

DETERMINANTS OF DEMAND FOR FRUIT VARIETY

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Abstract

The Food Guide Pyramid encourages people to consume a sufficient quantity and variety of fruits and vegetables. The 5 A Day campaign recently updated its message in order to emphasize the importance of variety, using a new slogan “5 A Day – The Color Way”. Variety is an important component of the Food Guide Pyramid because subcategories of food can differ considerably in nutrient content. Hence, a varied diet provides a most complete mix of nutrients.

The aim of this study is to describe the importance of fruit consumption, and particularly fruit variety for human health, and to identify the determinants of demand for fruit variety and the factors that influence households purchasing a variety of fruit.

For the purpose of the study, cross sectional data from Household Budget Survey (HBS) of 2004/05 supplied by National Statistical Service of Greece (NSSG) on fresh fruits purchases by over 6,049 households was employed. The data will fit a pair of simultaneous equations where the first equation models the household’s expenditures on fresh fruits and the second predicts the variety of the household’s fresh fruit purchases given its expenditure from the first equation. Additionally, the second equation will be specified considering two different definitions of fruit variety.

The results of this study show that demographics are the main drivers for variety on fruit. The age of the members of a household, the marital status and the education of the head, the household composition, as well as the location of the household, are main determinants for variety. The fitted values for fruit expenditure given from the first stage of regression were observed to have a positive impact on variety while the price index of fruit was negatively associated with variety.

The information of this type of analysis could be used by the social marketers and fruit industry in order to determine which group of consumers needs to be targeted or to develop appropriate marketing strategies for promoting fruit consumption and fruit variety.

Keywords: fruit, variety, expenditure, demographics, regression analysis, health

Introduction

The United States Department of Agriculture (USDA) advises Americans to consume a wide variety of fruits and vegetables on a daily basis in order to ensure that an adequate amount of nutrients are consumed. Recently, campaigns like “5 a day” have updated their messages to emphasize variety in fruits and vegetables consumed. Consumption of sufficient amounts of fruits and vegetables is negatively associated with obesity, risk for several types of cancer (Key et al, 1996) and coronary heart disease (Dauchet et al, 2006). They provide nutrients that are valuable for human body, like vitamins, fibers, folate, potassium, magnesium and other protective compounds (5aday.com).

Obesity has become a leading public health concern the last decades. Over 1 billion people worldwide are either overweight or obese (Cumming et al, 2003). OECD announced that the obesity rates have increased in recent decades in all countries. In the United States the prevalence of obesity has doubled in the past two decades, with nearly one-thirds of adults being obese, according to US Department of

Health and Human Services, 2005. Obesity is defined by a body-mass index (weight divided by square of the height) of 30kg/m^2 or greater. However, the person is considered overweight with a body mass of 25-29.9.

The issue of obesity goes far beyond the cosmetic problems that affect the obese human: it is associated with the development of specific types of diabetes, coronary heart disease, certain forms of cancer, respiratory complications and even decreased longevity (Hubert, 1986; Key et al, 2004). It is also worth mentioning some studies that picture obesity as an economic problem, as a 10% increase in the average body mass index reduces the real earning of males and females by 3.27% and 1.86% respectively (Brunello et al, 2006). The global epidemic of obesity is attributed to genetics, culture and life-style, energy expenditure, as well as nutrition (Kopelman G., 2000). Eating patterns among children and adults are changing in the developed countries, with people consuming more meals prepared out of home (Nicklas et al, 2001).

Table 1. Overweight/ obese population as a %, year 2003

	Overweight or obese population	Obese population
	% total pop. BMI>25 kg/m ²	% total pop. BMI>30 kg/m ²
	2003	2003
United States	65.7 ^a	30.6 ^a
United Kingdom	62.0	23.0
Greece	57.1	21.9
Hungary	52.8	18.8
Luxembourg	52.8	18.4
Czech Republic	51.1 ^h	14.8 ^a
Portugal	49.6 ^b	12.8 ^b
Germany	49.2	12.9
Spain	48.4	13.1
Ireland	47.0 ^a	13.0 ^a
Austria	46.1 ^b	9.1 ^b
Netherlands	45.0 ^a	10.0 ^a
Belgium	44.4 ^c	11.7 ^c
Turkey	43.4	12.0
Finland	43.1	12.8
Poland	43.1	..
Sweden	42.8	9.7
Norway	42.7 ^a	8.3 ^a
Italy	42.0 ^a	8.5 ^a
Denmark	41.7 ^c	9.5 ^h
France	37.5 ^a	9.4 ^a
Switzerland	37.1 ^a	7.7 ^a

a. 2002

b. 1999

c. 2001

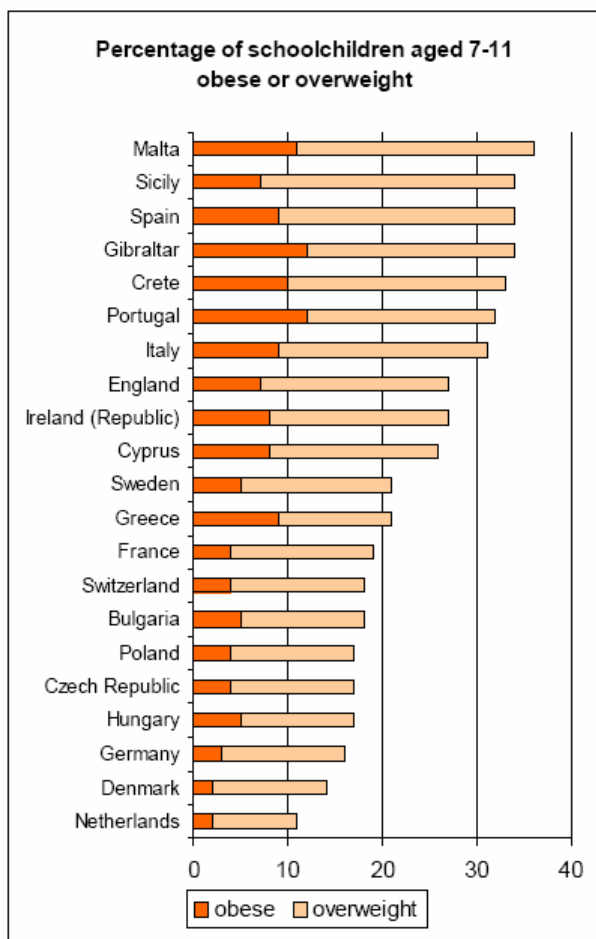
d. 1992

Source: OECD, 2005

The obesity rates are very high in Europe, with Greece having the second top position in terms of obese or overweight people as a percentage of population (see Table 1). Recent concern has focused on children, as overweight/ obese children are more likely to remain so as adults (EASO, 2005). The Mediterranean islands of Malta, Sicily, Gibraltar and Crete report overweight and obesity levels exceeding 30%

among children aged 7-11, as illustrated in the figure 1. In addition, Greece report levels above 20% among this age group (EASO, 2005).

Figure 1. Overweight and obesity in children aged 7-11, 2004



Source: European Association for the study of obesity (EASO), 2005

One of the strategies many researchers have proposed against overweight and obesity is the increased communication about healthy eating and physical activity. Fruits are low in fat, sugar and cholesterol free and can help overweight or obese people balance their diet. The dietary guidelines for Americans, 2005, encourage overweight and obese people to replace some of the food categories which are intense in fat, with fruits and vegetables. However, it is recommended to everyone to consumer 2 cups of fruits or more in a daily basis, as well as a wide variety of fruits.

Several analyses prove the negative relation between fruit and vegetable consumption and the risk of Coronary Heart Disease. According to Dauchet et al (2006), in six cohorts out of nine was reported an association between fruit intake and the risk of CHD. Another study in the dietary habits of 11,000 vegetarian and health conscious people associates the daily consumption of fresh fruit with a reduced mortality from ischemic heart disease and cerebrovascular disease (Key et al, 1996). Joffe et al (2001) estimate in their analysis that 26,000 deaths before the age of 65 years could be prevented annually, if fruit and vegetable intake was leveled up to the highest consumption levels in EU. Joshipura et al (2001) report in their findings that each 1-serving/day increase in intake of fruits and vegetables was associated with a 4% lower risk for coronary heart disease.

Key et al (2004) report that a high intake of fruits and vegetables probably reduce the risks for cancers of the oral cavity, oesophagus, stomach and colorectum. Other studies prove that individuals who consume very low amounts of fruit and vegetables have the greatest risk of colorectal cancer (Terry, 2001). In general, the increase in consumption of healthy food in a daily basis can affect longevity (Michels et al, 2002).

One could expect that as the disposable income increases, so does the expenditure for fruits. Indeed, the literature supports the fact that fruit consumption is positively related to income (Giskes et al, 2002). Blisard et al. (2004) confirmed that low-income households spend less than their higher income counterparts on fruits and vegetables. Additionally, Blisard et al found that an extra dollar of purchasing power would likely be allocated to food groups that these households perceive to be more basic, such as meats, cereals and bakery products. At the same time, a number of economic studies have found a positive relation between a household's expenditure on food and the variety of foods purchased (Stewart et al, 2006). Households with larger income are more likely to have preference for a change, and have higher variety for consumption (Moon et al, 2002).

In the literature, there are studies that support the association of demographics with the consumption of fruit. Whichelow et al (1995) suggest that the size of a household, the age, the socio-economic group and the geographic location affect the consumption of fruit in United Kingdom (Whichelow et al, 1995). Frequent use of fruit is associated to small households, living in the south of the country, middle age and non-manual socio-economic groups. Similarly, Johnson et al (1998) found that elderly people tend to consume less than the recommended levels of fruit compared to younger people. Education and occupation appear to be critical determinants of fruit consumption. Irala-Estevez et al (2000) proved that there is a positive association between high level of education or occupation and a greater consumption of fruit. Marital status also seems to play a significant role in the consumption of fruit. Being married is associated with increased fruit intake while being single/ divorced/ separated is associated with lower levels of fruit consumption (Billson, 1999).

When it comes to variety, there are fewer studies in the literature that link food variety with demographics. Moon et al (2002) suggest that highly educated consumers have been exposed to information about benefits of eating various types of foods and have consumed many different products. In this paper, the abovementioned theories will be tested for the fruit category.


Fruit Intake in EU and Greece

In Europe, there is an upward trend in fruit consumption (FAO) since 1995, with Greece, Spain, Portugal and Italy (Mediterranean countries) having the greatest intakes in Europe. The lowest intakes for all years since 1995 to 2005 appear in Finland and Poland.

Greece has the biggest consumption of fruit within EU for all years since 1995, a fact that could be attributed on culture-life style as well as on its big domestic production of apples and oranges -the most consumed fruit in Greece and EU according to FAO. The big supply normally boosts demand, especially if appropriate marketing strategies are applied. Furthermore, it is worth mentioning that Holland has increased substantially its fruit intake since 1995, at a level of 60%, which proves that

fruit consumption for a country has the potentiality to change. Figure 2 presents fruit quantity/year/capita for 11 countries of Europe for the year 2005.

Table 2. Evolution of fruit consumption per country per capita (kg), 1995-2005

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Greece	251.8	239.6	228.1	237.3	248.0	253.7	269.8	260.4	256.0	269.0	283.4
Netherlands	152.7	152.6	162.2	149.3	163.4	169.6	186.4	196.8	215.3	229.7	250.5
Italy	222.6	234.1	225.9	214.7	225.2	237.2	242.8	241.5	233.7	245.1	238.1
Portugal	173.6	209.2	188.2	209.4	224.7	207.2	240.1	218.8	204.0	223.5	217.4
France	233.2	224.4	217.8	213.8	205.1	206.3	215.4	210.4	212.7	220.7	209.8
Denmark	146.0	152.3	158.0	166.3	169.9	180.2	190.2	197.9	199.9	211.0	202.1
Spain	206.7	209.0	213.4	215.8	223.5	220.3	216.6	223.0	221.9	210.5	200.8
Austria	176.8	168.5	165.6	160.8	168.1	176.1	185.0	187.8	191.7	196.7	199.0
EU average* 	149.7	153.1	151.0	152.5	159.5	162.6	168.9	170.8	171.9	176.8	178.8
United Kingdom	123.3	126.1	130.7	131.2	129.0	132.8	140.2	148.7	157.6	159.9	159.0
Sweden	122.4	116.1	111.7	116.1	121.6	132.0	131.2	140.0	134.7	134.8	151.6
Germany	142.7	153.1	154.3	157.2	166.8	167.1	163.5	167.9	164.0	154.9	148.0
Hungary	124.9	125.3	121.1	115.5	117.8	124.1	120.5	117.8	120.8	128.0	140.2
Czech Republic	90.1	95.5	99.3	98.4	100.9	106.0	113.2	121.0	126.4	132.0	139.6
Ireland	87.0	91.9	89.4	92.4	100.2	107.8	107.5	116.1	126.9	124.4	127.8
Finland	84.8	88.9	92.9	95.5	97.6	101.3	103.6	105.8	109.4	111.2	115.0
Poland	57.1	62.5	57.8	66.5	89.9	79.6	76.9	78.9	75.9	77.6	78.4

*EU average is the average of the 16 countries presented in the table
Source: FAO data, 2007

Although the fruit consumption in Greece is high compared to other EU countries, focus should be given to retain and even increase the levels of fruit and vegetable intakes, as the obesity rates among children presented earlier create concern about the health of adults in the future. These rates signal the need to act immediately by adopting wide ranging and effective strategies to reverse the trend in overweight and obesity to prevent chronic diseases such as diabetes and heart disease. At the same, the variety of fruits consumed in Greece is very narrow, with 5 fruits (apples, grapes, peaches, oranges and watermelons) accounting the 76.9% and 78.8% of the total quantity per capita per year (kg) consumed for the years 2004 and 2005 respectively¹. As variety in fruit guarantees a more adequate intake of valuable ingredients, we are also concerned about variety in fruit consumption.

Data

In order to achieve the aims of this study, we used data from the National Budget Survey conducted in Greece during the period February 2004-January 2005 by the National Statistical Service of Greece. The sampling method is a two-stage stratified sampling in the 2/1000 of the Greek households. Researchers employed by NNSG visited the selected households for 15 consequential days and wrote down on questionnaires the value and quantity of every purchase made during the 15 days by the members of households. Socio-economic characteristics of the household were also contained in the data set and included household size, region, age, education level and professional status of household head etc.

In the analysis that will be described in this paper, the values and quantities of 22 fresh fruit categories were used, as given by the Household Budget Survey in 2004/2005. The total Household Budget Survey's sample was 6555 households. 506 households with zero consumption of fruit during the period of the research were eliminated. In total we used data from 6049 households for this study. Prices were obtained by dividing values by quantities. The household Budget Surveys, conducted in Greece every 5 years, are used for the formation of the Consumer Price Index (CPI). The grouping of items (goods and services) for the survey has been made according to the new international classification COICOP (Classification Of Individual Consumption by Purpose).

Method

In the data collected, we applied two regression analyses. For the estimations in this paper, the Eviews 5.0 software was used. Also, for some descriptive statistic results that are presented in the appendix, SPSS11.0 was employed.

In a first stage, a least square regression analysis determined the estimated household's expenditure for fruits in euros, given its demographics, a vector of prices and the household's expenditure on all goods and services.

$$(1) \quad m_i = f(p_i, z_i, y_i)$$

where m_i is the i 's household estimated fruit expenditure, p_i is a vector of prices for all fruits faced by household i , z_i is a vector of demographics describing household i and y_i is the household's i expenditure on all goods and services.

Given its total fruit expenditure and prices, a representative household makes decisions to maximize its utility for fruit category. Defining d_i to be a measure of the household i 's fruit purchase, we applied in a second stage the following regression model (least squares' method):

$$(2) \quad d_i = g(p_i^*, z_i, \hat{m}_i)$$

where p_i^* is a scalar measure of the set of all fruit prices faced by household i , such as price index for fruit, z_i is the same set of characteristics used in first stage (1), and \hat{m}_i is the household i 's fitted expenditure on fruit, given from the regression in the first stage (1).

Table 3. Variable Definitions

Variable	Name	Definition
<i>Dependent</i>		
Fruit Expenditure	FRUITEXP	Household expenditure on fruit €/year
Fruit Variety (Count definition)	COUNTVAR	The variety of fruits consumed by the household using the Count definition
Fruit Variety (Simpson Index)	SIMPVAR	The variety of fruits consumed by the household using the Simpson Index
<i>Independent</i>		
Gender	AGE	The gender of household head, Dummy variable, 1=man, 0=woman.
Age	GENDER	The age of household head
Location of Household		Greece was separated in four areas, dummy variables
Aegean islands, Crete	LOCAT1	The household lives in Aegean islands or Crete=1, otherwise=0
Central Greece, Peloponnesus, Ionian Islands	LOCAT2	The household lives in Centr. Greece or Peloponnesus or Ionian islands=1, otherwise=0
North Greece	LOCAT3	The household lives in North Greece=1, otherwise=0
Athens	LOCAT4	The household lives in Athens=1, otherwise=0
Marital Status		Marital status of the household head, dummy variables
Married	MARITST1	The head of the household is married=1, otherwise=0
Unmarried	MARITST2	The head of the household is unmarried=1, otherwise=0
Separated/ Divorced/ Widowed	MARITST3	The head of the household is separated or divorced or widowed=1, otherwise=0
Education Level		Education level of the household head, dummy variables
Educated	EDUC1	The household head has finished at least university, college=1, otherwise=0
Fair Education	EDUC2	The household head has finished lyceum=1, otherwise=0
No education	EDUC3	The household head has finished primary school or has no education at all=1, otherwise=0
Working Status		The working status of the household head
Working	WORKSTAT1	The household head has a full-time or part-time job=1, otherwise=0
Not working	WORKSTAT2	The household head is unemployed or not working=1, otherwise=0
Retired	WORKSTAT3	The household head is retired=1, otherwise=0
Age categories		Number of members in each age category
Category 0-12	C0_12	Number of members aged 12 or under
Category 13-17	C13_17	Number of members aged 13-17
Category 18-25	C18_25	Number of members aged 18-25
Category 26-40	C26_40	Number of members aged 26-40
Category 41-54	C41_54	Number of members aged 41-54
Category 55-70	C55_70	Number of members aged 55-70
Category 70_	C71_	Number of members aged over 70
Total Expenditure	TOTALEXP	Household's total expenditure on all goods and services, used as a proxy of income
Price of fruits	-	22 variables, one for each fruit category, adjusted for quality changes (for 1st stage)
Price Index	PRICEIND	1 variable with price index for all fruits, weighted according to a basis household (for 2nd stage)
Fitted value Fruit Expenditure	FITFREXP	The fitted value of fruit expenditure given from the 1st stage

The independent variable y_i is the sum of the household's expenditure on all goods and services. This variable is as a proxy of income, due to lack of other information about households' income statement. It is expected by theory that low income households allocate less of their money on fruits than household with a better income status. A variable with the square of the household's expenditure on all goods and services was also used in order to include the impact on fruit expenditure, as total expenditure continues to grow.

Demographics from the National Household budget survey were used in the analysis, such as the age, education level, marital and working status of household head, location of household and number of members in each age category within the household. Instead of using the household size, we preferred to create 6 new variables according to the age of each household member, in order to take into consideration the effect of each member's age in the fruit expenditure and fruit variety. However, it is worth mentioning that the size of households averaged about 2.7² people, ranging from 1 to 9. Dummy variables were created for location, educational level, marital and working status, as presented in table 3.

In the survey, each household have reported value and quantity for each purchased fruit category. The unit value was obtained by dividing value by quantity. As every household is possible to buy fruits of different quality, and thus at different prices, we used Gao and Spreen's (1994) methodology to adjust for quality differences. Thus, a vector of prices was created for each fruit³ (22 variables). In order to calculate a price index for the analysis on the second stage, a household was used as a base. The base household was selected to fit the means of the characteristics of all households in the data. Finally, the fitted values from the first regression were used in the second stage as a regressor to estimate variety.

For the purposes of this study, we assumed that the total quantities obtained by each household were also consumed by its members. This, of course, is not always the case, as some members might not consume some types of fruits that the household obtains or some quantities of fruit might end up go to waste or even spoil. The percentage of spoilage and wastage were not calculated.

Measuring Variety

The literature provides basically two approaches to calculate variety in a household's purchases (Stewart et al, 2006, McDonald et al, 2003). Both approaches were used and will be presented in this analysis.

The simplest is the *COUNT* approach. The different fruit categories purchased by the household i are counted. The Count can theoretically have values from 1 to 22, which is the maximum number of fruit categories available. Households with zero consumption of fruit during the period of the research were eliminated from the sample. Thus, in the case where two households have purchased the same number of different fruits in the period of the research, even in different quantities, they will have an equivalent diversity of fruit diet, according to Count approach.

The second approach to measure variety is the *SIMPSON* index. The Simpson index describes the distribution of quantity shares over the $n=22$ fruit categories. If we denote by w_{ij} the share of fruit j of the household i , then

$$(3) w_{ij} = \frac{q_{ij}}{\sum_{j=1}^n q_{ij}}$$

where q_{ij} is the quantity of j fruit category purchased by household i , Then, the Simpson index s_i is defined as

$$(4) s_i = 1 - \sum_{j=1}^n w_{ij}^2$$

It is obvious that if a household concentrates all of its purchases in only one fruit category, then $s_i=0$. The more a household diversifies the quantities of fruit purchases, the closer s_i is to 1.

Table 4. Mean, minimum and maximum of Count definition and Simpson Index

Descriptive Statistics					
Variable	N	Minimum	Maximum	Mean	Std. Deviation
Count definition	6049	1	11	3.379567	1.588989192
Simpson Index	6049	0	0.9017	0.531559	0.238120551
Valid N (listwise)	6049				

The Count definition varies from 0 to 11 fruits, out of the 22 fruit categories³ used in the analysis, with an average of 3.37. At the same time, the Simpson Index takes values from 0, for 726 households (11% of the sample) that concentrated all of their purchases on a single category, to 0.9071, for a household that allocated equal share to the 11 categories out of the 22. This data supports the initial assumption that Greek households don't adopt variety on fruit consumption.

Results

Fruit Expenditure Regression

In the first stage, demographics, total household expenditures and adjusted prices of fruit categories are used for a regression, using least squares method, to estimate the fruit expenditure. The results have been corrected for heteroskedasticity.

$$\begin{aligned} \text{FRUITEXP} = & a_0 + a_1\text{AGE} + a_2\text{GENDER} + a_3\text{LOCAT1} + a_4\text{LOCAT2} + a_5\text{LOCAT3} \\ & + a_6\text{MARITST2} + a_7\text{MARITST3} + a_8\text{EDUC1} + a_9\text{EDUC2} + a_{10}\text{WORKSTAT2} \\ & + a_{11}\text{WORKSTAT3} + a_{12}\text{TOTALEXP} + a_{13}\text{TOTALEXP}^2 + a_{14}\text{C0_12} + a_{15}\text{C13_17} \\ & + a_{16}\text{C18_25} + a_{17}\text{C26_40} + a_{18}\text{C41_55} + a_{19}\text{C55_70} + a_{20}\text{C71_} + a_{21}\text{LEMON} \\ & + a_{22}\text{MANDAR} + a_{23}\text{ORANG} + a_{24}\text{RETCITR} + a_{25}\text{BANAN} + a_{26}\text{APPL} + a_{27}\text{PEAR} \\ & + a_{28}\text{PEACH} + a_{29}\text{APRIC} + a_{30}\text{CHERR} + a_{31}\text{PLUM} + a_{32}\text{AVOCAD} + a_{33}\text{MEDLAR} \\ & + a_{34}\text{MANG} + a_{35}\text{GRAP} + a_{36}\text{STRAWA} + a_{37}\text{RESTFLESH} + a_{38}\text{FIG} + a_{39}\text{ACTIN} \\ & + a_{40}\text{WATERMEL} + a_{41}\text{MELON} + a_{42}\text{RESTFRUIT} \end{aligned}$$

The results of this stage are presented in the Appendix⁴. As expected, when the household's available income grows, so does the expenditure for fruits. According to the model, if the household's available income increases by 100 euros, then the expenditure on the group will increase by 5 cents. However, as proxy of income continues to increase in high levels, the expenditure on fruit will increase on a slower rhythm.

Demographics, like age and educational level of household head, location and size of household are observed to be determinants of expenditure on fruits. The fitted values of fruit expenditures given from the above equation were used to calculate the variety adopted by the household in the following stage.

Fruit Variety Regression

In the second stage, we are concerned to estimate the variety purchased by the household, given the fitted fruit expenditure from the first stage, with the method of least squares. The demographics for households are used again as independent variables, as well as a price index for fruits. Firstly, we apply the regression using the COUNT definition. Again, the regression is corrected for heteroskedasticity.

$$\begin{aligned} \text{COUNTVAR} = & b_0 + b_1\text{AGE} + b_2\text{GENDER} + b_3\text{LOCAT1} + b_4\text{LOCAT2} \\ & + b_5\text{LOCAT3} + b_6\text{MARITST2} + b_7\text{MARTIST3} + b_8\text{EDUC1} + b_9\text{EDUC2} + \\ & b_{10}\text{WORKSTAT2} + b_{11}\text{WORKSTAT3} + b_{12}\text{C0_12} + b_{13}\text{C13_17} + b_{14}\text{C18_25} + \\ & b_{15}\text{C26_40} + b_{16}\text{C41_55} + b_{17}\text{C55_70} + b_{18}\text{C71_} + b_{19}\text{PRICEIND} + b_{20}\text{FITFREXP} \end{aligned}$$

Table 5. Coefficient and Probability of Regression for Fruit Variety (COUNT)

Dependent Variable: COUNTVAR			
Method: Least Squares			
Sample: 1 6049			
Included observations: 6049			
White Heteroskedasticity-Consistent Standard Errors & Covariance			
Variable	Coefficient	Std. Error	Prob.
Constant	2.2397	0.1936	0.0000
AGE of household's head	0.0019	0.0028	0.5043
GENDER of household's head	-0.0218	0.0780	0.7801
LOCATION: Crete, Aegean islands	-0.2912	0.0717	0.0000
LOCATION: Central Greece, Peloponnesus, Ionian islands	-0.4432	0.0537	0.0000
LOCATION: North Greece	-0.0844	0.0497	0.0895
MARITAL STATUS: Divorced, Separated, Widowed	-0.0994	0.0840	0.2368
MARITAL STATUS: Unmarried	-0.2858	0.0948	0.0026
EDUCATION LEVEL: Educated	0.2926	0.0690	0.0000
EDUCATION LEVEL: Medium Education	0.2231	0.0510	0.0000
WORKING STATUS: Unemployed/Not Working	0.0575	0.0725	0.4278
WORKING STATUS: Retired	0.0337	0.0682	0.6209
NUMBER OF MEMBERS 0-12 YEARS OLD	0.0486	0.0431	0.2596
NUMBER OF MEMBERS 13-17 YEARS OLD	-0.0890	0.0541	0.1000
NUMBER OF MEMBERS 18-25 YEARS OLD	-0.0590	0.0408	0.1484
NUMBER OF MEMBERS 26-40 YEARS OLD	0.0702	0.0409	0.0865
NUMBER OF MEMBERS 41-54 YEARS OLD	0.0831	0.0463	0.0724
NUMBER OF MEMBERS 55-70 YEARS OLD	0.0427	0.0519	0.4112
NUMBER OF MEMBERS OVER 70 YEARS OLD	0.0008	0.0614	0.9899
PRICE INDEX	0.0012	0.0502	0.9815
FITTED FRUIT EXPENDITURE	0.0410	0.0041	0.0000

Table 6. R-square and F-statistics of regression on variety (COUNT)

R-squared	0.1008	F-statistic	33.7754
Adjusted R-squared	0.0978	Prob(F-statistic)	0.0000

It can be seen from the results of regression that households located in areas other than Athens have a narrow variety of fruit intake, compared to their counterparts located in Athens. This can be attributed to the fact that people living in capital have greater access in a bigger variety of fruit through open markets, retailing shops, groceries, super markets, hyper markets etc.

Being unmarried seems to be an obstacle on fruit variety. Holding all other factors constant, households with a married head tend to consumer bigger variety than households with an unmarried head. Education is also a determinant of variety. There is a clear trend that people who are either educated or of medium education purchase a greater variety of fruits, compared to households with a head of low education. Possibly, educated people have more years of schooling and greater nutrition knowledge.

According to the results of this study, although households allocate more funds for the purchase of fruits when their size increases- as given from the first stage, they don't necessarily also buy greater variety. Using the Count definition, it is proved on a 5% significant level that households continue to buy the same variety of fruits when their size increases, however they allocate more money on fruits, as given from the first equation. At the same time, the price index of fruits is observed not to play a significant role on variety. Households will not narrow or widen their variety if prices of fruits go up. This proves that variety is not influenced by variations in prices.

Finally, the fitted values from the first equation prove a significant positive relationship between fruit expenditure and fruit variety, *ceteris paribus*, which simply means that the more money a household allocates on the category of fruit, the greater variety it purchases.

In order to get a clear picture of a household fruit variety, we also used the SIMPSON index, in order to examine the differences obtained by this variety measurement.

$$\begin{aligned} \text{SIMVAR} = & c_0 + c_1\text{AGE} + c_2\text{GENDER} + c_3\text{LOCAT1} + c_4\text{LOCAT2} \\ & + c_5\text{LOCAT3} + c_6\text{MARITST2} + b_7\text{MARTIST3} + c_8\text{EDUC1} + c_9\text{EDUC2} + \\ & c_{10}\text{WORKSTAT2} + c_{11}\text{WORKSTAT3} + c_{12}\text{C0_12} + c_{13}\text{C13_17} + c_{14}\text{C18_25} + \\ & c_{15}\text{C26_40} + c_{16}\text{C41_55} + c_{17}\text{C55_70} + c_{18}\text{C71_} + c_{19}\text{PRICEIND} + c_{20}\text{FITFEXP} \end{aligned}$$

As mentioned earlier, the Simpson Index is a more weighted measurement of variety compared to Count definition, as it takes into account not only units purchased from each fruit category but quantities as well.

The regression analysis for fruit variety using the Simpson Index proves a narrow variety on fruit for all areas of Greece, compared to Athens, on a significant 5% level. Households living in Athens consume a wider, and more balanced in terms of quantity, variety of fruits. Again, access in big super market chains and grocery shops, which sell bigger variety of domestic and imported fruits, widely available in the area of Athens, is probably the key to an explanation for these results.

Table 7. Coefficient and Probability of Regression for Fruit Variety (SIMPSON)

Dependent Variable: SIMPVAR			
Method: Least Squares			
Sample: 1 6049			
Included observations: 6049			
White Heteroskedasticity-Consistent Standard Errors & Covariance			
Variable	Coefficient	Std. Error	Prob.
Constant	0.4468	0.0292	0.0000
AGE of household's head	0.0008	0.0004	0.0724
GENDER of household's head	-0.0072	0.0127	0.5696
LOCATION: Crete, Aegean islands	-0.0611	0.0113	0.0000
LOCATION: Central Greece, Peloponnesus, Ionian islands	-0.0753	0.0087	0.0000
LOCATION: North Greece	-0.0257	0.0072	0.0004
MARITAL STATUS: Divorced, Separated, Widowed	-0.0270	0.0132	0.0410
MARITAL STATUS: Unmarried	-0.0554	0.0148	0.0002
EDUCATION LEVEL: Educated	0.0335	0.0097	0.0005
EDUCATION LEVEL: Medium Education	0.0333	0.0075	0.0000
WORKING STATUS: Unemployed/Not Working	0.0071	0.0116	0.5403
WORKING STATUS: Retired	0.0038	0.0102	0.7087
NUMBER OF MEMBERS 0-12 YEARS OLD	0.0071	0.0062	0.2498
NUMBER OF MEMBERS 13-17 YEARS OLD	-0.0041	0.0078	0.5940
NUMBER OF MEMBERS 18-25 YEARS OLD	-0.0018	0.0058	0.7501
NUMBER OF MEMBERS 26-40 YEARS OLD	0.0117	0.0059	0.0489
NUMBER OF MEMBERS 41-54 YEARS OLD	0.0145	0.0067	0.0305
NUMBER OF MEMBERS 55-70 YEARS OLD	0.0051	0.0077	0.5078
NUMBER OF MEMBERS OVER 70 YEARS OLD	-0.0043	0.0093	0.6425
PRICE INDEX	-0.0274	0.0088	0.0018
FITTED FRUIT EXPENDITURE	0.0032	0.0005	0.0000

Table 8. R-square and F-statistics of regression on variety (SIMPSON)

R-squared	0.0662	F-statistic	21.3690
Adjusted R-squared	0.0631	Prob(F-statistic)	0.0000

Similarly to the results obtained from the regression on variety using the Count definition, education boosts variety. Household head's who have finished university or high school, reported a wider variety in fruits than the ones who haven't. It is noticeable in all regressions used in this study that education appears to be a major determinant of fruit consumption in terms of expenditure and variety on fruits.

When we used the Count definition, there was no association between the size of the household and the variety purchased. However, using the Simpson index, the size of household plays a significant role on variety only when members aged 26 to 55 are added. The taste and preference of these age groups seem to determine the variety of the household. In addition, marital status is strongly associated with variety on fruits, as households with a married head tend to buy a wider variety of fruits compared with households with an unmarried, divorced, separated or widowed head.

The application of regression using the Simpson Index provides different results for the dependent variable of price index than the Count definition. In this case, the variety seems to be sensitive in changes of fruit prices, as an increase in the price

index, keeping all other factors constant, will cause a decrease on the variety of fruit purchased by the households. This difference in the two measures of variety might be due to the fact that, according to the count definition, households could decrease their purchased quantity of a fruit, if the price index increase, and still report the same variety. Simpson index takes into account quantities purchased of each fruit category.

When the fitted fruit expenditure grows, so does the variety using the Simpson Index. Thus, it can be assumed that the more households allocate on fruit, they wider is the variety of fruit purchased.

Conclusions

The results of this study show that demographics are the main drivers for variety on fruit. Living in an area outside Athens is a determinant for allocating more money on fruit but, at the same time, is an obstacle for consuming a great variety of fruits. Possibly households in rural areas have greater access in specific fruit categories, produced in the local areas, while households in the area of Athens have greater access in super markets and other retails shops that trade wider variety of fruit, produced in Greece or in foreign markets.

The household's disposable income, approximated by the household's expenditure on all goods and services, had a positive effect on the household's expenditure on fruit in the first stage. People with higher income are likely to spend more money on fruits. At the same time, more money on fruits also means a wider variety, as given from the second stage. Thus, households with larger income are more likely to have preference to shift to new categories of fruit and have higher demand for fruit variety. However, it should be mentioned that only a small part of income's increase would go to the expenditure on fruit. Specifically, if the total expenditure increases by 100 euros, then the expenditure for fruit will increase by 0.3 euros.

A positive association between education and fruit variety was observed either using the Count definition or the Simpson index. Highly or medium educated people likely have been exposed to information about the benefits of healthy diets and consume greater quantity and variety of fruits than the less educated ones. Also, there was a positive association between the age of the household head and the expenditure on fruit. Possibly people become more conscious about health and dietary matters as they grow up. However, variety didn't appear to increase with age.

The household size is positively associated with fruit expenditure. More persons in the household result in an increase in fruit expenditure. However, when we calculate variety, only when people aged 26-55 are added in the household does the variety increases. It appears that household members of a certain age have particular needs and create demand for distinct categories of fruit, leading to a greater fruit variety within the household. Being married is positively associated with an increase in variety, keeping all other factors constants.

The fitted value of fruit expenditures estimated on the first stage had a positive impact on fruit variety for both definitions of variety, *d*. Hence, as spending increases, households try new fruits. The results comply with the theory that when the expenditure on a food category increases, so does the demand for variety in this category (Stewart et al, 2006).

While the price index of fruits didn't appear to have an impact on variety when using the Count definition, a negative association significant at a 5% level was

observed when we used the Simpson index. This is due to the fact that only the Simpson index takes into account the quantity purchased of each fruit category. Hence, it is possible that, if prices increase, the households would purchase less quantity of each category, without necessarily shifting to other fruit categories or deleting some fruit categories from their diets, and so the Count definition remains the same. Following the Simpson index, the households will lower their variety if prices increase.

Looking ahead to the future, the aging population, rising incomes and education levels in Greece will likely favor fruit consumption and fruit variety. At the same time, the health risks derived by obesity rates among children create an alarming situation. Thereby, it is highly essential for health campaigns to focus on the promotion of fruit consumption and, especially, variety. The obstacles on fruit variety derived from this study can point out the characteristics of low fruit consumers and the households that purchase a narrow variety, possibly resulting on an inadequate diet for their members. Health campaigns aiming to increase variety should focus on low income households with a less educated and unmarried head that live outside the area of Athens.

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Appendix

¹The fruit quantity per capita per year in Kg for Greece the years 1990-2005 is presented in the following table.

A1. Fruit quantity per capita per year (kg) in Greece, 1990-2005

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Apples	20.59	18.37	19.88	20.81	20.45	18.51	17.37	17.96	18.47	16.95	14.94	13.06	13.36	14.60	15.42	15.12
Apricots	4.72	4.17	4.61	4.73	3.96	2.33	1.65	2.21	2.85	3.71	3.93	3.45	3.11	3.35	3.92	4.22
Bananas	6.05	4.73	3.72	3.10	3.21	2.67	3.77	4.80	5.39	5.41	5.41	5.63	5.89	6.11	6.24	6.36
Cherries (incl. sour cherries)	3.12	2.87	3.32	3.46	3.86	3.91	4.00	3.60	3.48	3.70	3.93	3.58	3.50	3.64	3.90	3.85
Citrus fruit, nec	0.00	0.01	0.07	0.09	0.11	0.13	0.12	0.10	0.11	0.19	0.33	0.50	0.62	0.59	0.48	0.35
Cranberries, blueberries	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Figs	3.73	4.40	5.04	5.34	5.71	6.05	6.10	6.12	6.16	6.02	5.49	4.57	3.66	3.15	3.51	4.98
Fruit, nec (inc. persimm.)	3.58	1.96	1.00	3.01	2.31	0.89	2.58	2.22	0.00	2.42	2.88	0.00	0.00	0.04	0.00	0.00
Grapefruit and pomelo	0.52	0.72	0.85	0.83	0.82	0.82	0.89	0.96	1.02	1.05	1.10	1.15	1.25	1.41	1.56	1.70
Grapes	0.00	42.56	59.27	55.30	59.51	70.63	76.11	79.31	82.29	80.21	84.60	92.66	100.30	105.88	100.59	88.51
Guavas, mangoes, mangosteens	0.00	0.00	0.00	0.00	0.75	1.17	1.31	1.41	1.54	1.75	2.34	3.21	3.88	3.77	2.51	0.09
Kiwi fruit	2.83	2.56	2.33	2.18	1.99	1.90	1.83	1.77	1.88	2.05	2.31	2.64	2.85	2.92	2.86	2.51
Lemons and limes	13.17	7.61	6.71	7.01	8.93	9.72	10.12	10.51	10.36	9.54	8.89	10.35	11.72	12.10	11.09	9.76
Oranges	48.28	24.60	17.01	22.68	20.59	27.23	26.61	29.59	33.99	32.32	35.23	39.41	35.44	39.36	34.31	27.13
Other melons (incl. cantaloupes)	9.24	10.32	11.02	11.14	10.63	10.28	10.60	11.11	11.18	10.60	10.31	10.69	11.17	11.32	10.99	10.63
Palm nuts-kernels (nut equiv.)	0.01	0.02	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.05	0.00	0.00	0.04	0.05	0.07	0.00
Papayas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Peaches and nectarines	48.86	45.34	43.84	49.94	56.95	53.79	35.18	16.03	19.26	32.46	30.26	34.50	17.39	0.00	22.49	57.59
Pears and quinces	6.42	5.60	5.14	5.06	5.15	5.24	5.22	5.42	5.69	5.75	5.49	4.87	4.18	3.77	3.54	3.33
Pineapples	0.83	0.89	0.97	1.10	1.23	1.27	1.18	1.02	1.00	1.20	1.53	1.93	2.38	2.85	3.31	3.77
Plums and sloes	1.29	1.20	1.14	1.11	1.10	1.10	1.12	1.12	1.14	1.18	1.24	1.27	1.26	1.26	1.27	1.29
Raspberries and other berries	0.13	0.12	0.13	0.13	0.13	0.13	0.12	0.14	0.16	0.18	0.18	0.20	0.27	0.33	0.37	0.39
Strawberries	0.61	0.61	0.65	0.72	0.80	0.82	0.80	0.79	0.78	0.78	0.74	0.73	0.76	0.77	0.80	0.83
Tangerines, mandarins, clem.	7.23	6.59	6.38	6.33	6.26	6.03	5.64	5.18	4.76	5.23	5.99	6.52	6.30	5.94	5.73	5.96
Watermelons	31.78	31.56	30.86	29.56	28.08	27.19	27.19	26.67	25.81	25.20	26.55	28.84	31.12	32.83	34.05	35.02
Total	212.99	216.82	223.93	233.61	242.54	251.82	239.56	228.06	237.32	247.97	253.69	269.77	260.44	256.04	269.01	283.40

Source: FAO stat., 2007

²In the following table some descriptive statistics for the household's size are presented. A positive significant correlation was observed between married status of household head and household size. On the contrary, negative significant correlation was found for unmarried status of household head and household size, and divorced/separated/ widowed status and household size. The data was produced using SPSS11.0.

A2. Descriptive Statistics for household size

	N	Minimum	Maximum	Mean	Std. Deviation
Household size	6049	1	9	2.6993	1.2895
Valid N (listwise)	6049				

A3. Correlation between Married status of head and Household size

		Household size	Married
Household size	Pearson Correlation	1.0000	0.5590
	Sig. (2-tailed)	.	0.0000
	N	6,049	6,049
Married	Pearson Correlation	0.5590	1.0000
	Sig. (2-tailed)	0.000	.
	N	6049	6049

**Correlation is significant at the 0.01 level (2-tailed)

A4. Correlation between divorced/separated/widowed status of head and household size

		Household size	Divorced/ Separated/ Widowed
Household size	Pearson Correlation	1	-0.4333
	Sig. (2-tailed)	.	0.0000
	N	6049	6049
Divorced/ Separated/ Widowed	Pearson Correlation	-0.4333	1
	Sig. (2-tailed)	0.0000	.
	N	6049	6049

** Correlation is significant at the 0.01 level (2-tailed).

A5. Correlation between unmarried status of head and household size

		Household size	Unmarried
Household size	Pearson Correlation	1.0000	-0.2787
	Sig. (2-tailed)	.	0.0000
	N	6049	6049
Unmarried	Pearson Correlation	-0.2787	1
	Sig. (2-tailed)	0.0000	.
	N	6049	6049

**Correlation is significant at the 0.01 level (2-tailed)

³ Categories of fruits included in the analysis:

1. Lemons
2. Mandarins
3. Oranges
4. Rest of citrus fruits
5. Bananas
6. Apples
7. Pears
8. Peaches, nectarines

9. Apricots
10. Cherries
11. Plums
12. Avocados
13. Medlars
14. Mangos
15. Grapes
16. Strawberries
17. Rest of fleshy fruit
18. Figs
19. Actinides
20. Watermelons
21. Melons
22. Rest of fruit

⁴In the following tables, the results of the regression for fruit expenditure are presented. The results were produced using Eviews 5.0. The regression has been corrected for heteroskedasticity.

A6. Coefficient and Probability of Regression for fruit expenditure

Dependent Variable: FRUITEXP			
Method: Least Squares			
Sample: 1 6049			
Included observations: 6049			
White Heteroskedasticity-Consistent Standard Errors & Covariance			
Variable	Coefficient	Std. Error	Prob.
Constant	4.7513	41.4776	0.9088
AGE of household's head	0.1127	0.0301	0.0002
GENDER of household's head	0.5228	0.8397	0.5336
LOCATION: Crete, Aegean islands	2.8327	0.8580	0.0010
LOCATION: Central Greece, Peloponnesus, Ionian islands	0.0011	0.6329	0.9987
LOCATION: North Greece	2.8205	0.5540	0.0000
MARITAL STATUS: Divorced, Separated, Widowed	-1.5556	1.0146	0.1253
MARITAL STATUS: Unmarried	-1.0827	1.1741	0.3565
EDUCATION LEVEL: Educated	1.5609	0.8604	0.0697
EDUCATION LEVEL: Medium Education	1.3203	0.5915	0.0257
EXPENDITURE ON ALL GOODS AND SERVICES	0.0058	0.0006	0.0000
EXPENDITURE ON ALL GOODS AND SERVICES^2	-0.000000322	0.0000	0.0002
WORKING STATUS: Unemployed/Not Working	0.3193	0.7742	0.6801
WORKING STATUS: Retired	-0.0194	0.8088	0.9809
NUMBER OF MEMBERS 0-12 YEARS OLD	2.8426	0.5183	0.0000
NUMBER OF MEMBERS 13-17 YEARS OLD	2.9723	0.7274	0.0000
NUMBER OF MEMBERS 18-25 YEARS OLD	0.7257	0.4755	0.1271
NUMBER OF MEMBERS 26-40 YEARS OLD	1.7280	0.4818	0.0003
NUMBER OF MEMBERS 41-54 YEARS OLD	2.4038	0.5336	0.0000
NUMBER OF MEMBERS 55-70 YEARS OLD	3.3030	0.6276	0.0000
NUMBER OF MEMBERS OVER 70 YEARS OLD	2.3917	0.7381	0.0012
Price of Lemons	2.4390	1.3576	0.0725
Price of Mandarins	5.1314	2.0298	0.0115
Price of Oranges	7.5627	1.4673	0.0000
Price of Rest of citrus fruit	0.2431	3.7788	0.9487
Price of Bananas	5.5059	1.4123	0.0001
Price of Apples	2.4733	0.9758	0.0113
Price of Pears	3.0267	1.2471	0.0153
Price of peaches	8.8806	1.7153	0.0000

Price of apricots	6.5535	2.3753	0.0058
Price of cherries	1.4214	1.0831	0.1895
Price of plums	1.4547	2.0897	0.4864
Price of avocados	-4.8666	5.9206	0.4111
Price of medlars	-12.1615	5.7054	0.0331
Price of mangos	-1.4459	3.8152	0.7047
Price of grapes	4.3345	1.9186	0.0239
Price of strawberries	-1.0562	0.9577	0.2701
Price of rest of fleshy fruit	-6.2063	3.6771	0.0915
Price of figs	6.1534	2.9019	0.0340
Price of actinides	1.9022	1.3543	0.1602
Price of water melons	5.8959	3.0494	0.0532
Price of melons	5.8219	2.2630	0.0101
Price of rest of fruit	-2.2260	1.6636	0.1809

A7. R-square and F-statistics of regression on fruit expenditure

R-squared	0.1967	F-statistic	35.0124
Adjusted R-squared	0.1911	Prob(F-statistic)	0.0000

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CREDIT IN THE MONETARY TRANSMISSION MECHANISM: AN EVALUATION OF THE CREDIT CHANNEL USING GREEK DATA

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Abstract

This paper investigates the relevance of the credit channel of monetary policy transmission in Greece by employing a SVAR model on both aggregated and disaggregated data and estimating the response of bank loans to different macroeconomic shocks. By distinguishing between households and firms instead of focusing on the response of total bank credit (heterogeneity of the loan types) to a tightening monetary policy shock and by employing a SVAR methodology using monthly data following the work by Safaei and Cameron (2003), this paper identifies structural models to study bank credit in Greece as a source of macroeconomic variation for the period 1995-2005. The findings suggest that the credit channel in Greece for the period 1995-2005 is inoperative in spite of the two monetary policy variables used, the monetary base and the interest rate. The responses of the different bank credit measures to monetary policy changes do not significantly differ, rendering the credit channel ineffective for both consumers and business firms.

Keywords: Monetary policy transmission; bank lending; SVAR model; Greece

JEL classification: E44; E52; G21

1. Introduction

Monetary policy transmission mechanisms have been a subject of theoretical and empirical research over the last two decades in an effort to better comprehend how monetary policy affects the real economy¹. A central point of this research has been the role played by banks in the transmission of monetary policy, inclusive of the effect of monetary policy on bank lending. Despite the general agreement on the active role of banks in the transmission of monetary policy, there is an extensive dispute over the exact role that banks play. The basic idea behind the concept of the credit channel is that central bank impulses affect output, as an upshot caused by shifts in the supply of loans. This comes in contrast with the traditional

¹ See Bernanke and Gertler (1995) and Kashyap and Stein (1993,1997) for excellent surveys.

money view where there is no reference to loan supply shocks. According to the money channel theory the focus is placed on the effects of monetary policy on the attraction of investment and saving that predominate when financial markets are complete. The major shortcoming of money view is the considerable difficulty in the identification of a quantitatively meaningful effect on aggregate spending and investment that the theory indicates it should influence. The credit channel has emerged to fill the gap. Even though the credit channel and the money channel share a common starting point in highlighting the relevance of financial considerations, they are reckoned to be complementary, which implies the simultaneous coexistence of the two transmission channels. Two subchannels of the credit channel have been presented in the literature, the balance sheet channel (BSC) and the bank lending channel (BLC). The BSC states that shifts in monetary policy can severely affect the creditworthiness of borrowers due to information asymmetries that consequently affect the bank loan supply and thus borrowers' investment and spending decisions stemming from the inability of borrowers to raise funds from any provider. The BLC, in turn, rests on the assumption that banks have a dual nature as holders of reserved-backed deposits and as originators of loans and this can affect the availability of bank loans. It is generally accepted that commercial banks are the major source for investment expenditure financing and consumption financing of small firms and households, particularly valid for most of the euro area countries that are prevailed by rather small-sized banks and strong customer relationships. The structure of a banking system is of great importance since it can create the required conditions for a BLC to be operative.

There is a wide body of literature utilizing SVAR models to analyse the macroeconomic effects of monetary policy conducted at both national and aggregate euro area level especially following the urgent need to apprehend the new economic entity and to achieve the desired goals. The relative merits of the SVAR approach have been discussed to a great extent (see Sims, 1986; Bernanke, 1986; Blanchard and Watson, 1986; Shapiro and Watson, 1988; and Blanchard and Quah, 1989) and it is beyond the scope of this study to review this argumentation. Mixed results were reported on the effectiveness of the BLC. Early literature has investigated the possible repercussions of monetary policy by studying the relationship between money and output as well as bank loans and output mainly by using correlations or through Granger-causality tests. It has approximately deduced in favor of the money channel. During the 1990s numerous studies have attempted to assess the existence of the BLC. Although the magnitude of financial market imperfections –the credit view in general- has been recognized by a substantial number of surveys, the empirical evidence for the existence of a BLC is much less definite. A very influential study that made use of aggregated US data and supports the BLC is that of Bernanke and Blinder (1992). Other SVAR studies supported

the presence of the credit channel are that of Kashyap et al. (1993), Gibson (1997) for the U.S. where the composition of bank balance sheets has an impact on the strength of the transmission mechanism, whereas Carlino and DeFina (1999) following the theory proposed by Peek and Rosengren (1995), offered contrasting outcomes revealing that the credit channel is not present at the state level and greater concentration of small banks minimise responsiveness to monetary policy shocks at the level state. This is in contrast to the theory advocated by Kashyap and Stein (1994)². Ramaswamy and Sloek (1998) and Clements et al. (2001) reported that a credit channel is present in most EU countries. Output responses of core countries react slower but deeper than in periphery countries. It is interesting to notice for instance that Gerlach and Smets (1995), Ehrmann and Worms (2001) revealed similar results against the efficacy of the credit channel in Germany while Hortemoller (2003) offers a contradictory outcome. Agung (1998) observed that the BLC is operative in Indonesia and consumer loans of all bank categories drop following monetary contraction. On the other hand, findings of the empirical part of Bacchetta and Ballabriga (2000) and Dedola and Lippi (2000) lie between the two opposite findings providing fairly supportive evidence for the BSC and inconclusive or partially consistent for the BLC.

Although there is a sizeable number of studies on investigating the existence of a credit channel in terms of broad and narrow version for the U.S. and major European countries, such investigation for smaller countries is virtually absent. The contribution of this paper is to resolve the puzzle whether the results found on the established literature on the existence of the BLC are applicable to a country such as Greece and to examine evidence for a BLC in Greece. Following the approach suggested by Safaei and Cameron (2003) we use both aggregate and disaggregated data to analyse a macro-dynamic system utilising the SVAR approach that examines the effect of monetary policy to different bank credit measures (heterogeneity of the loan types) in Greece for the years 1995-2005.

The remainder of the paper is organised as follows. Section 2 describes the data and presents the SVAR model. Subsequently, the estimated structural relationships are set out in section 3 along with the impulse response functions to the structural shocks and the variance decompositions. Section 4 provides concluding remarks.

² The hypothesis of Kashyap and Stein (1994) states that small banks can easier confront higher costs in attracting CDs and other non-deposit sources to counteract a loss in reserves resulting from monetary policy tightening. Consequently, small banks are forced to contract bank loans by relatively more than large banking groups.

2. The model

This section summons up the specification of the benchmark models that have been employed by Safaei and Cameron (2003). The small-scale models include 5 variables to capture the economy and the domestic sector of Greece. Although a larger SVAR that makes use of more variables may allow for more affluent interactions, a more parsimonious model is likely to be easier to estimate and more constant and more reliable to grasp key macroeconomic interactions. Impulse responses of macroeconomic variables to monetary shocks are estimated so as to investigate the credit view of monetary policy for the case of Greece over the period 1980-2005,

$$\mathbf{A}_0 \boldsymbol{\varepsilon}_t = \mathbf{u}_t \quad [1]$$

where \mathbf{A} is the matrix of short-run coefficients, $\boldsymbol{\varepsilon}_t$ is the reduced form residual resulting from the first step estimation of the VAR model and \mathbf{u}_t is the independent structural disturbance term of the structural model. The \mathbf{A} matrix contains n^2 parameters. Hence, in a contemporaneous version of a five variable model implying five equations, $n^2 - (n+1)n/2 = n(n-1)/2$ unique elements or to put it differently $((5^2 - 5)/2 = 10)$ restrictions are required to identify the structural parameters (orthogonal shocks) on the covariance matrix. Therefore, just-identification of the parameters in matrix \mathbf{A} calls for exactly 10 restrictions (9 zero restrictions and an equality restriction) on the off diagonal elements of the matrix. In order to set the short-run restrictions that are necessary for the identification of the structural model, economic theory is applied for this purpose. In this way, the “aggregate demand” relationship is included in the contemporaneous restrictions. It is generally accepted that IS shocks (u_y) have a straightforward negative impact to real output which is greater comparing to that of price level. Taking into consideration shocks in output growth resulting from shocks in the growth rate of real credit ($\varepsilon_{ci} - \varepsilon_p$) is central to the theoretical underpinning of credit constraints that arise from the ability and willingness of banks in the bank lending procedure along with the cost of borrowing money which severely affects both the level of investment, real economic activity and the level of output³. Furthermore, the “aggregate supply” function is embraced, describing the shifts in price level and the corresponding impact in inflation rate stemming from shocks in aggregate demand. The thought behind shocks in aggregate demand is compatible with the short-run Philips curve, thus it is logical to recognize that inflation shocks (u_p) entail economic changes that drastically affect the cost of inputs derived from adverse shocks associated with factors of production such as oil

³ Vermeulen (2002), Hubbard (1998), Boyd and Smith (1997), Oliner and Rudebusch (1996) and Greenwald and Stiglitz (1993) are indicative examples in the literature providing empirical evidence of asymmetric effects resulting from monetary shocks that actually affect the supply of loans which in turn determine investment spending and the level of economic activity (balance sheet channel).

prices, energy costs, unemployment rate, tax regime or technological advances (i.e. information processing and communications technology)⁴.

In addition, a policy reaction function caused by the monetary policy decisions set by the Central Bank should be considered as well. In particular, two policy variables are taken into account, namely monetary base and interest rate that make distinction between two classes of models (monetary base - B models and interest rate - R models). As far as Class B models are concerned, nominal reserve money responds in shifts of real output, price level as well as M1 balances (narrow money) reflecting a monetary base reaction function. It is reasonable to regard as it is also influenced by shocks in monetary base emerging from foreign exchange rate distractions⁵. Referring to Class R models, the policy variable selected is the interest rate. More precisely, interest rate is considered and is taken for granted to react to price and money balances but not to output at least in short-term. Responsiveness to output is added in the reaction function due to the just-identification of the model. Nonetheless, it seems rational to presume that in the bounds of the quarter, no data for real GDP is on hand. On contrary, data referring to inflation and money supply are offered in monthly basis.

Also, an illustration of the money stock function and specification of the demand for money balances are embodied. Many factors that determine the demand for money balances are found in the literature. Nevertheless, the level of real GDP, the level of prices, the level of interest rates accompanied by the pace of financial innovation turn out to exhibit greater influence to the money stock function. For this reason, structural disturbances u_m represent such financial innovation factors like financial system/institutional innovations, process and product innovations that are not unambiguously incorporated in the models.

An effort is made to incorporate a “credit supply” function attempting to capture the credit view of monetary transmission mechanism originated by the influential study of Bernanke (1983)⁶ and empirically tested by King (1986). To be more specific, in the credit supply function, responses in price shocks, monetary base shocks and money demand shocks are taken into account. Monetary base tightening weakens the accessibility of funds to the financial system and to banks in particular. This results to credit constraints of borrowers as a consequence of draining bank reserves depressing the amount of loanable funds. In this way,

⁴ See Ball and Mankiw (1995).

⁵ A considerable amount of papers take into account the exchange rate in investigating the transmission mechanism of monetary policy, i.e. Taylor (2001) and Leitimo and Soderstrom (2005).

⁶ Bernanke (1983) examined the correlations between bank lending and economic activity and the consequences of output on bank lending. In this framework, the author investigated the impact of the Great Depression in the United States for the period 1930-1933. However, in his SVAR model, credit grants an unresponsive prospect, which cannot disentangle the supply-versus-demand puzzle.

an attempt is made so as to identify the credit view of monetary transmission mechanism. In addition, the inclusion of money demand can be rationalised based on the fact that unanticipated money shocks have an effect on monetary aggregates and bank deposits that represent the principal source of funds for bank lending. This can lead to the deterioration of investment funds imposed by the negative influence on loanable funds which force bank-dependent borrowers to contract investments. Structural credit shocks, u_{ci} , correspond to exogenous financial innovations or monetary policy regulatory innovations.

Given the short-run restrictions analysed above based on economic theory, the matrices for the two different classes of models B and R are as follows:

$$\begin{vmatrix} 1 & a1 & 0 & 0 & -a1 \\ -a2 & 1 & 0 & 0 & 0 \\ -a3 & -a4 & 1 & -a5 & 0 \\ -a6 & -a7 & 0 & 1 & 0 \\ 0 & -a8 & -a9 & -a10 & 1 \end{vmatrix} \begin{vmatrix} \varepsilon_y \\ \varepsilon_p \\ \varepsilon_b \\ \varepsilon_m \\ \varepsilon_{ci} \end{vmatrix} = \begin{vmatrix} u_y \\ u_p \\ u_b \\ u_m \\ u_{ci} \end{vmatrix}$$

By multiplying the matrices we obtain 5 equations that are clearly displayed in the structural equations [2] to [6] for the Class B models. On purpose, the time subscripts are neglected to have a more comprehensible presentation.

$$\varepsilon_y = a1(\varepsilon_{ci} - \varepsilon_p) + u_y \quad [2]$$

(+)

$$\varepsilon_p = a2\varepsilon_y + u_p \quad [3]$$

(+)

$$\varepsilon_b = a3\varepsilon_y + a4\varepsilon_p + a5\varepsilon_m + u_b \quad [4]$$

(+) (-) (?)

$$\varepsilon_m = a6\varepsilon_y + a7\varepsilon_p + u_m \quad [5]$$

(+) (+)

$$\varepsilon_{ci} = a8\varepsilon_p + a9\varepsilon_b + a10\varepsilon_m + u_{ci} \quad (i = 1,2,3) \quad [6]$$

(+) (-) (?)

In equations [2] to [6] $\varepsilon_y, \varepsilon_p, \varepsilon_b, \varepsilon_m$ and ε_{ci} correspond to the reduced form errors, "innovations" in the related variables. Similarly, u_y, u_p, u_b, u_m and u_{ci} , specify the orthogonal structural shocks. Respectively, the coefficients $a1, a2, \dots, a10$ are the structural parameters that measure instantaneous reactions and identify the short-run relationships among the shocks in variables. Lastly, c_i ($i = 1,2,3$) symbolize the three alternative measures of bank credit. The corresponding relationship of the structural parameter is specified in the parentheses

underneath the coefficients and a question mark (?) under a parameter implies theoretical uncertainty on the appropriate sign related to the economic relationship of that parameter.

To this point, class B models considering the monetary base have been clarified. Regarding class R models reckon with interest rate, approximately similar theoretical relationships are applicable. Following the same procedure, the contemporaneous restrictions referring to Class R models lead to the matrices depicted below.

$$\begin{vmatrix} 1 & a1 & 0 & 0 & -a1 \\ -a2 & 1 & 0 & 0 & 0 \\ 0 & -a3 & 1 & -a4 & 0 \\ -a5 & -a6 & -a7 & 1 & 0 \\ 0 & -a8 & -a9 & -a10 & 1 \end{vmatrix} \begin{vmatrix} \varepsilon_y \\ \varepsilon_p \\ \varepsilon_r \\ \varepsilon_m \\ \varepsilon_{ci} \end{vmatrix} = \begin{vmatrix} u_y \\ u_p \\ u_r \\ u_m \\ u_{ci} \end{vmatrix}$$

Similarly, by multiplying the matrices we obtain another 5 equations that can be viewed distinctly in the structural equations (7) to (11) for the Class R models. Again, the time subscripts are omitted so as to facilitate the understanding of the structural relationship between the variables.

$$\varepsilon_y = a1 (\varepsilon_{ci} - \varepsilon_p) + u_y \quad [7]$$

(+)

$$\varepsilon_p = a2\varepsilon_y + u_p \quad [8]$$

(+)

$$\varepsilon_r = a3\varepsilon_p + a4\varepsilon_m + u_r \quad [9]$$

(+) (?)

$$\varepsilon_m = a5\varepsilon_y + a6\varepsilon_p + a7\varepsilon_r + u_m \quad [10]$$

(+) (+) (-)

$$\varepsilon_{ci} = a8\varepsilon_p + a9\varepsilon_r + a10\varepsilon_m + u_{ci} \quad (i = 1,2,3) \quad [11]$$

(+) (-) (?)

Equations [7] and [8] are precisely the same with Equations [2] and [3]. In Equation [9] where the policy response function is represented, instead of the monetary base, the interest rate is considered. Turning to Equation [10], the money demand function is enriched by permitting impacts arising from interest rate shocks, leaving the other elements unchanged. Consequently, in Equation [11] interest rate shocks instead of monetary base are set to influence credit supply function, and to put it differently interest rates shocks are behind the credit slowdown. An alternative method employed by Sims (1986) named Maximum Likelihood method (ML) and further developed by Amisano and Giannini (1997) is employed to estimate the parameters in Equations [2] to [11] for both classes and to calculate standard

errors. The log likelihood is maximized by the method of scoring (with a Marquardt-type diagonal correction).

2.1. Data and variable selection

Five endogenous variables are encompassed in the SVAR models to detect the macroeconomic responses of the Greek economy to monetary innovations in the spirit of other studies of the monetary policy transmission process: output (y), price level (p), money stock (m), credit (c) and a monetary policy variable. There are two classes of models under consideration namely Class B and Class R. For Class B model the monetary policy variable that has been selected is monetary base (b), whereas in Class R model is bank rate (r). In order to disentangle the impact of monetary policy, three different measures of bank credit (c) are considered that is to say credit to households ($c1$), credit to firms ($c2$) and total bank credit ($c3$). Hence, there are three models in class B and class R respectively. Seasonally adjusted monthly time series for Greece over the period 1995:1 to 2005:12 are used. The time series in the SVAR analysis are: industrial production index (y), the consumer price index (p), the monetary base (b), overnight interbank rate (r), narrow money stock M3 (m), bank credit to households ($c1$), bank credit to firms ($c2$) and total bank credit ($c3$) used as three alternative measures of credit. The overnight interbank rate is the bank rate. For the analysis of macro data, economic aggregates such as money stock and monetary base are obtained from monthly statistical bulletins published by the Bank of Greece (BoG). Variables regarding bank credit are based on monthly data provided from the statistics department of Bank of Greece (BoG) as well as monthly data on the overnight interbank rate. Industrial production index IPI and consumer price index CPI are taken from the National Statistical Service of Greece (NSSG).

3. Estimation results

Having ensured stationarity of all variables, the estimation results based on the Maximum Likelihood method (ML) demonstrate the estimated structural relationships for both classes of models in Tables 1 and 2. The significance of the estimated coefficients have been determined taken into account the p-values along with the z-statistic that allow us to perform the test at the 5% significance level, a p-value lower than 0.05 is taken as evidence to reject the null hypothesis of a zero coefficient and a z-statistic greater than 2 at the same significance level respectively. To begin with the monetary-base models, it is apparent that the estimation results of B2 and B3 models are quite similar, however they are not significantly different than that of B1 model. More importantly, on average 6 out of 8 expected signs indicated in the previous section confirm the economic theory behind the equivalent relationship of the structural parameters for all B models.

Table 1: Estimated structural relationships for monetary-base models

Model B1			
$\varepsilon_y = -0.247 (\varepsilon_{c1} - \varepsilon_p) + u_y$			$\sigma(u_y) = 0.052$
(0.220)			
(0.261)			
$\varepsilon_p = 0.021 \varepsilon_y + u_p$			$\sigma(u_p) = 0.005$
(0.008)			
(0.015)			
$\varepsilon_b = 0.007 \varepsilon_y + 1.638 \varepsilon_p + 0.141 \varepsilon_m + u_b$			$\sigma(u_b) = 0.080$
(0.142)	(1.384)	(0.233)	
(0.955)	(0.236)	(0.545)	
$\varepsilon_m = -0.077 \varepsilon_y + 1.290 \varepsilon_p + u_m$			$\sigma(u_m) = 0.030$
(0.052)	(0.514)		
(0.143)	(0.012)		
$\varepsilon_{c1} = 0.435 \varepsilon_p - 0.048 \varepsilon_b + 0.029 \varepsilon_m + u_{c1}$			$\sigma(u_{c1}) = 0.021$
(0.377)	(0.024)	(0.063)	
(0.248)	(0.044)	(0.648)	
Model B2			
$\varepsilon_y = 0.247 (\varepsilon_{c2} - \varepsilon_p) + u_y$			$\sigma(u_y) = 0.053$
(0.420)			
(0.556)			
$\varepsilon_p = 0.032 \varepsilon_y + u_p$			$\sigma(u_p) = 0.004$
(0.008)			
(0.000)			
$\varepsilon_b = 0.005 \varepsilon_y + 2.125 \varepsilon_p + 0.123 \varepsilon_m + u_b$			$\sigma(u_b) = 0.079$
(0.143)	(1.496)	(0.234)	
(0.971)	(0.155)	(0.596)	
$\varepsilon_m = -0.087 \varepsilon_y + 1.483 \varepsilon_p + u_m$			$\sigma(u_m) = 0.030$
(0.054)	(0.553)		
(0.106)	(0.007)		
$\varepsilon_{c2} = 0.343 \varepsilon_p - 0.002 \varepsilon_b - 0.034 \varepsilon_m + u_{c2}$			$\sigma(u_{c2}) = 0.012$
(0.233)	(0.013)	(0.035)	
(0.141)	(0.836)	(0.332)	
Model B3			
$\varepsilon_y = 0.097 (\varepsilon_{c3} - \varepsilon_p) + u_y$			$\sigma(u_y) = 0.052$
(0.575)			
(0.865)			
$\varepsilon_p = 0.032 \varepsilon_y + u_p$			$\sigma(u_p) = 0.005$
(0.009)			
(0.001)			
$\varepsilon_b = -0.001 \varepsilon_y + 2.058 \varepsilon_p + 0.129 \varepsilon_m + u_b$			$\sigma(u_b) = 0.079$
(0.143)	(1.425)	(0.228)	
(0.989)	(0.148)	(0.055)	
$\varepsilon_m = -0.081 \varepsilon_y + 1.336 \varepsilon_p + u_m$			$\sigma(u_m) = 0.030$
(0.055)	(0.541)		
(0.143)	(0.013)		
$\varepsilon_{c3} = 0.202 \varepsilon_p - 0.006 \varepsilon_b - 0.036 \varepsilon_m + u_{c3}$			$\sigma(u_{c3}) = 0.008$
(0.158)	(0.009)	(0.502)	
(0.199)	(0.025)	(0.140)	

Note: The numbers in parentheses are asymptotic standard errors and P-values respectively. σ_u 's are the estimated standard errors of the structural disturbances.

Table 2: Estimated structural relationships for interest-rate models

Model R1		
$\varepsilon_y = -0.049 (\varepsilon_{c1} - \varepsilon_p) + u_y$		$\sigma(u_y) = 0.039$
(0.154)		
(0.749)		
$\varepsilon_p = -0.008 \varepsilon_y + u_p$		$\sigma(u_p) = 0.003$
(0.008)		
(0.341)		
$\varepsilon_r = 2.251 \varepsilon_p - 0.570 \varepsilon_m + u_b$		$\sigma(u_b) = 0.088$
(2.605)	(1.540)	
(0.387)	(0.711)	
$\varepsilon_m = -0.132 \varepsilon_y + 0.909 \varepsilon_p + 0.022 \varepsilon_r + u_m$		$\sigma(u_m) = 0.029$
(0.067)	(0.734)	(0.170)
(0.050)	(0.215)	(0.893)
$\varepsilon_{c1} = 0.934 \varepsilon_p - 0.003 \varepsilon_r + 0.018 \varepsilon_m + u_{c1}$		$\sigma(u_{c1}) = 0.023$
(0.545)	(0.023)	(0.072)
(0.086)	(0.874)	(0.797)
Model R2		
$\varepsilon_y = 0.265 (\varepsilon_{c2} - \varepsilon_p) + u_y$		$\sigma(u_y) = 0.051$
(0.434)		
(0.541)		
$\varepsilon_p = 0.033 \varepsilon_y + u_p$		$\sigma(u_p) = 0.004$
(0.009)		
(0.003)		
$\varepsilon_r = 2.382 \varepsilon_p - 0.079 \varepsilon_m + u_b$		$\sigma(u_b) = 0.088$
(2.751)	(1.980)	
(0.386)	(0.968)	
$\varepsilon_m = -0.082 \varepsilon_y + 1.459 \varepsilon_p - 0.023 \varepsilon_r + u_m$		$\sigma(u_m) = 0.029$
(0.054)	(0.736)	(0.223)
(0.134)	(0.047)	(0.914)
$\varepsilon_{c2} = 0.399 \varepsilon_p - 0.006 \varepsilon_r - 0.049 \varepsilon_m + u_{c2}$		$\sigma(u_{c2}) = 0.011$
(0.213)	(0.011)	(0.033)
(0.062)	(0.579)	(0.143)
Model R3		
$\varepsilon_y = 0.288 (\varepsilon_{c3} - \varepsilon_p) + u_y$		$\sigma(u_y) = 0.036$
(0.398)		
(0.468)		
$\varepsilon_p = 0.000 \varepsilon_y + u_p$		$\sigma(u_p) = 0.003$
(0.009)		
(0.917)		
$\varepsilon_r = 4.657 \varepsilon_p - 0.579 \varepsilon_m + u_b$		$\sigma(u_b) = 0.088$
(3.313)	(2.115)	
(0.159)	(0.784)	
$\varepsilon_m = -0.102 \varepsilon_y + 1.077 \varepsilon_p + 0.025 \varepsilon_r + u_m$		$\sigma(u_m) = 0.030$
(0.075)	(1.235)	(0.250)
(0.172)	(0.383)	(0.918)
$\varepsilon_{c3} = 0.152 \varepsilon_p - 0.000 \varepsilon_r - 0.037 \varepsilon_m + u_{c3}$		$\sigma(u_{c3}) = 0.008$
(0.207)	(0.008)	(0.025)
(0.464)	(0.934)	(0.132)

Note: The numbers in parentheses are asymptotic standard errors and P-values respectively. σ_u 's are the estimated standard errors of the structural disturbances.

The positive sign of the credit coefficient in the aggregate demand equation of B2 and B3 models are in accordance with the economic theory however the coefficient proved to be rather insignificant. In particular, they verify the fact that credit constraints do have an effect on both the level of investment, real economic activity and the level of output. The negative insignificant credit coefficient of model B1 is unexpected. The positive and significant coefficient of output in the aggregate supply equation for all B models, also confirms the economic theory, implying that the short-run Philips curve holds to be true in Greece. Aggregate demand innovations are important determinants of the course of inflation, at least in the short run. Referring to monetary base reaction function, the response of monetary base to output in B1 and B2 models is positive but insignificant indicating that price level targeting has been undertaken with the objective to achieve price stability. The positive but insignificant coefficient of price level to monetary base in all B models can be interpreted as a lack of inflation targeting initiated by the monetary authority. Furthermore, the positive but insignificant response of monetary base to money demand expresses the altering of interest rates by the monetary authority as being able to affect the money supply and keep it under its control by mandating specific types of interest rates that may lead to liquidity shocks. The negative coefficient of output in the money demand function is unexpected suggesting that the level of real output does not exhibit any influence to the money demand. On the other hand, the significant but positive coefficient of level of prices in all B models proves to be a factor that determines the demand for money balances. Most of the coefficients referring to credit supply function are insignificant but the majority of them assert the economic theory. More specifically, in all B models the credit supply is negatively affected by monetary base. It is notable that the negative sign in monetary base cannot affirm the existence of the credit view of monetary transmission mechanism for any form of credit. In other words, the respective negative coefficients in all B models point to the fact that the credit view seems not to be relevant in the individual, corporate or total credit implying a non-operative role of the credit view for any credit category. Additionally, the theoretical uncertainty prevailing the effect of money demand in the credit supply function is evident due to the fact that leads to contradictory signs in the coefficients of B1 model on the one hand and that of B2 and B3 models on the other hand. In particular, model B1 points to a positive impact of money demand shocks on the credit supply function while models B2 and B3 underline a negative impact correspondingly. Having examined the B models it is reasonably to assume that the credit view cannot be supported when monetary base is taken into account.

Turning to class R models, the results of the estimated coefficients for the 3 different models are fairly comparable as they are presented in Table 2. In the aggregate demand function there is an insignificant but positive impact of credit in R2 and R3 models supporting the

economic theory in a way similar to monetary-base models indicating the positive role of credit in output changes. The aggregate supply function is characterized by the significant short-run impact of aggregate demand on price level for R2 model. The right sign can be detected in R3 model though insignificant, while the insignificant and negative sign in R1 justifies a flat short-run supply curve. In the interest rate function which reflects the monetary policy variable for this class of models, it is evident that interest rate responds positively nonetheless insignificantly to price level in R1, R2 and R3 models, which indicates once again absence of inflation targeting by the monetary authority following the corresponding interest rate shock. In the same function, shocks in money demand lead to negative and insignificant effects on interest rate in all R models which is contrary to the responses of monetary-base models discussed above. In this sense, it is logically to assume that when interest rate is taken into account as a monetary-base variable, money demand shocks affect interest rates in a similar way than they affect monetary base. Looking at the money demand function, it doesn't verify the expected positive relationship between money demand and output in any R model, however there is validation for the expected positive relationship between money demand and price level since nominal money demand is proportional to the price level in the economy (notable exception is the independent relationship between real money demand and price level). Additionally, there is validation for the expected reverse relationship between money demand and level of interest rates only in R2 model. R1 and R3 models do not support the expected negative relationship between money demand and rate of interest. Lastly, the estimated coefficients of the credit supply function offer valuable insights for the credit view in the Greek economy. The given economic theory asserting the positive relationship between credit and price level is justified in R1, R2 and R3 models. Once again there is no definite impact of money demand shocks to credit supply, as it is evident in the interest rate models. In R1 model, is apparent the positive effect of money demand shocks to credit supply, while the opposite prevails in R2 and R3 models, rationalising thus the theoretical ambiguity on the issue. The expected negative response, even though insignificant, of credit supply to interest rate innovations in all models implies that banks in Greece do not induce bank loan supply in case of interest rate increase brought about by tighter monetary policy. Thus, the credit view of monetary policy transmission mechanism is inoperative for all types of credit.

To conclude, in spite of a considerable amount of insignificant estimated coefficients in R class models, the general impression for the credit view in Greece is quite prompting. A considerable portion of the estimated coefficients conforms to the imposed restrictions of the economic structure and the outcomes are pretty stable for the 3 alternative credit measures. Both monetary policy variables used in this study cannot support the existence of the credit

on real output, price level, money demand and credit supply as indicated in the economic theory. Approximately 2 quarters after the monetary shock, real output and price level disclose a moderate increase, while credit and money demand reveal a minor almost insignificant rise, which then tend to approach the zero baseline. Especially, the indifferent long-run response of real output is well suited in the economic theory. The negative impact of credit to monetary base resulting from contractionary monetary policy is in favour of the credit view however this outcome is in contrast with estimated structural relationships at least in the short run.

Figure 3. Responses to a monetary policy shock – R2 model

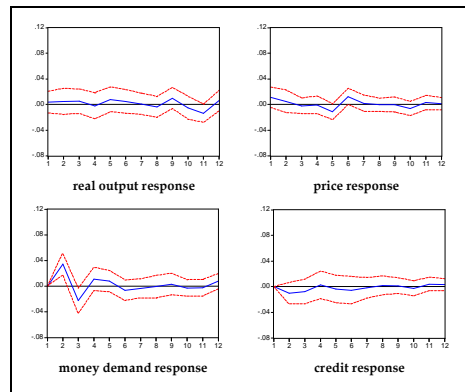
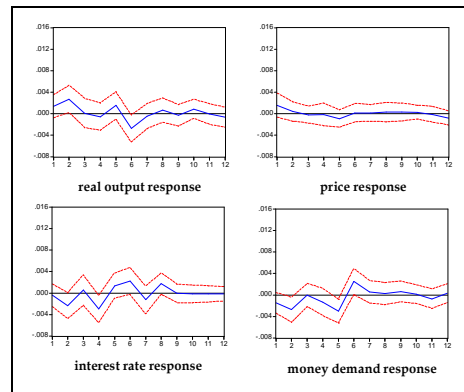


Figure 4. Responses to a credit shock – R2 model



Note: The dashed lines enclose the one-standard deviation of the residuals that have been calculated from the asymptotic distributions of the responses

Responses to a credit shock are depicted in Figure 2 where it is noticeable the positive effect on real output that converges to zero in the following periods, the minor short-term negative impact on money demand, the initial scarcely positive effect on monetary base is accompanied by a relatively unaffected period of no effect and the permanent adverse effect on price level for all the forecast horizon. Hence, the impulse responses present an inconsistency with the estimated structural relationships in the credit supply function and the economic theory as well. Generally speaking, monetary base responds indifferently to credit shock according to the impulse responses, however, the estimated structural coefficient points to a significant but negative impact which fits the economic theory. In other words, a paradox is observed in this case. Monetary base should have the same effect with real output and price level, nevertheless price level seems to have an initial independent response which conforms with the other responses in the long term. Moreover, the corresponding response of money demand as implied by policy reaction function should exhibit a positive effect, though the impulse response of money demand is associated with a rather indifferent short-term effect that converges the baseline in the following quarters. It is reasonably to assume that the

dynamics of the monetary policy shock and money demand may not be captured in the corresponding functions of the structural model.

The impulse responses of R2 model which is based on bank credit to firms are illustrated in Figure 3. Admittedly, they follow a different pattern than that of B1 model and do not follow the same pattern. To be more specific, real output is almost unaffected through the period of 12 quarters following the monetary policy shock which is in this case the interest rate shock. A lagged response of real output to monetary policy fits the economic theory, however the real output remains roughly unchanged 3 years after the corresponding shock. Money demand is positively affected by interest rate shock but this increase does not last more than 2 quarters. Then, a sharp decrease can be detected which ends up to remain steady over the baseline in the long-term. Prices right after a slight drop that lasts for about 5 quarters, show a kind of inertia for the remaining period. The real output and money demand responses pursue a reverse direction than the estimated ones. Likewise, credit supply demonstrates a minor initial decrease until it converges to the baseline for about 8 quarters. This upshot is a strong indication that the credit view of monetary policy transmission is inoperative in Greece for the period under examination.

Finally, in Figure 4 the responses to a credit shock are displayed. Surprisingly, the impulse responses referring to real output, interest rate and money demand confirm both the economic theory and the estimated coefficients in the credit supply function. The real output response in corporate credit is positively affected right after the credit shock whereas the corresponding response in household credit is negatively affected before becoming neutral. Greater impulse responses in credit on output can be taken as an indication of diminishing importance of credit constraints for firms in Greece. A possible explanation for this incident is that household credit in form of consumer and housing loans is a relatively new activity of the banking operations in Greece hence bank loans attracts the interest of Greek banks basically following the transformation system after 1996. Thus, it is reasonable to assume that individual seem to be more vulnerable compared to bank credit for firms for the period 1995-2005.

There are some implications for the credit view after presenting the impulse responses functions for the 2 classes of models that may contribute to the investigation on the bank lending channel of transmission mechanism and shed some light on the issue for the case of Greece. The feeling extracted from the responses is that there is no explicit evidence for the existence of the credit view just encouraging indication no matter if monetary base or interest rate is used as a monetary policy variable given the presence of certain anomalies. To sum up,

the findings of the impulse responses support the view that households instead of firms give the impression of being more credit constrained. This argument is based on the findings referring to the impact of bank credit shock in real output. However, credit constraints to households are somewhat predicted by the structural economic theory, nonetheless it can be verified by the organization and structure of the Greek banking system.

4.2. Variance decompositions

An alternative method to interpret system variables and the properties of the models is the variance decomposition. To assess the importance of the different shocks for the macroeconomic variables, the forecast error variances of the variables are decomposed with reference to the shocks. Given that factorisation is based on structural orthogonalisation, the forecast standard errors are identical to those from the Cholesky factorisation since the SVAR is just identified. It is representative for a variable to elucidate all its forecast variance in short run horizons and smaller percentages in long run horizons. The results for different time horizons are presented in Tables 3 and 4 only for R1 and R2 models, since there is little variability between corporate and total bank credit for both classes of models.

It is another paradox that in the short and long run, all shocks that correspond to each variable's own shocks are important determinants for their forecast errors. For example in Table 3 it is apparent that aggregate supply, monetary policy, money demand and credit supply shocks contribute only a small part to the forecast error variance of real output during the whole forecast period. At the end of time horizon, IS shock accounts for 68,1 per cent of total variation in real output, AS shock for 13 per cent, monetary policy shock, that is the interest rate shock for 5.5 per cent respectively. In the study of Safaei and Cameron (2003) IS shock contributes approximately 53 per cent to the total real output variation after 12 quarters following the shock while aggregate supply shock gradually increases its influence reaching a peak up to 22 per cent. This is an indication that interest rate shocks cannot be considered accurate indicator for monetary policy. As a result the negative impact of money supply shock on real output remains unclear for the case of Greece. Variability in the price level is ruled by aggregate supply shocks in the whole forecast period of 12 quarters however there are considerable temporary effects to IS shock (25,9 per cent). Monetary policy shock has sound effects on interest rate which in turn is influenced in a lesser extent by aggregated demand shocks and even lesser by aggregate supply and credit supply shocks. The IS shock has a moderate impact on money demand particularly in the long run, whereas monetary policy shock seems to influence money demand 2 years following the shock. Lastly, money demand shock demonstrates a slow and unimportant impact to credit to persons revealing a non-operative role in explaining credit variations.

Table 3: Variance decompositions for the R1 model (Proportion of forecast error variable for variable)

Variable	Quarter(s) ahead	IS shock	Aggregate supply shock	Interest rate shock	Money demand shock	Credit supply shock
Real output	1	100.0	0.0	0.0	0.0	0.0
	2	99.6	0.0	0.4	0.0	0.0
	4	91.2	0.4	0.7	6.9	0.8
	8	71.2	12.9	3.2	10.4	2.3
	10	69.4	13.3	4.6	10.3	2.4
	12	68.1	13.0	5.5	10.6	2.8
Price	1	0.7	99.3	0.0	0.0	0.0
	2	7.0	92.2	0.0	0.2	0.6
	4	13.0	84.2	1.8	0.4	0.6
	8	29.4	62.0	2.2	3.5	2.9
	10	27.1	62.1	2.8	4.9	3.1
	12	25.9	60.4	3.8	5.9	4.0
Interest rate	1	0.1	0.5	99.4	0.0	0.0
	2	0.1	0.6	87.7	11.5	0.1
	4	0.3	0.9	81.5	16.4	0.9
	8	1.8	1.7	75.1	14.9	6.5
	10	1.8	1.7	73.5	14.8	8.2
	12	3.3	1.8	71.9	14.7	8.3
Money demand	1	3.5	1.5	1.3	93.7	0.0
	2	3.4	2.0	3.2	89.6	1.8
	4	6.0	2.3	9.6	79.9	2.2
	8	9.3	3.5	9.3	72.2	5.7
	10	12.4	4.9	8.8	67.4	6.5
	12	12.4	6.6	8.4	65.2	7.4
Credit to persons	1	0.2	2.4	0.0	0.1	97.3
	2	0.2	3.0	0.7	0.1	96.0
	4	2.5	2.8	1.9	3.2	89.6
	8	3.0	3.0	2.5	6.7	84.8
	10	3.7	3.0	2.5	6.9	83.9
	12	3.8	3.0	2.5	7.3	83.4

Overall, the variance decompositions for firm bank credit are comparable to some of the impulse responses presented in the previous section. However, some of the variance decompositions are in contrast to the estimated results and the impulse response functions. The money supply shock has a very modest impact on real output and even smaller to the variance of price level and the contribution of aggregate supply shock is noticeable only to money demand and household credit. It is remarkable that credit shock is not an important factor in bringing about essential variations in other variables.

Table 4: Variance decompositions for the R2 model (Proportion of forecast error variable for variable)

Variable	Quarter(s) ahead	IS shock	Aggregate supply shock	Interest rate shock	Money demand shock	Credit supply shock
Real output	1	100.0	0.0	0.0	0.0	0.0
	2	84.1	8.5	0.1	3.4	3.9
	4	70.1	11.0	2.0	9.1	7.8
	8	63.0	13.7	4.2	11.3	7.8
	10	60.7	14.0	4.1	11.8	9.4
	12	60.7	13.8	4.6	11.6	9.2
Price	1	9.5	90.5	0.0	0.0	0.0
	2	9.9	84.4	1.6	2.0	2.1
	4	14.0	72.0	2.2	6.6	5.2
	8	37.4	47.0	2.1	9.4	4.1
	10	36.0	44.5	2.5	13.1	3.9
	12	36.4	43.8	3.1	12.7	4.0
Interest rate	1	0.2	1.6	98.2	0.0	0.0
	2	0.4	1.4	86.0	11.2	1.0
	4	0.6	1.4	80.4	16.1	1.5
	8	1.4	3.8	76.9	16.1	1.8
	10	2.4	4.0	75.7	16.0	1.9
	12	4.2	4.0	73.7	16.1	2.0
Money demand	1	0.5	5.1	0.9	93.5	0.0
	2	0.6	5.2	2.1	91.8	0.3
	4	1.5	5.5	2.1	90.2	0.7
	8	10.6	16.3	8.1	64.3	0.7
	10	14.2	15.6	9.0	59.6	1.6
	12	16.4	15.9	9.0	57.0	1.7
Credit to firms	1	1.4	1.9	0.1	1.6	95.0
	2	5.9	1.7	3.6	6.1	82.7
	4	5.6	1.6	8.5	6.7	77.6
	8	9.4	1.7	12.1	12.7	64.1
	10	9.7	1.7	12.1	12.8	63.7
	12	9.8	2.0	12.0	12.9	63.3

The variance decompositions for R2 model are shown in Table 4. There are several differences but not very determined between household and corporate credit. For corporate credit, credit supply and money demand shocks are greater determinants of real output compared to that of household credit and this influence is apparent in the second quarter after the initial shock but still the percentages are very low and statistically insignificant. Unexpectedly, interest rate shocks do not contribute to real output variation at any forecast period. Money demand shock plays a more active role in the variation of price level of corporate credit along with IS shock. The contribution of IS shock on price is greater for R2 model compared to R1 model

and explains 36.4 per cent of the variation at the end of the forecast period. As far as the interest rate variation is concerned, the majority of the shocks do not alter. When it comes to money demand variation it is evident that aggregate demand and aggregate supply shocks do play a more important role to firm credit for the whole forecast horizon than that in the household credit variation. Finally, the role of aggregate supply shock, interest rate shock and money demand shock is improved for R2 model and on the other hand, the significance of credit supply shock is significantly deteriorated compared to R1 model.

Overall, both classes of bank credit do not exert significant similarities on the variances reported in Tables 3 and 4. It is evident that IS shock has a considerable appeal to real output, price level and to a lesser extent to money demand. The role of AS shock is more restricted to real output, price level and money demand variations. Interest rate shock does not seem to exert a noteworthy influence to the variables of the system. On the other hand, money demand shock has a moderate but stable influence to the variables so it can be considered a reliable source of macroeconomic variation. It is remarkable the fact the credit shock does not seem to be a determinant factor macroeconomic fluctuations.

4. Concluding remarks

This paper examined the importance of bank credit as a critical financial source of variation on output and other major macroeconomic variables in Greece for the period 1995-2005. Following a SVAR approach that imposes contemporaneous constraints in the structural models and distinguishing between household, corporate and total bank lending based on two different classes of models for two different monetary policy variables, the outcomes offer sensible rationale for the specifications embodied in the SVAR models. A reasonable number of precise estimates of the structural parameters is observed, which implies consistency with the theoretical grounds. The feeling derived from the impulse responses fairly fitted the choice of credit measure.

However, lack of similar studies for the case of Greece does not permit comparison on the drawing conclusions although the results of this study mostly match those of Brissimis et al. (2001), the only Greek study that addresses the credit channel by using panel bank level data. The upshots of this study pointed to the restricted role of monetary policy on the supply of bank loans and on aggregate economic activity in general despite the considerable number of statistically insignificant structural estimates. In particular, it seems that it is of minor importance whether monetary base or interest rate are considered as a monetary policy variable since the structural estimates, the impulse responses and the variance decompositions across the models are not in favor of the existence of the bank lending

channel in Greece for the period 1995-2005. However, lack of conclusive evidence calls for further investigation and scrutinisation on the issue. A likely extension of this study would be to encompass other macroeconomic variables or monetary aggregates such as interest rates on loans or deposits. This may prove to be useful to uncover the credit channel in Greece.

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Comparing International Financial Reporting Standards (IFRSs) and Greek GAAP: financial statements effects

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Abstract

Greek GAAP differ substantially from IFRSs and on the basis of recent accounting developments, the present study considers both quantitative and qualitative approaches for analysing the reconciliation statements provided by the Greek listed companies on transition to IFRSs. Qualitative analysis includes description of the differences between Greek GAAP and IFRSs. Quantitative approaches include the use of Gray's conservatism index (1980) for examining the impact caused on companies' financial position and financial performance. The findings suggest that the implementation of IFRSs did indeed have a significant impact on the financial position of Greek listed companies with reference to shareholders' equity, as well as gearing and liquidity ratios. Seven standards, appearing in more than 50% of the companies examined, have significant contribution on these effects. However, in relation to impact on performance, with reference to net income and Return on Equity, the results are inconclusive. The findings of this study suggest that the subject requires further investigation especially in respect of compliance with IFRSs disclosure requirements. It is apparent that many companies provide inadequate disclosures in respect of the transition to IFRSs. This issue appears to be significantly related to the auditing firms have reviewed companies' accounts.

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1. Introduction

In accordance with Regulation (EC) No 1606/2002 of the European Parliament and of the Council of 19 July 2002 all publicly traded companies have to prepare their consolidated accounts on the basis of International Accounting Standards (IASs)/ International Financial Reporting Standards (IFRSs)². This regulation applies from the financial year commencing 1st of January 2005. In Greece, Law 3301/2004 introduced this Regulation to all Greek listed companies' accounts, including individual company accounts³.

In accordance with IFRS 1 "First time adoption of International Financial Reporting Standards", first IFRS financial statements should provide at least one year comparatives under IFRSs (para 36). Moreover, they should explain how the transition from previous GAAP to IFRSs affected companies' reported financial position, financial performance and cash flows by providing reconciliation statements (paras 38-43).

Drawing on the comparative figures and reconciliation statements for the financial year ended 31st December 2004, the present study aims to identify and evaluate the materiality of the impact of IFRSs adoption on companies' financial position and performance for the financial year 2004, and to examine individual standards' effects on shareholders' equity. Given the differences between Greek GAAP and IFRSs (see below), I assumed that the Greek companies' financial position and results would have been affected considerably.

This study makes the following contributions: It provides a review of the current Greek accounting rules and regulations and in-depth comparison of the *de jure* differences between the two GAAPs. Secondly, it provides a methodological contribution by employing Gray's comparability index not only on shareholder's equity and earnings, but also on key financial indicators: Return on Equity (ROE); gearing and liquidity. Thirdly, it provides a benchmark for comparison with companies from other countries, especially those with stakeholder accounting regimes such as Germany and France, which are also facing the transition to IFRSs under a mandatory environment. Finally, investors and analysts will benefit from the findings since I examine and explain which accounting standards affect companies' financial position most.

The remainder of the paper is organised as follows. Section 2 provides an overview of the background to the Greek accounting environment. In section 3 earlier literature pertinent to my study is reviewed. Section 4 discusses the *de jure* differences between IFRSs and Greek GAAP and introduces my research hypotheses. Section 5 describes the data and research methods employed, and section 6 summarises the findings. In section 7 I discuss the limitations of the study and section 8 forms the concluding remarks.

² IASs were issued by the International Accounting Standards Committee (IASC). Since 2001 the International Accounting Standards Board (IASB) has been issuing IFRSs. Many IASs are still in place.

³ This also applies in Italy, the Czech Republic, Estonia, Lithuania, Malta, Slovakia and Slovenia (Bertoni and De Rosa, 2006). For Greece, my interviewees (see below) suggested that this was the case because IFRSs are considered to be higher quality standards and thus would improve comparability of information provided by companies.

2. The Greek Accounting Environment

Background

Greek culture, politics and economics remain affected by a duality of Eastern and Western influences (Caramanis, 2005; Ballas, 1998); in particular, the contrast between ‘a ‘modernising’ reform-minded, Westward-looking, pro-liberal culture and an ‘underdog’, Eastward-looking, anti-reform and pro-statist culture’ with ‘nationalist and xenophobic overtones’ (Caramanis, 2005:202-3⁴). During the last two decades the traditional state corporatism has been modified by modernisation and neo-liberal, free market influences (Caramanis, 2005). Ballas et al. (1998, with reference to Doukas, 1993) stress the political significance of EC membership in 1981 in the transition to democracy in that harmonisation of legislation and institutions limits opportunities for diversion from Western norms. However the ‘underdog’ influence has by no means disappeared (Caramanis, 2005).

Historically, Greek accounting and commercial law have been strongly influenced by French precedents and developments (Ballas, 1994; Ballas et al., 1998). In 1980, in order to facilitate ascension to EU membership Greece adopted a General Accounting Plan closely based on the French Plan Comptable; this was amended in 1987 in accordance with the 4th and 7th EU directives⁵ (Ballas, 1994; see also Venieris, 1999).⁶ Ballas et al. (1998:278) suggest that ‘the Greek Accounting Plan was addressed to an international audience while domestic affairs of taxation and its related bookkeeping remained an exclusively Greek domain’. In fact, with regard to accounting regulation, ‘the Greek state has demonstrated a remarkable degree of autonomy from societal interests’ (Ballas et al., 1998:274). Interest groups are weak, and professional bodies’ interest is indirect, through members with government responsibility (ibid.; see also Venieris, 1999⁷).

Patronage has been a feature of the Greek state, bringing with it a lack of trust and a perception that it is not pursuing the public, but rather sectional interests. This leads to ambivalent behaviour by its citizens: a pursuit of state favour as well as attempts to cheat the system (Ballas et al., 1998, with reference to Charalambis, 1996 and Tsoukalas, 1993), which in turn leads to increased regulation (Ballas et al., 1998). Thus Greece represents a low trust society, which is detrimental to self-regulation of accounting, or trust in the ‘true and fair view’ of financial statements, but requires state regulation and extensive rules, which however increase monitoring costs and distrust (Ballas et al., 1998). This leads to ‘formalism’, which is ‘defined as an excessive adherence to prescribed forms and the use of forms without regard to inner significance’ (Ballas et al., 1998:279). Further:

‘... formalism in Greek accounting is a defining characteristic. It provides reporting entities with ground rules on what is ‘acceptable’ in a manner which can be communicated easily without having to document why a

⁴ With reference to prior literature: Diamantouros, 1993; Faubion, 1993; Herzfeld, 1987, 1993; Mouzelis, 1978, 1986, 1995.

⁵ The implementation of the 7th Directive came into force in 1990. There was no previous legal requirement for group accounts (Papas, 1993).

⁶ Significant differences between Greek and French accounting plans exist in particular in the objectives: in France these are still largely the collection of macro-economic data, in Greece fiscal objectives (Ballas et al., 1998).

⁷ Venieris (1999) provides an overview of the accounting rule-making process and the agencies involved in accounting rule-making in Greece.

specific alternative (disclosure, valuation rules, etc.) is preferred. The existence of a thick rule book allow preparers to claim that ‘rules are rules’ and close the discussion’ (Ballas et al., 1998:279).

The taxation system is ‘a nebulous system of conflicting laws, court decisions and ministerial decisions, which clearly panders to special interests’ (Ballas, 1994:110). The close link between accounting and taxation and the fact that taxes are perceived to be unfairly high, results in tax avoidance and evasion as well as creative accounting (Baralexix, 2004:442). Tax adjustments (such as accelerated depreciation) in financial statements (Venieris, 1999) further distort companies’ results.

The Profession

The accounting/audit profession is relatively young and weak (Baralexix, 2004). Ballas et al. (1998) suggest that capital was not involved in the decision to create the initially ‘quasi-civil service’ (Ballas, 1994:116-7) auditing profession,⁸ but rather that the state was the main constituency for audit services, which were perceived as ‘a technology that could help the state root out dishonest business practices and increase tax revenues’ (Ballas, 1998:716) and as ‘an instrument of social control’ (ibid.:733). Auditing was, until reformed in 1992, not effective, with auditors subjected to management pressure (Baralexix, 2004), auditor liability (until 2000) very limited (Baralexix, 2004) and qualified audit reports disregarded (Ballas, 1994:117). Since 1992, the jurisdiction of the statutory audit has been opened to private auditing firms, including international firms (see Ballas, 1994, 1998; Caramanis, 2002). Since then the audit market has grown considerably and is subject to fierce competition (Leventis and Caramanis, 2005; Leventis et al., 2005), however, the effectiveness of auditing has recently been questioned, leading the profession to take new regulatory measures (see Leventis and Caramanis, 2005). In 2003 (Law 3148/03) the Accounting Standardisation and Auditing Committee (ELTE) was established. This Committee reports to the Minister of Finance and National Economy and deals *inter alia* with professional ethics, audit quality and accounting regulation implementation guidance. Its activities are carried out by the Board of Accounting Standardisation and the Board of Audit Quality (Art. 1-5).

Companies, corporate governance and the stock exchange

Greek company law recognized two main types of company: the Anonymi Etairea (AE, approximately comparable to the French Société Anonyme) and the Etaireia Periorismenis Efthynis (EPE - approximately comparable to the UK Limited Liability Company) (Ballas, 1994). Management performance is poor with losses common, leading to a need ‘to raise funds (especially working capital) from the debt-orientated capital market’ (Baralexix, 2004:443, with reference to the Federation of Greek Manufacturing, 1999). Banks are the main capital provider for Greek companies (Venieris, 1999). Features of bank lending are the importance of collateral, personal relationships, political intervention and social criteria⁹ as well as special rules/advantages for SMEs (see e.g. Ballas, 1994; Ballas et al. 1998; Baralexix, 2004). Debt financing leads to conservatism and an emphasis on historical costs: ‘This has torpedoed many attempts to modernize accounting policies, especially in the area of disclosure’ (Ballas, 1994:114).

⁸ In fact, when a statutory audit requirement was introduced for listed companies in 1959, 40 out of 76 companies delisted (Ballas, 1998).

⁹ Such as number of employees (ibid.).

However, Greek legislation on corporate governance has been updated to cover many aspects of corporate governance rules applied in other European countries. Specifically, the board of directors must be made up of at least 1/3 non-executive members of which at least two must be independent. Legislation also covers mandatory related parties' disclosures and specific requirements in respect of formalizing companies' internal procedures (investors' relations, procedures of employing managerial staff and the organisation and establishment of internal auditing committees (Iliokaftos, 2005).

The Athens Stock Exchange (ASE) was founded in 1876 and since 2000 has been considered a developed market (Mandikidis, 2000), in spite of a collapse in 2000-2003. In September 2006 FTSE classified Greece in the 'watch list', meaning it may change status to 'Advanced Emerging Market' (no earlier than March 2008). At the end of 2006, 317 companies were listed with a total market capitalisation of €158 billion of which 46% belonged to foreign investors (Central Security Depository, 2006). ASE's major indices are: Main index, FTSE 20, FTSE Mid 40 and Small Cap 80. In November 2005, ASE was aligned with the International Classification Benchmark (ICB¹⁰) and since 2 January 2006 Greek listed companies are disaggregated across 17 'super-sectors' (henceforth: sectors). This fact allows comparison of the Greek sectors with the corresponding ones in international stock exchanges such as NYSE, NASDAQ, Euronext and LSE.

The capital market is regulated and supervised by the Hellenic Capital Market Commission (HCMC). HCMC is also authorised to provide accreditation and professional qualifications to fund managers, investment analysts, investment consultants and share traders (Law 2836/00). HCMC's operations are regulated by PD 25/03 and Law 3152/03. The latter transferred the supervisory responsibilities of the Ministry of National Economy to the HCMC. It now officially operates as an independent body although the influence and the supervision of the Ministry of National Economy have been maintained. HCMC was one of the founding members of Forum of European Securities Commissions (FESCO) which preceded the Committee of European Securities Regulators (CESR). Additionally, it is member of the International Organisation of Securities Commissions (IOSCO).

Financial reporting and Transition to IFRSs

Financial Reporting in Greece is traditionally closely linked to taxation (Michalatos, 2001).¹¹ According to the Tax Law (PD 186/92¹²), companies' fiscal year should be of 12 months ending either on 30 June or 31 December (Art. 26). Legislation (Law 2190/20 and PD 360/85) also contains detailed regulation on the publication of full and summarised financial statements. Law 3229/04 (amending Law 2190/20), introduced the mandatory implementation of IFRSs by all Greek listed companies from 1 January 2005.¹³ In February 2006 the HCMC, following auditors' and companies' requests in relation to the difficulties of providing financial statements under IFRSs, abolished the early publication date for summarised financial statements (two months after the year end) but effectively brought forward the required

¹⁰ ICB breaks into four levels of classification consisting of 10 Industries, 18 Super-sectors, 39 sectors and 104 sub-sectors. The Greek sectors are comparable to 17 of the ICB Sectors (ASE, 2005).

¹¹ See Ballas et al. (1998) for a critical interpretation of the Greek state's utilisation of accounting books for tax collection purposes.

¹² Also known as *Code of Books and Records*.

¹³ An earlier (2002) law intended to implement IASs/IFRSs for Greek listed companies never came into force.

publication date for full financial statement (to three months after the year end) (Decision 6/372/15.2.06, Law 3461/06). Subsequently, at the end of March 2006 the first set of annual financial statements of Greek listed companies prepared in accordance with IFRSs became available.

3. Literature Review

Studies using reconciliation statements

Gray (1980) provided the first study attempting to quantify the impact of different national accounting practices on profit measurement by means of a 'conservatism index': $1 - [(R_A - R_D) / |R_A|]$, where R_A = adjusted profits and R_D disclosed profits. Thus Gray's study differed from other studies of harmonization (e.g. van der Tas, 1988; Archer et al., 1995) which instead calculate the *incidence* of accounting differences (Weetman et al., 1998; Street et al., 2000). Measuring post-tax profits as disclosed in French, German and UK financial statements against these profits as adjusted for international financial analysis,¹⁴ Gray found that French and German companies' results were more conservative than the results of the UK companies.

Gray's seminal work has been widely replicated and extended, in particular by studies using of companies' form 20-F reconciliations to US GAAP (Weetman and Gray, 1990; 1991; Cooke, 1993; Hellman, 1993, etc.). Breaking the index down into partial indices (Weetman and Gray, 1990, 1991; Norton, 1995; etc.) also permitted the measurement of the impact of specific adjustments or reconciling items.

Adams et al. (1993) extended the use of the index and of partial indices also to measuring conservatism in equity (see below). Hellman (1993) and Whittington (2000) additionally examined return on equity (ROE). Whittington's study focused on only two companies - one British, one French - from the same industry comparing US GAAP reconciliations, and found that such reconciliations to a common GAAP only have limited benefits for financial analysis. Hellman (1993) expected a conservative accounting regime to yield lower profits *and* lower equity (than a less conservative regime), and that this dual effect would smooth out any effect on ROE; however this was not borne out. Also Norton (1995:199) finds that 'the hypothesis that U.S. GAAP is more conservative than Australian financial reporting practice is not supported in terms of impact on profits, but is supported in terms of the impact on shareholders' equity'.¹⁵ To emphasise the index's use as a measure of comparability (without judging relative conservatism), Weetman et al. (1998) rename the index 'comparability index', a terminology which is adopted by subsequent studies.

While earlier studies consider the materiality of adjustments (see esp. Weetman et al., 1998), such materiality is a specific focus of Adams et al. (1999), who find that while UK reported net income was higher, and UK shareholders' equity lower, than those reported under US GAAP, the majority of adjustments was not material. (Adams et al. (1999) therefore challenge the assumption of the usefulness of US GAAP reconciliation statements.)

Adams et al. (1993) was the first study employing the index in comparing national GAAP with IAS, and found Finnish balance sheet equity measure to be more

¹⁴ The 'European Method' developed by the European Federation of Financial Analysts Societies.

¹⁵ Traditional definitions of conservatism imply understatement of book values *and* earnings figures, however, differences in earnings figures are temporary and will eventually reverse (Garcia Lara and Mora, 2004). Garcia Lara and Mora therefore distinguish between balance sheet conservatism and earnings conservatism, the former implying understatement of the book value of equity, the latter a desire to require a higher degree of verification for recognition of good news than for bad news (*ibid.*).

conservative than IAS adjusted measure. However, results for profit measures were largely not statistically significant. They also found that the Finnish companies' IAS reconciliations offered only limited benefits to financial statement users, mainly because of inconsistent presentation and inadequate explanations. From the late 1990s comparability studies increasingly focused on IAS/IFRS. Initially studies provided descriptive comparisons of IAS measurement rules with those of UK and US GAAP (Weetman et al., 1998) and of the EU directives (Adams et al., 1999). Weetman et al. (1998) found that US GAAP and IAS were becoming more closely aligned as part of the IASB's core standards programme. Such convergence was subsequently confirmed by empirical findings. Street et al. (2000), Uceda Blanco and Garcia Osma (2004) and Haverty (2006) thus measure the difference between IAS/IFRSs and US GAAP based earnings of non-US companies with US listings. One important additional finding of Street et al. was that auditors do not always report on incomplete compliance with IAS. Haverty's findings, based on the financial statements of Chinese companies listed on the New York Stock Exchange, suggest that while there is movement towards convergence, *de facto* a lack of comparability between US GAAP and IAS financial statements prepared by these Chinese companies still exists, mainly due to revaluation of fixed assets under IFRSs but not under US GAAP. The study by Uceda Blanco and Garcia Osma (2004) covers a longer time period than that by Street et al. (2000), including the transition to the IAS 1 revised (1997) and finds that although the number of adjustments increased, their overall materiality declined, and that differences appear to be narrowing.

Among studies not applying the comparability index, Chen et al. (1999) found that during 1994 to 1997 Chinese GAAP earnings were considerably higher than IASs based earnings for companies reporting under both. Changes to Chinese GAAP effective from 1998 however led the authors to expect a reduction in differences after the period investigated. Hung and Subramanyam (2006) examined the impact of voluntary IAS adoption among German companies during 1998 to 2002. They make use of the fact that the financial statements prepared under German accounting rules for the year preceding change to IAS have to be restated on the basis of IAS as comparatives for the year of transition. In line with expectations, they found higher balance sheet conservatism (and income smoothing) under German accounting rules.¹⁶ In a different setting, the same approach was adopted by Goodwin and Ahmed (2006) to examine the transition from Australian GAAP to Australian IFRSs looking at any relationship between firm size and impact from transition to the new accounting regime. Descriptive statistics were used to capture the impact on major balance sheet and income statement items, on reconciling items and income variability. They report that 'more than half of small firms have no change in net income or equity from A-IFRS and that small firms experience higher earnings variability than medium-sized or large firms under A-IFRS' (Goodwin and Ahmed, 2006:460).

The recent transition of European companies to IFRSs as a result of the EU Regulation is now giving rise to studies attempting to capture the impact of this, making use of the 2004 financial statements, initially prepared on the basis of national GAAP and restated under IASs as comparatives for the 2005 financial statements. Thus focusing on the 2004 financial statements of companies listed on the Milan stock exchange, Bertoni and De Rosa (2006), applying Gray's index to net income, equity, ROE, and partial adjustments, find that Italian GAAP is more conservative

¹⁶ This study also reports on the respective value relevance of both sets of financial statements.

than IFRSs, but that this result is not as strong as had been expected. ‘the Italian accounting system does not produce measures systematically more conservative than those derived by the adoption of IFRS’ (ibid.,: 16). Asbitt (2006) made use of the reconciliations of 2004 balance sheets of the FTSE 100 companies under UK GAAP to these balance sheets restated under IFRSs. Not using the comparability index, she examined the effect of the transition on net assets and on individual balance sheet line items. She found that there was no overall significant effect on equity, but that the effect varied for different companies, with no apparent industry effects. Further, ‘the effect of the change in convention on individual line items could have important consequences for financial analysis and contractual obligations’ ((ibid.:117). Lopes and Viana (2007) found, with reference to the comparability index, that the transition to IFRSs had led to less conservative reported profits for Portuguese listed companies. The authors noted also poor compliance with disclosure recommendations and inconsistently presented reconciliations.

With reference to partial indices, prior literature identifies two ways of classifying adjustments reported within the reconciliation statements: a standard approach or a transaction approach. The first combines adjustments with reference to the standard which requires the adjustments (see Weetman and Gray, 1990; Adams et al., 1993; Weetman et al., 1998; Street et al., 2000; Bertoni and De Rosa, 2006; and Asbitt 2006), while the second does so with reference to the specific transactions giving rise to the adjustment (see Ucieda Blanco and Garcia Osma, 2004).

Studies on the Greek market

I have identified two prior studies which examine transition to IFRSs in Greece. Both are non-academic studies published in Greek and not available in the English language.

The first of these was carried out by the HCMC in May 2006. It examined the impact of transition to IFRSs, in terms of percentage changes, on revenues, earnings and shareholders’ equity of Greek listed companies. The study reports its results across 11 sectors but not according to the ICB industry classification employed here. It used the ASE’s industry classification as at 31st December 2005. This means its findings cannot be compared to this or similar studies on IFRSs implementation in other countries which have adopted the ICB classification. Unlike the present study it does not examine the impact on financial indicators and as it was not intended for an international (academic) audience, it also only provides a very brief discussion of the differences between Greek GAAP and IFRSs. Its analysis follows a transaction, and not a standard approach as I do here for reporting the adjustments disclosed in the reconciliation statements. However, like the present study, it reports frequency and significance in value only in respect to adjustments to shareholders’ equity.¹⁷ It acknowledges as limitation the poor quantity and quality of disclosures provided by companies.

The findings of HCMC’s study, which does not exclude outliers, reveal that on average, under IFRSs, equity was 2.44% higher and profit after tax 6.16% higher. The aggregate impact on revenues was not material (decrease of 0.49%; although the Constructions sector was materially affected with an increase of 27.63%). The strongest impact on shareholders’ equity was caused by adjustments to tangible assets,

¹⁷ According to the anonymous key informant interviewee, this was for two reasons: Firstly, the HCMC attributes higher importance to the impact on shareholders’ equity. Secondly, because of timing and resource constraints: the study was published just one month after the publication of companies’ annual financial statements.

deferred tax assets and liabilities, and intangible assets. The most frequent adjustments were recognition of deferred tax assets and liabilities, derecognition of start up costs capitalised as intangible assets and recognition of pension liabilities. Reconciliation adjustments were presented inconsistently and “other” appeared as an adjustment for 52% of companies. This included both positive and negative adjustments which cannot be identified by the reader. As a result, the fact that a high degree of subjective judgment is required to assess the impact of adjustments is mentioned as a limitation of the study (HCMC, 2006).

In June 2006, Grant-Thornton published a more comprehensive study which also reports the differences on earnings and shareholders’ equity.¹⁸ It also does not exclude outliers and found that 54% of firms reported a positive impact on equity. The impact on small companies (small cap 80 index) tended to be negative, that on the two other indices (FTSE 20 and FTSE Mid 40) positive. The effect on net profit was an increase of 4%. The study reports that the most significant positive adjustments related to fixed and deferred tax assets. The most significant negative adjustments related to the recognition of liabilities for employee benefits, impairment losses on loans and receivables and derecognition of start-up costs previously capitalised.

Again some subjective judgment was required in assessing the impact because of deficiencies in format and content of the disclosures. It is indicative that the study reports 20 key areas where companies’ recognition, measurement, and disclosure practices fall short of IFRSs (discussed in sections 4.1.2.2 and 4.1.2.3). Although the findings are presented *inter alia* for the 10 ICB sectors; the constituents of ICB industries and ASE’s indices are those as of the end of May 2006. Accordingly, the findings are not fully comparable to those presented here because of differences in the composition of the sectors used. The study focuses only on impact on earnings and equity and, similar to the HCMC study, very little reference is made to the differences between the two GAAPs. Moreover, the adjustments approach has been also followed here although a reference to the related standards is provided.

Limitations of studies using reconciliation statements

Prior research has identified a number of limitations of approaches based on reconciliation statements. One issue relates to the timing of studies: changes to national accounting regulations date findings and make comparison of earlier studies with later ones problematic.¹⁹ A major problem is non-uniform presentation of reconciliations, requiring researchers to restate data or make adjustments. This appears the case equally for US GAAP and for IAS reconciliation statements (see e.g. Weetman and Gray, 1990, 1991; Adams et al., 1999; Street et al., 2000; Ucieda Blanco and Garcia Osma, 2004; Aisbitt, 2006). Limitations of studies using US GAAP reconciliations relate to questions of whether companies with overseas listings are representative of quoted companies in their home country and their accounting principles of their domestic GAAP, as well as concerns regarding industry specific distortions (Norton, 1995). Also in some cases the small size of populations meant that studies had to adopt a case study approach (Weetman and Gray, 1991; Cook,

¹⁸ The findings of this study were later presented to the European Financial Reporting Advisory Group (EFRAG). Additionally, the results relating to small companies are more comparable to the findings of the current study as I exclude financials which are the bigger ones.

¹⁹ For example, amortisation of goodwill was one of the most material reconciling items between UK and US GAAP (e.g. Weetman and Gray, 1990, 1991), but this is likely to have been addressed by the UK’s FRS 10 (Weetman et al., 1998).

1993) or were conceived as pilot study (Hellman, 1993), rather than testing statistical significance of findings or case study Whittington (2000).

There is also a risk that the results reflect short-term timing differences, which may reverse in later accounting periods (Street et al., 2000). In prior studies this problem was overcome by examining data over a number of years, although as Norton (1995) points out, even then the window of analysis may be too narrow to allow for timing differences to be resolved. However, the current studies examining compulsory transition to IFRSs can only make use of the 2004 financial statements (see above). An additional problem for these and other studies using prior period comparatives is that this carries the risk of ‘noise’ introduced by prior period adjustments (Ucieda Blanco and Garcia Osma, 2004).

Further, *de jure* GAAP may differ from *de facto* accounting practice (Hellman, 1993; Norton, 1995, etc.). This needs to be taken into account when differences in *de jure* accounting regulation are examined and discussed in order to explain or contextualise empirical (comparison index) findings. As Norton (1995: 186) points out: ‘company accounts may continue to be influenced by older, presently unacceptable, accounting policies. Furthermore, companies may adopt a policy of non-compliance in relation to reporting requirements. In such cases reporting practice will differ from reporting requirements’. Similarly Street et al. (2000) found that sample companies violated IASs, although unqualified audit reports indicated compliance. However companies included in the sample had adopted IASs voluntarily and I could add as a reference the rest studies examined compliance with IASs after the implementation of IAS 1 revised which was expected to bring some improvement, as it prohibits companies claiming compliance unless they comply completely (ibid.) (see Street et al, 1999; Street and Bryant, 2000; Cairns, 2001; Street and Gray; 2001; Glaum and Street, 2003).

4. Differences between Greek GAAP and IFRSs and research questions

Differences between Greek GAAP and IFRSs

Greek accounting principles differ substantially from IFRSs and can be characterised as stakeholder-oriented and tax-driven (Ballas, 1994; Spathis et al., 2002). Whilst Greek GAAP follows a ‘prudent’ approach to asset valuation and liability recognition, IFRSs perceive shareholders as the main users of financial statements, promote the ‘fair value’ approach and are independent of tax reporting considerations (Spathis and Georgakopoulou, 2007). The main differences between IFRSs and Greek GAAP are summarised in Table 1.

Table 1 – About Here

As is apparent from Table 1, the concepts of deferred tax, assets held for sale, investment properties, biological assets and biological produce are not recognised by Greek Law. Additionally, the fair value model is not considered. Land and properties can be revalued every four years, but only in accordance with government indices. Depreciation and amortisation rates for tangible and intangible assets are also specified by the government; the estimated useful life of assets is not considered. Start-up costs and interest during the construction period of properties are capitalised together with acquisition costs. Government grants are recognised within equity, proposed dividends are recognised as liabilities, pension deficits are rarely recognised and there are no specific requirements for hedge accounting. Finally, several consolidation differences exist between the two accounting regimes as interests in

joint ventures is treated as investment at cost, subsidiaries with different activities may be excluded from consolidation and the condition of significant influence is not considered for the consolidation of investments in associates (in cases of less than 20% interest).

Research questions

Taking into consideration the substantial differences between IFRSs and Greek GAAP, the following five research questions addressed by this study are:

1. Has the financial position and performance of Greek listed companies been materially affected by the transition to IFRSs?

Accordingly, my purpose is to identify the magnitude/materiality of the change on shareholders' equity, net profit and return on equity.

Additionally, the transition to IFRSs and the changes in companies' financial positions may have an impact on their contractual obligations (Asbitt, 2006, with reference to Ormrod and Taylor, 2004). This becomes an important issue as in Greece banks are the main capital providers for companies. On that basis, the second research question is:

2. Have the liquidity and gearing of Greek listed companies been materially affected under IFRSs?

Having the opportunity to examine a relatively large sample of companies disaggregated across fourteen sectors, I explore the impact on the different sectors. Therefore the third research question is:

3. Is there a difference in the impact across the fourteen sectors and to what extent is the impact on different sectors material?

Although I have identified the major differences between the two sets of GAAPs (Table 1) I believe that the accounting, auditing, and investing communities are interested in knowing which IFRS cause a material impact. In other words do the changes in the bottom line figures derive from aggregate adjustments or did the implementation of particular standards cause distinct and material changes to companies' financial position? Since, because of inconsistencies in presentation and lack of disclosures I was unable to examine the impact of individual standards on income statement reconciliations, my fourth research question focuses on equity, as follows:

4. To what extent the various standards cause a material impact on shareholders' equity?

Following this, I examine the materiality of the impact (or any trends) caused by each standard and the frequency with which the standards appear in companies' reconciliation statements across the different sectors. Subsequently, the fifth research question under examination is:

5. Which standards cause the most material impact and appear most frequently across the different sectors?

5. Research methods and data

Research methods

The present study adopts the comparability index for evaluating the impact of IFRSs on equity and earnings. I follow Hellman (1993), Whittington (2000) and Bertoni and DeRosa (2006) by also employing the index to explore differences in ROE, which is one of the most common performance measures. I expand on previous studies by exploring the impact of IFRSs recognition and measurement requirements on gearing and liquidity. Where Greek reported equity (or other) is compared to that reported under IFRSs, the index is expressed by the formula:

$$1 - \frac{Equity_{IFRS} - Equity_{GR}}{|Equity_{IFRS}|} \quad (1)$$

In parallel to previous studies, a value larger than 1 suggests that equity under Greek GAAP is higher than equity under IFRSs, a value lower than 1 suggests that equity under Greek GAAP is lower than equity under IFRSs and an index value of 1.0 is neutral suggesting no change.

One limitation of the index is that it reports extreme values where equity under IFRSs approaches zero and equity under Greek GAAP is a relatively large amount (cf. Weetman et al., 1998; Street et al., 2000). However, the fact that the formula reports changes comparative to those used under the accounting concept of materiality outweighs the presence of such outliers (cf. Weetman et al., 1998; Street et al., 2000). In addition ‘materiality cannot be judged on a relative value basis when net income is small or the item causes a change from a small net income to a small net loss’ (Street et al., 2000: 45-6; cf. Weetman et al., 1998).²⁰

I follow the prior studies in using as the denominator the ‘yardstick’ or benchmark of the adjusted equity (or other), i.e. here the equity (or other) as reconciled to IFRSs, because I assume that IFRSs are of higher quality than Greek GAAP, and because application of IFRSs is now required by EU and subsequently Greek law. Therefore an international investor would view any differences between Greek GAAP and IFRSs as departures from IFRSs rather than departures from Greek GAAP. This implies that an investor could compare companies from different European countries on the basis of IFRSs reported figures. Using IFRSs as denominator will also aid comparison with other studies focusing on other countries (cf. Hellman, 1993; Adams et al., 1999 with respect to US GAAP). This may be particularly relevant as the current transition period of IFRSs implementation in EU member states, is likely to give rise to comparable studies elsewhere (cf. Bertoni and De Rosa, 2006).

²⁰ As an alternative I considered the ‘forecasting errors’ methodology which is common for identifying the difference between actual earnings and forecasted earnings (Bails and Peppers, 1993; Brown, et al. 1985). However, several advantages of the index led us to employ it for the purposes of the present study: The index not only provides evidence of the magnitude of the changes but also reveals the sign of the change (similar to the ‘forecasting errors’ methodology). In addition to this, when the value computed is multiplied by the IFRSs reported figures the total equals to equity (or other) as reported under Greek GAAP. Moreover, it can be broken down into partial indices, which allows the identification of the impact of each particular adjustment/standard (see below). Most importantly, use of the index allows our results to be compared to other academic studies employing this methodology (Hellman, 1993; Adams et al., 1999; Bertoni and De Rosa, 2006). (I thank Paul Andre for pointing out this alternative).

Although there is no agreed threshold of materiality, most researchers provide their results based on two bands of materiality thresholds: 5% and 10% (Weetman and Gray, 1990; 1991; Weetman et al., 1998; Adams et al., 1999; Street et al., 2000 etc). In addition, because I expect to find changes of considerable magnitude, and to avoid loss of what I consider relevant information, I also provide information based on the 20% band. (These thresholds do not coincide with those of statistical significance).

Similar to the previous studies, I use partial indices for the adjustments in the reconciliations of shareholders' equity. The following formula for measuring partial indices is employed:

$$1 - \frac{\text{Partial Adjustments}}{|\text{Equity}_{IFRS}|} \quad (2)$$

This formula provides a relative measure of the contribution or in other words the significance of each reconciling item. I follow the 'standard approach' (see above) in clustering adjustments and thus examine the effect caused by the adoption of each specific standard. (For example, deferred tax adjustments have been captured as deriving from the adoption of IAS 12 'Income taxes'.) Accordingly, any reported partial adjustment has been allocated to the relevant IFRS(s). I follow this approach because in many cases, items are combined and may have been netted off, i.e. companies explicitly refer to the impact of a particular standard without any further explanation and this does not allow for the identification of the magnitude of several individual adjustments falling within a single standard. The value of the partial index may be interpreted as the % difference between equity under IFRSs and Greek GAAP because of the effect of each individual standard. The partial indices or the impact attributed to the adoption of each standard add up to the total index (which represents the total impact of the adoption of IFRSs) as follows:

$$\text{Total Index: } \sum_1^n \text{Adjustment}_n - (n - 1) \quad (3)$$

Data

In contrast with previous studies based on (sometimes small) samples, the present research investigated the majority of available Greek industrial listed companies' accounts, thus avoiding any sampling bias. Companies belonging to the banking, insurance and financial services sector were excluded (due to their specific accounting and reporting requirements), as were companies whose shares were suspended from trading or were under supervision by the HCMC. Companies which have the 30th of June as their year end were also excluded.²¹ Thus from a population of 318 listed companies (including those under suspension/supervision), 238 companies were utilised in this study. Table 2 provides an analysis of the number of companies utilised in the study, disaggregated across each ICB sector.

Table 2 – About Here

²¹ Jumbo SA, Rainbow SA, Epilektos SA, Texapret SA, Hellenic Sugar Industry SA, Nakas Music SA, CPI Computer Peripherals International SA, Ilektroniki Athinon SA, Alysida SA, Vivere SA, Everest SA.

I acquired from the ASE the 2004 financial statements (under the Greek GAAP) in electronic format. This contained all the line by line items of the statements for each listed company. I then downloaded from the ASE website the 2005 financial statements. From these, I captured ‘by hand’ and transferred to a spreadsheet for analysis the comparative figures referring to the 2004 accounts under the IFRSs, together with the adjustments from the reconciliation statements.

Statistical tests

I employ the ‘one sample Student’s *t*-test for a mean’ to test whether the means of the index values of the bottom line items and financial indicators were statistically significantly different from their neutral value. I acknowledge that this is a parametric test, and although my sample is relatively large and subsequently the central limit theorem applies (Argyrous, 2006), the results have to be treated cautiously because of possibly skewed distributions (cf. Adams et al., 1999). Although I report the median values in parallel to the mean, I do not employ the Wilcoxon signed rank test because this is more appropriate to studies with relatively small sample size (Adams et al., 1999; Pallant, 2005). I employ the non-parametric ‘Kruskal-Wallis H test’ so as to conclude if there is statistically significant difference in the comparability index value (both for total and partial indices) across the fourteen sectors (Pallant, 2005).

6. Results

General findings

Starting from evaluating companies’ reconciliation statements, I created three categories for classifying companies’ transitional disclosures: a) ‘Detailed’, which included companies which provided both reconciliation statements and additional, narrative disclosures explaining the transition to IFRSs; b) ‘Adequate’, which included companies which provided reconciliation statements both for earnings and shareholders’ equity but which did not provide additional narrative disclosures; and c) ‘Inadequate’, within which fall companies which did not provide reconciliation statements, did not provide narrative disclosures or which did provide inadequate narratives (which did not enable the users to evaluate the impact caused by individual standards). Table 3 shows that 42 out of the 238 companies in the sample (17.6%) provided inadequate reconciliation disclosures. It is interesting that only two of these had been audited by a big-four auditing firm. Further, 5 had provided reconciliation statements which did not allow identification of the individual standards’ effects, and the remaining 37 did not provide reconciliation statements for either shareholders’ equity or net income. Subsequently, I examined any possible relationship between companies’ transitional disclosures and their auditors and the Chi-Square test reveals that there is statistically significant relationship between them ($p=0.009$).

Table 3 – About Here

Considering that companies may be less willing to discuss the negative aspects of change in their financial position and performance (see Clatworthy and Jones, 2003), I examined if there is a relationship between the impact on shareholders’ equity and earnings and the transitional disclosures provided. The possible relationship was investigated using Pearson product-moment correlation coefficient. However, like Asbitt (2006), I have to reject this hypothesis as there is no statistically

significant relationship between transitional disclosures and impact on earnings or equity.

Impact on financial position

Users of financial statements are interested in specific companies; however the mean and the median of all companies' results provide a broader picture on overall effects. Accordingly, Table 4 presents the distributions across the materiality bands together with descriptive statistics and the results of the significance test employed. To avoid distortion through extreme values, I have excluded cases where the index values were lower than -2.0 and higher than 4.0. This means that I exclude symmetrically cases where equity (or other) under Greek GAAP was less or more than 300% of that under IFRSs. Appendix 2 presents the companies treated as outliers with their index values for each category examined in this study.

Table 4 shows that, although the median index of 0.99 reveals that more companies were affected positively by the transition to IFRSs (120 compared to 109 with negative impact), the average index value reveals that under Greek GAAP, shareholders' equity was 8% higher of that under IFRSs. Additionally, the *t*-test shows that the mean index of 1.08 was significantly higher than 1 ($p=0.004$). However, the standard deviation (0.42), together with the minimum (0.35) and maximum (2.99) index values reveal that there is a broad range of index values *per se*. In line with prior studies (Weetman et al., 1998) and auditors' perceptions of materiality I consider changes of less than 5% as not material, and changes of more than 10% as material, with a 'grey' area between 5% and 10%. On that basis, 41 companies faced a positive or negative transition change of less than 5% whilst only 5 faced no change. Additionally, 39 are to be found in the 'grey' area of equal or more than 5% and less than 10%. This leaves us with 149 companies facing a material effect ($\geq 10\%$) on their net assets which represents 63% of the total sample (excluding 4 outliers).

Gearing and liquidity have also been affected materially by the transition to IFRSs²². For 191 companies gearing under Greek GAAP was lower. The average gearing ratio index value of 0.61 reveals that gearing under Greek GAAP was 61% of that under IFRSs and the *t*-test shows that this mean is statistically lower than 1.0 ($p=0.000$). As with impact on net assets, a broad range of index values is revealed as the standard deviation is 0.48, the minimum value is 0.00 and the maximum value is 3.02. For only 17 companies are these changes not material and only 2 faced no change; a further 10 fall within the 'grey' area. Subsequently there are 206 companies (87%) with material change in their gearing ratio. The liquidity ratio was higher for 138 and lower for 87 companies under Greek GAAP. As with shareholders' equity, on average the liquidity ratio was 108% of that under IFRSs and the *t*-test shows that the mean index of 1.08 was significantly higher than 1 ($p=0.000$). While the minimum value is 0.02 and the maximum is 2.32, standard deviation in this case is lower compared to the other two measures (0.26). Similarly, fewer companies (132) are facing material effects, however the majority of these (69) faced a change of more than 20% on their liquidity. 64 companies faced a positive or negative transition change of less than 5% and 39 are to be found in the 'grey' area. Companies with no change to their liquidity ratio were 12.

²² Gearing is defined as Total long-term liabilities/Net assets and Liquidity as Current assets/Current Liabilities. When looking at the gearing comparability index the reader should be cautious on the interpretation. A lower than 1.0 index value means that gearing under Greek GAAP was lower, so we see a negative impact which is the opposite interpretation to other measures.

Table 4 – About Here

Although the number of companies varies substantially (from 2 to 39) across the 14 sectors used in this study, Table 5 shows the average index values and the standard deviations for the measures under examination with reference to all sectors in comparison to the overall values. Additionally, Table 6 shows the results of the Kruskal Wallis H test which identifies any statistically significant differences in the index values across the various sectors.

Table 5 – About Here

Table 6 – About Here

The findings in Table 5 reveal that some sectors are affected more strongly (or differently) than others and the findings in Table 6 support this finding as, in relation to all three measures, the index values are statistically different across the sectors (shareholders' equity ($p=0.047$), gearing ($p=0.003$), liquidity ($p=0.000$)). More specifically, the impact on equity was particularly positively high in the 'Health care', 'Oil and gas', and 'Telecommunications' sectors: Greek GAAP reported equity was, respectively, 88%, 77% and 88% of IFRSs. In contrast, equity of companies at the 'Media', 'Technology' and 'Constructions and materials' sectors have been affected negatively: Greek GAAP equity was 20%, 26% and 14% higher than that under IFRSs. Gearing appears to be substantially lower under the Greek GAAP, expressed as a % over IFRSs, for companies in the utilities (38%), personal and household goods (46%), and media (46%) sectors. Although most companies in the remaining sectors follow the same trend, only those in the 'Oil and gas', 'Telecommunications' and 'Travel and leisure' sectors have been affected positively from the transition to IFRSs. Turning to liquidity, the findings reveal that 5 industries have been affected positively and 9 negatively with the average index in the retail sector being 1.02 which means on average a very low negative change. Another characteristic of the liquidity comparability index values is that although we see material (more than 10%) changes in several industries, these are less spread out as the standard distribution values are relatively lower than in relation to the other two measures.

Impact on performance

Under Greek GAAP companies providing consolidated financial statements are not required to report profit after tax. On that basis, this figure was not available for some 50 companies and this study is limited to examining the impact on earnings after tax in the remaining 188 companies provided this information. Information on 12 outliers excluded can be found in appendix 2.

Table 4 shows that compared to shareholders' equity, on average, impact on net income was positive and in particular (earnings under) Greek GAAP were 2% lower than those under IFRSs. Although, the t -test on the mean was inconclusive ($p=0.770$), the median value of 0.96 supports this finding, as does the fact that 99 companies faced a positive change. The majority of those (88) faced a material change of equal or more than 10% whilst, on the other hand, 54 companies faced material negative impact. Only 7 companies' net income did not change and for 28

the change was not material. Finally, it is interesting that only 9 companies fall into the area of 5% to 10% change.

The material and statistically significant negative change to equity seems to affect the impact on ROE as this on average was lower under IFRSs. More specifically, although the *t*-test is again inconclusive ($p=0.416$), it appears that on average ROE was 4% higher under Greek GAAP. The median value of 1.0 is indicative of the fact that 87 companies faced a negative impact and 84 a positive one. Like net income, in the area of 5% to 10% change we find only 14 companies. Additionally, 25 companies faced no or immaterial change and the remaining 137 have been materially affected.

Focusing on the impact on companies' performance in relation to net profit and ROE across the different sectors, tables 5 and 6 report material changes but statistically inconclusive results as the H test reveals no statistically different index values across sectors (net income ($p=0.240$) and ROE ($p=0.105$)). In particular, only companies in the 'Industrial goods & services' sector reported on average net profit of 95% of that under IFRSs. However, the standard deviation of 0.82 reveals substantial spread over the individual changes²³. Furthermore, the average change of four sectors falls in the materiality band of 5% and 10%. For the remaining eight sectors the average impact was material. With reference to ROE, companies in the 'Industrial goods & services', 'Basic resources' and 'Media' sectors have faced a non material change (index values of 0.99, 0.95, and 1.02 respectively). Within the 'grey area' of 5% to 10% change fall companies in further three sectors: 'Retail' (index 1.09); 'Technology' (index 1.06); and 'Food and beverage' (0.93). Like net income, the remaining eight sectors appear to have been materially affected. However, the high standard deviations in all cases merit attention.

Individual standards' effects

Having identified 20 companies which either did not provide reconciliation statements in relation to shareholders' equity (15) or unclear reconciliations (5), this discussion is limited to the 218 companies which I was able to analyse. Additionally, as some companies did not adopt IAS 32 and IAS 39 for the 2004 restated comparatives and adopted them for the restated equity as of 1st January 2005, this discussion refers to equity at the beginning of 2005. However, as I exclude financial companies and as most companies adopted these standards from the date of transition, this fact does not cause a significant change in the aggregate impact on the restated shareholders' equity at 31st December 2004 and 1st January 2005. The same companies treated as outliers in the previous section remain as such in this section.

I report the findings in four tables: 7-10. Table 7 shows the frequency of the 9 standards (including the category 'other') which appear in more than 50% of the companies under examination together with the materiality of each standard based on the 5 categories I have defined. Table 8 reports the significance of the average impact caused by the adoption of each of those 9 standards across the 14 sectors considered in the present study. Tables 9 and 10 show the same information with reference to the remaining 13 standards which appear with less frequency in companies' reconciliations. Although, I focus my discussion on Tables 7 and 8 the reader should be aware that there are 5 standards affecting significantly company's financial

²³ And the one company within the Telecommunications sector reported Greek GAAP earnings being 96% of that under IFRS.

position but they appear in less than 37% of the reconciliations under study (see Table 9).

Table 7 - About here

Table 8 – About here

Table 9 – About here

Table 10 – About here

The absence of the concept of deferred tax under Greek GAAP results in almost all companies (203-94.9%) to make an adjustment because of the adoption of IAS 12. However, the average impact does not appear to be material (index 1.01) or statistically significant ($p=0.056$). However, it worth mentioning that, 42 companies reported a material adjustment on shareholders' equity relating to recognition of deferred tax assets and liabilities. Additionally, although none of the sectors appear to have been affected more than 10% (4 can be found in the 'grey' area of 5% to 10%) the Krustal Wallis H test reveals that the mean across sectors is significantly different ($p=0.000$). The latter allow us to generalise that some sectors face different impact than others. The second standard appearing more often is IAS 38 (almost 91%) which in contrast with IAS 12 causes a change of 7% which is statistically significant. More specifically, on average shareholders' equity under Greek GAAP was 7% higher than that under IFRSs (mainly) because of recognition of start-up costs as intangible assets whereas these do not meet the recognition criteria of IAS 38. The fact that the impact of the adoption of IAS 38 was not material is supported by the fact that 137 companies have a partial index between 0.95 and 1.04. However, companies within the 'Retail' and 'Technology' sectors have been materially negatively affected as the average indices are 1.18 and 1.23 respectively. In common with IAS 12 average partial indices differ significantly across different sectors ($p=0.019$).

Taking into consideration the main characteristics of IAS 16 which are: a) the option of the fair value model to be followed for recognition of property, plant and equipment; and b) the consideration of the useful life of the assets for defining the depreciation period and charges, results in its adoption to cause adjustments to 88.8% of the companies surveyed. Additionally its impact is material (115 of those companies faced a change of more than 10%) and statistically significant ($p=0.000$). This becomes even more obvious by looking at table 8 which shows that only one sector faced a non-material change, one falls in the area of 5% to 10% and the rest 12 faced a material change between 15% and 39%. However, the Kruskal Wallis H test reveals insignificantly different partial indices across sectors ($p=0.075$). The recognition of the defined benefit liabilities required by IAS 19 result in this standard appearing in 185 (86.4%) companies' reconciliation statements causing a statistically significant non-material negative change (index 1.02; $p=0.000$). We find only 11 companies facing a material change and only one sector is on average affected materially ('Oil & Gas'; partial index 1.11) and similar to above the average partial indices differ significantly across sectors ($p=0.000$).

Looking at the adoption of IAS 32 and IAS 39, perhaps the two most discussed IASs, we find that their adoption causes an average negative impact of 9% on 175 companies (81.8%). The main adjustments related to these standards were the deduction of own shares from shareholders' equity (IAS 32) and impairment of loans

and receivables (IAS 39). 40 companies have been affected materially causing a material effect on 4 sectors: 'Healthcare' (1.20); 'Technology' (1.14); 'Constructions & materials' (1.15); and 'Food & beverage' (1.14). However, this evident range of average partial indices across sectors is not statistically significant ($p=0.059$). The same applies to IAS 10 which although appears in 146 companies' reconciliations and causes a statistically significant positive change of 5% the average sectors' partial indices are not statistically different ($p=0.196$). Furthermore, its adoption causes materially positive change only into 12 companies and two sectors: 'Travel & leisure' (0.87) and 'Oil & gas' (0.86). Like IAS 10, IAS 37 appears to cause diverse impact on companies' financial positions. In particular, 134 companies (62.6%) have adjusted their net assets following adoption of this standard with an average statistically significant ($p=0.000$) negative effect of 8%. Although it causes a material impact into 28 companies, on average two sectors have been affected materially: 'Media' (28%) and 'Technology' (12%). Additionally, the Kruskal Wallis H test produces inclusive results relating to the different average partial index values across sectors ($p=0.616$). The last standard appears frequently (59.3%) on companies reconciliation statements is IAS 2 and its adoption causes an average 5% negative change which is statistically significant ($p=0.000$). Additionally it is apparent that companies across the 14 sectors affected differently as there is an apparent statistically significant difference across the partial indices ($p=0.008$). However, only 17 companies faced a material change including those in the 'Utilities' sector which faced on average a material impact of 32% because of implementation of IAS 20.

Finally, in common with the two previous non-academic studies we see that 55.6% of the companies in the sample present adjustments under the category 'Other'. Nevertheless, the mean index value of 1.00, median index value of 1.00 and relatively low standard deviation are indicative of the fact these adjustments do not cause material impact. More specifically, in only 8 companies shareholders' equity these adjustments cause a material change and in only 4 companies cause adjustments which are within the band of 5% to 10%. Similarly, in none of the sectors these adjustments cause a material change and sectors' average index values do not differ significantly ($p=0.805$).

7. Limitations

While Table 1 lists *de jure* differences between Greek GAAP and IFRSs, the empirical analysis focuses on *de facto* differences. In other words, it may be possible that Greek companies had, in their 2004 financial statements, not (completely) complied with Greek GAAP, and/or that they are not (completely) complying with IFRSs in their restatement of the 2004 comparatives (cf. e.g. Hellman, 1993; Norton, 1995; Weetman et al., 1998; Haverty, 2006). This is an important issue because creative accounting is not a rare phenomenon in the Greek corporate practice (see Spathis 2002; Spathis et al. 2002). Additionally, with reference to Table 3 it is obvious that there is a large proportion of companies do not comply with the disclosure requirements of IFRSs. This has been discussed by HCMC's and Grant-Thornton studies and both interviewees mentioned their concerns in respect of compliance with the measurement and recognition aspects. Additionally, Vroustouris²⁴ (2007) states that 'there is the sensation that a systematic audit of financial statements, by experienced and specialised auditors, would reveal many and

²⁴ Mr Vroustouris is member of ELTE.

significant problems in relation to IFRSs' implementation'. Avlonitis (2007),²⁵ with reference to the first IFRSs financial statements, states that in addition to non compliance with IFRSs' disclosure requirements some companies violated the Standards' measurement and recognition requirements.

Norton (1995) also points out that the period covered by studies may not reflect a typical economic environment and typical accounting policies, a consideration that may be especially true in the period of transition: The EU Regulation was passed in 2002, making it likely that at least some companies' accounting policy choices were influenced by anticipation of the change. Further, in common with other studies examining the one-off event of transition to IFRSs we cannot assess the impact of timing differences (cf. also Bertoni and De Rosa, 2006).

8. Conclusion

With reference to the research questions, the key findings of this study are as follows: On average shareholders' equity faced a significant negative change on transition to IFRSs, although the average comparability index is to be found at the 'grey' area of 5% to 10% change. Looking at the reconciliation statements, these reveal that 8 standards appear in more than 59% of companies' reconciliations whilst 7 of those affect significantly shareholders' equity though only one causes a material average impact. Additionally, 5 of these standards appear to cause significantly different impact across sectors.

Material and significant negative impact on gearing is revealed whilst liquidity is similarly changed significantly although its negative change falls into the materiality band of 5% to 10%. Like impact on shareholders' equity for both measures average sector index values appear to be significantly different.

In contrast with impact on financial position impact on financial performance appear to be material for many companies but on average is not statistically significant. More specifically, net income faced a low positive change of 2% but the t-test revealed inconclusive results. Likewise, ROE faced a negative insignificant average change. Furthermore, although 8 sectors have been affected materially, on average, there are no significantly different mean index values across sectors.

With particular interest to regulators, standard setters and investors overall transitional disclosures appear to be of low quality whilst 17.6% provided inadequate reconciliation statements. This also provides an opportunity for researchers to explore in depth overall level of compliance with IFRSs' disclosure requirements as is apparent that these lack uniformity and transparency.

²⁵ Mr Avlonitis is the director of the 'Listed companies supervision' division in HCMC.

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Tables

Table 1 – Key accounting differences between IFRSs and Greek GAAP

IFRSs	Greek GAAP (Law 2190/20)
<p>IAS 2 ‘Inventories’ Inventories shall be measured at the lower of cost and net realisable value (para 9) using the first-in, first-out (FIFO) or weighted average cost formula. For inventories with a different nature or use, different cost formulas may be justified (para 25). IAS 23 ‘<i>Borrowing Costs</i>’ identifies limited circumstances where borrowing costs are included in the cost of inventories (para 17). For the measurement of the cost of inventories, the retail method may be used for convenience if the results approximate cost (para 21). In some circumstances, it may be appropriate to group similar or related items (para 29). Materials and other supplies held for use in the production of inventories are not written down below cost if the finished products in which they will be incorporated are expected to be sold at or above cost (para 32). The amount of any write-down of inventories to net realisable value and all losses of inventories shall be recognised as an expense in the period the write-down or loss occurs. Any reversal arising from an increase in net realisable value shall be recognised as a reduction in the amount of inventories recognised as an expense in the period in which the reversal occurs (para 34).</p>	<p>Inventories shall be measured per-item at the lower of cost and fair value (<i>Per item lower value rule</i>). If fair value is less than cost but higher than net realisable value, measurement shall be made at net realisable value. The cost of inventories can be assigned by all the possible accepted methods (including last-in, first-out / LIFO). The use of the retail method is not permitted. The use of different cost formulas for inventories with different nature or use is not permitted and in no case the grouping of similar or associated goods is permitted (this applies also to the case of material and other supplies). In no case borrowing costs can be included in the cost of inventories, even if they need time to mature. In the event of an increase in fair value of any inventories previously written-down no reversal is recognised.</p>
<p>IAS 10 ‘Events after the balance sheet date’ If an entity declares dividends to holders of equity instruments after the balance sheet date, the entity shall not recognise those dividends as a liability at the balance sheet date (para 12). Such dividends are disclosed in the notes (para 13).</p>	<p>Dividends declared after the balance sheet date shall be recognised as a liability. Only if these dividends are declared for the purpose of increase in capital shall be recognised in equity (D.L. 148/1967, Art. 3).</p>
<p>IAS 12 ‘Income Taxes’ The Standard distinguishes Current from Deferred tax and specifies when a deferred tax asset may be recognised.</p>	<p>There is no distinction between current and deferred tax. The concept of deferred tax does not exist. The advantage related to tax in respect of losses carried forward is not considered neither recognised.</p>

<p>IAS 16 ‘Property, Plant and Equipment’</p> <p>An entity shall choose either the cost model or the revaluation model as its accounting policy and shall apply that policy to an entire class of property, plant and equipment (para 29).</p> <p>The cost of an item of property, plant and equipment comprises: (a) its purchase price, including import duties and non-refundable purchase taxes, after deducting trade discounts and rebates (b) any costs directly attributable to bringing the asset to the location and condition necessary for it to be capable of operating in the manner intended by management (c) the initial estimate of the costs of dismantling and removing the item and restoring the site on which it is located (para 16).</p> <p>If a company applies the revaluation model and an asset’s carrying amount is increased as a result of a revaluation, the increase shall be credited directly to equity under the heading of revaluation surplus (para 39).</p> <p>The depreciable amount of an asset shall be allocated on a systematic basis over its useful life (para 50).</p> <p>The residual value and the useful life of an asset shall be reviewed at least at each financial year-end and, if expectations differ from previous estimates, the change(s) shall be accounted for as a change in an accounting estimate in accordance with IAS 8 ‘Accounting Policies, Changes in Accounting Estimates and Errors’ (para 51).</p>	<p>There is no distinction between different classifications of assets such as held for sale, biological assets or investment properties.</p> <p>Only in respect of properties: any acquisition costs together with interest during the construction period are capitalised as assets under the heading ‘<i>expenses of perennial depreciation</i>’. As a general rule these should either be expensed in the period incurred or amortised in equal tranches over a maximum period of 5 years.</p> <p>Fixed assets are recognised at cost and revaluation is not permitted unless a special law is applicable. The tax law 2065/1992 introduced a system of revaluation, only for land and buildings, which allows revaluation every 4 years following indices provided by the minister of finance. The increase in value is recognised within equity as the company issues free shares to the shareholders.</p> <p>The depreciation is carried in accordance with depreciation indices set by the Ministry of Finance. However, these are not in line with the assets’ useful life. (The most recent P.D. which defines the depreciation factors is the P.D. 299/2003)</p> <p>In case of impairment, on the basis that this is temporary, a provision is recognised.</p>
<p>IAS 17 ‘Leases’</p> <p>The Standards defines explicitly finance and operating leases (para 8) and provides specific recognition and measurement requirements for each case (paras 20 & 33).</p>	<p>There is no distinction between finance leases and operating leases. All leases are treated as operating leases and the accounting treatment is the same with that of IAS 17.</p> <p><i>**It has to be stated though that the Greek GAAP has “converged” with IFRS in this respect. With Law 3229/04 (Art. 13), companies have the option to adopt IAS 17 ‘Leases’.</i></p>
<p>IAS 18 ‘Revenue’</p> <p>The Standard identifies the circumstances in which these criteria will be met and, therefore, revenue will be recognised. It also provides practical guidance on the application of these criteria. As a rule, Revenue is recognised when it is probable that future economic benefits will flow to the entity and these benefits can be measured reliably (Objective).</p>	<p>Revenue recognition is driven by tax considerations. Revenue is recognised as soon as services or products have been invoiced which usually takes place after the delivery of goods or services.</p> <p>The effective interest method is not used for recognising revenue arising from interest.</p>

<p>IAS 19 ‘Retirement benefits’ An entity shall use the Projected Unit Credit Method to determine the present value of its defined benefit obligations and the related current service cost and, where applicable, past service cost (para 64). In measuring its defined benefit liability an entity shall, either recognise a portion of its actuarial gains and losses as income or expense in accordance with the corridor method (para 93), or may adopt a policy of recognising actuarial gains and losses in the period in which they occur and recognise them outside profit or loss, providing it does so for: (a) all of its defined benefit plans; and (b) all of its actuarial gains and losses (para 93A). Actuarial gains and losses recognised outside profit or loss shall be presented in the ‘statement of recognised income and expense’.</p>	<p>Under the Greek Law there is no concept of defined benefit plan. A company has the obligation to pay a lump-sum to the employees who get redundant or retired. The amount of that sum depends on the number of years in employment in the company and the way of leaving the company (redundancy or retirement). In the case of retirement the amount of benefit is equal to the 40% of the amount in the case of redundancy. These benefits fall within the defined benefit schemes under IAS 19. This liability falls into the definition of provisions under Greek law and could be recognised in the balance sheet. However, in practice most of the companies do not recognise this liability.</p>
<p>IAS 20 ‘Accounting for Government Grants and Disclosure of Government Assistance’ Government grants, shall not be recognised until there is reasonable assurance that: (a) the entity will comply with the conditions attaching to them; and (b) the grants will be received (para 7). Government grants shall be recognised as income over the periods necessary to match them with the related costs which they are intended to compensate, on a systematic basis. They shall not be credited directly to shareholders’ interests (para 12).</p>	<p>Government grants, shall not be recognised until there is reasonable assurance that the grants will be received. However the condition about company’s compliance with the conditions attaching to them is not considered. Government grants are recognised directly within shareholders equity. It is not permitted to be recognised as a credit to granted assets.</p>
<p>IAS 21 ‘The Effects of Changes in Foreign Exchange Rates’ Non-monetary items that are measured at fair value in a foreign currency shall be translated using the exchange rates at the date when the fair value was determined (para 23(c)). Exchange differences arising on the settlement of monetary items or on translating monetary items at rates different from those at which they were translated on initial recognition during the period or in previous financial statements shall be recognised in profit or loss in the period in which they arise (para 28).</p>	<p>As stated earlier, it is not permitted the recognition of non-monetary items at fair value. Exchange differences arising on the settlement or on translating loans or credits in respect of acquiring properties at rates different from those at which they were translated on initial recognition during the period or in previous financial statements can be recognised as assets under the heading ‘expenses of perennial depreciation’. Non realisable gains from exchange differences of current receivables are recognised within equity.</p>

<p>IAS 23 ‘Borrowing Costs’ <i>Under the allowed alternative method</i>, borrowing costs that are directly attributable to the acquisition, construction or production of a qualifying asset shall be capitalised as part of the cost of that asset (para 11) and depreciated over its useful life. To the extent that funds are borrowed generally and used for the purpose of obtaining a qualifying asset, the amount of borrowing costs eligible for capitalisation shall be determined by applying a capitalisation rate to the expenditures on that asset. The capitalisation rate shall be the weighted average of the borrowing costs applicable to the borrowings of the entity that are outstanding during the period, other than borrowings made specifically for the purpose of obtaining a qualifying asset. The amount of borrowing costs capitalised during a period shall not exceed the amount of borrowing costs incurred during that period (para 17). Additionally, capitalisation continues during the extended period needed for inventories to mature (para 24).</p>	<p>As stated earlier, borrowing costs that are directly attributable to the acquisition, construction or production of a property either expensed in the period incurred or capitalised separately as assets under the heading ‘<i>expenses of perennial depreciation</i>’ and amortised over a maximum period of five years. To the extent that funds are borrowed generally and used for the purpose of obtaining a qualifying asset, no amount of borrowing costs is eligible for capitalisation. The construction period starts when the loan is received and borrowing costs are not determined on the value of the capital invested but the interest of the loan associated with the construction of the qualified is capitalised. Capitalisation of borrowing costs in relation to inventories is not permitted.</p>
<p>IAS 27 ‘Consolidated and Separate Financial Statements’ A subsidiary is not excluded from consolidation because its business activities are dissimilar from those of the other entities within the group (para 20).</p>	<p>A subsidiary can be excluded from consolidation if its business activities are so dissimilar from those of the other entities within the group where the true and fair view of the financial statements might be distorted. **<i>It has to be stated though that, with Law 3487/06, the Greek GAAP has ‘converged’ with IFRS in this respect.</i></p>
<p>IAS 28 ‘Investments in Associates’ Investments in associates are accounted for using the equity method and the carrying amount includes any goodwill arising. If an investor holds, directly or indirectly less than 20% of the voting power of the investee, it is presumed that the investor does not have significant influence, unless such influence can be clearly demonstrated. Additionally, the standard provides examples of the ways in which the existence of significant influence by an investor is usually evidenced.</p>	<p>Investments in associates are also accounted for using the equity method but the carrying amount does not include any goodwill arising. It is recognised separately in the consolidated statements as intangible asset and is either expensed in the period incurred or amortised in equal tranches over a maximum period of 5 years. The investor shall hold at least 20% of the investment so as to account for it as an associate.</p>
<p>IAS 31 ‘Interests in Joint Ventures’ A venturer shall recognise its interest in a jointly controlled entity using proportionate consolidation or alternatively the equity method (para 30).</p>	<p>The Greek Law remains silent in this respect and interests in joint ventures are carried at cost.</p>

<p>IAS 36 ‘Impairment of Assets’</p> <p>An asset is impaired when its carrying amount exceeds its recoverable amount (para 8) and a company shall assess at each reporting date whether there is an indication that an asset may be impaired. If any such indication exists, the company shall estimate the recoverable amount of the asset (para 9).</p> <p>Irrespective of whether there is any indication of impairment, an entity shall also: test an intangible asset with an indefinite useful life (including goodwill) or an intangible asset not yet available for use for impairment annually (para 10).</p> <p>The Standard defines recoverable amount as the higher of an asset’s or cash-generating unit’s fair value less cost to sell and its value in use (para 18). Value in use is the present value of the future cash flows expected to be derived from an asset or cash-generating unit (para 6).</p>	<p>Like IAS 36, Greek Law requires a company to assess whether there is an indication of impairment. However, it does not consider the value in use and the recoverable amount as a way of testing an asset for impairment. Additionally, the useful life is not considered for the estimation of the asset’s fair value.</p> <p>In case that an asset is impaired, and considering that the impairment will be continual, the impairment is recognised so as the assets value be reduced at the lower cost value between and fair value.</p> <p>This impairment can be reversed. The reversal is optional not mandatory and is treated as exceptional revenue.</p>
<p>IAS 37 ‘Provisions, Contingent Liabilities and Contingent Assets’</p> <p>The Standard explicitly distinguishes provisions from contingent liabilities (para 10). Additionally, it explains the reasons why contingent liabilities are not recognised whilst provisions are recognised (para 12).</p>	<p>Greek Law does not explicitly distinguish provisions and contingent liabilities. In general requires companies to recognise liabilities for any risk can be defined but does not specify recognition criteria. This allows plenty room for subjectivity when deciding whether or not to recognise provisions (see for example pension liabilities). Usually, companies recognise provisions related to tax issues.</p>
<p>IAS 38 ‘Intangible assets’</p> <p>The Standard requires specific criteria to be met for a non-monetary asset without physical substance to be recognised as an intangible (paras 8, 11, 13, 17). Start-up costs do not meet these criteria and should be expensed in the period occurred.</p> <p>Research and Development are clearly distinguished (para 8) and no intangible asset arising from research (or from the research phase of an internal project) shall be recognised. It shall be recognised as an expense when it is incurred. (para 54).</p> <p>An intangible asset arising from development (or from the development phase of an internal project) shall be recognised if, and only if, several criteria are met (para 57).</p> <p>An entity shall choose either the cost model or the revaluation model as its accounting policy (para 72).</p> <p>An entity shall assess whether the useful life of an intangible asset is finite or indefinite and, if finite, the length of, or number of production or similar units constituting, that useful life. An intangible asset shall be regarded by the entity as having an indefinite</p>	<p>Although the definition of an intangible asset is similar to that of IAS 38 there are not specific recognition criteria. Intangible assets are recognised at cost. Additionally, start-up costs, capital expenditure etc (see above) and should either be expensed in the period incurred or capitalised as intangibles under the heading ‘<i>expenses of perennial depreciation</i>’ and amortised in equal tranches over a maximum period of 5 years.</p> <p>As intangible assets can also be recognised licenses and research and development expenses. In particularly, licenses of mobile telecommunications are amortised over a period of 20 years and research and development expenses are amortised over a period of 3 years.</p> <p>However, Law does not explicitly distinguish research and development phases and but reasons that, as such costs may produce long-term</p>

<p>useful life when, based on an analysis of all of the relevant factors, there is no foreseeable limit to the period over which the asset is expected to generate net cash inflows for the entity (para 88).</p>	<p>utilisation benefits permits companies to capitalise them. The Law does not consider the concept of intangible assets with indefinite useful life.</p>
<p>IAS 32 “Financial instruments: disclosure and presentation” Own shares shall be recognised in fair value and be deducted from equity.</p> <p>IAS 39 “Financial instruments: recognition and measurement” The standard allows 4 different categories of financial instruments and permits different recognition and measurement criteria: a) financial assets at fair value through profit or loss; (b) held-to-maturity investments; (c) loans and receivables; and (d) available-for-sale financial assets. After initial recognition, loans and receivables shall be measured at amortised cost using the effective interest method. Financial assets and liabilities that are designated as hedged items are treated under specific hedge accounting requirements.</p>	<p>Own shares are carried at cost as held-to-maturity investments.</p> <p>Greek Law allows only for two types of financial instruments which are similar but not identical to IAS 39: (a) held-to-maturity investments and (b) available-for-sale financial assets. The effective interest method is not considered for subsequent measurement of loans and receivables. The Law does not specify any recognition and measurement requirements for hedge accounting.</p>
<p>IAS 40 ‘Investment property’ The Standard defines explicitly Investment property and requires companies to choose either the fair value model or the cost model and shall apply that policy to all of its investment property (para 30).</p>	<p>Greek Law does not recognise the concept of Investment property. Although a distinction between ‘operating’ and ‘non-operating’ properties exists, the latter are recognised as such only if they have not been used or they are not currently in use. Accordingly, properties held to earn rentals are considered as “operating”. As there is no separate classification of properties and investment properties the cost model is applied to all.</p>
<p>IAS 41 ‘Agriculture’ The Standard provides explicit definitions of a biological asset and agricultural produce (para 5) and provides specific recognition and measurement requirements (paras 10-13)</p>	<p>Greek Law does not recognise the concept of biological assets or agricultural produce.</p>
<p>IFRS 3 ‘Business combinations’ The Standard specifies that all business combinations, within its scope, should be accounted for by applying the purchase method (para 1). Goodwill is measured at cost less any accumulated impairment and is tested for impairment annually or more frequently if events or changes in circumstances indicate that it might be impaired, in accordance with IAS 36 ‘Impairment of Assets’ (paras 54). Any negative goodwill is recognised immediately in the income statement (para 56).</p>	<p>Greek Law permits both the pooling of interests and the purchase method for combinations. However, in most cases companies follow the pooling of interest method and accordingly, goodwill rarely is recognised. Additionally, recognition of negative goodwill is permitted and is recognised in the consolidated shareholders’ equity as ‘difference in consolidation’.</p>

Main source: Sakellis, 2005.

Table 2 - Number of companies per sector*

Media	14
Travel and leisure	16
Health care	8
Retail	13
Personal and household goods	39
Technology	22
Constructions & materials	32
Food and beverage	31
Basic resources	17
Telecommunications	3
Oil and gas	2
Industrial goods and services	27
Chemicals	11
Utilities	3
<i>Total</i>	<i>238</i>

*Appendix 1 shows the constituents of each sector

Table 3 – Transitional information and auditing firms

		Transitional information		
		Detailed	Adequate	Inadequate
Auditing firm	Big four	16	34	2
	Other	56	90	40

Pearson Chi-Square: 9.441^a, 2df, Asymp. Sig. (2-sided) 0.009

^a 0 Cells (.0%) have expected count less than 5.

The minimum expected count is 9.18.

Table 4 – Impact on financial position and performance

	Equity	Earnings	ROE	Gearing	Liquidity
	Comparability Index	Comparability Index	Comparability Index	Comparability Index	Comparability Index
	No of companies	No of companies	No of companies	No of companies	No of companies
Greek GAAP less than 80% of IFRS	43	62	58	162	15
Greek GAAP between 81% and 90% of IFRS	28	16	12	16	21
Greek GAAP between 91% and 95% of IFRS	23	4	3	4	18
Greek GAAP between 96% to 100% of IFRS	26	17	11	9	33
IFRS > GR Index <i>less</i> than 1	120	99	84	191	87
Index = 1 - No change Greek GAAP 100% of IFRS	5	7	5	2	12
IFRS < GR Index <i>more</i> than 1	109	70	87	42	138
Greek GAAP between 100% and 104% of IFRS	15	11	9	8	31
Greek GAAP between 105 & 109% of IFRS	16	5	11	6	21
Greek GAAP between 110 & 119% of IFRS	21	12	11	6	32
Greek GAAP more than 120% of IFRS	57	42	56	22	54
Total number of companies	234	176	176	235	237
Mean	1.08	0.98	1.04	0.61	1.08
Standard Deviation	0.42	0.74	0.71	0.48	0.26
Minimum	0.35	-1.27	-1.15	0.00	0.02
Maximum	2.99	3.12	3.27	3.02	2.32
Median	0.99	0.96	1.00	0.57	1.03
one sample <i>t</i> -test	t=2.904, * <i>p</i> =0.004	t=-0.293, <i>p</i> =0.770	t=0.816, <i>p</i> =0.416	t=-12.455, * <i>p</i> =0.000	t=4.755, * <i>p</i> =0.000

Table 5 – Average comparability indices per sector

Sectors	Total number of companies	Equity Comparability Index		Earnings Comparability Index		ROE Comparability Index		Gearing Comparability Index		Liquidity Comparability Index	
		N*	Mean & St. Deviation	N*	Mean & St. Deviation	N*	Mean & St. Deviation	N*	Mean & St. Deviation	N*	Mean & St. Deviation
Media	14	14	1.20 (0.66)	11	1.20 (0.80)	11	1.02 (0.53)	14	0.46 (0.36)	14	1.08 (0.21)
Travel & leisure	16	16	1.04 (0.45)	12	1.18 (0.55)	13	1.58 (0.79)	16	1.03 (0.67)	16	0.95 (0.25)
Health care	8	7	0.88 (0.25)	6	0.68 (1.05)	5	1.10 (0.39)	8	0.98 (0.75)	8	1.20 (0.22)
Retail	13	12	1.09 (0.48)	12	1.06 (0.72)	12	1.09 (0.52)	12	0.57 (0.38)	13	1.02 (0.11)
Personal & household goods	39	39	1.04 (0.32)	24	0.85 (0.63)	24	0.82 (0.64)	39	0.46 (0.42)	39	1.04 (0.17)
Technology	22	22	1.26 (0.36)	18	1.08 (0.68)	17	1.06 (0.51)	21	0.72 (0.45)	22	1.11 (0.16)
Constructions & materials	32	32	1.14 (0.51)	17	0.75 (0.85)	18	0.81 (0.79)	32	0.49 (0.43)	31	1.22 (0.40)
Food & beverage	31	29	1.10 (0.51)	24	0.91 (0.79)	24	0.93 (0.88)	30	0.53 (0.45)	31	1.20 (0.37)
Basic resources	17	17	0.99 (0.41)	15	0.77 (0.27)	15	0.95 (0.31)	17	0.79 (0.45)	17	1.03 (0.12)
Telecoms	3	3	0.88 (0.38)	1	0.96 (-)	1	1.90 (-)	3	1.12 (0.43)	3	0.87 (0.23)
Oil & gas	2	2	0.77 (0.23)	2	0.93 (0.05)	2	1.25 (0.31)	2	1.18 (0.50)	2	0.92 (0.07)
Industrial goods & services	27	27	0.98 (0.26)	22	0.95 (0.82)	22	0.99 (0.81)	27	0.54 (0.42)	27	0.97 (0.14)
Chemicals	11	11	1.05 (0.23)	10	1.50 (0.95)	10	1.50 (0.87)	11	0.61 (0.31)	11	1.08 (0.09)
Utilities	4	4	1.35 (0.16)	2	2.11 (0.40)	2	1.64 (0.31)	3	0.38 (0.16)	3	0.90 (0.15)
Total	238	234	1.08 (0.42)	176	0.98 (0.74)	176	1.04 (0.71)	235	0.61 (0.48)	237	1.08 (0.26)

N* : Number of companies excluding outliers (For outliers see Appendix II)

Table 6 – Statistical significance test in relation to impact across sectors

	Equity Comparability Index	Earnings Comparability Index	ROE Comparability Index	Gearing Comparability Index	Liquidity Comparability Index
Chi-Square	22.575	16.172	19.616	31.462	38.935
df	13	13	13	13	13
Asymp. Sig.	* $p=0.047$	$p=0.240$	$p=0.105$	* $p=0.003$	* $p=0.000$

Kruskal Wallis Test, Grouping Variable: Sector, *Significant at 5%

Table 7 - Frequency table of distribution and materiality of partial index values

Standard	Count	Mean & St. Deviation	One sample <i>t</i> -test for a mean	Median	Min	Max	Partial Index ≤ 0.90	Partial Index between 0.91 – 0.94	Partial Index between 0.95 – 1.04	Partial Index between 1.05 – 1.09	Partial Index ≥ 1.10
<i>Overall Change</i>	214 (100%)	1.07 (0.40)	2.616 * <i>p</i> =0.010	0.99	0.35	2.99	64	21	46	14	69
IAS 12 “Income taxes”	203 (94.9%)	1.01 (0.09)	1.923 <i>p</i> =0.056	1.00	0.38	1.37	13	10	125	26	29
IAS 38 “Intangible assets”	194 (90.7%)	1.07 (0.17)	5.794 * <i>p</i> =0.000	1.02	0.98	2.25	0	0	137	26	31
IAS 16 “Property, plant and equipment”	198 (88.8%)	0.79 (0.29)	-10.397 * <i>p</i> =0.000	0.87	-1.09	1.35	110	19	54	2	5
IAS 19 “Retirement benefits”	185 (86.4%)	1.02 (0.04)	7.722 * <i>p</i> =0.000	1.01	0.98	1.29	0	0	156	18	11
IAS 32 “Financial instruments: disclosure and presentation”, IAS 39 “Financial instruments: recognition and measurement”	175 (81.8)	1.09 (0.18)	6.407 * <i>p</i> =0.000	1.02	0.84	2.22	2	1	105	29	38
IAS 10 “Events after the balance sheet date”	146 (68.2%)	0.95 (0.07)	-9.207 * <i>p</i> =0.000	0.97	0.38	1.00	12	30	103	0	0
IAS 37 “Provisions, contingent liabilities and contingent assets”	134 (62.6%)	1.08 (0.17)	5.159 * <i>p</i> =0.000	1.02	0.99	2.38	0	0	91	15	28
IAS 20 “Accounting for government grants and disclosure of government assistance”	127 (59.3%)	1.05 (0.09)	6.546 * <i>p</i> =0.000	1.02	1.00	1.70	0	0	86	24	17
Other	119 (55.6%)	1.00 (0.11)	0.105 <i>p</i> =0.916	1.00	0.28	1.71	2	4	107	0	6

*Significant at 5%

Table 8 – Impacts from individual standards on companies' financial position across sectors

Standard	Media	Travel & leisure	Health care	Retail	Personal & household goods	Technology	Constructions & materials	Food & beverage	Basic resources	Tele-coms	Oil & gas	Industrial goods & services	Chemicals	Utilities	Kruskal Wallis ‡Test
<i>Overall</i>	1.19	1.06	0.88	1.11	1.01	1.26	1.10	1.08	0.99	1.07	0.77	0.98	1.03	1.38	21.041 <i>p</i> =0.072
IAS 12	0.95	1.00	0.99	1.03	1.02	0.92	1.02	1.03	1.09	0.95	1.04	1.04	1.01	0.99	43.226 * <i>p</i> =0.000
IAS 38	1.03	1.02	1.05	1.18	1.03	1.23	1.06	1.05	1.08	1.07	1.02	1.03	1.03	1.04	25.670 * <i>p</i> =0.019
IAS 16	0.82	0.93	0.67	0.78	0.83	0.82	0.80	0.80	0.61	0.99	0.78	0.78	0.85	0.75	20.906 <i>p</i> =0.075
IAS 19	1.05	1.00	1.05	1.05	1.02	1.02	1.01	1.02	1.01	1.00	1.11	1.02	1.06	1.02	38.948 * <i>p</i> =0.000
IAS 32/39	1.08	1.05	1.20	1.00	1.05	1.14	1.15	1.14	1.07	1.03	1.00	1.05	1.06	1.07	21.747 <i>p</i> =0.059
IAS 10	0.93	0.87	0.95	0.94	0.97	0.95	0.95	0.95	0.97	-	0.86	0.95	0.98	0.96	15.905 † <i>p</i> =0.196
IAS 37	1.28	1.05	1.03	1.07	1.03	1.12	1.08	1.08	1.06	-	1.00	1.03	1.04	1.02	9.996 † <i>p</i> =0.616
IAS 20	1.02	1.01	1.01	1.00	1.05	1.01	1.04	1.07	1.04	1.02	1.02	1.05	1.04	1.32	28.414 * <i>p</i> =0.008
Other	1.00	1.00	0.93	0.98	1.01	1.00	1.03	0.96	1.07	1.00	1.00	0.99	1.00	1.00	8.567 <i>p</i> =0.805

‡13df, †12df, *Significant at 5%

Table 9 - Frequency table of distribution and materiality of partial index values

Standard	Count	Mean & St. Deviation	One sample <i>t</i> -test for a mean	Median	Min	Max	Partial Index ≤ 0.90	Partial Index between 0.91 – 0.94	Partial Index between 0.95 – 1.04	Partial Index between 1.05 – 1.09	Partial Index ≥ 1.10
<i>Overall Change</i>	214 (100%)	1.07 (0.40)	2.616 * <i>p</i> =0.010	0.99	0.35	2.99	64	21	46	14	69
IAS 17 “Leases”	83 (38.8%)	1.00 (0.10)	0.274 <i>p</i> =0.785	0.99	0.82	1.51	5	6	63	2	7
IAS 27 “Consolidated and separate financial statements”	79 (36.9%)	1.02 (0.07)	3.260 * <i>p</i> =0.002	1.01	0.88	1.30	2	1	62	5	9
IAS 21 “The effects of changes in foreign exchange rates”	64 (29.9%)	0.99 (0.03)	-1.980 <i>p</i> =0.052	1.00	0.85	1.04	1	2	61	0	0
IAS 2 “Inventories”	63 (29.4%)	1.04 (0.05)	6.007 * <i>p</i> =0.000	1.02	1.00	1.20	0	0	46	8	9
IAS 36 “Impairment of assets”	40 (18.7%)	1.10 (0.17)	3.807 * <i>p</i> =0.000	1.03	1.00	1.67	0	0	26	3	11
IAS 18 “Revenue”	31 (14.5%)	1.05 (0.12)	2.282 * <i>p</i> =0.030	1.01	0.95	1.62	0	0	23	4	4
IAS 28 “Investments in associates”	26 (12.1%)	1.07 (0.33)	1.129 <i>p</i> =0.269	1.00	0.94	2.67	0	3	18	1	4
IFRS 3 “Business combinations”	25 (11.7%)	0.97 (0.06)	-2.924 * <i>p</i> =0.007	0.98	0.83	1.11	3	4	17	0	1
IAS 11 “Construction contracts”	20 (9.3%)	1.05 (0.12)	2.097 <i>p</i> =0.050	1.03	0.87	1.32	1	0	13	2	4
IAS 40 “Investment property”	9 (4.2%)	0.76 (0.45)	-	0.95	-0.35	1.00	2	2	5	0	0
IAS 23 “Borrowing costs”	9 (4.2%)	1.01 (0.03)	-	1.00	0.99	1.09	0	0	8	1	0
IAS 31 “Interests in joint ventures	7 (3.3%)	1.02 (0.06)	-	1.02	0.94	1.14	0	1	5	0	1
IAS 41 “Agriculture”	6 (2.8%)	0.89 (0.13)	-	0.95	0.68	0.99	2	1	3	0	0

*Significant at 5%

Table 10 – Impacts from individual standards on companies’ financial position across sectors

Standard	Media	Travel & leisure	Health care	Retail	Personal & household goods	Technology	Constructions & materials	Food & beverage	Basic resources	Tele-coms	Oil & gas	Industrial goods & services	Chemicals	Utilities	Kruskal Wallis Test
Overall	1.19	1.06	0.88	1.11	1.01	1.26	1.10	1.08	0.99	1.07	0.77	0.98	1.03	1.38	21.041 <i>p</i> =0.072 (13df)
IAS 17	0.96	1.04	0.97	1.01	1.01	0.99	1.00	1.00	1.17	1.01	-	0.97	1.00	0.98	11.070 <i>p</i> =0.523
IAS 27	1.00	0.98	1.08	1.02	1.05	1.05	1.03	1.01	1.02	-	-	1.00	1.02	1.02	11.436 <i>p</i> =0.408
IAS 21	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.99	0.98	0.95	0.85	1.00	1.00	-	12.161 <i>p</i> =0.433
IAS 2	1.08	-	1.02	1.04	1.01	1.05	1.06	1.05	1.03	-	-	1.04	1.02	1.01	8.273 <i>p</i> =0.602
IAS 36	-	1.35	1.07	1.39	1.02	1.02	1.01	1.11	1.01	-	-	1.10	1.01	1.31	15.439 <i>p</i> =0.117
IAS 18	1.00	1.01	-	1.01	1.00	1.09	1.02	1.04	1.00	1.00	-	1.32	1.01	1.02	9.879 <i>p</i> =0.541
IAS 28	2.67	1.08	1.00	0.97	1.00	1.02	1.00	0.99	1.00	-	-	1.03	0.96	-	9.364 <i>p</i> =0.498
IFRS 3	0.97	0.99	-	-	0.95	0.92	0.95	0.95	1.00	-	1.02	1.02	0.96	-	7.113 <i>p</i> =0.625
IAS 11	-	-	1.04	-	1.03	1.03	1.07	-	1.00	-	-	1.00	-	1.02	2.274 <i>p</i> =0.893
IAS 40	1.00	-	-	-	-	-	0.60	0.91	-	-	-	0.95	0.98	-	
IAS 23	-	0.99	1.00	-	1.00	-	1.00	1.05	-	-	-	1.03	-	-	
IAS 31	-	-	-	-	1.00	-	1.03	-	-	-	-	.	-	-	
IAS 41	-	-	-	-	-	-	-	0.89	-	-	-	.	-	-	

APPENDICES

Appendix I –Sectors and constituents

Media (14)	LAMBRAKIS PRESS S.A.	TECHNICAL PUBLICATIONS S.A.	IMAKO MEDIA S.A.
	TILETIPOS S.A.	ELEFThERI TILEORASI S.A.	AUDIO VISUAL ENTERPRISES S.A.
	X. K. TEGOPOULOS EDITIONS S.A.	KATHIMERINI PUBLISHING SA	ATTICA PUBLICATIONS S.A.
	ALMA-ATERMON S.A.	LIVANIS PUBLICATIONS SA	NAYTEMPORIKI PUBLISHING S.A.
	LIBERIS PUBLICATIONS S.A.	PEGASUS PUBLISHING S.A.	
Travel and leisure (16)	MINOAN LINES S.A.	ATTICA HOLDINGS S.A.	BLUE STAR MARITIME S.A.
	INTRALOT S.A. INTEGRATED LOTTERY SYSTEMS & SERVICES	ASTIR PALACE VOULIAGMENI S.A.	ANEK LINES S.A.
	KIRIAKOULIS MEDITERRANEAN CRUISES SHIPPING S.A.	NICK GALIS YOUTH CENTERS & ASSISTED LIVING S.A.	HYATT REGENCY S.A.
	GREEK ORGANISATION OF FOOTBALL PROGNOSTICS S.A.	NEL S.A.	IONIAN HOTEL ENT. S.A.
	AUTOHELLAS S.A.	LAMPSA HOTEL CO. S.A.	GEKE S.A.
	OLYMPIC CATERING S.A.		
Health care (8)	MEDICON HELLAS S.A	EUROMEDICA S.A.	AXON S.A. HOLDING
	ATHENS MEDICAL C.S.A.	LAVIPHARM S.A.	DIAGNOSTIC & CURING CENTRE OF ATHENS YGEIA S.A.
	IASO S.A.	VETERIN S.A.	
Retail (13)	SPRIDER S.A	GERMANOS IND. & COM. CO S.A.	NOTOS COM HOLDINGS S.A.
	HELLENIC DUTY FREE SHOPS S.A.	REVOIL S.A.	ATLANTIC SUPER MARKET S.A.
	ALFA-BETA VASSILOPOULOS S.A.	IKONA - IHOS S.A.	AS COMPANY S.A.
	MULTIRAMA S.A.	MICROLAND COMPUTERS S.A.	VARDAS SA
	SFAKIANAKIS S.A.		
Personal and household goods (39)	GR. SARANTIS S.A.	YALCO - CONSTANTINOY S.A.	ELVE S.A.
	KARELIA TOBACCO COMPANY INC. S.A.	EL. D. MOUZAKIS S.A.	ALSINCO S.A
	FOLLI - FOLLIE S.A.	HELLENIC FABRICS S.A.	SATO S.A.
	F.G. EUROPE S.A.	FASHION BOX HELLAS S.A.	ELMEC SPORT S.A.
	CHATZIOANNOU HOLDINGS S.A.	DROMEAS S.A. OFFICE FURNITURE INDUSTRY	EMPORIKOS DESMOS S.A.
	MINERVA KNITWEAR S.A.	DUROS S.A.	FIERATEX S.A.
	PLIAS CONSUMER GOODS S.A.	SP. TASOGLOU S.A.	RIDENCO S.A.

	X. BENRUBI S.A.	ELFICO S.A.	FINTEXPORT S.A.
	RILKEN S.A.	SANYO HELLAS HOLDING S.A.	LANAKAM SA
	VARANGIS AVEPE S.A.	TECHNICAL OLYMPIC S.A.	ETMA RAYON S.A.
	VARVARESSOS S.A. EUROPEAN SPINNING MILLS	FOURLIS S.A.	KLONATEX GROUP OF COMPANIES S.A.
	BIOKARPET S.A. INDUSTRIAL AND COMMERCIAL ENTERPRISES	ZAMPA SA	KNITWEAR FACTORY MAXIM C.M. PERTSINIDIS S.A.
	HELLATEX S.A. SYNTHETIC YARNS	NAFPAKTOS TEXTILE INDUSTRY S.A.	WOOL INDUSTRY TRIA ALFA S.A.
Technology (22)	INFORMER S.A.	MLS MULTIMEDIA S.A.	FORTHnet S.A.
	UNIBRAIN S.A.	LOGISMOS SA	QUALITY AND RELIABILITY S.A.
	CENTRIC MULTIMEDIA S.A.	MARAC ELECTRONICS S.A.	SPACE HELLAS S.A.
	HITECH SNT S.A.	Info-Quest S.A.	NEXANS HELLAS S.A.
	PLAISIO COMPUTERS S.A.	INTRACOM S.A. HOLDINGS	ILYDA S.A.
	ALTEC S.A. INFORM. & COMMUN. SYST.	INTERTECH S.A. INTER TECHNOLOGIES	LOGIC DATA INFORMATION SYSTEMS S.A.
	BYTE COMPUTER S.A.	UNISYSTEMS S.A.	
	PROFILE SYSTEMS & SOFTWARE SA	COMPUCON COMPUTER APPLICATIONS SA	
Constructions and materials (32)	J. & P. - AVAX S.A.	DOMIKI KRITIS S.A.	EDRASIS - C. PSALLIDAS S.A.
	TERNA S.A.	PROODEFTIKH TECHNICAL COMPANY S.A.	KERAMICS ALLATINI S.A.
	BABIS VOVOS INTERNATIONAL TECHNICAL S.A.	PANTECHNIKI S.A.	MATHIOS REFRACTORY S.A.
	ELLINIKI TECHNODOMIKI TEB S.A.	DELTA PROJECT S.A.	BIOSSOL S.A.
	GENER S.A.	TITAN CEMENT COMPANY S.A.	MESOCHORITI BROS CORPORATION
	ATHENA S.A.	INTRACOM CONSTRUCTIONS S.A. TECHN & STEEL CONSTR.	I. KLOUKINAS - I. LAPPAS S.A. CONSTR. AND COM.COMP.
	SHELMAN SWISSHELLENIC WOOD PROD. MANUF. S.A.	MOCHLOS S.A.	BIOTER S.A.
	AKRITAS S.A.	MICHANIKI S.A.	BETANET SA
	N. VARVERIS-MODA BAGNO S.A.	DIEKAT S.A.	ERGAS S.A.
	AEGEK S.A.	HERACLES GENERAL CEMENT COMPANY S.A.	IKTINOS HELLAS S.A.- GREEK MARBLE INDUSTRY
	XYLEMPORIA S.A.	EKTER SA	

Food and beverage (31)	HELLENIC FISHFARMING S.A.	CHATZIKRANIWTIS & SONS MILLS S.A.	PERSEUS SPECIALTY FOODS S.A.
	ALLATINI Ind. and Com Co. S.A.	KRE.KA S.A.	DIAS AQUA CULTURE S.A.
	C. CARDASSILARIS & SONS - CARDICO S.A.	INTERFISH AQUACULTURE S.A.	DELTA HOLDINGS S.A.
	FLOUR MILLS C. SARANTOPOULOS S.A.	KTIMA KOSTAS LAZARIDIS S.A.	ELAIS - UNILEVER S.A.
	KARAMOLENGOS BAKERY INDUSTRY S.A.	FLOUR MILLS KEPENOS S.A.	KEGO S.A.
	KRI-KRI MILK INDUSTRY S.A.	EVROFARMA SA	STELIOS KANAKIS S.A.
	NIREFS S.A.	EUROHOLDINGS CAPITAL & INVESTMENT CORP. S.A.	HIPPOTOUR S.A.
	KATSELIS SONS S.A. BREAD IND.	GREGORY'S MIKROGEVMATA S.A.	J.BOUTARIS & SON HOLDING S.A.
	P.G. NIKAS S.A.	ELBISCO HOLDING S.A.	SELONDA AQUACULTURE S.A.
	KRETA FARM SA	GALAXIDI FISH FARMING S.A	DELTA ICE-CREAM S.A.
	ELGEKA S.A.		
Basic resources (17)	S & B INDUSTRIAL MINERALS S.A.	ETEM S.A.	ALCO HELLAS S.A.
	N. LEVENTERIS S.A.	BITROS HOLDING S.A.	KORDELLOS CH. BROS S.A.
	MYTILINEOS HOLDINGS S.A.	PIPE WORKS L. GIRAKIAN PROFIL S.A.	SIDMA S.A., STEEL PRODUCTS
	ALUMINIUM OF GREECE S.A.	ELVAL ALUM. PROCESS. Co. S.A.	SHEET STEEL CO. S.A.
	HALKOR S.A (FORMER VECTOR)	A. KALPINIS - N. SIMOS Steel Service Center S.A.	SIDENOR S.A. (FORMER ERLIKON)
ALUMIL MILONAS ALUM. IND. S.A.	CORINTH PIPEWORKS S.A.		
Telecommunications (3)	HELLENIC TELECOM. ORG. S.A.	COSMOTE - MOBILE TELECOMMUNICATIONS S.A	LAN-NET S.A.
Oil and Gas (2)	MOTOR OIL (HELLAS) CORINTH REFINERIES S.A.	ELINOIL HELLENIC PETROLEUM COMPANY S.A.	
Industrial goods and services (27)	FRIGOGLASS S.A.	VOGIATZOGLOU SYSTEMS S.A.	CROWN HELLAS CAN S.A.
	METKA S.A.	HELLENIC CABLES S.A.	IMPERIO S.A.
	M. J. MAILLIS S.A.	INFORM P. LYKOS S.A.	KLEEMAN HELLAS S.A.
	VIS Container Manufacturing Co. S.A.	FLEXOPACK S.A.	GEN. COMMERCIAL & IND SA
	PIRAEUS PORT AUTHORITY S.A.	MEVACO S.A.	P. PETROPOYLOS S.A
	E. PAIRIS S.A	NEWSPHONE HELLAS S.A. AUDIOTEX	KARATZIS S.A.

	NEORION HOLDINGS S.A.	ELTRAK S.A.	XAIDEMENOS S.A.
	SPIDER METAL INDUSTRY N.PETSIOS & SONS S.A.	THESSALONIKI PORT AUTHORITY S.A.	VIOHALKO HELLENIC COPPER AND ALUMINIUM INDUSTRY S.A.
	ZENON S.A. ROBOTICS AND INFORMATICS	DIONIC S.A.	PAPERPACK - TSOUKARIDIS S.A.
Chemicals (11)	THRACE PLASTICS CO. S.A.	CYCLON HELLAS S.A.	LAMDA DEVELOPMENT S.A.
	THE HOUSE OF AGRICULTURE SPIROY S.A.	EURODRIP S.A.	NEOCHIMIKI - L.V. LAVRENTIADIS S.A.
	CRETE PLASTICS S.A.	ELTON S.A.	PETZETAKIS S.A.
	DRUCKFARBEN HELLAS S.A.	DAIOS PLASTICS S.A.	
Utilities (3)	ARCADIA METAL IND. C. ROKAS S.A.	THESSALONIKI WATER & SEWAGE Co. S.A.	ATHENS WATER SUPPLY & SEWAGE Co. SA

*Companies' names as provided by ASE.

Appendix II – Excluded companies as outliers

	Equity Comparability Index	Earnings Comparability Index	ROE Comparability Index	Gearing Comparability Index	Liquidity Comparability Index
Index < -2	Microland Computers SA (-7.36)	Veterin SA (-8.16), Fieratex SA (-20.60), Zampa SA (-6.85)	IASO SA (-2.95), Veterin SA (-8.93), Fieratex SA (-26.49), Zampa SA (-6.91), Logic Data Information Systems SA (-4.88)	0	0
Index > 4	Douros SA (2487.17), EuroHoldinngs Capital & Investment SA (8.98), Gregory's Microgevmeta SA (6.65)	Lambrakis Press SA (4.55), ANEK lines SA (4.82), X. Benrubi SA (6.52), AEGEK SA (7.82), Rilken SA (8.68), Compucon Computer Applications SA (32.05), Galaxidi Fish Farming SA (8.53), EuroHoldinngs Capital & Investment SA (23.85), DIEKAT SA (4.33)	Lambrakis Press SA (4.14), X. Benrubi SA (5.50), AEGEK SA (4.03), Rilken SA (9.22), Compucon Computer Applications SA (26.81), EuroHoldinngs Capital & Investment SA (4.43), Galaxidi Fish Farming SA (10.36).	Logic Data Information Systems SA (8.86), Delta Ice-cream SA (4.90)	Keramics Allatini SA (5.47)
Total number of companies excluded	4	12	12	2	1

