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Stock Market Dispersion and Unemployment in Greece

by
Costas Siriopoulos and Dimitris Asteriou***

1. Introduction

This paper tries to answer the question: what causes unemployment in Greece? There are two main hypothesis advanced from economic theory. First he role of the aggregate demand shocks and second the so-called sectoral shift hypothesis. Indeed, while Keynesian theory tries to explain unemployment emphasizing aggregate disturbances as the cause of business cycles, many real business cycle theories attribute unemployment primarily to sectoral shocks that are propagated through imperfect labour market adjustment.

Until the recent interest in real business cycles, macroeconomists generally relied on aggregate demand shocks to explain cyclical movements in unemployment. These shocks are important in both the Keynesian sticky price models and the Lucas-type imperfect information models (Lucas, 1975; Barro, 1977). However, Lilien (1982) proves that in postwar U.S. data there is a strong positive correlation between the aggregate unemployment rate and a dispersion index measuring the variance in employment growth rates across various sectors. He interprets this index as a proxy for underlying shifts in demand from some industries to others, which necessitate a movement of labour out of the adversely affected industries. However, due to the presence of industry-specific skills, and due to the time-consuming nature of job search, the process of labour absorption into other industries tends to be slow and involves considerable unemployment in the interim. Therefore, the higher the dispersion of intersectoral shifts the higher the unemployment rate. This view is commonly referred to as the sectoral shift hypothesis.

Although the sectoral shift hypothesis provides a provocative explanation for variation in cyclical unemployment, Lilien's work has been criticized

* University of Macedonia, Department of Economics, Thessaloniki, Greece.
** City University, Department of Economics, London, UK.

because the key data series, the dispersion index, picks up both temporary and permanent labour market changes. Loungani, Rush and Tave (1990) eliminate this dilemma by creating a superior dispersion index based on stock market data and conclude that stock market dispersion index affects unemployment supporting the sectoral shift hypothesis. Also, Brainard and Cutler (1993) develop a new measure of reallocation shocks based on the variance of industry stock market excess returns to assess the contribution of sectoral reallocation to unemployment in the postwar U.S. economy. They conclude that reallocation shocks explain only a moderate share of the fluctuations in aggregate unemployment on average over the period.

The debate over the causes of unemployment persists in large part because it is difficult to distinguish empirically between unemployment associated with reallocation and aggregate shocks. An increase in unemployment may reflect a contradiction in aggregate demand that induces firms in most sectors to lay off workers temporarily. Alternatively, it may reflect sector-specific shocks that change the pattern of demand among sectors. The above methodologies were used as a test on the validity of the sectoral shift hypothesis in various countries (Samson, 1990; Fortin and Araar, 1997).

In this study, we apply various stock market dispersion measures to Greek data in order to assess the importance of sectoral shocks on the unemployment rate. There are compelling reasons for applying the sectoral shocks hypothesis to the Greek economy. First, there is a large disagreement in the literature as to whether or not sectoral shocks have been an important source of unemployment fluctuations, while until now, the sectoral shifts hypothesis has been tested only in developed economies. Applying this methodology to Greece we want to find evidence from a developing economy on this debate. Second, at the beginning of 1990s Greece recorded a puzzling combination of high unemployment rates, fertility at historical minima and low female participation, posing the problem of unemployment as one of the major problems of the Greek economy. The paper is organized as follows: first we present the recent developments in the Greek labour market (discussed in section 2). In section 3 we construct stock market dispersion measures for the Greek case in order to test the validity of the sectoral shift hypothesis in Greece. Then, in section 4 we present the substantive empirical results of the paper while in section 5 we summarize and present the concluding remarks of the paper.

2. Recent Developments in the Greek Labour Market

Substantial illegal immigration and the underground economy make a proper assessment of labour market development difficult. However, recent developments in the Greek labour market reflect characteristics that for the most part are not unique to the Greek case. The Greek unemployment rate increased in two bursts (similarly with the EU average, but in slightly lower levels) corresponding in both cases to a combination of negative demand and supply shocks to the Greek labour market (see figure 1). First, in early 1980s, the second oil shock had hit Greece at a time when wage concessions were reflecting the 1975 return to democratic government, and the recession in Europe was resulting in the return of workers from central and northern Europe. Second, in the early 1990s a sustained period of economic consolidation coincided with an inflow of immigrants, many of Greek origin, following the fall of communism in eastern Europe and former Soviet Union.

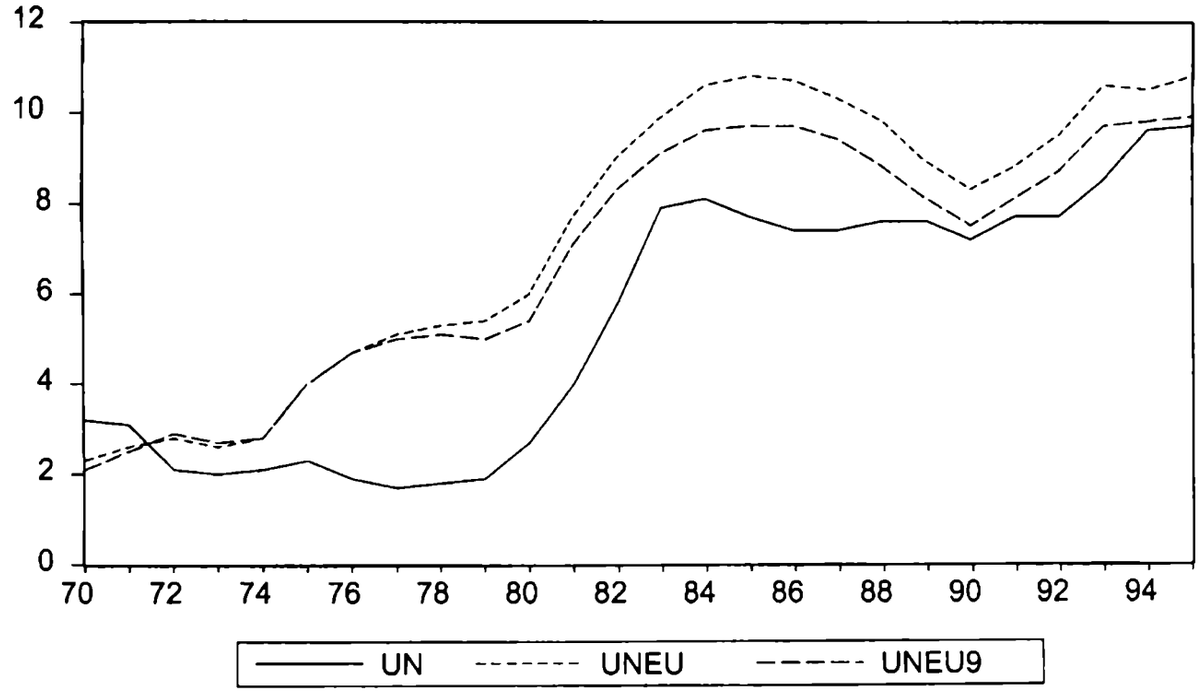

Figure 1
Unemployment: Greece and EU-12, EU-9 (Portugal, Greece and Spain excluded)

In addition to the macroeconomic shocks, the underlying structure of the economy experienced various changes. First, the importance of the agricultural sector is declining. As a result agricultural employment has fallen from about a third of the labour force in 1981 to about a fifth in 1995 (see Table 1). Second,

Table 1
Structure of Employment in Greece

Sectors of Activity	1981	1990	1995
Primary	30.7%	25.3%	20.4%
Secondary	29.0%	27.5%	23.2%
Tertiary	40.3%	47.1%	56.4%

Source: National Statistical Association (Various Volumes)

the industrial sector has begun to undertake the shake-out already experienced by many other OECD countries, as adjustment is made to a new generation of products and techniques. As a partial consequence of this restructuring effort, manufacturing industry shed 21% if its employees between 1981 and 1995, with most of the consolidation occurring in large enterprises during the 1990s.

Nevertheless, employment growth has averaged over 0.5% per year since 1981, mainly due to the annual average growth of 3.4% in service sector employment (Table 2). However, a large part of this employment creation especially prior to 1990 has been in the public sector where employment has increased at an average annual rate of about 2% –over three times as high as the business sector– and currently accounts for 27% of salaried workers (see table 3).

The deviation between the unemployment rate of prime-aged men (4%) and the unemployment rate for women (15%) and youth (29%) are high

Table 2
Employment Trends (annual percentage change)

	1993	1994	1995	1981-91	1991-95	1981-95
Total Employment	1.0	1.9	0.9	0.3	1.7	0.5
By Sector						
Agriculture	-1.6	-0.5	-1.0	-2.9	-1.0	-1.9
Industry	-10.0	-0.5	-0.9	-0.2	-3.9	-0.8
Services	7.9	3.9	2.4	2.5	5.7	3.4
Dependent Employment	2.2	1.9	2.1	1.1	3.4	2.5

Source: National Statistical Association (Various Volumes)

Table 3
Civilian Employment Participation Share

	1995	Percentage Shares	
		of Total Employment	of Wage Earners Total
Total Civilian Employment	3 823.8	100.0	
of which Wage Earners	2 060.1	53.9	
Other Self Employed Workers	1 763.7	46.1	
Wage Earners Total	2 060.1		100.0
of which Agriculture	39.3	1.0	1.9
Industry	608.7	16.0	29.6
Services	1 412.1	36.9	68.5
Wage Earners Total	2 060.1		100.0
of which Public Sector	566.1	14.6	27.0
of which General Government	385.1	9.8	
Dependent Private Sector	1 494.0	39.8	73.0

Source: National Statistical Association (Various Volumes)

Table 4
Comparison of the Greek Labour Market with OECD and EU

		OECD (average)		EU (average)		Greece	
		1985	1994	1985	1994	1985	1994
Unemployment	Total	7.9	8.0	10.9	11.3	7.8	9.6
Rate	Males	7.4	7.6	9.6	10.1	5.6	6.5
	Females	8.7	8.5	12.9	13.0	11.7	14.9
Youth	Total	16.6	15.3	23.2	21.6	23.9	29.1
Unemployment	Males	16.2	15.5	21.3	20.9	17.4	20.6
Rate	Females	17.0	15.0	25.4	22.6	31.7	33.8
Long -term	Total	35.3	34.5	54.0	49.0	44.6	52.1
Unemployment	Males	34.4	34.7	53.7	47.2	34.8	42.5
	Females	33.5	35.0	54.3	50.7	53.2	59.0

Source: National Statistical Association (Various Volumes) and Eurostat.

comparably to the OECD average, and consisted with a high share of long-term unemployed (52%) (see Table 4). Moreover, OECD studies (OECD, 1995) indicate that Greece has the lowest rates of both inflow to and outflow from the ranks of the unemployed among the OECD member countries, as well as one of the lowest shares of dismissed workers in total employment (35%). This happens because the Greek economic and social system favours job stability (with the exception of tourism because of seasonal factors). A large number of people working in the wider public sector have a job guarantee, while massive lay-offs in the private sector are also difficult because of the law forbidding dismissals of more than 2% of the labour force per month, but, more importantly, industrial peace is prized by unions and employers, so that unless a firm is in serious difficulty dismissals are rare.

Finally, the analysis of developments in the Greek labour market cannot be completed without reference to the large number of the immigrants from the former communist block, most of whom without permits. Reliable data on the number of illegal immigrants is obviously difficult to obtain, but estimates suggest about half a million, a large share of which originated from Albania (Lianos, Sarris and Katseli, 1995). The effect of the illegal workers on the labour market is uncertain as the extent to which they crowd out legal employment is not clear. Survey data have indicated that the illegal immigrants work mostly as household help, agricultural workers, and in construction.

3. Stock Market Dispersion Indexes

The basic idea is that whenever different industries' futures diverge, unemployment results as workers are suffled from the declining sector into the expanding one. This can be measured by stock market data. As stock market participants forecast the contraction of some industries and expansion of others, the price of shares in the weakening sector will fall while share prices in the growing sector will increase. The greater the difference predicted in the industries' futures the larger is the divergence in their stock prices and thus the more the unemployment is expected to result as resources shift sectors. Therefore, we expect that an increase in the dispersion of stock prices will act as a leading indicator of unemployment.

The index proposed by Loungani, Rush and Tave (1990) is given by the difference between sectoral stock price growth rates and the average stock price growth rate. More precisely the dispersion measure is calculated as:

$$STOCK = \log\left[\left(\sum_{i}^{n}(g_{it}-g_t)^2\right)/n_t\right]^{1/2} \quad (1)$$

where g_{it} is the growth rate of stock prices for industry i at time t, g_t is the average growth rate of stock prices in time t, n_t is the number of industries in the sample period, and the summation is taken over all the industries in the sample period. Obviously, STOCK is simply the logarithm of the standard deviation of the growth rate of the industries' stock prices.

However, since the importance of its sector is determined by its employment share in the labour market, they also propose an alternate measure of dispersion given by:

$$SW = \log\left[\left(\sum_{i}^{n} w_{it}(g_{it}-g_t)^2\right)\right]^{1/2} \quad (2)$$

where the weights w_{it} are based on industry i 's average share of aggregate employment.

Brainard and Cutler (1993) also used a dispersion index based on stock market data to measure sectoral shocks. But, instead of using a weighted variance in the growth rate of stock prices in different sectors, they evolved their index, which they call cross section volatility (CSV), using sectoral excess returns as measured by residuals from regressions of sectoral stock price growth rates on the average growth rate of the stock market. Their CSV index is similar to the second dispersion index of Loungani, Rush and Tave (1990), but they point out that according to the Capital Asset Pricing Model (CAPM) there is a component of sectoral stock price growth rates which is related to the average stock price growth rate, that is:

$$g_{it} = \alpha_i - b_i g_t + e_{it} \quad (3)$$

Only excess returns not explainable by market fluctuations in stock prices are indicative of sectoral shocks. These excess returns are measured by:

$$h_{it} = \hat{\alpha}_i + \hat{e}_{it} \quad (4)$$

Therefore, the cross-section volatility (CSV) is defined by:

$$CSV = \sum_{i}^{n} w_{it}(h_{it}-\bar{h}_t)^2 \quad (5)$$

We use this measure in order to control for idiosyncratic sectoral responsiveness to aggregate shocks in Greek unemployment rate. Also, stock returns are useful in this regard since the CAPM provides a theoretical method for separating cyclical and reallocation movements in stock prices.

To built those dispersion indexes, we combine employment data from the Labour Force Survey and stock price data from the Athens Stock Exchange (ASE). The ASE is divided into 9 sectors (for a thorough description of the data set see Appendix). Plots presenting the time behaviour of the stock marker indexes are given at Figure 2. We can easily identify two periods of greater dispersion . The first, in 1968-1976 and is clearly associated with the oil price shocks and the subsequent recession, and the second in 1986-1992. The second period includes the Gulf Crisis and the Gulf War of February 1991 and major institutional and legislative changes in the Greek Capital Market.

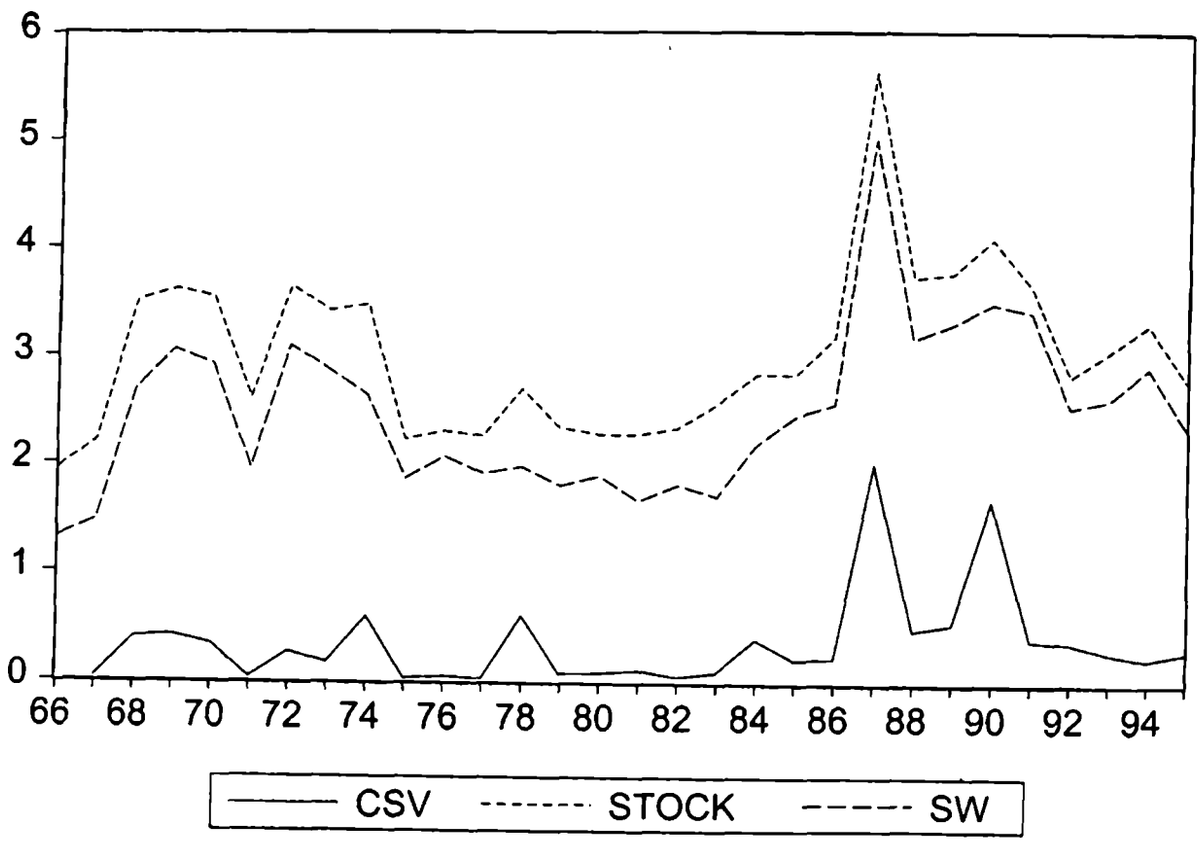

Figure 2
Stock Market Dispersion Indexes

4. Model Specification and Empirical Results

Our primary interest is in determining the effect of the stock market dispersion on aggregate unemployment. Thus, empirical investigation must clarify the importance of the sectoral shocks. However, dispersion is only one

element that may influence unemployment, which necessitates to incorporate in our unemployment equation -in addition to stock market dispersion indexes- some variables of aggregate demand shocks, and other of structural changes. For instance, virtually all economists agree that government spending affects unemployment. Thus, we include the ratio of government expenditures to GNP, called GEXP, as an explanatory variable. According to Barro (1977, 1981) aggregate demand shocks, measured by the unpredictable growth rate of M1, affects unemployment, so we estimate the model with the current unexpected money shock (MS) and three lagged values[1]. The unpredictable component of the M1 has been defined as the residual of an equation wherein the rate of growth of gross M1 is estimated in between our sample period (1966-1995) on its lagged values, the lagged value of the unemployment, and those of the rate of change in the Consumer Price Index.

In addition to these traditional government policy variables, an increasing number of economists have followed the lead of Friedman and Schartz (1963) by recognizing that "nontraditional" factors such as financial intermediation can also have an impact on the nation's aggregate economic activity. To capture this effect, we include as an explanatory variable the growth rate of the ratio of M2 to the base money supply, called MR.

Finally, it is often suggested that demographic changes, such as changes in labour force composition, have been an important factor affecting unemployment. We take account of this by including a variable called DEMO, which equals the percentage of women participation in the total labour force.

To capture any inertia that we failed to explicitly model, we allowed for first-order serial correlation and then checked to see if a lagged dependent variable was also necessary.

In summary, we use the following specification:

$$UN = b_1+b_2MS+b_3MS_{-1}+b_4MS_{-2}+b_5MS_{-3}+b_6MR+b_7MR_{-1}+b_8MR_{-2}+b_9MR_{-3}$$
$$+b_{10}GEXP+b_{11}DEMO+b_{12}SMI+b_{13}SMI_{-1}+b_{14}SMI_{-2}+b_{15}SMI_{-3} \quad (6)$$

where UN denotes the unemployment rate, and SMI includes the various stock market dispersion indexes. We expect that b_2, b_3, b_4, b_5, b_6, b_7, b_8, b_9, all should be negative, while b_{10} should be positive. More important though are b_{12}, b_{13}, b_{14}, b_{15} which measure the impact of dispersion and we expect to be positive. For two reasons, however, we focus most strongly on b_{13}, b_{14}, b_{15}.

1. We have included three lags, a number that minimizes Akaike's Information Criterion.

First, the effects of the contemporaneous dispersion variable, measured by b_{12}, may reflect effects from other, omitted aggregate variables that differentially affect industries. Second, the theory suggests that dispersion in the stock market serves as a leading indicator of dispersion amongst industries, so that we expect lags of the various indexes to affect unemployment.

The estimates of equation (6) are presented in Table 5. Due to reasons of expense, we used Ordinary Least Squares (OLS) rather than a full system estimation. However, this should have little effect because we estimated the same specification using both OLS and the full system and noted that the results were very similar. The regression results, which are corrected for serial correlation[2] indicate three main results. First, the specification of our model seems adequate, since all our estimates have the expected, according to the economic theory, sign and most of them are statistically significant and different from zero.

Second, the low t-statistics on MS, or unanticipated money, shows that this series is not a significant factor in changing unemployment. This result suggests that either unanticipated money based on M1 is too narrowly defined for a long-run proxy variable or that unanticipated money is not a significant force in labour markets. However, various estimates of the same equation with the inclusion of other monetary variables[3] than MS didn't improve the significance of the estimated coefficients, suggesting that monetary aggregate is not important. This means, that unanticipated money increases does not cause people into working harder, because they understand that this demand shift is nominal and not real. The demographic variable (DEMO), the financial intermediation proxy variable (MR) and the ratio of government expenditures over the GNP (GEXP) in all cases have the expected sign and are statistically significant at least at 10%.

2. To explore the sensitivity of our results, we estimated several other specifications: equations with and without the lagged depended variable, allowing for first order serial correlation but omitting the lagged depended variable, or estimating the regressions with a correction for second order serial correlation, with and without the lagged depended variable. These alternative specifications did not have major qualitative effects on the dispersion variables and are not presented here for want of space. Tables and results are available from authors upon request.
3. Instead of MS we used the unexpected component of M2 and the growth rates of both M2 and Reserve Money (Base Money Supply). No one of these variables altered the results significantly. Tables and results are available from authors upon request.

Table 5

Yearly OLS Regression Results From 1966-1995

	Dependent Variable is the Unemployment Rate								
	For SMI=STOCK			For SMI=SW			For SMI=CSV		
Regressions	1	2	3	1	2	3	1	2	3
constant	-24.75	-3.0	-0.08	-22.11	-1,05	-1,18	-35,4	3.86	3,82
	(-1.92)*	(-1.03)	(-2.3)*	(-1.84)*	(-0,04)	(-0,4)	(-2,84)*	(3,9)*	(4,2)*
MS	-0.4	8.9		-0.58	7,6		-2,8	0,06	
	(-0.02)	(0.46)		(-0.03)	(0.38)		(-0.19)	(0.002)	
MS_{-1}	-10.94	-19.8		-10.65	-19.7		-7,11	-9,33	
	(-0.51)	(-0.82)		(-0.53)	(-0.88)		(-0.35)	(-0,32)	
MS_{-2}	-4.7	-22.5		-6.1	-25,0		-23,8	-28.3	
	(-0.26)	(-0.95)		(-0.36)	(-1,07)		(-1,12)	(-0.80)	
MS_{-3}	-4.09	-39.0		-6.01	-37,3		-10,0	-31.0	
	(-0.3)	(-2.2)*		(-0.47)	(-2.1)*		(-0,74)	(-1,27)	
MR	-0.01	-0.01	-0.04	-0.021	-0.01	-0,01	-0.05	-0.04	-0.01
	(-1.18)	(-1.11)	(-1.05)	(-1.37)	(-2,12)	(-0.01)	(-1,72)	(-0.35)	(-0.14)
MR_{-1}	-0.09	-0.08	-0.119	-0.005	-0.066	-0.102	-0.01	-0.09	-0.098
	(-2.15)*	(-1.95)*	(-1.97)*	(-2.10)*	(-1.76)	(-1.31)	(-2,26)*	(-1.98)*	(-2.22)*
MR_{-2}	-0.034	-0.2	-0.196	-0.029	-0.21	-0.193	-0.07	-0.25	-0.153
	(-2.09)*	(-2.08)*	(-2.04)*	(-2.42)*	(-2.05)*	(-2.02)*	(-1,99)*	(-2.58)*	(-2.46)*
MR_{-3}	-0.09	-0.04	-0.104	-0.89	-0.05	-0.113	-0.076	-0.11	-0.16
	(-1.96)*	(-2.46)*	(-1.92)*	(-1.99)*	(-2.54)*	(-1.94)*	(-1.93)*	(-2.02)*	(-2,43)*
GEXP	-0.003			-0.005			-0.0003		
	(-2.03)*			(-2.13)*			(-2.54)*		
DEMO	9.91			9.20			12,8		
	(2.55)*			(2.49)*			(3,16)*		
SMI	0.06	1.89	0.96	0.04	2,07	0.96	0.43	2,38	1,98
	(2.1)*	(1.96)*	(1.99)*	(2.07)*	(2,04)*	(1.99)*	(2.42)*	(2,36)*	(2,29)*
SMI_{-1}	0.42	0.67	0.78	0.28	0.65	1,90	0.20	2,65	2,43
	(2.24)*	(2.02)*	(2.07)*	(2.43)*	(2.57)*	(1,96)*	(2.18)*	(2.43)*	(2.59)*
SMI_{-2}	0.66	0.009	0.37	0.82	0.21	0.61	0.85	1.25	1.18
	(1.92)*	(2.1)*	(2.13)*	(1.96)*	(2.22)*	(2.56)*	(1.81)	(2.01)*	(2.33)*
SMI-3	0.53	0.39	0.008	0.73	0.27	0.15	1.47	0.23	0.51
	(1.62)	(1.38)	(1.019)	(1.95)*	(2,28)*	(2,15)*	(1.95)*	(2,13)*	(2,36)*
D-W	1.89	1.95	1.93	1.97	1.96	1.96	1.89	1.98	1.99
R2	0.86	0.78	0.65	0.88	0.64	0.58	0.86	0,95	0.69

* denotes statistical significance at least at 10%.
Values of t-statistics in parentheses.

Third, and more important, restricting our attention to the stock market variables, we see that the coefficients of all the dispersion indexes (STOCK, SW and CSV) are positive and statistically significant at 10% (with the rare exception of the third lagged value of STOCK index). This result, suggests the existence of strong influence of stock market dispersions on the Greek unemployment rate and strongly supports the sectoral shift hypothesis. The robustness of this result is very high, since it is stable for all indexes and remains significant even after controlling with various alterations in the specification of our model (regressions 2 and 3 in each case).

5. Summary and Conclusions

In this paper we constructed various indexes of stock market dispersions over a time period expanding from 1966 to 1995 and we used them to test for the significance of reallocation unemployment in Greece. Our empirical results, confirm that stock market dispersion, measured either by the indexes proposed by Loungani, Rush and Tave (1990) or by the Brainard and Cutler's (1993) cross-section volatility, is highly positively related with the Greek unemployment rate. This result, provides evidence in favour of the sectoral shift hypothesis for a developing economy and suggests that the causes of unemployment are mainly real and not nominal shocks to the economy. The inclusion or not of unexpected monetary disturbances and other demographic and economic variables does not alter the significance of our results.

APPENDIX: DATA DESCRIPTION AND DATA SOURCES

- **Sectoral Stock Market Data:** Yearly Stock Market Indexes of the 9 sectors (Banks, Insurance, Transportations, Buildings and Construction, Textiles, Metals, Foods, Chemichals, Others) of the ASE (the growth rate of those indexes is denoted as $\mathbf{g}_{it}$ in the text). *Source:* National Statistical Association (Various Volumes).
- **Unemployment Rates:** (a) Greek unemployment rate (denoted by **UN**), (b) Average unemployment rate of the 12 EU Member States (denoted by **UNEU-12**), (c) Average unemployment rate of the 9 (Greece, Portugal and Spain excluded) EU Member States (denoted by **UNEU-9**). *Source:* Eurostat.

- w_i : Percentage of persons employed by industry division and selected sectors. *Source:* National Statistical Association (Various Volumes).
- **M1** : Currency and demand deposits from which MS is calculated. *Source:* National Statistical Association (Various Volumes).
- **MS** : Ratio of M2 over Base Money Supply. *Source:* National Statistical Association (Various Volumes).
- **GEXP** : Ratio of government expenditures over GNP. *Source:* National Statistical Association (Various Volumes).
- **DEMO** : The ratio of women participation in the labour force. *Source:* National Statistical Association (Various Volumes).

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Abstract

This paper tries to investigate the sources of unemployment in Greece. Specifically we test the sectoral shift hypothesis, advanced by Lilien (1982) which suggests that unemployment is, in part, the result of resources being reallocated from declining to expanding sectors of the economy. Using data from 1966 to 1996, we test this hypothesis by constructing an index measuring the dispersion among stock prices from different industries. We find that lagged values of this index significantly affect unemployment supporting the sectoral shift hypothesis.