European market factors and macroeconomic fundamentals: trend at firm level including the IT bubble and sovereign debt crisis

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Abstract

We analyse the trend in global, country and industry effects at firm level based on an extensive database of 2048 equities spread over 17 European economies and 10 industry groups, running from 1974 to 2013. We find significant increasing market integration and decreasing country effects for most countries and industries since the advent of the EMU. However, these effects are now reversing in the wake of the sovereign debt crises. Industrial factor effects have decreased in technological sectors and increased in "old economy" sectors since the bursting of the IT bubble, and are larger than country effects in most countries and industries. From a macroeconomic point of view, we report evidence of a link between the percentage of variance that can be attributed to the country effect and government budget deficits/surpluses. More strikingly, we find that global common factor effects anticipate changes in GDP by one to three terms. These results support the notion of market integration having macroeconomic predictive power.

Keywords: International diversification; Country/industry effects; European Integration

1 Introduction

The study of the relative importance of global, country and industry factors in explaining equity market movements with a view to evaluating the real impact of international investment alternatives in the reduction of portfolio risks is a common topic in international financial literature. On the one hand measuring the explanatory power of a common international factor serves as an indicator of global market integration and establishes the bottom line for potential benefits of diversification strategies. On the other hand, comparing the strengths of country and industry effects provides a direction that determines the most efficient portfolio compositions. Particular interest has been focused on Europe, not only because of its importance in the global economy but also particularly due to the fact that the implementation of monetary integration and the introduction of the consequent common currency, the Euro, on January 1, 1999 provided the largest near-to-natural experiment that is likely to be found in financial economics. The macroeconomic environment in the continent includes several appealing, unique characteristics such as a very high degree of openness, different levels of monetary policy integration and an even larger diversity in fiscal policies, leading to intrinsic impacts from global crises such as the bursting of the IT bubble and the sovereign debt crisis and enable potential explanations of cross-country correlations to be compared. The historical trend in all these elements is well-documented, as are the main stock markets, and many authors have explored linkages between the two worlds.

This topic was primarily addressed in the pre-Euro era by Drummen and Zimmermann (1992). Their paper presents a factor analysis procedure in 105 equities from 11 European countries. They find that country factors dominate industry and global factors in 1986-89. Heston and Rouwenhorst (1994, 1995), focusing on 12 European markets covering seven different industrial sectors between 1978 and 1992, apply a fixed effects cross-sectional regression model and report that most benefits stem from country rather than sectoral diversification. Beckers et al. (1996) extend this analysis up to February 1995 and also to 10 non-European countries. They conclude that global and country factors are of roughly equal importance in explaining comovements in international stocks and that a significant trend toward market integration within the European Union can be seen in the early 1990s. Rouwenhorst (1999) explores the consequences of the Maastricht Treaty up to August 1998 and finds that the relative strength of country effects is unaffected by increasing economic integration at that time.

Hardouvelis et al. (2006) gauge the importance of an EU-wide risk relative to country-specific risk in 11 Eurozone countries plus UK from January 1991 to June 1998 through a conditional asset pricing model which allows for a time-varying degree of integration. Their findings suggest that market integration substantially increased in the course of the decade and that it was primarily driven by the prospects of the EMU and was independent of any potential simultaneous world-market integration. The UK is an exception to this phenomenon. These results are similar to findings in various other developed countries (see Grinold et al., 1989; Griffin and Karolyi, 1998).

Several publications dating from the early 2000s report that country effects have shrunk internationally to the extent that they have been equalled (Baca et al., 2000) or even surpassed (Cavaglia et al., 2000; Flavin, 2004) by industry effects. These results suggest that industrial diversification may provide a European investor with at least the same level of risk reduction as strategies based on international compositions.

Ferreira and Ferreira (2006) confirm this intuition via a Heston-Rouwenhorst model in EMU countries from 1975 to 2001 and conclude that industry effects are similar in magnitude to country effects in the post-Euro period. Phylaktis and Xia (2006a), using a database covering 34 countries,16 of them European, confirm that since 1999 a major upward shift of industry effects has taken place in Europe.

Eiling et al. (2012) apply a style regression analysis from 1990 to 2008 in eleven of the twelve initial adopters of the Euro (the exception is Luxembourg). They report that the dominance of country over industry effects has reversed since the introduction of the common currency. This reversal is mainly driven by the countries that were least integrated into the EMU and world markets prior to the Euro launch, whereas industry effects were already dominant in countries with stronger economic linkages such as Germany and France. Using a mean-variance approach on the same countries from January 1995 to December 2004, Moerman (2008) confirms that diversification across industries yields more efficient portfolios than diversification across countries. By contrast, Soriano and Climent (2006) suggest, in line with Brooks and Del Negro (2002, 2004), that the variation typically attributed to country effects may to a large extent be explained by regional effects in both developed and emerging countries. They contrast region (rather than country) effects with industry effects and find an overall dominance of region effects over industry effects from January 1995 to December 2004.

However, the financial crisis that started in 2007 and to some extent continues today has become an important event to be considered in this country effect analysis.

In recent years many European economies have had to incur large deficits to meet their social protection commitments to their suddenly impoverished middle and lower classes. This fact, accompanied by a number of downgraded credit-ratings, has placed a serious stress on Europe's sovereign credit profiles, to the extent that some countries have had to ask for bailouts from their Eurozone co-members and the IMF to avoid defaulting on debts or having to abandon of the Euro and re-establish a national currency. European banks own a significant amount of sovereign debt, so concerns regarding the solvency of sovereign states can be expected to have large, negative effects on the behavior of their equities; effects that can span markets and affect most, if not all, sectors in a country. As these events have not affected all of Europe equally or indeed occurred simultaneously in the countries involved, they can be expected to have increased the influence of country factors, even to the extent that they have again come to outweigh industry factors. Using a database that covers twelve Eurozone and four non-Eurozone countries from 1992 to September 2011, Chou et al. (2014) confirm this hypothesis and report that country effects have regained importance to the detriment of industry effects since the bursting of the subprime bubble. This factor reversal is mainly driven by countries with poor economic fundamentals, specifically Portugal, Italy, Ireland, Greece and Spain.

Nevertheless, apart from this regained importance of country factors it is still unclear how overall market integration is affected by these events in what could be a double-shot effect that reinforces the benefits of country diversification. It is well-known (see Estrella and Mishkin, 1998; Qi, 2001; Henry et al., 2004; Nyberg, 2010, among many others) that stock market indices serve as a leading indicator for the real economy, with a lead of between one and three terms, as they price investors' expectations as to the future value of companies and interest rates. From our point of view it also seems logical that investors should tend to diversify risks more in the expectation of expansions, thus producing a fairly consistent global increase in stock prices, whereas they concentrate on stable reliable assets if they stay in the market during recessions. If these decisions occur, they would affect global market integration and we would find a predictive capacity for the real economy in the degree of comovements between equities measured by the explanatory power of a common global factor.

This paper explores this last hypothesis and analyses the validity of previous findings in a historical database that covers the main European macroeconomic scenarios of the last 40 years. To that end we first use the Heston-Rouwenhorst model (HR model hereafter) to estimate time series of global, country and industry factor returns cross-sectionally. In this method the country (industry) coefficients can be interpreted as the return relative to the European index of a portfolio that invests only in that country (industry) and maintains an industry (country) composition identical to that of the European index. The analysis of the cumulative variability of factor returns gauges the predominance of industry vs. country effects in the variability of individual stocks and shows the possibilities of beating the benchmark with diversification strategies that mimic Europe's industry or country composition (see Rouwenhorst, 1999; Cavaglia et al., 2000; Brooks and Del Negro, 2004; Campa and Fernandes, 2006; Bai et al., 2012). However, the HR model is somewhat restrictive since it assumes that all asset factor loadings are 1, which means that multinational companies would have the same degree of exposure to a global effect or a country effect as purely domestic firms.

To overcome this, in a second stage we implement the iterative procedure introduced by Marsh et al. (1997) and later used by Cavaglia et al. (2001) and Phylaktis and Xia (2006b). In this approach the time series of returns of global, country and industry factors estimated cross-sectionally in the HR model are standardised at unit variance and used as exogenous variables at firm level to obtain the relative sensitivity to them (*betas*) of each equity. Then the explanatory powers of the three factors in regard to each equity are calculated and averaged to provide more realistic estimations of factor effects at firm level and thus measure the risks associated with individually diversified strategies. Market integration is jointly measured in this procedure as the average explanatory power of the global factor for all equities (see Beckers et al., 1996).

The paper is structured as follows: Section 2 presents the data, which span 17 countries and 10 industrial sectors. Section 3 introduces the model for the analysis and describes the estimation procedures. Section 4 discusses the estimation results. Section 5 analyses the consequences on the factor effects at firm level of the introduction of the Euro, the IT bubble and the sovereign debt crisis. Section 6 analyses the links between firm-level factors and macroeconomic fundamentals. Section 7 concludes.

2 Data

We use daily returns and market capitalisations for available companies spread across seventeen Western European countries: the twelve initial adopters of the Euro, three non-Eurozone EU Member States (Denmark, Sweden and the United Kingdom) and two non-EU states (Norway and Switzerland). The data are collected from DATASTREAM and extend from January 1, 1974 to April 7, 2014, with different dates of introduction for eight countries due to data availability[1]; specifically Norway enters in 1981, Ireland in 1982, Sweden in 1983, Spain in 1988, Finland, Greece and Portugal in 1989 and Luxembourg in 1993. The equities are classified following the Industry Classification Benchmark (ICB) into ten different industries: Basic Materials, Consumer Goods, Consumer Services, Financials, Health Care, Industrials, Oil & Gas, Technology, Telecommunications and Utilities[2]. Table 1 shows the time availability of equities, ranging from a total of 351

[1] A minimum of five equities was required for entry due to estimation issues.

[2] The ICB (see `www.icbenchmark.com`), developed in 2005 and currently maintained by FTSE International Limited, distinguishes on a coarser to finer scale between industry, supersector, sector and subsector. We only use the first level of the taxonomy, i.e. industry, and refer here

in 1974 to 2048 in 2014, for each country and industry together with their market value percentages[3]. Table 2 shows the distribution of equities through the 17 countries and 10 industrial sectors of our data set as of April 7, 2014. The UK is the most widely represented country in our sample in terms of both number of equities and market value. In the Eurozone, France and Germany have around the same weight, followed by Italy, Spain and Netherlands. Regarding sectors, Financials is the largest group of equities, exceeding Industrials by more than one hundred and having twice the number grouped under Consumer Goods. The least widely represented industry in number of equities is Telecommunications. The distribution of market value total weights is more balanced and Financials only outweighs Consumer Goods by four points and Industrials by eight.

Working on a daily basis provides a more refined set of results than in past publications. Specifically, global, country and industry effects are estimated yearly for all countries and industrial sectors.

3 Methodology

The first stage of our approach is to adopt the fixed effects model presented by Heston and Rouwenhorst (1994, 1995) (the HR model), which has been extensively used in the literature on the analysis of common factors in returns (see Beckers et al., 1996; Rouwenhorst, 1999; Baca et al., 2000; Cavaglia et al., 2000; Wang et al., 2003; Brooks and Del Negro, 2004; Flavin, 2004; Isakov and Sonney, 2004; Campa and Fernandes, 2006; Ferreira and Ferreira, 2006; Phylaktis and Xia, 2006a,b; Bai et al., 2012; Chou et al., 2014) and in the decomposition of stock risks (Bai and Green, 2010) and firm default risks (Aretz and Pope, 2013). From this perspective the total return of equity j on day t (R_{jt}) can be written as

$$R_{jt} = \alpha_t + \gamma_{ct} + \delta_{it} + \varepsilon_{jt}. \tag{1}$$

In model (1), α_t represents a common or global return for all equities, γ_{ct} a country-specific return shared by all equities in country c, δ_{it} an equivalently defined industry-specific return and ε_{jt} a firm-specific idiosyncratic component

interchangeably, as is common among specialists in this field, to industries or sectors. We use this class scheme for the full sample, including data prior to 2005, as its broad categorization provides robustness against a look-ahead bias. We also rely on Marsh et al. (1997), Baca et al. (2000) and Isakov and Sonney (2004), who compare different schemes and show that the degree of industry granularity does not affect the results in terms of the relative importance of effects.

[3] All market values are in ECU/Euro currency. In the cases of the five non-Eurozone countries the currencies were exchanged using the rates published by Eurostat (see `ec.europa.eu/eurostat`) extending from July 1st, 1974. For the six first months of this initial year the first available rate datum was taken as a reference. Macroeconomic data on all countries are also obtained from Eurostat.

Table 1: Number of equities per year and percentage of market value.

This table reports the time availability of equities (*panel A*) and market value percentages (*panel B*) for industries and countries for some representative years. A minimum of five equities was required for the estimation of industry and country factor returns.

	1974	1981	1989	1997	2005	2013
Panel A: Number of equities						
Austria	5	5	13	28	39	50
Belgium	16	16	34	39	68	86
Denmark	11	13	24	38	44	49
Finland	-	-	13	34	42	48
France	30	39	66	151	208	241
Germany	42	45	85	119	197	243
Greece	-	-	16	25	47	50
Ireland	4	4	12	14	23	33
Italy	19	19	45	63	117	154
Luxembourg	-	-	-	15	19	28
Netherlands	33	36	55	72	97	110
Norway	2	5	12	19	35	45
Portugal	-	-	13	25	38	48
Spain	-	-	21	52	86	118
Sweden	-	-	28	46	61	70
Switzerland	25	33	64	90	122	147
United Kingdom	164	168	226	336	424	528
Basic Mats	20	21	45	71	93	122
Consumer Gds	52	57	105	160	210	239
Consumer Svs	45	49	84	127	199	242
Financials	100	108	209	350	459	587
Health Care	7	11	20	47	81	113
Industrials	105	112	199	290	387	448
Oil & Gas	8	10	20	29	49	77
Technology	5	5	24	46	108	122
Telecom	1	1	5	12	27	34
Utilities	8	9	16	34	54	64
TOTAL	351	383	727	1166	1667	2048
Panel B: Market value percentages						
Austria	0.25	0.13	0.33	0.48	0.81	0.98
Belgium	1.79	1.1	1.76	1.47	2.37	2.64
Denmark	7.9	0.94	1.08	1.21	1.59	2.03
Finland	-	-	0.37	1.37	2.12	1.41
France	6.79	9.5	13.88	12.9	16.26	15.58
Germany	25.87	25.65	17.64	15.06	11.6	13.66
Greece	-	-	0.11	0.43	1	0.28
Ireland	0.11	0.18	0.27	0.31	0.47	0.45
Italy	1.53	2.54	5.55	3.6	7.28	4.52
Luxembourg	-	-	-	0.14	0.3	0.38
Netherlands	12.27	7.04	5.94	7.42	4.58	4.32
Norway	4.94	0.94	0.77	0.92	1.48	2.44
Portugal	-	-	0.17	0.57	0.81	0.56
Spain	-	-	4.09	4.58	6.19	5.33
Sweden	-	-	3.1	4.44	4.09	4.88
Switzerland	23.03	7.29	6.34	10.77	9.69	11.32
United Kingdom	15.52	44.7	38.58	34.35	29.37	29.24
Basic Mats	12.22	9.88	7.65	6.25	4.72	8.53
Consumer Gds	18.81	14.02	19.94	14.94	12.35	18.56
Consumer Svs	4.68	8.67	10.24	11.87	9.18	7.87
Financials	19.36	24.1	23.96	22.98	27.41	21.25
Health Care	13.07	3.78	4.65	9.94	8.51	9.1
Industrials	20.26	15.3	13.88	11.52	10.92	13.56
Oil & Gas	5.27	18.65	8.8	8.27	8.74	8.86
Technology	0.15	0.32	1.69	3.26	3.8	2.94
Telecom	0.04	0.26	6.32	6.75	9.16	4.44
Utilities	6.14	5.01	2.87	4.23	5.21	4.89

Table 2: Country-Industry distribution of equities.

This table reports the distribution of the number of equities between countries and industries at the end of the period (April 7, 2014).

	Basic Mats	Cnsmr Gds	Cnsmr Svs	Finan-cials	Health Care	Indus-trials	Oil & Gas	Techno-logy	Tele-com	Utili-ties	TOTAL
Austria	3	8	1	17	0	15	2	0	1	3	50
Belgium	6	9	7	31	9	15	1	5	2	1	86
Denmark	1	8	1	11	12	12	1	1	1	1	49
Finland	8	5	5	6	2	17	1	2	1	1	48
France	6	41	31	52	18	51	8	24	1	9	241
Germany	19	34	28	42	18	58	5	27	4	8	243
Greece	5	4	10	12	1	9	2	2	1	4	50
Ireland	4	7	7	4	1	3	5	1	1	0	33
Italy	4	26	16	41	5	37	5	6	2	12	154
Luxembourg	0	3	4	19	0	0	0	0	0	2	28
Netherlands	6	13	10	29	3	28	2	17	2	0	110
Norway	2	7	2	7	0	8	15	2	1	1	45
Portugal	6	5	12	7	1	9	1	3	2	2	48
Spain	9	15	13	26	9	24	6	5	4	7	118
Sweden	5	7	4	23	4	21	1	3	2	0	70
Switzerland	6	12	8	50	16	40	0	8	1	6	147
U.K.	32	35	83	210	14	101	22	16	8	7	528
TOTAL	122	239	242	587	113	448	77	122	34	64	2048

assumed to be distributed with zero mean and finite variance, all valued at time t. In regression form, the model becomes

$$R_{jt} = \alpha_t + \sum_{c=1}^{17} \gamma_{ct} C_{cj} + \sum_{i=1}^{10} \delta_{it} I_{ij} + \varepsilon_{jt}, \tag{2}$$

where C_{cj} and I_{ij} are dummies each defined as $C_{cj} = 1$ if equity j is in country c and 0 otherwise and $I_{ij} = 1$ if equity j is in industry i and 0 otherwise. This specification rules out any interaction between industries and countries and assumes that each equity belongs exclusively to one country and one industry throughout the sample period.

Model (2) can be estimated by taking into account the sum-to-zero restrictions below on both sets of country and industry parameters for each t,

$$\sum_{c=1}^{17} v_{ct}\gamma_{ct} = 0 \quad \text{and} \quad \sum_{i=1}^{10} w_{it}\delta_{it} = 0,$$

where the weights v_{ct} and w_{it} are the sum of market values for each country and each industry. We estimate the daily parameters via a Weighted Least Squares cross-section regression with weights equal to the daily market value for each equity. The estimated country (industry) coefficients $\hat{\gamma}_{ct}$ $(\hat{\delta}_{it})$ can be interpreted as the return relative to the weighted European index of a portfolio that invests only in country c (industry i) and keeps an industry (country) composition identical to that of the European index. This portfolio represents the pure bet on country c (industry i) without industry (country) bias.

Stage two consisted of implementing the iterative procedure introduced by Marsh et al. (1997) but stopping, as in Cavaglia et al. (2001) and Phylaktis and Xia (2006b), at the second step. The time series of returns of global, country and industry factors estimated in model (2) are standardised at unit variance and used as exogenous variables in a regression model at firm level to obtain the relative sensitivity to them (*betas*) of each equity. This allows us to gauge the reproducibility of the global, country-specific and industry-specific factors by individual equities and provides a measurement of the risks associated with individually diversified investment strategies. We then proceed to estimate the following factorial model

$$R_{jt} = \sum_{k=G,C,I} \beta_j^k f_t^k + e_{jt}, \tag{3}$$

where f_t^k are the global (G), country (C) and industry (I) factors that correspond to the previously estimated standardized $\hat{\alpha}_t$, $\hat{\gamma}_{ct}$ and $\hat{\delta}_{it}$ and β_j^k are the respective factor loadings. Based on (3), a firm's total variance can be decomposed into the sum of portions of variance explained by each of the factors and the idiosyncratic component[4], that is,

$$Var\left(R_j\right) = \sum_{k=G,C,I} \left(\hat{\beta}_j^{\,k}\right)^2 + \hat{\sigma}_j^2. \tag{4}$$

The overall contribution of each factor is then assessed through the value weighted average of the corresponding proportional squared *betas*, that is,

$$PV^k = \sum_{j=1}^{N} \omega_j \frac{\left(\hat{\beta}_j^k\right)^2}{Var\left(R_j\right)} \tag{5}$$

where $k = G, C, I$, is the variance source component (global, country or industry), PV^k accounts for *Proportion of variance*, N is the number of equities and ω_j is the proportional market value of equity j as on the last date included in model (3).

The relative strength of country versus industry effects is assessed via the ratio of the corresponding PV^C/PV^I. This PV ratio provides a measure of the relevance of country or industry factors for individual equities. If it is greater than 1 then country factors explain a larger proportion of the variability of individual equities than industry factors.

[4]Equation (4) is based on the orthogonality of regressors in (3). As usual in the relevant literature, this restriction was not imposed in the estimation of model (2). Squared correlations over 0.1 between the conceptually unrelated factors estimated were rare in any case.

As a robustness check, we also run a principal component analysis that calculates alternative global, country and industry factor returns. In this method, a global singular maximum variance common component is first estimated using all available equities. Then country and industry factors are equivalently extracted in the residuals from the global component of the implied equities in each case. We thus obtain orthogonal estimates of the country and industry factors with respect to the global factor. The proportions of variance for each factor are finally assessed as above as the value weighted average of the proportions of variance explained for each equity. As this method can only be applied to balanced panel data, which would lead to a substantial loss of information on either the time frame or the number of equities considered if applied to the whole sample or time period, it is implemented on a yearly basis. The results[5] will be discussed when appropriate.

4 Global, country and industry effects

This section discusses the results of the estimation of global, country and industry effects on the whole sample and annually, for all equities altogether and classified by countries and industries.

As described in the previous section, daily returns of one global, 17 country and 10 industry-specific factors were estimated cross-sectionally. Then full-sample and yearly versions from 1974 to 2013 of the average proportion of variance explained by each of the three factors were calculated, allowing for time-varying betas in the factorial model (3), with ω_j corresponding to April 7, 2014 in the first case, and the last market trading day of each year in the annual version.

Figure 1 shows the distribution of proportional effects across the countries and industrial sectors calculated as in (5). In this and following related figures we measure the relative importance of each factor effect with respect to the total variance of each equity and not only with respect to the explained variance of the model, as we consider that this provides a more immediate way of perceiving the potential risk reduction benefits of diversification. The global factor effect dominates country effects in most countries, thus revealing a high level of integration in the European market, with the sole exception of Switzerland, where the influence of its own country factor is greater. Also, country effects dominate industry effects in all cases except the UK and are larger in absolute terms in Norway, Portugal, Switzerland, Belgium and Denmark. Large industry effects appear in Switzerland and the UK and in the largest Eurozone economies, i.e. Germany, Italy, Spain and France. Regarding industries, the global effect is found to be more influential in Utilities, Basic Materials, Consumer Goods and Services, Financials, Industrials

[5] Available in detail from the authors upon request.

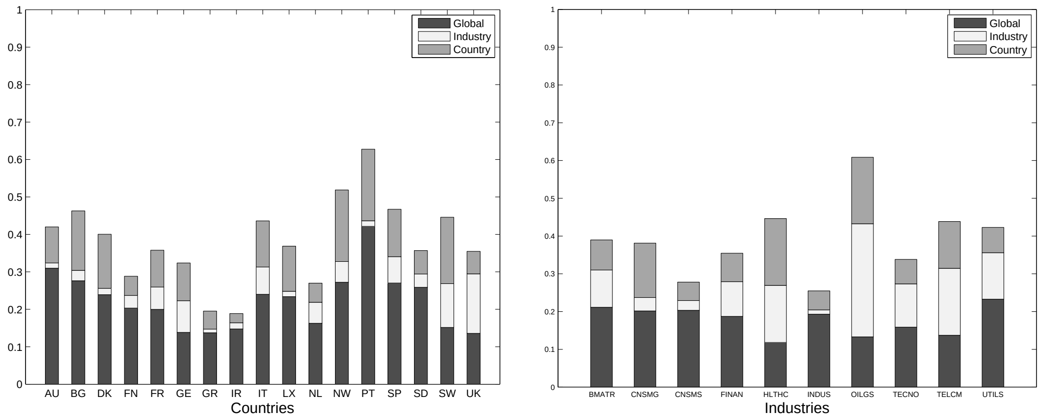

Figure 1: Average decomposition of variance. Countries and industries.

This figure shows the factor effects calculated as $PV^k = \sum_{j=1}^{N} \omega_j \left(\hat{\beta}_j^k\right)^2 / Var\left(R_j\right)$ where N corresponds to the number in the last column of *Panel A* of Table 1. Each column represents the three factor effects (global, country and industry) for each of the 17 countries and 10 industries.

and Technology. The country factor dominates the industry factor in Consumer Goods and Services, Health Care and Industrials but is dominated by it in Basic Materials, Financials, Oil and Gas, Telecommunications, Technology and Utilities. The sectors with the largest industry effects are, in descending order, Oil and Gas, Telecommunications, Health Care, Technology, Utilities and Basic Materials. Large country effects are found in Health Care, Oil and Gas, Consumer Goods and Telecommunications.

Figure 2 displays the trend in effects across the sample period. The first column in this figure corresponds to the overall proportions calculated with the whole sample for each equity and the rest to equivalent measures considering data from one year at a time. The results show a clear increase in the explanatory power of the model estimated on a yearly basis, from an average explained variance of under 40% for the global model to over 50% in most years and even over 60% in some. There may be two potential explanations for this: on the one hand, it may reflect the time-varying nature of betas in the context of model (3). On the other, the smaller sample size in the annual measures may be causing larger covariances between the estimated global, industry and country factor returns that contribute to both an overlap of explanatory power between them and a consequent underestimation of the idiosyncratic factor. Which of these cases predominates here cannot be ascertained exclusively from this analysis. The results of the principal component analysis, however, confirm the suitability of the annual model as the estimated idiosyncratic effects calculated in both approaches are very similar (with a small

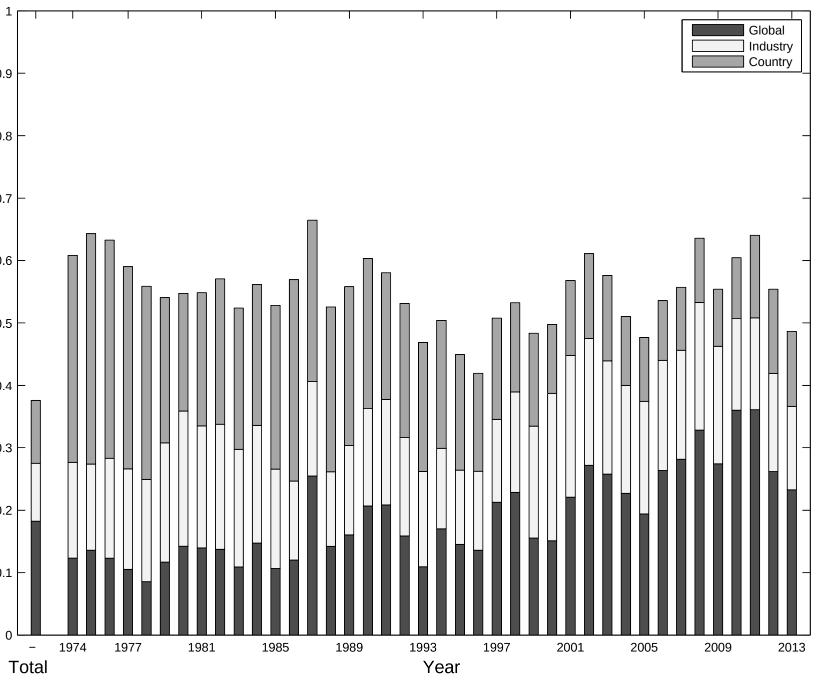

Figure 2: Average decomposition of variance. Trend over time.

This figure shows the annual trend in factor effects calculated as $PV^k = \sum_{j=1}^{N} \omega_j \left(\hat{\beta}_j^k\right)^2 / Var\left(R_j\right)$. The first bar (*Total*) takes into account the full available sample for all equities. Yearly bars are calculated with one year data, where N corresponds to the number in the last line of *Panel A* of Table 1.

Figure 3: PV country/industry ratio.

This figure shows the yearly trend in the PV_t^C/PV_t^I ratio. 1 indicates no predominance of either factor, > 1 indicates predominance of country factors whereas < 1 indicates predominance of industry factors.

average increase of 0.0266 -standard deviation, 0.05- for the PCA method).

The most noteworthy outcome found in the trend over time of the effects in Figure 2 is a shift in the relative importance of country effects in favour of a global effect, which limits the potential benefits of international diversification strategies in terms of risk reduction. The industry effect, by contrast, reveals itself to be of almost constant relevance in the variability of returns. However, Figure 2 reflects a decrease of the global effect at the end of the period. This is discussed in the next section.

Figure 3 shows the trend over time of the country/industry annual PV ratio. The preponderance of industry factor effects is not an exclusive phenomenon of the post-Euro era: it can also be found briefly in the early 80s. Although the sustained predominance that started in 1998 seems to have weakened in the last three years as a clear increase in the PV ratio from around 0.5 to 0.9 has taken place, this is not sufficient to revert the influence of factor effects on the variability of individual equities. These results contrast with those presented by Chou et al. (2014), who report that country factor effects outweigh industry factor effects in Europe in the period 2008-2011 in terms of the variability of factors in 13 estimates in the HR model. Figure 3 shows that this reversal, however, is not confirmed at firm level.

A more detailed analysis is presented in Figures 4 and 5, which show the trend in effects for the same sample period for each country and industry treated individually. As can be observed in Figure 1 for the cases of Greece or Ireland, the overall model seems to underestimate country effects, and the contribution of this factor to the variability of the returns has increased considerably for these countries. Again, the PCA results show an average difference of 0.0037 and 0.052 respectively in the estimated country effects for these countries.

The results in these figures show that the shift from country to global effect is common in the largest economies of the Eurozone and can clearly be seen in France, Germany, Italy and Netherlands. Smaller economies display a more consistent behaviour and although the global contribution to variability increases in all these cases, major country effects are still present. The process of market integration is not exclusive to the countries that have adopted the Euro: it can also be found, on a smaller scale, in Norway, Sweden and the UK. These results support the findings reported by Allen and Song (2005), who argue that the financial institutions developed for the EMU have not only helped financial integration within the Euro area, but have also favoured overall regional integration within Europe between Eurozone and other non-Eurozone EU Member States.

Regarding industries, the results in Figure 5 reveal a more consistent behaviour in the trend in effects over time. The most noteworthy outcome is again the shift from country to global factors, which has mainly affected Basic Materials, Consumer Services and Industrials.

Table 3 shows the PV country/industry ratio broken down by countries and industries in the post-Euro years. A clear predominance of industry effects is found in the largest economies of Europe (France, Germany, Italy, Switzerland and the UK), with lower levels in the Netherlands and Spain. This is confirmed for all industries except Financials, where country factors are more important for half of the period. The increase shown in the global PV ratio in Figure 3 is confirmed in various countries such as Austria, Belgium, Finland, Italy and Norway.

5 The Euro era, the IT bubble and the debt crisis

There are three events which are referred to commonly in the relevant literature: i) the increase in global market integration and the decrease in country effects in Europe after the advent of the Euro, reported in Hardouvelis et al. (2006); ii) the increase in industry effects during the IT bubble, as shown in Brooks and Del Negro (2004) and Phylaktis and Xia (2006a); and iii) the increase in country effects after the sovereign debt crisis (Chou et al., 2014). Here, we study these

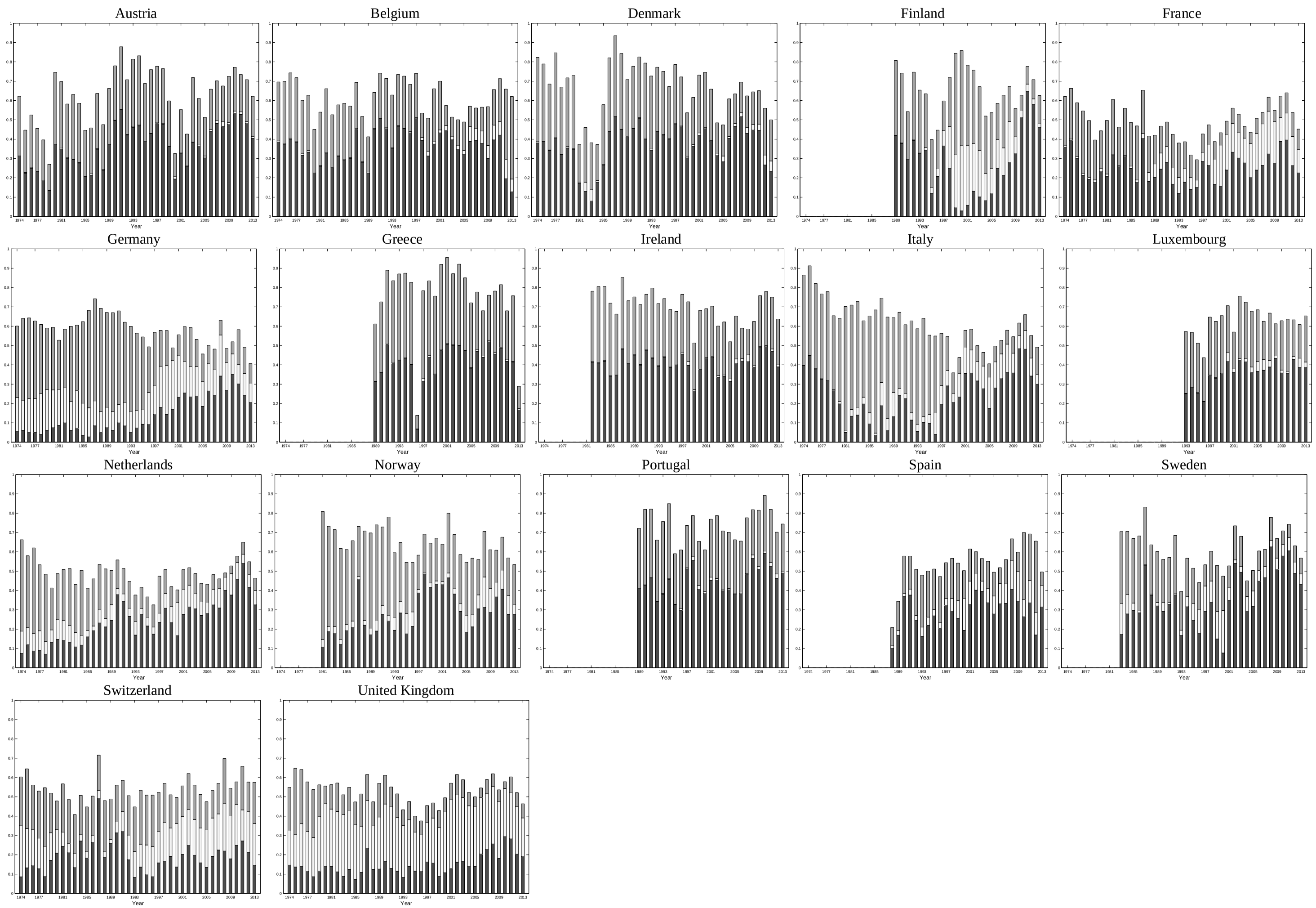

Figure 4: Average decomposition of variance. Trend over time by countries.

This figure shows the annual trend in factor effects for countries where ■ represents Global Effects, ■ Country Effects and □ Industry Effects. A minimum of five equities was required for estimation.

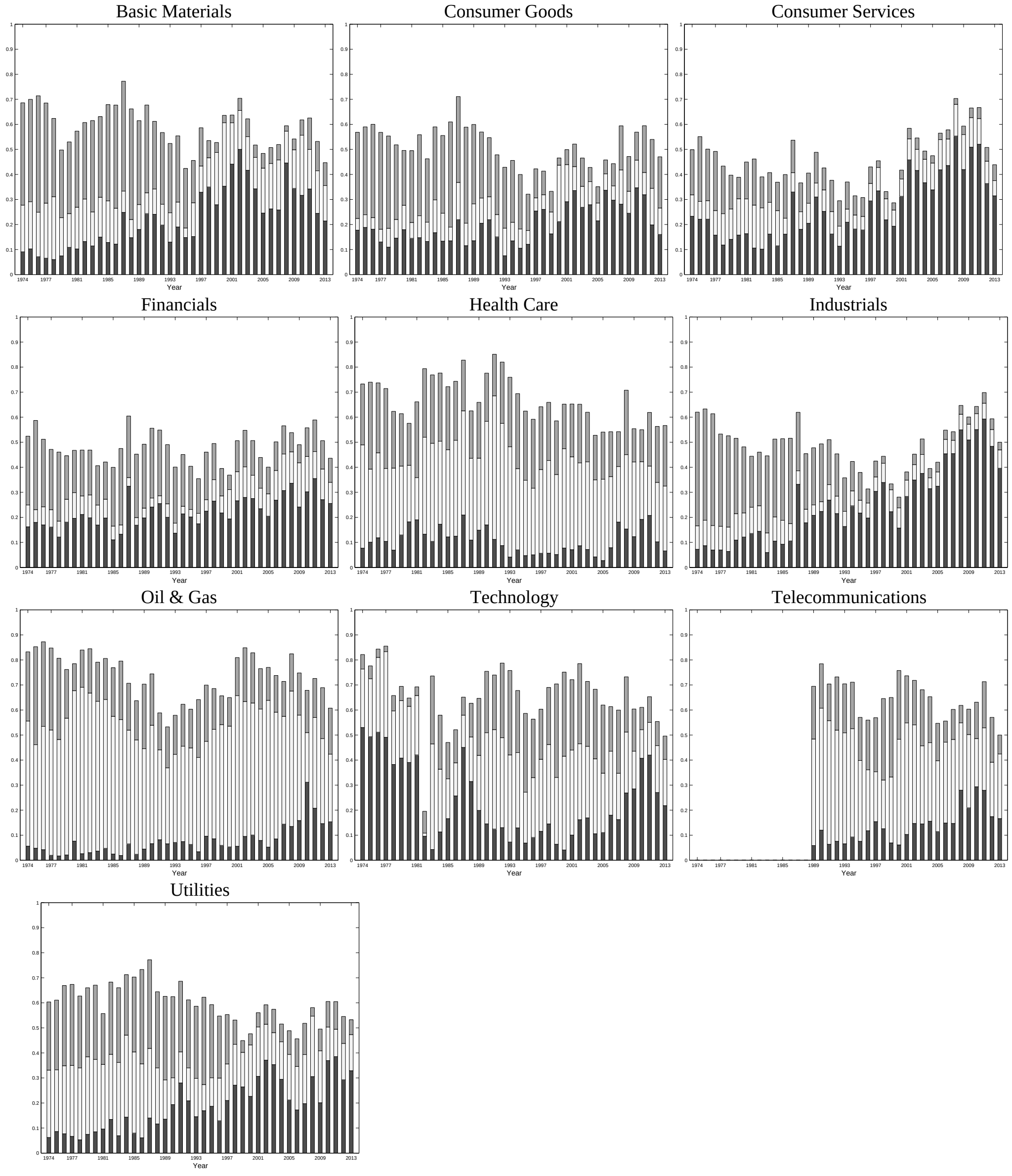

Figure 5: Average decomposition of variance. Trend over time by industries.

This figure shows the annual trend in factor effects for industries where ■ represents Global Effects, ■ Country Effects and □ Industry Effects. A minimum of five equities was required for estimation.

Table 3: PV country/industry ratio by countries and industries.

This table reports the yearly trend in the PV_t^C/PV_t^I ratio for 1999-2013 for countries and industries. 1 indicates no predominance of either factor, > 1 indicates predominance of country factors whereas < 1 indicates predominance of industry factors.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Austria	88.69	8.28	44.57	31.02	213.19	52.54	21.56	25.14	13.03	6.82	20.20	18.53	14.62	21.73	23.20
Belgium	7.02	17.96	16.83	3.95	6.46	6.69	6.74	1.39	1.67	1.92	2.98	2.41	3.18	3.61	6.47
Denmark	27.20	28.28	25.89	51.70	52.45	12.50	5.41	20.63	10.19	7.83	5.16	5.92	5.40	4.71	4.02
Finland	1.88	1.44	1.35	1.54	1.38	2.09	2.17	1.24	1.93	0.85	1.67	1.92	2.38	3.62	7.63
France	0.69	0.30	0.37	0.54	0.74	0.48	0.34	0.41	0.27	0.33	0.27	0.91	0.75	0.82	0.86
Germany	0.71	0.25	0.51	1.12	1.30	0.92	1.10	0.68	0.83	0.36	0.50	0.60	1.78	1.22	1
Greece	116.72	156.32	126.27	123.81	287.48	178.57	58.13	40.49	35.85	39.09	36.17	62.39	31.79	133.15	17.27
Ireland	35.04	127.68	43.30	44.97	25.32	43.35	15.39	8.87	13.31	3.40	32.40	68.24	49.18	20.84	23.54
Italy	2.22	0.70	0.63	0.90	0.81	0.60	0.43	0.60	0.55	0.49	0.83	0.96	0.85	1.26	2.72
Luxembourg	80.21	4.95	11.43	46.74	16.20	10.10	5.24	3.64	7.11	9.94	17.04	27.80	11.81	3.56	8.19
Netherlands	1.19	0.39	0.82	0.81	1.34	1.25	1.53	0.94	0.48	0.33	0.36	0.37	1.28	0.95	0.88
Norway	9.57	14.09	11.48	12.48	10.50	6.62	3.28	4.45	2.54	1.50	1.58	2.17	1.73	1.95	4.01
Portugal	10.89	21.03	19.44	44.41	59.81	39.03	39.21	31.76	53.07	12.67	22.13	28.04	14.59	9.57	28.07
Spain	2.09	0.89	1.36	1.27	2.24	1.86	1.32	0.77	1.17	0.74	0.65	3.89	2.08	3.16	0.62
Sweden	1.67	0.81	1.66	9.77	5.39	1.09	1.35	1.79	1.47	3.74	1.75	1.14	1.01	1.44	1.55
Switzerland	1.18	0.60	0.80	0.99	0.96	0.97	0.76	0.72	0.85	0.95	0.65	0.55	1.41	0.72	0.98
United Kingdom	0.34	0.23	0.23	0.29	0.28	0.22	0.16	0.17	0.24	0.22	0.20	0.14	0.33	0.30	0.37
Basic Materials	0.19	0.12	0.19	0.31	0.53	0.39	0.33	0.35	0.31	0.17	0.28	0.25	0.80	0.69	0.65
Consumer Goods	0.94	0.13	0.40	0.94	1.35	0.62	0.91	0.85	1.56	1.29	1.58	1.01	2.10	1.34	1.93
Consumer Services	0.34	0.45	0.52	0.50	0.54	0.35	0.27	0.22	0.34	0.19	0.24	0.32	0.43	0.61	1.05
Financials	1.61	0.50	1.07	1.20	1.49	1.50	1.19	0.96	0.77	0.61	0.41	0.81	1.17	0.93	1.14
Health Care	0.67	0.45	0.57	0.71	0.57	0.58	0.58	0.63	0.63	0.87	0.45	0.55	1.09	0.94	0.93
Industrials	0.27	0.54	0.50	0.68	0.82	0.86	0.68	0.64	0.65	0.57	0.45	0.45	0.67	0.64	0.42
Oil & Gas	0.24	0.24	0.25	0.40	0.38	0.31	0.22	0.29	0.32	0.27	0.40	0.85	0.43	0.60	0.68
Technology	1.40	0.90	0.83	1.05	0.91	0.93	1.15	0.70	1.36	0.91	1.12	0.78	0.79	0.52	0.51
Telecommunications	1.21	0.65	0.42	0.45	0.72	0.59	0.53	0.26	0.36	0.26	0.35	0.75	0.74	0.82	0.29
Utilities	0.34	0.22	0.29	0.54	0.73	0.48	0.52	0.64	0.64	0.14	0.42	0.76	1.01	0.74	0.41

events from a firm-level perspective.

We checked this set of hypotheses by comparing means tests. For the first assertion, we divided the estimated proportions of variance corresponding to each *beta* for all equities in the last 30 years into two sets, one for 1984-1998 and the other for 1999-2013. Then we ran t-tests for the differences in means. Equivalent tests were applied to the analysis of the second and third assertions, but to isolate those effects from the aforementioned Euro effect we restricted the sample to the Euro era. Table 4 shows the results of these analyses for all equities taken together and also separated by sectors and countries.

The results in the first column of Table 4 indicate that an increase in the global effect is found after the advent of the Euro considering the full sample of equities all together. In most industrial sectors the global effect has increased, with the exceptions of Telecommunications and Health Care. For countries, however, we find a greater diversity of outcomes. Statistically significant increased global effects are found in Finland, France, Germany, Greece, Italy and the Netherlands within the Eurozone, and in Norway, Sweden, Switzerland and the UK outside it. By contrast, Austria, Belgium and Denmark show smaller global components than they did before the Euro. Finally, a decrease in country effects has occurred in all sectors except Oil and Gas and all countries except Norway, where no effect is reported by the statistical procedures used, and Greece, where an increase is observed.

Brooks and Del Negro (2004) and Phylaktis and Xia (2006a) relate the increase in industry effects in the Euro era to the years of the dot-com bubble. We checked whether that increase continues or whether it disappeared after the bubble burst in 2000 and 2001. To that end, we divided the sample into two periods: 1999-2001 and 2002-2013. The results of t-tests on the difference in means for the two periods are shown in the third column of Table 4. An overall increase in the proportional absolute sensitivities of returns to industry factors after the bursting of the dot-com bubble is seen. However it does not follow a homogeneous pattern in all countries and is found only in Austria, Belgium, Denmark, Greece, Ireland, Italy, Norway and the United Kingdom. Finland, France, Luxembourg, Portugal, Spain, Sweden and Switzerland show no change and a small but significant decrease is found in Germany.

Regarding sectors, the results are even more diversified. Increases in industry effects are found only in Consumer Services, Financials and Industrials. By contrast Consumer Goods, Technology and to a lesser degree Telecommunications show significant decreases. These results show that although the sharp rise that affected the Technology and Telecommunications sectors during the IT bubble has now faded away, in its place the influence of other “old” economy sectors has increased.

Table 4: Tests results for Euro, IT bubble and sovereign debt crisis effects.

This table presents the t-statistics for the null of equal means of the proportions of variances explained by each factor in two different periods. The first two columns compare the global and country effects in 1984-1998 (pre-Euro) and 1999-2013 (with the Euro), the third column compares the industrial effects in 1999-2001 and 2002-2013 and the fourth column compares the country effects in 1999-2007 and 2008-2013. $^{\circ}$, $^{\circ\circ}$ and $^{\circ\circ\circ}$ indicate significance at the 5%, 1% and 0.1% level respectively against $H_a : \mu_2 > \mu_1$, where μ_1 is the mean of the first period and μ_2 the mean of the second; *,** and *** indicates significance at the 5%, 1% and 0.1% level respectively against $H_a : \mu_2 < \mu_1$.

	t_{stat}			
Effects:	Global Pre-Post Euro	Country Pre-Post Euro	Industry Pre-Post IT bubble	Country Pre-Post Debt crisis
Panel A: Total result				
Total	$29.1416^{\circ\circ\circ}$	-34.4461^{***}	$2.5111^{\circ\circ}$	2.0650°
Panel B: By country				
Austria	-2.3488^{**}	-7.9271^{***}	1.7413°	2.2627°
Belgium	-6.6286^{***}	-15.4849^{***}	$5.3317^{\circ\circ\circ}$	-6.0420^{***}
Denmark	-1.6969^{*}	-14.0377^{***}	$3.9965^{\circ\circ\circ}$	-4.3972^{***}
Finland	2.3069°	-9.9523^{***}	-0.3822	$2.7158^{\circ\circ}$
France	$14.8338^{\circ\circ\circ}$	-15.8315^{***}	0.4827	$5.4271^{\circ\circ\circ}$
Germany	$28.7691^{\circ\circ\circ}$	-19.3484^{***}	-1.6551^{*}	2.0058°
Greece	$9.9558^{\circ\circ\circ}$	$2.8257^{\circ\circ}$	$7.3743^{\circ\circ\circ}$	-7.2874^{***}
Ireland	-0.0207	-3.6143^{***}	$2.682^{\circ\circ}$	$5.5015^{\circ\circ\circ}$
Italy	$18.3963^{\circ\circ\circ}$	-18.1945^{***}	2.1849°	$5.1677^{\circ\circ\circ}$
Luxembourg	-0.5487	-2.6465^{**}	1.4143	-0.9863
Netherlands	$7.9954^{\circ\circ\circ}$	-8.4378^{***}	-0.9936	1.0649
Norway	$6.5065^{\circ\circ\circ}$	-1.1098	$3.5681^{\circ\circ\circ}$	-5.5436^{***}
Portugal	1.1607	-3.3803^{***}	0.8828	0.3704
Spain	1.0923	-9.5707^{***}	0.6159	$4.9060^{\circ\circ\circ}$
Sweden	$10.7635^{\circ\circ\circ}$	-11.1943^{***}	-0.1438	-0.2036
Switzerland	$2.8824^{\circ\circ}$	-6.4644^{***}	1.1680	1.7412°
United Kingdom	$17.0409^{\circ\circ\circ}$	-19.5704^{***}	$2.8766^{\circ\circ}$	$8.1448^{\circ\circ\circ}$
Panel C: By industry				
Basic Mats	$7.0399^{\circ\circ\circ}$	-12.1843^{***}	-1.5029	2.2198°
Consumer Gds	$7.8989^{\circ\circ\circ}$	-18.672^{***}	-3.7479^{***}	$4.6703^{\circ\circ\circ}$
Consumer Svs	$19.964^{\circ\circ\circ}$	-10.1266^{***}	$10.3692^{\circ\circ\circ}$	-2.1432^{*}
Financials	$5.8424^{\circ\circ\circ}$	-15.0622^{***}	$2.5439^{\circ\circ}$	0.8164
Health Care	-1.5288	-9.9211^{***}	-0.7237	-0.2161
Industrials	$23.9261^{\circ\circ\circ}$	-19.6495^{***}	$15.2360^{\circ\circ\circ}$	$2.5747^{\circ\circ}$
Oil & Gas	$10.2572^{\circ\circ\circ}$	-1.3079	0.3701	-0.3270
Technology	$10.2695^{\circ\circ\circ}$	-3.7277^{***}	-5.2017^{***}	-2.4307^{**}
Telecom	0.9816	-4.9155^{***}	-1.7906^{*}	-3.5793^{***}
Utilities	$6.7896^{\circ\circ\circ}$	-5.9849^{***}	0.1883	1.5995

Finally, we checked the effect of recent macroeconomic events on country factors by comparing the means of the proportion of variance explained by those factors before and after the beginning of the sovereign debt crisis, which can be dated to 2008, when the bursting of the real estate bubble produced a drastic decrease in government revenues. The results, shown in the fourth column of Table 4, confirm that country factors have increased globally in the last six years (similar results are reported in Chou et al., 2014). This increase can be seen in Austria, Finland, France, Germany, Ireland, Italy, Spain, Switzerland and the UK, and in Basic Materials, Consumer Goods and Industrials. By contrast, the opposite effect is found in Belgium, Denmark, Greece and Norway and in Consumer Services, Technology and Telecommunications.

6 Factor effects and macroeconomic fundamentals

The increase in country effects after the government debt crisis reported in the fourth column of Table 4 in previous section raises the following questions: have macroeconomic balances been a driving force behind European investors' decisions on the international exposures of their portfolios? If so, is this phenomenon new and therefore a consequence of the financial crisis? We answer these questions by analysing the following panel data model, which relates the percentage of variance that can be attributed to the country effect to the government budget balances in the European Union in the preceding year (published at year-end):

$$PV_{c,t}^{C} = \alpha_c + \beta D/S_{c,t-1} + u_{c,t} \tag{6}$$

where PV^C is the *percentage* of variance explained by country factors calculated as defined in (5), D/S is the government budget *deficit/surplus* (percentage of GDP), c indicates each of the 15 EU countries in our sample and $t = 1999, \ldots, 2013$. We run this analysis for the whole period 1999-2013 and for the two sub-periods 1999-2007 and 2008-2013 separately. The results are shown in Table 5, which reveals a significant relationship between the two variables for the 2008-2013 period, implying that a decrease of 1% in the government budget balance (an increase in deficit if negative) is linked to an increase of half a point in the country effect after 2008. However, after dividing the sample between the countries that have had to be bailed out in some way by their EU co-members and the IMF (Greece, Ireland, Portugal and Spain) and the rest it becomes clear that government balances have been conditioning investors' decisions exclusively in rescued countries, where a 1% increase in deficit results in a significant increase of 0.57% in the percentage of variance explained by each country factor.

Table 5: Budget balance model estimates.

This table shows the estimated coefficients (SEs) of the budget balance panel data model $PV^C_{c,t} = \alpha_c + \beta D/S_{c,t-1} + u_{c,t}$ for the complete Euro period and before and after the bursting of the subprime bubble, for the EU as a whole or for rescued countries (Greece, Ireland, Portugal and Spain) and non-rescued countries. *** and ** indicate significance at the 0.1% and 1% level respectively. The hypothesis of equal intercepts between countries is always rejected at the 0.1% level except in the model for rescued countries in 2008-2013, with $\hat{\alpha} = 18.8798$ (SE=1.7639, p-value=0.52). The Durbin-Watson test reports no significant first-order autocorrelation on the residuals of the model. The Wald test reports significant heteroscedasticity so the covariance matrix estimator proposed by Arellano (2003), which is robust to the presence of both autocorrelation and heteroscedasticity, is used.

	1999-2013	1999-2007	2008-2013	Rescued 2008-2013	Non rescued 2008-2013
$\hat{\beta}$	−0.1065	0.0768	−0.4809***	-0.5719**	-0.2442
	(0.2098)	(0.2880)	(0.1492)	(0.1937)	(0.3040)

We finally checked whether the global effect has any predictive power over the behaviour of the real economy as measured by GDP. To answer this question we analysed the following panel data model, which relates quarterly GDP with the equivalently measured global effect in 16 countries from 1999:Q1 to 2013:Q3[6]:

$$gdp_{c,t} = \delta_c + \gamma_1 PV^G_{c,t-1} + \gamma_2 PV^G_{c,t-2} + \gamma_3 PV^G_{c,t-3} + v_{c,t}, \quad (7)$$

where $gdp_{c,t}$ is the logarithm of the seasonally adjusted quarterly GDP of country c measured at quarter t and PV^G is the *percentage* of variance explained by the global factor calculated as defined in (5) on a quarterly basis. The results, shown in Table 6, report significant predictive power in all three lags. The estimated values indicate that an increase of 1% in the influence of a global factor will result in changes in GDP of around 0.2%, 0.1% and 0.3%, one, two and three terms ahead respectively. This shows that the degree of co-movements in markets can play a useful role in macroeconomic prediction.

The trend in factor effects shown in Figures 2, 4 and 5 reveals a decrease in the proportion of variance explained that can be attributed to a pan-European factor that is confirmed globally or separately in many countries and industries in the last two years. In order to statistically assess this phenomenon, which does not seem to be related to any macroeconomic outcome, we fitted a series of linear time trend panel data models to the Euro era global effects. The model can be

[6] Greece was left out due to data incompleteness in the relevant period. This time basis was selected as the most common horizon with predictive power reported in the literature runs from one to three terms. Other models with longer time frames were also explored, with no significant coefficients over three lags.

Table 6: GDP-GE model estimates.

This table shows the estimated coefficients (SEs) of the GDP-global effect panel data model $gdp_{c,t} = \delta_c + \gamma_1 PV^G_{c,t-1} + \gamma_2 PV^G_{c,t-2} + \gamma_3 PV^G_{c,t-3} + v_{c,t}$. *** indicates significance at the 0.1% level. Intercepts differ significantly from country to country. Significant autocorrelation is reported by the Durbin-Watson test so Arellano's (2003) SE estimators are used.

$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$
0.00222***	0.00084***	0.0027***
(0.000724)	(0.000298)	(0.000627)

Table 7: Global effects time trend model estimates.

This table shows the estimated coefficients (SEs) of the two opposite maximal-sloped results for the global effects time trend model $PV^G_{c,t} = \theta_c + \varphi t + \varepsilon_{c,t}$. *** indicates significance at the 0.1% level. Intercepts differ significantly from country to country in all models. Positive and negative significant autocorrelations are found in the residuals of some of the models so again the reflected SEs correspond to Arellano's (2003) estimators.

	1999-2011	2011-2013
$\hat{\varphi}$	1.1452***	−7.2293***
	(0.2965)	(0.8905)

expressed as

$$PV^G_{c,t} = \theta_c + \varphi t + \varepsilon_{c,t} \tag{8}$$

where $t = 1, \ldots, 15$ indicates the year from 1999 to 2013 and $c = 1, \ldots, 17$ indicates country.

Different variations of periods were utilized from 1999-2001 up to 1999-2013 and then to 2011-2013 with a minimum time frame of three lags at each end of the continuum. Table 7 shows the two opposite maximal-sloped results (which coincide with the maximal $t - ratios$). No a priori consecutiveness was sought and the outcome, incidentally, shows that a clear shift of direction in the trend in the degree of influence of a global common market factor has taken place after peaking in 2011, with an average decrease of around 7% for 2012 and 2013. This indicates that market integration is weakening in Europe. The extent to which this is temporary and the potential macroeconomic consequences are areas that need further research.

7 Conclusions

The influence of global, country and industry factors on the comovements of equities constitute a key element on which the potential benefits of different diversification strategies depend. This paper explores the historical trend in these factors in 2048 equities from seventeen European countries from 1974 to 2013 and analyses how they have been affected by the main macroeconomic scenarios on the continent: the launch of the Euro, the IT bubble and the sovereign debt crisis. To that end, we measure the average proportion of variance explained by each of the factors at firm level.

Using yearly estimations, we find a significant increase in a global common factor effect and a significant reduction in country factor effects after the advent of the Euro. This trend is not exclusive to the Eurozone countries: it can also be found in Norway, Sweden, Switzerland and the UK. It implies that the risk reduction that can be attained in Europe from international diversification has drastically decreased in the last fifteen years. These results are in line with similar findings reported by Allen and Song (2005), who maintain that the financial institutions developed for the EMU have favoured overall regional integration within Europe.

Industrial diversification, however, is gradually becoming more significant in the Euro era, driven first by the Technology and Telecommunications sectors and more recently by other "old" economy sectors such as Financials and Industrials.

As already reported by Chou et al. (2014), the recent sovereign debt crisis constitutes a turning point in the trend in country factors. We find that at firm level too the exposure of individual equities to such factors is increasing in most countries and sectors. However, in contrast with the results of the said authors, we do not find a reversal in the relative importance of country versus industry effects.

In relation to macroeconomic fundamentals, we present evidence of a significant negative link between the proportions of variance explained by country returns and the Budget Balances of rescued countries in the years following the bursting of the real estate bubble. This reflects that investors are currently concerned about the macroeconomic environment on the continent.

Finally, we analyse the macroeconomic predictive power of market integration and show that global common factor effects predict changes in GDP one to three terms ahead. A significant decreasing trend in global effects for the last two years is also reported that might indicate a coming deterioration of the macroeconomic scenario in the continent.

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