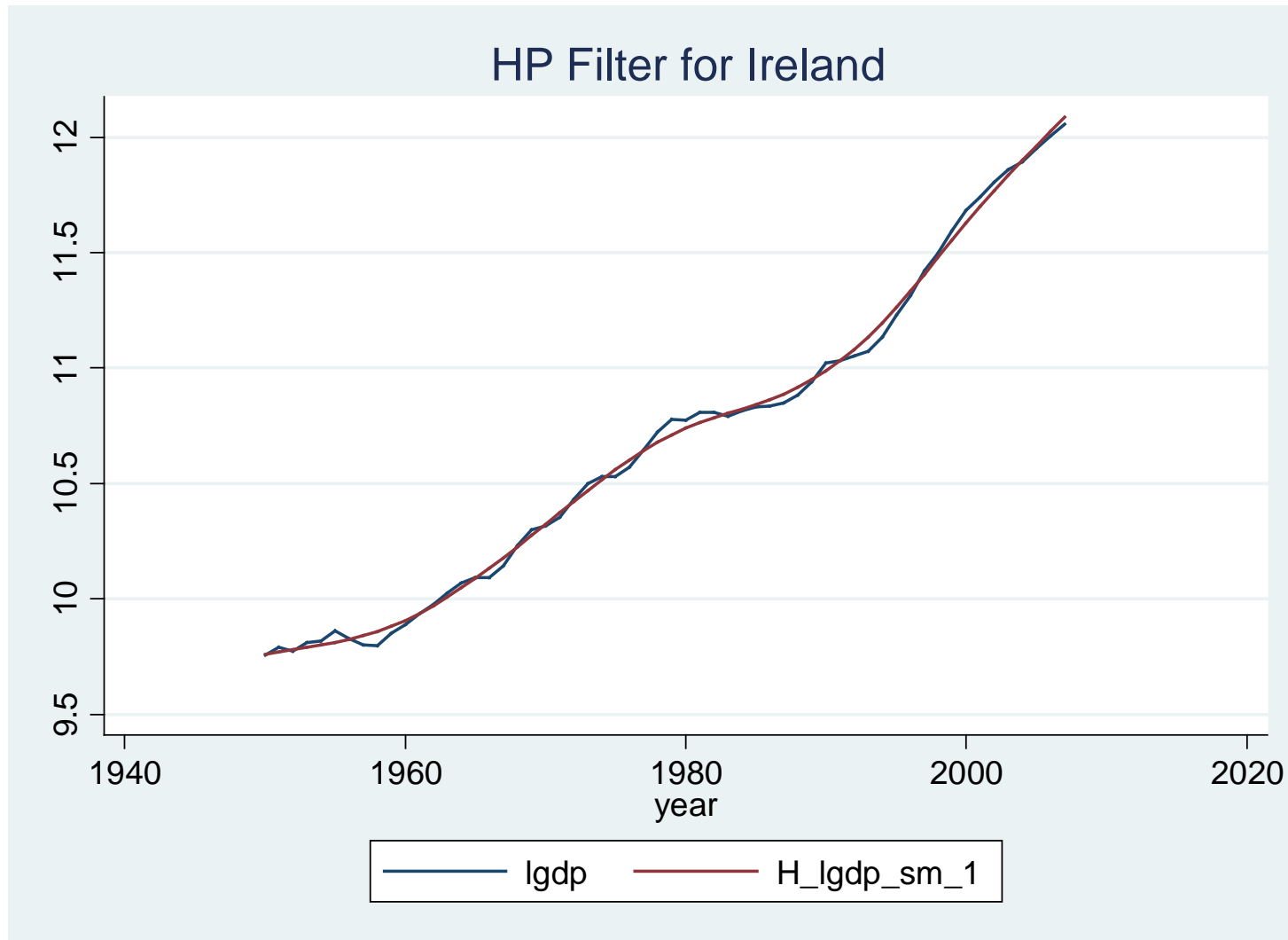
Separating trend and cyclical components

▸ No "correct" way to do it

- ▸ Obvious changes in underlying growth rate should be tracked in the trend component
- ▸ Obviously temporary deviations from the trend should be left in the cyclical component

▸ Piecewise linear trends

- ▸ Assume discrete changes in trend rate
- ▸ Appropriate where discrete event (revolution?) can be assumed to cause change

▸ HP filter and other, similar methods

- ▸ Trend rate can change continuously
- ▸ HP trend will, to some extent, follow *all* changes in series

▸

Conclusions

‣ Most economies grow
  ‣ Growth explains most of the variation in GDP
‣ Underlying growth rates vary over time
  ‣ Changes in growth rates may result from specific event at specific date
  ‣ Or may be gradual slowdowns or speedups
‣ GDP fluctuates considerably around its trend
  ‣ Fluctuations are called "cycles" even if they aren't
  ‣ Traditional "business cycle" has a period of 3-8 years
‣ We'll spend the first section of the course understanding trend growth, then the next section looking at fluctuations around the trend

▶