



# 1979–2001: A Greek great depression through the lens of neoclassical growth theory<sup>☆</sup>



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## ABSTRACT

This paper focuses on the performance of the Greek economy during the period 1979–2001. Following the work of Cole and Ohanian (1999) and Kehoe and Prescott (2002, 2007) this twenty year episode can be characterized as a great depression. We use this methodology and ask whether, given the observed exogenous path of total factor productivity (TFP), the neoclassical growth model can generate an equilibrium behavior that has growth accounting characteristics similar to those in the data. The answer is affirmative: Changes in TFP are crucial in accounting for the Greek great depression. Our model economy predicts a big decline of economic activity during the 80s and until the mid-90s and a strong recovery for the period 1995–2001. This is exactly what happened in Greece. Moreover, the model successfully mimics the actual data with respect to the timing of peaks and troughs and the time paths of most key macroeconomic variables. However, puzzles between theory's predictions and the observed data are not missing. For instance, things are (not surprisingly for the neoclassical growth model) less successful when it comes to the labor factor.

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## 1. Introduction

During the last five decades (1960–2012) the average annual growth rate of real per capita GDP in Greece was 2.55%. However, this seemingly good performance is misleading in that it fails to reveal a far from smooth trajectory (see Fig. 1). If we divide the period between 1960 and 2012 into four subperiods, we identify sharp differences. During the period 1960–1979 the Greek economy was in a boom. The average annual growth rate of real per capita GDP was 6.06%. In the next subperiod, that is 1979–1995, the Greek economy stagnated and the average annual growth rate of real per capita GDP fell to  $-0.07\%$ . During the period 1995–2007 the Greek economy recovered and the average annual growth rate of real per capita GDP rose to  $3.48\%$ .<sup>1</sup> Finally,

since 2008 the Greek economy experiences a dramatic downturn with the average annual growth rate of real per capita GDP being  $-4.62\%$  (2007–2012). In this paper we focus in the period 1979–2001.

Let us first define detrended real per capita GDP in period  $t$ ,  $\tilde{y}_t$ , as the ratio of real per capita GDP,  $y_t$ , over trend real per capita GDP,  $g^{t-T_0}y_{T_0}$ ,

$$\tilde{y}_t = \frac{y_t}{g^{t-T_0}y_{T_0}} \quad (1)$$

where  $g$  is the gross trend growth rate and  $T_0$  is the starting year of the detrending period.

Following Kehoe and Prescott (2002) we define the trend growth rate as the average annual real per capita GDP growth rate of the industrial leader of the world economy. In the 20th century this was the United States of America with an average annual growth rate of real per capita GDP of 2%. Hence, in our case, trend real per capita GDP is assumed to grow at this 2% rate, taking 1979 as the starting year  $T_0$ .

As Fig. 1 and Tables 1 and 2 reveal, during 1979–2001, the Greek economy experienced a substantial business cycle. Based upon the work of Cole and Ohanian (1999) and Kehoe and Prescott (2002, 2007) we characterize this period as a great depression. More specifically, from 1979 to 1995 the Greek economy fell into a persistent recession. At the trough of the recession, which was the year 1995, real per capita GDP was 27.99% below its trend value, real per capita consumption

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<sup>1</sup> For a review of the performance of the Greek economy during the last half century, see Alogoskoufis (1996), Dimeli et al. (1997), Bosworth and Kollintzas (2001) and Kollintzas et al. (2012).

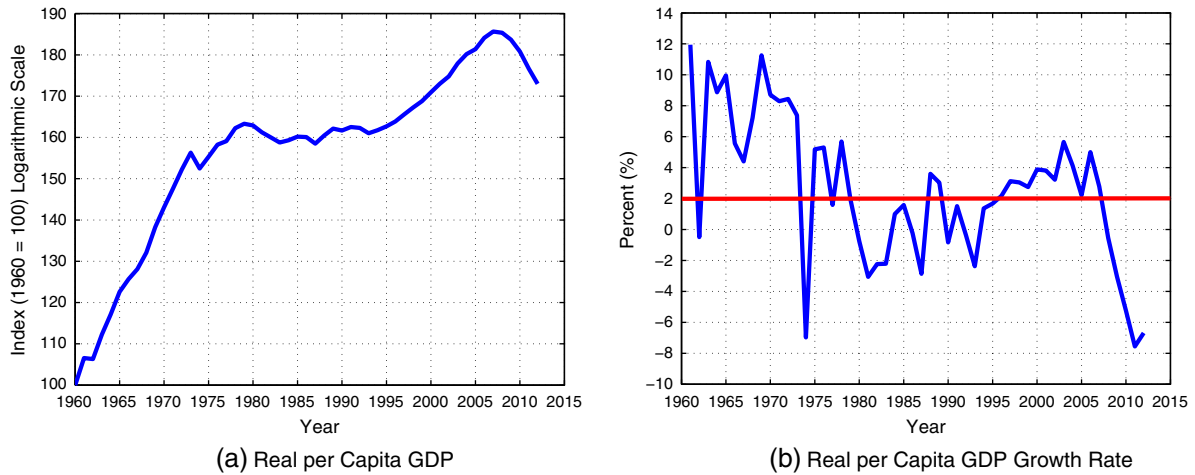


Fig. 1. Greece 1960–2012 stylized facts.

expenditure was 17.15% below its trend value, and real per capita investment expenditure was 59.42% below its trend value.<sup>2</sup> The recovery phase started in 1996 and lasted until 2001. At the end of the recovery phase real per capita GDP was 77.16% relative to its trend, real per capita consumption expenditure was 86.76% relative to its trend, and real per capita investment expenditure was 55.23% relative to its trend. After 2001 Greece entered a period of growth rates well above trend, which abruptly ends in the end of 2007.<sup>3</sup> Our purpose in this paper is to examine this two decade event from the perspective of neoclassical growth theory.

The research agenda opened up during the last ten years by the above authors, that is, the “great depressions methodology”, is built upon two pillars.<sup>4</sup> The first one is growth accounting, a technique which has its origins in the seminal work of Robert Solow in the late 1950s, and the second one is dynamic general equilibrium models, which is now the modern approach of doing macroeconomics. As a first step, we choose the neoclassical growth model as the workhorse of our analysis. The way we work is as follows.

First, using the criteria set by Kehoe and Prescott (2002, 2007), we identify and date the great depression incident. Second, using a standard constant returns to scale production function (Cobb–Douglas) we compute the implied series of total factor productivity for the period under consideration. Third, we set up the neoclassical growth model, calibrate it to the Greek economy and solve for the competitive equilibrium. We then feed the actual TFP series into the model and generate artificial data for the main aggregate economic variables. Finally, we compare the growth accounting characteristics of the actual data to those of the artificial economy.

We find that the neoclassical growth model can account rather well for the great depression in Greece during the 80s and 90s. Given the exogenous paths of TFP and population, our model economy predicts a big decline of economic activity during the 80s and mid-90s and a strong recovery for the period 1995–2001. This is exactly what happened in the Greek economy during this twenty year period. In terms of timing, both with respect to peaks–troughs, as well as the paths as a whole for most key macroeconomic variables our model economy moves synchronously with the data. However, puzzles between theory’s predictions and the observed data are not missing. For instance, things

Table 1  
Average annual real per capita growth rates (%).

Period	1960–2012	1960–1979	1979–1995	1995–2001	2001–2007	2007–2012
$g_y$	2.55	6.06	−0.07	3.13	3.83	−4.62
$g_c$	2.53	5.22	0.8	2.75	3.62	−3.72
$g_i$	1.75	8.45	−3.66	7.12	6.65	−18.72

Note:  $g_y$ ,  $g_c$  and  $g_i$  are the annual growth rates of real per capita GDP,  $y$ , real per capita final consumption expenditure,  $c$ , and real per capita Gross Fixed Capital Formation,  $i$ , respectively. All variables have been converted in real terms using the GDP deflator. The growth rates have been computed using annual natural logarithm differences, that is  $g_x = \ln(x(t+1)) - \ln(x(t)) = \frac{x_{t+1} - x_t}{x_t}$ .

Table 2  
Detrended values, index (1979 = 100).

Year	1979	1995	2001	2007	2012
$y$	100	72.01	77.16	86.23	62.01
$c$	100	82.85	86.76	95.74	72.01
$i$	100	40.58	55.23	73.09	25.97

are (not surprisingly for the neoclassical growth model) less successful when it comes to the labor factor.

The paper is organized as follows: Section 2 presents the definition of great depressions according to Kehoe and Prescott (2002, 2007), and checks whether the Greek economy meets the required criteria. Section 3 describes the data. Section 4 presents the growth accounting analysis. Section 5 presents the model. Section 6 discusses the calibration and transition dynamics. Section 7 presents the main results and, finally, Section 8 concludes.

## 2. The definition of great depressions

If output is significantly above trend, then the economy is in a boom. If it is significantly below trend, then the economy is in a depression. According to Kehoe and Prescott (2002, 2007), to be a great depression, a negative deviation of real per capita GDP from trend over the time period  $D = [T_0, T_1]$  must satisfy three conditions:

1. It must be a sufficiently large negative deviation (20% or larger). That is, there is some year  $t$  in  $D$  such that:

$$\frac{y_t}{g^{t-T_0} y_{T_0}} \leq 80\% \tag{2}$$

<sup>2</sup> That is,  $\bar{y}_{1995} = \frac{y_{1995}}{(1.02)^{1995-1979} y_{1979}} = 72.01\%$ , etc.

<sup>3</sup> The end of 2007 marks the beginning of a new negative business cycle incident which can potentially lead to a second great depression. See Section 7.3 for a discussion.

<sup>4</sup> In 2002 the Review of Economic Dynamics published a series of papers examining great depression episodes for different countries using the same methodology, that is growth accounting and dynamic general equilibrium (DGE) models.

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