

Inequality and Business Cycles in the U.S. and European Union Countries

SOPHIA DIMELIS AND ALEXANDRA LIVADA*

This paper derives the business cycle properties of some aggregate and disaggregate inequality indices for the U.S. and three European Union countries (United Kingdom, Italy, and Greece). The findings suggest that inequality indices move countercyclically with output in the U.S. and the United Kingdom, a procyclical behavior prevailed in Greece, and a mixed cycle influenced Italy. A common countercyclical pattern of inequality indices with inflation and unemployment characterizes the three large economies (U.S., United Kingdom, and Italy). Also, in most countries, the top income group seems to lose at the benefit of the rest during inflationary periods while, in all four countries, the poor will gain from inflation and suffer from unemployment. (JEL E32, D63, O57)

Introduction

A challenging topic in income inequality research has always been the analysis of how aggregate and disaggregate inequality indices fluctuate and how they are influenced by macrovariables. The majority of studies in relevant literature use traditional econometric techniques to examine the distributive impact of the most important macroeconomic aggregates such as inflation, unemployment, and growth. These studies suggest that unemployment increases inequality while growth and inflation ambiguously affect income distribution. Some studies for the U.S. are Schultz [1969], Mirer [1973a, 1973b], Beach [1977], Blinder and Esaki [1978], and Blank and Blinder [1986]. Studies for other countries include, among others, Schultz [1969] for the Netherlands, Buse [1982] for Canada, Nolan [1989] for the United Kingdom, Bjorklund [1991] for Sweden, and Achdut [1996] for Israel. However, the cyclical influences in these studies were either ignored or captured *ad hoc* by a trend factor among the regressors.

Income inequality has also been viewed extensively in literature in connection with development economics. The question of whether or not a trade-off exists between inequality and growth remains controversial. This literature can be traced back to Kuznets' [1955] inverted U-curve hypothesis which postulates that, as economic development occurs, income inequality widens in the early phase and narrows at later stages of development. This hypothesis has been investigated both theoretically and empirically in various studies [Chenery et al., 1974; Danziger and Gottschalk, 1982;

*Athens University—Greece. The authors appreciate the helpful comments from the participants of the International Atlantic Economic Conference, Rome, Italy, March 14-21, 1998 and from the participants of the 1997 meetings of the Society for Economic Dynamics, Oxford, United Kingdom, July 1997.

Lindert and Williamson, 1985]. Further evidence and recent critiques on the U-curve hypothesis can be found in Campano and Salvatore [1988], Ram [1988], and Anand and Kanbur [1993].

On the other hand, a series of studies in growth literature explores the opposite linkage, that is, the causal relation from income distribution to growth. There is empirical evidence [Clarke, 1995] that inequality, as captured by conventional measures, exerts a significant and negative impact on the level of output as well as on its growth. These facts have given rise to many theoretical and empirical works that explore the relationship between income distribution and growth through various channels such as investment in human capital, tax policies, capital market imperfections, or political processes (see, for example, Galor and Zeira [1993], Perotti [1993], Persson and Tabellini [1994], and Alesina and Rodrik [1994]).

Within business cycle literature, however, the evidence is very scarce. In an earlier classic study, Kuznets [1953] found a tendency for overall inequality to move countercyclically in the U.S. during the interwar period (1919-38). He argued that income shares of upper income groups decline during business expansion and increase during business contraction. Some years later, Creamer [1956] examined U.S. personal income and its components over four decades and his findings were in line with those of Kuznets. However, these conclusions were not accepted by all due to the limitations of the official statistics.

This paper takes up the issue of how income inequality behaves over the business cycle. It examines the cycles of income inequality and determines the stylized facts of their comovements with the cycles of the main macroeconomic aggregates of real per capita gross domestic product (GDP), inflation rate, and unemployment rate. Analysis is performed for the U.S. and three European Union (EU) countries—the United Kingdom, Italy, and Greece—using the Kydland and Prescott [1990] methodology. The intention here is to identify any empirical regularities displayed by the income inequality data without actually imposing any theoretical structure. Also, some of the results are contrasted to the evidence implied by a Kuznets type of curve obtained from the time series data.

The type of analysis performed here is useful in comparing countries of different socioeconomic and political backgrounds related to the pattern of their business cycles. Any empirical regularities observed in these countries will have important implications for income distribution and the transmission of the business cycles between the U.S. and EU countries. This study may also provide useful information about the distributive impact of any socioeconomic programs or policies undertaken in the EU or the U.S. These facts can finally be used for theorization and calibration in the growing literature of business cycles and income distribution.

The rest of the paper is organized as follows. The second section describes the methodology and the data series used in the analysis. The third section presents the main statistics that summarize the business cycle characteristics of the income inequality indices and their comovements with the real per capita output and the rates of inflation and

unemployment for each country. The fourth section provides a summary and concluding remarks.

Methodology and Data

The paper studies the business cycle features of income inequality measures by applying the methodology of Kydland and Prescott [1990]. This procedure is based on the Lucas [1977] definition of the business cycle as the component of a variable that is derived by taking deviations from its smooth trend. That is, growth business cycles are computed as opposed to the classical business cycles, which refer to the levels of the variables.¹ There are several ways to represent a smooth trend such as using deterministic polynomial functions of time, differencing, or other stochastic procedures. This study chooses the Hodrick and Prescott [1980] filter (hence, HP filter) for comparative purposes since it has become a standard detrending technique in recent business cycle literature.²

The income inequality time series data used in this study are published estimates of three aggregate inequality indices: the Gini coefficient, the coefficient of variation (CV), and the first index of Theil. Quintile income shares ($Q_i, i = 1, \dots, 5$) are also used as disaggregate inequality measures. The main criteria for the choice of these indices are to satisfy certain properties [Sen, 1973; Cowell, 1977] and to have the same measures for a long period of time in all four of the countries examined. Analysis is not restricted to only one index since there is almost universal consensus that no perfect inequality index exists nor hypothetical statistical distribution to describe it. For example, the Gini coefficient tends to attach more weight to income transfers that occur around the middle income classes, the CV is very effective in reflecting inequality mainly among high incomes, and Theil's index attaches equal weight to transfers at the lower and upper end. In this sense, using different inequality measures can be viewed as a test of robustness on the results.³ The inequality measures and their data source as well as the period covered by country are as follows:

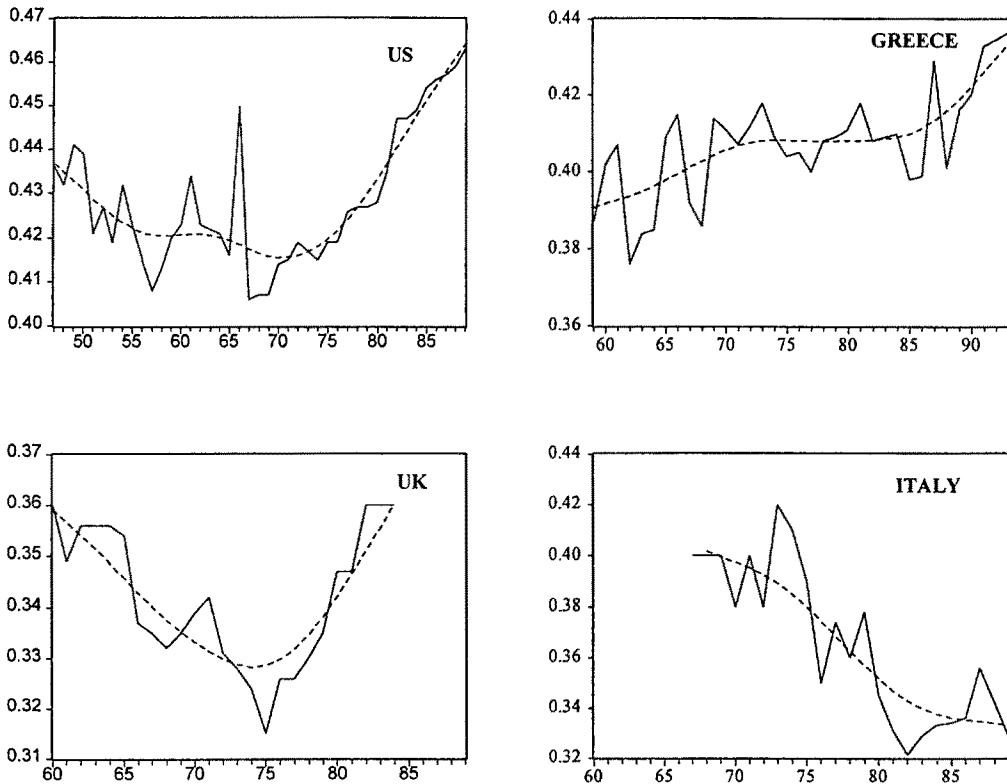
- 1) for the U.S., 1947-89: Gini, Theil, and Q_i [Slotje et al., 1989; Hayes et al., 1990];
- 2) for the United Kingdom, 1960-84: CV, Gini, and Q_i [Atkinson and Micklewright [1992];
- 3) for Italy, 1977-89: CV, Gini, Theil, and Q_i [Brandolini and Cannari, 1994; Brandolini, 1992]; and
- 4) for Greece, 1959-93: CV, Gini, Theil, and Q_i [Livada, 1991] (updated).

The above annual inequality measures are estimated using consumer income data from the Current Population Report for the U.S., tax unit net income from the Blue Book for the United Kingdom, family income from tax declaration forms for Greece, and family income from surveys by the Bank of Italy for Italy. The macroeconomic variables considered are the GDP per capita in constant prices, the inflation rate derived from the Consumer Price Index (CPI), and the unemployment rate. The main data source for these variables is the *Economic Outlook* of the Organization of Economic Cooperation and

Development (OECD) [1996] for 1960 onward. For previous years, national sources were used.

As an illustration, Figure 1 presents the evolution of the Gini coefficient along with its trend computed by the HP filter. It becomes quite clear that both the U.S. and the United Kingdom have experienced an increasing inequality trend since the early and mid-1970s, respectively. After a period of stable inequality, Greece experienced an upward trend since the mid-1980s, though much smaller, and, only in Italy is there a systematic downward trend since the late 1960s. Similar observations have been made by Levy and Murnane [1992], Gottschalk [1997], and others for the U.S.; by Johnson and Webb [1993] and Jenkins [1995] for the United Kingdom; by Dimelis and Livada [1995] for Greece; and by Brandolini and Sestito [1994] for Italy.

FIGURE 1
Actual and Fitted Values of the Gini Coefficient



The trend of high and growing inequality in the U.S. and the United Kingdom has been an issue of great concern and has raised a major debate over the causes and consequences of this phenomenon. It is widely accepted today that the rise in income inequality is due to the widening of the dispersion in earnings or wages. Several explanations have been put forth for this rise among which, the most often quoted for the U.S. economy are

shifts in labor demand away from low-skilled labor as a consequence of skill-biased technological change, trade with low-wage developing countries, and international competition [Blank, 1995; Johnson, 1997]. In the United Kingdom, the causal forces are a mixture of earnings inequality, employment structure, and changes in the tax and benefit system as documented by Jenkins [1995]. In Greece, the rise in inequality seems to have occurred right after the austerity program enforced in 1986 to control rising deficits and inflation. In Italy, according to recent estimates, the trend of inequality has also been rising after 1989 due to institutional reforms (see OECD [1996]).

Following the methodology of Kydland and Prescott [1990], first compute the trend component of each series using the HP filter. Then obtain the cyclical component by taking deviations of the above trend from the actual series. All deviations are expressed in percentage terms by taking natural logarithms of the level variables. For the share variables, such as the inequality indices or rates, no other transformation was undertaken.

Next, for each detrended series, compute:

- 1) the standard deviation as a measure of the relative amplitude of the fluctuations;
- 2) the cross correlations of the reference variable with each one of the inequality indices (contemporaneous correlations); and
- 3) the cross correlations of the reference variable with a number of lags and leads of the same index to account for the degree of comovements.

If the contemporaneous correlation is positive (negative) and statistically significant, then the inequality index is procyclical (countercyclical), meaning that the cycles of the index move in the same (opposite) direction as that of real output or other pertinent variable. A number close to zero indicates that no contemporaneous correlation exists. For the statistical significance of the correlation coefficients, the two-sided t-test was used to test the null hypothesis of a zero correlation at the 5 percent significance level. The cross correlations of the reference variable with leads and lags provide information on the phase shift of the inequality cycles relative to the cycles of the reference variable.

Business Cycle Facts

In this section, Table 1 will present the volatility of the inequality indices and macrovariables by country. This is the standard deviation of the relevant detrended series which measures the variability of the cyclical fluctuations. For comparison purposes, the standard deviation is expressed in percentage terms for all series. Tables 2 through 5 will summarize the comovements of the income inequality cycles relative to those of real output, rates of inflation, and unemployment. Following the description in the previous section, under column $x(t)$, the contemporaneous cross correlations are reported to determine procyclicality (positive correlation), countercyclicality (negative correlation), or an acyclical behavior (zero correlation). Under the columns of $x(t \pm j)$, for $j = 1, \dots, 3$, the cross correlations of the pertinent variable with three lags and leads of the inequality index series x are reported. If this correlation has its largest absolute value in entries $x(t - j)$, $x(t)$, or $x(t + j)$, then the cycle of income inequality (x) is leading by j periods, is synchronous with j periods, or is lagging by j periods the cycle

of the pertinent index, respectively. The facts are presented and discussed separately for each case in the following sections.

Volatility

Looking first at the volatility of the cycles in Table 1, observe that the standard deviation of the GDP fluctuations varies from a low of 1.8 percent in Italy to 2.4 percent in Greece and the U.S. Inflation cycles are more volatile than GDP in all countries except the U.S. while the unemployment cycles are highly volatile everywhere. Among the aggregate inequality indices, the CV is the most volatile measure while Gini shows the least volatility, except in the U.S. The cycles of income shares have, as expected, smaller variability, with the top and bottom quintiles (Q5 and Q1) being the most variable. Overall, the cycles of the main macrovariables and some of the most common inequality measures show considerable uniformity among countries with respect to the relative amplitude of the above cycles.

TABLE 1
Volatility of Cyclical Fluctuations

Variables	U.S.	United Kingdom	Italy	Greece
GDP	2.39	2.02	1.80	2.40
CPI Inflation Rate	1.25	2.52	2.78	3.82
Unemployment Rate	99.70	20.60	51.80	87.50
Gini	.77	.55	1.46	.92
CV	—	1.71	11.02	10.57
Theil	.56	—	3.08	1.59
Q1	.15	.32	.39	.45
Q2	.15	.23	.30	.29
Q3	.13	.24	.23	.21
Q4	.10	.22	.15	.29
Q5	.35	1.14	.91	.67

Notes: Figures are standard deviations.

Inequality and GDP

Table 2 presents the results with respect to real GDP per capita. The correlation coefficients at time t show that in the U.S. and the United Kingdom, all aggregate inequality indices move countercyclically with real output. In Italy, the CV moves

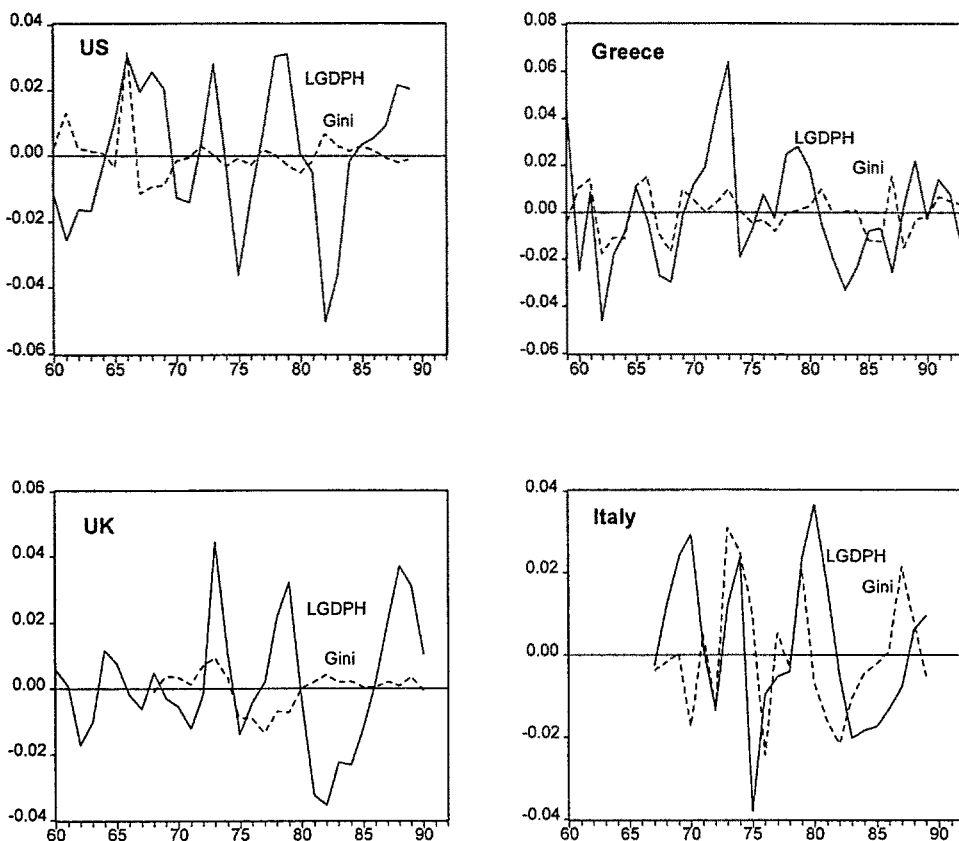
countercyclically but Gini and Theil move procyclically. In Greece, all indices are procyclical. However, these coefficients are significant only in the case of Greece.⁴ A diagrammatic representation of the above comovements with regard to the Gini coefficient is given in Figure 2. A more careful examination of these graphs suggests that the above behavior for the U.S., the United Kingdom, and Italy has not been uniform in the entire period examined. This may explain the low correlation coefficients computed for these countries. On the other hand, Greece presents a dichotomy in the pattern of income inequality over business cycles, resulting in countercyclical behavior from the late 1980s onward.⁵ The pattern of the phase shift is variable among countries as indicated by the cross correlations with leads and lags. The only exception is Greece where inequality is consistently lagging.

TABLE 2
Real Per Capita GDP and Income Inequality Indices by Country

Index	Country	Cross Correlation of Real GDP with:						
		$x(t-3)$	$x(t-2)$	$x(t-1)$	$x(t)$	$x(t+1)$	$x(t+2)$	$x(t+3)$
CV	U.S.	—	—	—	—	—	—	—
	U.K.	-.10	0.22	-.31	-.24	-.30	-.15	-.03
	Italy	.77	.47	-.08	-.28	-.32	-.36	-.31
	Greece	-.15	-.24	-.26	.43	.47	.26	-.02
Gini	U.S.	.25	.26	.17	-.15	-.24	-.22	-.19
	U.K.	.03	-.01	-.17	-.24	-.31	-.33	.04
	Italy	.05	.02	.18	.12	-.11	-.54	-.16
	Greece	-.16	-.21	-.05	.30	.32	.27	-.12
Theil	U.S.	.22	.19	.22	-.20	-.23	-.22	-.13
	U.K.	—	—	—	—	—	—	—
	Italy	.20	.52	.70	.27	-.40	-.57	-.41
	Greece	-.18	-.21	-.11	.37	.43	.31	-.11

Notes: Deviations from trend are from annual data. Sample size for the U.S. is from 1947-89; for the United Kingdom (U.K.), 1960-84; for Italy, 1977-89; and for Greece, 1959-93.

FIGURE 2
Business Cycles: Log GDP Per Capita (LGDPH) and Gini Coefficient



The previous evidence is documented by looking at the movements of the disaggregate indices in Table 3. The cyclical behavior of the quintile income shares in the U.S. suggests that over the output expansions, the middle and lower income classes benefit the most, while the upper-middle and top income classes seem to lose. This becomes evident from the positive and significant correlation coefficients for Q1 and Q2 and the significantly negative correlation coefficient for Q5. In the United Kingdom, only the lower income class appears to benefit from output expansion while the rest of the classes either lose or are unaffected. An opposite picture characterizes the case of Greece where the top income class (Q5) benefits the most at the expense of the rest of the population during expansions. In Italy, the lower income classes (Q1 and Q2) lose, the middle income class gains, and the rest seem to be unaffected during the GDP upturns. Therefore, the results might be interpreted as implying that recessions are bad for overall equality or that inequality results in recessions, or both.

The previous evidence is also related to the well-known puzzle in growth literature of whether inequality is harmful to growth or helpful. In this literature, the political regime seems to play a significant role in determining the relationship between inequality and

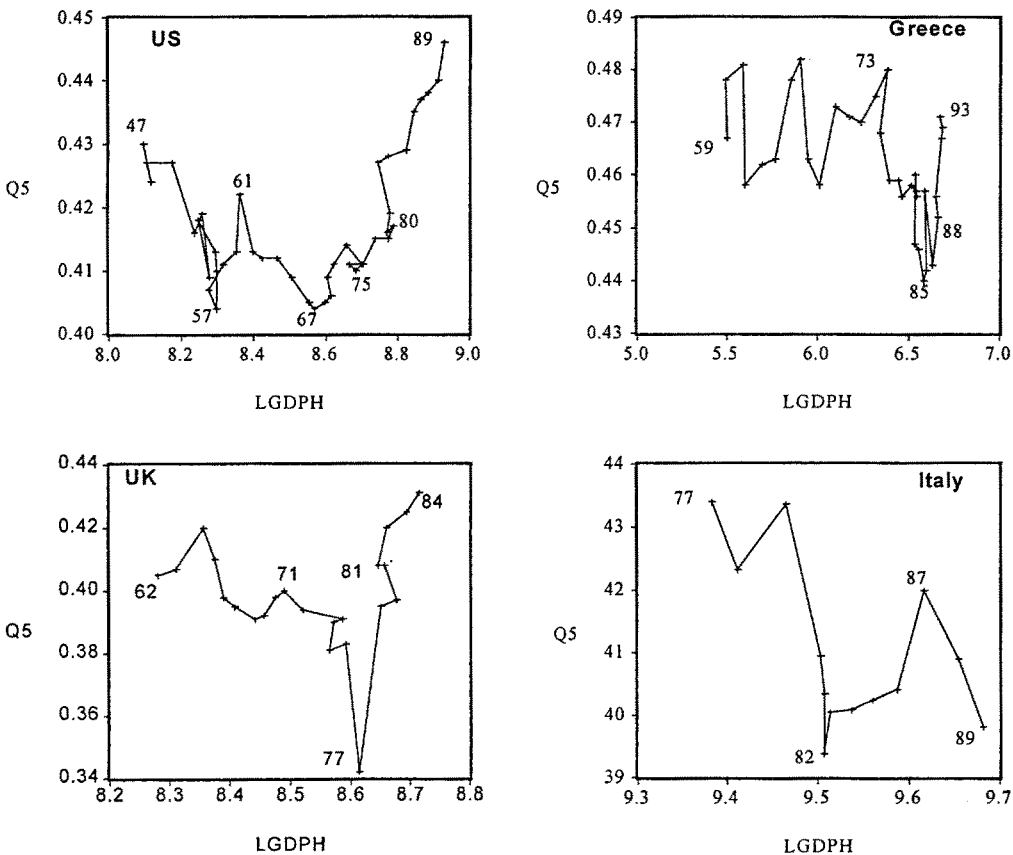
growth. For example, van Wijck [1992] provides evidence for the U.S. that inequality trends were negatively influenced by democratic administrations for the period 1959-89. From a time series and cross section sample of developed and less-developed countries in the period 1960-85, Persson and Tabellini [1994] found that over the periods of democratic regimes, output growth and inequality were negatively correlated. However, Clarke [1995] showed that this negative relationship holds for both democracies and nondemocracies. A useful extension to the present analysis would therefore be to examine whether the political regime differentiates the previous conclusions with respect to the cyclical behavior of inequality.

TABLE 3
Cross Correlations with Quintile Indices by Country

Quintile	Country	Cross Correlations of Variable $x(t)$ with:		
		Real Per Capita GDP	CPI Inflation Rate	Unemployment Rate
First	U.S.	.45	.22	-.61
	United Kingdom	.31	.22	-.24
	Italy	-.16	.52	-.22
	Greece	.00	.04	-.12
Second	U.S.	.40	.28	-.57
	United Kingdom	-.10	.07	.21
	Italy	-.10	.51	-.37
	Greece	-.21	-.28	.00
Third	U.S.	.27	.28	-.35
	United Kingdom	-.04	.21	-.13
	Italy	.13	.60	-.44
	Greece	-.56	-.31	.44
Fourth	U.S.	-.22	.16	.29
	United Kingdom	.05	.32	-.28
	Italy	-.07	.17	-.35
	Greece	-.27	-.53	.38
Fifth	U.S.	-.38	-.32	.53
	United Kingdom	-.02	-.19	.06
	Italy	.08	-.57	.39
	Greece	.43	.27	-.22

This paper also attempts to combine its findings with evidence from a Kuznets type of curve. Most of the empirical studies on the Kuznets hypothesis are based on cross-sectional data.⁶ Using the time series data, Figure 3 presents the association of inequality as measured by the top 20 percent income share (Q5) with the logarithm of per capita GDP at each point in time for the four countries examined. What characterizes these figures is a sequence of inverse U-shaped curves rather than a single Kuznets type of curve.

FIGURE 3
Kuznets Curves: Income Share of Top 20 Percent (Q5)
and the Log Real Per Capita GDP (LGDPH)



More specifically, in the U.S., the top income share is steadily rising over a period of sluggish growth of per capita GDP, mostly from the mid 1970s onward, despite the fact that in the entire period examined, inequality was found to be decreasing over business cycle upturns. A similar analysis holds for the United Kingdom. However, in Greece, this phenomenon is more severe since over the years of recession and contractionary policy measures (1986-93), an almost vertical increase in the top income share has occurred, leading to a more unequal income distribution. On the other hand, in Italy, with

reservation of the limited sample, a downward movement of the top income share has prevailed since 1977. The above findings therefore support Atkinson's [1993] observation that for the United Kingdom and the U.S., "the trend in recorded income inequality departs from Kuznets' hypothesis.... The inverse-U shape is replaced by a curly \wedge ." Of course, in order to determine the exact form of relationship, a rigorous econometric analysis is required which is beyond the scope of this paper.

Inequality and Inflation

The distributional impact of inflation has been a controversial issue in literature. Some argue that inequality is unaffected by inflation [Buse, 1982; van Wijck, 1992]. Others claim that only some of the poor would gain [Blinder and Esaki, 1978; Nolan, 1989]. On the other hand, the incomes of some groups, such as wage earners and pensioners, are slower to adapt in inflationary periods, whereas other groups' incomes (for example, the self-employed) respond relatively quickly to inflation. Attention should also be paid to the definition of income or the type of inflation employed when comparing the redistributive effects of inflation among various studies.⁷ Schultz [1969] argues that in the case of demand-pull inflation, inequality rises because prices rise faster than costs, resulting in higher profit shares and thus higher shares of the upper income groups. In the case of cost-push inflation, however, inequality falls because the profit share decreases relative to wages.

The contemporaneous cross correlations reported in Table 4 reveal that most aggregate inequality indices move countercyclically with inflation in all countries except Greece. The correlation coefficients are significant only in the U.S. and in the following cases: for the United Kingdom, the Gini; for Italy, the Theil; and for Greece, the CV and Theil. Regarding the timing in cycle phases, a variable pattern emerges. In Table 3, the behavior of disaggregate indices regarding inflation shows that low, middle, and upper-middle income groups move procyclically with inflation in the U.S., the United Kingdom, and Italy, but countercyclically in Greece. The top income group seems to lose at the benefit of the rest during inflation periods in all countries but Greece.

TABLE 4
CPI Inflation Rate and Income Inequality Indices by Country

Index	Country	Cross Correlation of CPI Inflation Rate with:						
		$x(t-3)$	$x(t-2)$	$x(t-1)$	$x(t)$	$x(t+1)$	$x(t+2)$	$x(t+3)$
CV	U.S.	—	—	—	—	—	—	—
	U.K.	-.06	-.17	-.24	-.21	-.27	-.14	-.29
	Italy	.40	-.30	-.59	-.18	-.34	-.28	-.11
	Greece	-.21	-.06	.65	.50	-.10	-.30	-.26

TABLE 4 (CONT.)

Index	Country	Cross Correlation of CPI Inflation Rate with:						
		$x(t-3)$	$x(t-2)$	$x(t-1)$	$x(t)$	$x(t+1)$	$x(t+2)$	$x(t+3)$
Gini	U.S.	.14	.11	-.18	-.14	-.06	.10	.14
	U.K.	.06	-.26	-.32	-.37	-.21	-.08	-.03
	Italy	.27	.23	.24	.09	-.26	-.37	-.13
	Greece	.03	-.01	.15	.21	.06	-.20	-.25
Theil	U.S.	.17	-.05	-.01	-.19	-.05	.07	.23
	U.K.	—	—	—	—	—	—	—
	Italy	.39	.18	.17	-.50	-.71	-.13	-.06
	Greece	-.04	-.05	.32	.35	-.05	-.30	-.34

Notes: Deviations from trend are from annual data. Sample size for the U.S. is from 1947-89; for the United Kingdom (U.K.), 1960-84; for Italy, 1977-89; and for Greece, 1959-93.

The current evidence should be interpreted as in the previous discussion. In the three large economies (U.S., United Kingdom, and Italy), overall inequality exhibits a common countercyclical behavior regarding inflation. These results can further be interpreted as having progressive implications. On the other hand, a rather regressive behavior is dominant in Greece. This different cyclical behavior exhibited by the inequality indices relative to inflation can be attributed to the different market structure of the individual economies. It is also a matter of dominance between demand-pull and cost-push inflation or the type of income concept used. Thus, the countercyclical behavior in the U.S., the United Kingdom, and Italy implies a possible dominance of cost-push inflation as opposed to Greece where the demand-pull inflation may have prevailed in the periods examined.

Inequality and Unemployment

Unemployment has distributional effects as well as dead-weight losses since a substantial amount of unemployment compatible with zero inflation is involuntary and not optimal. The social costs of involuntary unemployment are obvious and immediate, compared with those of inflation [Tobin, 1972]. Studies on unemployment and income inequality assert that unemployment hurts the poor and that the impact of unemployment is stronger than that of inflation [Blinder and Esaki, 1978; Nolan, 1989; Blank and Blinder, 1986; Danziger and Gottschalk, 1989].

Table 5 presents the cross correlations of the unemployment rate with the inequality indices. The results show aggregate inequality indices move procyclically with

unemployment for all countries except Greece. Both the U.S. and the United Kingdom show significant contemporaneous correlations. In Italy, only the CV is significant while, in Greece, all coefficients are insignificant. The pattern of the phase shift varies with the cycles being synchronous in the U.S., variable in the United Kingdom, and lagging in Italy and Greece. The disaggregate indices in Table 3 suggest that in most countries, unemployment harms the poor and middle income classes while the top income class (and the upper-middle class for the U.S.) gains. The exceptional behavior in Greece, where the very poor and very rich seem to be harmed by unemployment, may be attributed either to the nature of unemployment data or to the country's labor market structure. In fact, the Greek unemployment series is partly estimated, whereas the Greek labor markets are largely regulated. Finally, comparing the results of unemployment with those of inflation, notice that the cross correlations of aggregate inequality indices and quintiles with unemployment were consistently stronger than those of inflation in the case of the U.S.

TABLE 5
Unemployment Rate and Income Inequality Indices by Country

Index	Country	Cross Correlation of Unemployment Rate with:						
		$x(t-3)$	$x(t-2)$	$x(t-1)$	$x(t)$	$x(t+1)$	$x(t+2)$	$x(t+3)$
CV	U.S.	—	—	—	—	—	—	—
	U.K.	.26	.44	.40	.33	.22	.04	.01
	Italy	-.33	.08	.19	.39	.40	.28	.18
	Greece	.02	.12	.01	-.13	-.25	-.14	.06
Gini	U.S.	-.32	-.23	-.04	.33	.23	.10	.06
	U.K.	.07	.18	.32	.33	.29	.14	-.09
	Italy	-.07	-.04	-.23	.06	.34	.24	-.07
	Greece	.17	.18	.07	-.06	-.19	-.21	-.09
Theil	U.S.	-.24	-.17	-.07	.32	.22	.11	.02
	U.K.	—	—	—	—	—	—	—
	Italy	-.03	.01	-.14	.18	.17	.21	.22
	Greece	.11	.16	.04	-.11	-.23	-.16	.04

Notes: Deviations from trend are from annual data. Sample size for the U.S. is from 1947-89; for the United Kingdom (U.K.), 1960-84; for Italy, 1977-89; and for Greece, 1959-93.

In further analyzing these results, it would be useful to refer to recent discussions in literature about the empirical evidence of both high and persistent unemployment and rising (wage) inequality in OECD countries. In particular, there is the view that wage inequality has been the crucial factor that explains the better employment performance in the U.S. [European Commission, 1996]. This assertion of a trade-off between persistent unemployment and inequality was based on specific regulatory institutions in labor markets across nations. Thus, the U.S., one of the most unregulated labor markets, kept unemployment low at the expense of higher wage inequality as a result of the downward wage flexibility. In contrast, the more rigid labor market institutions in the EU have prevented wages of low-skilled workers from falling but have caused unemployment to persist. However, more recent evidence casts doubts on this argument as in the case of the United Kingdom which has experienced the largest rise in inequality and unemployment despite the high degree of unregulation. Blank [1995] extensively reviews existing literature on these issues and discusses policy issues as well. The results in this paper for the U.S., the United Kingdom, and Italy are also against this assertion since the cyclical relation between unemployment and income inequality was found to be positive and significant. The fact that Greece has been one of the most highly regulated labor markets may partly explain the lack of correlation found in the data.

Conclusions

This paper studies the business cycle properties of some aggregate and disaggregate income inequality indices for the U.S. and three EU countries (United Kingdom, Italy and Greece). Following the Kydland-Prescott methodology, the main stylized facts regarding business cycles were obtained and compared among countries. These findings suggest that some regularities can be observed in the cyclical pattern of inequality indices in these countries.

At the aggregate level, inequality indices move countercyclically with real per capita GDP in the U.S. and the United Kingdom. The evidence is mixed for Italy while a procyclical behavior prevailed in Greece. A better picture emerged from the disaggregate indices which support the above findings. That is, during expansions, the lower income classes benefit in the U.S. and the United Kingdom while, in Greece and Italy, they either lose or are unaffected. On the other hand, the graphical examination of the cyclical patterns and the Kuznets curves suggest that breaks exist in the above patterns which are possibly associated with economic, political, or institutional reforms, specific for each country.

Regarding the comovements with the other macroeconomic variables, a common pattern characterizes the three large economies (U.S., United Kingdom, and Italy). Thus, inequality indices showed a countercyclical behavior with both inflation and unemployment in these countries. On the other hand, the small economy of Greece, with highly regulated labor markets, exhibited a procyclical behavior with respect to inflation and no correlation with unemployment. Also, in most countries, the top income group seems to lose at the benefit of the rest during inflationary periods while, in all four

countries, the poor gain from inflation and suffer from unemployment. It is interesting that in this study, the observed correlations between cyclical inequality and inflation were quite strong in some cases as opposed to previous studies that showed weak or no such correlation. In addition, in the case of the U.S., the cross correlations of aggregate inequality indices and quintiles with unemployment were consistently stronger than those of inflation.

These results are helpful for formulating and calibrating business cycle models. Interesting extensions of this study would be, first, to combine the time series evidence with a cross-sectional panel of countries and, second, to examine the above business cycle features in association with the socioeconomic, historical, and political structure of each economy. Hence, further theoretical and empirical work concerning the issues of income distribution, macroeconomic behavior, and politics should be undertaken toward this direction.

Footnotes

- 1) Classical business cycles refer to the much quoted definition of business cycles first given by Wesley Mitchell in 1927 (and revised by the same author [Burns and Mitchell, 1946]) as sequences of expansions and contractions of the level variables with an emphasis on turning points and phases. For an extensive survey on various phases of business cycle theories, see Zarnowitz [1991].
- 2) For a short explanation and application of the HP filter, see the *European Economy* [1995].
- 3) See the special issue of the *Journal of Econometrics* [1990] for a representative sample of new methods for analyzing and measuring economic inequality with emphasis on estimation and modeling.
- 4) In the case of U.S. where the sample of the examined series is the largest (43 observations), a value of the correlation coefficient higher than 0.29 is statistically significant at the 5 percent level according to the two-sided t-statistic.
- 5) Figure 2 refers to the Gini coefficient, but a similar picture emerged from the other indices as well.
- 6) Although Kuznets hypothesis refers to the time relationship between economic development (as measured by the level of income) and income inequality, most of the existing literature is dominated by cross-sectional studies, a large number of which confirms it while others refute it [*European Economy*, 1995].
- 7) It has also been argued [Shorrock and Marlin, 1982] that the distributional effects of inflation depend not only on the change in money income due to inflation, but also on changes in the relative prices during inflation. That is, since there are different expenditure patterns for different income groups (or different households), there are different price indexes for these groups as well.

References

- Achdut, Lea. "Income Inequality, Income Composition and Macroeconomic Trends: Israel, 1979-93," *Economica*, 63, 1996, pp. S1-S27.

- Alesina, Alberto; Rodrik, Dani. "Distributive Politics and Economic Growth," *Quarterly Journal of Economics*, 109, 1994, pp. 465-90.
- Anand, Sudhir; Kanbur, S. M. R. "Inequality and Development," *Journal of Development Economics*, 41, 1993, pp. 19-43.
- Atkinson, Anthony B. "What is Happening to the Distribution of Income in the UK?," *Welfare State Program Discussion Paper 87*, Suntory-Toyota International Centre for Economics and Related Disciplines, London School of Economics, 1993.
- Atkinson, Anthony B.; Micklewright, John. *Economic Transformation in Eastern Europe and the Distribution of Income*, Cambridge, MA: Cambridge University Press, 1992.
- Beach, Charles M. "Cyclical Sensitivity of Aggregate Income Inequality," *Review of Economics and Statistics*, 59, 1, 1977, pp. 56-66.
- Bjorklund, Anders. "Unemployment and Income Distribution: Time-Series Evidence from Sweden," *The Scandinavian Journal of Economics*, 93, 3, 1991, pp. 457-65.
- Blank, Rebecca M. "Changes in Inequality and Unemployment over the 1980s: Comparative Cross-National Responses," *Journal of Population Economics*, 1995, pp. 1-21.
- Blank, Rebecca M.; Blinder, Alan S. "Macroeconomics, Income Distribution and Poverty," in S. Danziger; D. H. Weinberg, eds., *Fighting Poverty*, Cambridge, MA: Harvard University Press, 1986.
- Blinder, Alan S.; Esaki, H. Y. "Macroeconomic Activity and Income Distribution in the Postwar United States," *Review of Economics and Statistics*, 60, 4, 1978, pp. 604-9.
- Brandolini, Andrea. "A Description and an Assessment of the Sample Surveys on the Personal Distribution of Incomes in Italy," *Servizio Studi*, Rome, Italy: Banca d'Italia, 1992.
- Brandolini, Andrea; Cannari, L. "Methodological Appendix: The Bank of Italy's Survey of Household Income and Wealth," in A. Ando; L. Guiso; I. Visco, eds., *Saving and the Accumulation of Wealth. Essays on Italian Households and Government Saving Behavior*, Cambridge, MA: Cambridge University Press, 1994, pp. 369-86.
- Brandolini, Andrea; Sestito, Paolo. "Cyclical and Trend Changes in Inequality in Italy, 1977-1991," *Servizio Studi*, Rome, Italy: Banca d'Italia, 1994.
- Burns, Arthur F.; Mitchell, Wesley C. *Measuring Business Cycles*, Cambridge, MA: National Bureau of Economic Research, 1946.
- Buse, Adolf. "The Cyclical Behavior of Size Distribution in Canada: 1947-78," *Canadian Journal of Economics*, 15, 2, 1982, pp. 189-204.
- Campano, Fred; Salvatore, Dominick. "Economic Development, Income Inequality and Kuznets U-Shaped Hypothesis," *Journal of Policy Modeling*, 10, 2, 1988, pp. 265-80.
- Chenery, M.; Ahluwalia, M.; Bell, C. L. G.; Duly, J.; Jolly, R. *Redistribution with Growth*, Oxford, United Kingdom: Oxford University Press, 1974.
- Clarke, George R. G. "More Evidence on Income Distribution and Growth," *Journal of Development Economics*, 47, 1995, pp. 403-27.
- Cowell, Frank A. *Measuring Inequality*, Oxford, United Kingdom: Phillip Allan, 1977.
- Creamer, D. *Personal Income During Business Cycles*, Princeton, NJ: Princeton University Press, 1956.
- Danziger, Sheldon; Gottschalk, Peter. "Increasing Inequality in the United States: What We Know and What We Don't," *Journal of Post Keynesian Economics*, 11, 2, 1989, pp. 174-95.
- Dimelis, Sophia; Livada, Alexandra. "Business Cycles and Income Inequality in Greece," *Cyprus Journal of Economics*, 8, 1995, pp. 23-40.
- European Commission. "Labor Costs, Wages, and Employment in the EU," *II/482-EN*, 1996.
- Galor, Oded; Zeira, Joseph. "Income Distribution and Macroeconomics," *Review of Economic Studies*, 60, 1, 1993, pp. 35-52.

- Gottschalk, Peter. "Inequality, Income Growth and Mobility: The Basic Facts," *Journal of Economic Perspectives*, 11, 2, 1997, pp. 21-40.
- Hayes, Kathy; Slotje, D. J.; Porter-Hudak, Susan; Scully, Gerard. "Is the Size Distribution of Income a Random Walk?," *Journal of Econometrics*, 43, 1990, pp. 213-26.
- Hodrick, Robert J.; Prescott, Edward C. "Post-War U.S. Business Cycles: An Empirical Investigation," manuscript, Carnegie-Mellon University, 1980.
- Jenkins, Stephen P. "Accounting for Inequality Trends: Decomposition Analyses for the U.K., 1971-86," *Economica*, 62, 1995, pp. 29-63.
- Johnson, George E. "Changes in Earnings Inequality: The Role of Demand Shifts," *Journal of Economic Perspectives*, 11, 2, 1997, pp. 41-54.
- Johnson, Paul; Webb, Steven. "Explaining the Growth in U.K. Income Inequality: 1979-1988," *The Economic Journal*, 103, 1993, pp. 429-35.
- _____. *Journal of Econometrics*. Special issue, 42-43, 1990.
- Kuznets, Simon. "Economic Growth and Income Inequality," *American Economic Review*, 45, 1, 1955, pp. 1-28.
- _____. "Shares of Upper Income Groups in Income and Savings," Cambridge, MA: National Bureau of Economic Research, 1953.
- Kydland, Finn E.; Prescott, Edward C. "Business Cycles: Real Facts and a Monetary Myth," *Federal Reserve Bank of Minneapolis Quarterly Review*, 14, 2, 1990, pp. 3-18.
- Levy, Frank; Murnane, Richard J. "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations," *Journal of Economic Literature*, 30, 1992, pp. 1333-81.
- Lindert, Peter H.; Williamson, Jeffrey G. "Growth, Equality, and History," *Explorations in Economic History*, 22, 1985, pp. 341-77.
- Livada, Alexandra. "Income Inequality in Greece: A Statistical and Econometric Analysis," *Oxford Bulletin of Economics and Statistics*, 53, 1991, pp. 69-82.
- Lucas, Robert E., Jr. "Understanding Business Cycles," in K. Brunner; A. H. Meltzer, eds., *Stabilization of the Domestic and International Economy*, Carnegie-Rochester Conference Series on Public Policy 5, Amsterdam, Netherlands: North-Holland, 1977.
- Mirer, Thad W. "The Effects of Macroeconomic Fluctuations on the Distribution of Income," *Review of Income and Wealth*, 19, 1973a, pp. 385-406.
- _____. "The Distributional Impact of the 1970 Recession," *Review of Economics and Statistics*, 55, 1973b, pp. 214-24.
- Nolan, Brian. "Macroeconomic Conditions and the Distribution of Income: Evidence from the United Kingdom," *Journal of Post Keynesian Economics*, 11, 2, 1989, pp. 196-221.
- Organization for Economic Cooperation and Development. "Earnings Inequality, Low-Paid Employment and Earnings Mobility," *Employment Outlook*, 1996, pp. 59-108.
- Perotti, Roberto. "Political Equilibrium, Income Distribution, and Growth," *Review of Economic Studies*, 60, 1993, pp. 755-76.
- Persson, Torsten; Tabellini, Guido. "Is Inequality Harmful for Growth?," *American Economic Review*, 84, 1994, pp. 600-21.
- Ram, Rati. "Economic Development and Income Inequality: Further Evidence on the U-Curve Hypothesis," *World Development*, 16, 1988, pp. 1371-6.
- Schultz, T. Paul. "Secular Trends and Cyclical Behavior of Income Distribution in the United States: 1944-1965," in Lee Soltow, ed., *Six Papers on the Size Distribution of Wealth and Income*, Cambridge, MA: National Bureau of Economic Research, 1969, pp. 75-100.
- Sen, Amartya K. *On Economic Inequality*, London, United Kingdom: Clarendon Press, 1973.

- Shorrocks, Anthony F.; Marlin, E. "Inflation and Low Incomes," *Canadian Public Policy*, 1982, pp. 334-6.
- Slottje, Daniel J.; Basmann, R. L.; Nieswiadomy, Michael L. "On the Empirical Relationship Between Several Well-Known Inequality Measures," *Journal of Econometrics*, 42, 1, 1989.
- Tobin, James. "Inflation and Unemployment," *American Economic Review*, 62, 1, 1972, pp. 1-18.
- van Wijck, P. "Cyclical and Political Influences on the Size Distribution of Income in the U.S., 1959-1989," *Applied Economics*, 24, 1992, pp. 169-73.
- Zarnowitz, Victor. "What is a Business Cycle?," *Working Paper No. 3863*, Cambridge, MA: National Bureau of Economic Research, 1991.