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The Importance of Industry and Country Effects in the EMU Equity Markets

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Abstract

Most empirical studies find that country effects are larger than industry effects in stock returns, although industry effects have gained in importance recently. Our results support the dominance of country effects relative to industry and common effects in the EMU equity markets in the 1975–2001 period. However, there is an increasing importance of industry effect relative to country effect in the 1990s. In fact, industry effects is similar in magnitude to country effect in the post-euro period. The evolution of the ratio of country to industry effect is explained by the decrease in the cross-sectional variance of interest rate movements across EMU countries. Thus, there is evidence that nominal convergence has reduced the differences between national equity markets.

Keywords: *international equity markets*; *diversification*; *volatility*; *EMU*.

JEL classification: *G*11, *G*15

1. Introduction

What are the gains from international portfolio diversification and what factors drive the co-variation in stock returns across countries are questions that have had a lot of attention from both academics and practitioners. The topic of international portfolio selection is mainly related to the study of the role of country and industry factors in explaining the variation in portfolio returns of a global investor. The benefits from international diversification can arise from different economic environments underlying national financial markets as well as heterogeneous industrial structures across countries.

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Most empirical studies find low correlations between country portfolio returns. Even equity markets of considerably developed economies have proved to move quite independently from one another in terms of their returns.[1] Goetzmann *et al.* (2005) report an average correlation between four major stock markets (USA, France, UK and Germany) of 0.2 during the 1872–2000 period.

There is also substantial empirical evidence that correlations are time varying. In fact, correlation across markets increased during periods of higher economic and financial integration. Moreover, correlations are currently higher compared with historical levels (Goetzmann *et al.*, 2005).

Several explanations are usually put forward to explain the low correlations between equity markets. A first explanation is the country-specific environment, such as differences in monetary and fiscal policies, movements in interest rates, budget deficits, productivity, growth rates and legal and institutional regimes. Basically, it is argued that asset returns are mainly driven by domestic economic shocks (Rouwenhorst, 1999).

A second explanation is that financial markets are segmented and that the price of risk is different across countries. The pricing rule can be different even in well-integrated economies, if there are informal or formal barriers to investing abroad (Serra, 2000).

A final explanation arises from a difference in index composition across countries. Lessard (1974) was the first to argue the importance of different industrial structures to explain the variation in global stock returns. Roll (1992) and Arshanapalli *et al.* (1997) find that national industrial composition is important in explaining cross-sectional differences in stock return variation across countries.

While Roll (1992) attributes the low correlation among country indexes to diverse industry structures, Heston and Rouwenhorst (1994) decompose stock return volatility into pure country and industry sources of variation and clearly document the dominance of country specific effects. Heston and Rouwenhorst (1994) findings support the view that little of the variation in country portfolio returns can be explained by their industrial composition. Pure country effects are, on average, much larger than pure industry effects using monthly returns, denominated in Deutschemark, for 12 European countries and seven broad industries between 1978 and 1992. The ratio of the cross-country average variance of the pure country effect (24.32%-squared) to the cross-industry average variance of the pure industry effect (6.46%-squared) is 4.5.

This dominance of country over industry effects is also found in subsequent empirical work. Griffin and Karolyi (1998) find a ratio of four between country and industry effects using weekly data 66 industry indexes in 25 countries between 1992 and 1995. They have also confirmed that the dominance of country factors in stock returns is robust to the industry classification. In fact, the country/industry effects ratio increases to 12 using a broader industry classification.

Heckman *et al.* (1998) examine country and industry influences on returns in 15 European countries from 1989 to 1998 using monthly data. The results present an industry variance three times higher using a disaggregated industry level than using a broader industry classification, but even so, smaller than country effects, which is consistent with the finding in Griffin and Karolyi (1998). The analysis of the variances

[1]See Adler and Dumas (1983) for a review.

series across time shows that while country factors are getting less important over time, industry factors remain more or less the same in terms of average variances. Heckman *et al*. (1998) also explore whether the differences in results stem from using local instead of common currency returns and find no significant difference.

Recently, following an increasing perception on the part of the investment community that industry effects are gaining importance, a number of studies have found an increase in the importance of industry effects (Baca *et al*., 2000; Cavaglia *et al*., 2000; Brooks and Catão (2000); Isakov and Sonney, 2002). In some cases, since 1995, industry effects are becoming even greater than country effects.

Isakov and Sonney (2002) obtain a country to industry effects variance ratio of 1.6 using a sample of 20 developed countries over the 1997–2000 period. Brooks and Catão (2000) find evidence in favour of the growing importance of the global industry factor associated with the behaviour of technology stocks. Cavaglia *et al*. (2000) show the increasing importance of industry effects relative to country effects using a sample of 21 developed countries.

Overall, most studies find that country effects dominate industry effects. Yet, recent results show that industry effects are gaining in importance over country effects. The globalisation of the world economy and financial markets may have an effect on the relative importance of country and industry effects in explaining equity markets co-movements. The observed trend of markets deregulation, improved and cheaper communications systems, along with the harmonisation of economic, monetary and fiscal policies suggests that industrial factors are starting to play a large role in the allocating strategies of investors.

Our paper revisits the relative importance of country and industry specific sources of return variation within the unique market that is composed of the 12 countries that currently form the EMU and adopted a single currency, the euro.

The launch of a single currency shared by 12 European countries was only the final stage of a process of economic and monetary convergence started in the early 1990s. The main objective has been the real convergence of economic structures in the EMU and the progressive reduction of differences that can induce different regional responses to global shocks.

The negotiations leading to the signing of the Maastricht treaty on 7 February, 1992, which defined a plan for the creation of a true EMU in Europe. That plan began with free capital movement and closer policy coordination, followed by the creation of the European Central Bank (ECB), and by tightening the exchange rates movements' limits. Also, supranational authorities gained greater powers. More recently, fixed exchange rates were imposed with the complete transfer of monetary policy from member states to the European Union institutions. At the same time, an effort to reduce trading costs and homogenise accounting rules, fiscal policies and banks refinancing procedures would encourage investors to shift away from country level decisions toward industry allocation strategies.

In the context of a region going through such a level of economic and monetary integration, it is natural to speculate about the implications of this process of nominal and real convergence over the characteristics of stock returns. These events should lead to a deeper integration of equity markets, and therefore be reflected in two ways: (1) an increasing co-variation in returns and (2) a change in the historical dominance of country effects over industry effects. One important question to be answered in this paper is whether this change has been reflected in the EMU equity markets through a change in the correlations between returns and to what extent.

The main purpose of this paper is to confirm this trend in a sample of EMU countries, in which we should find stronger evidence of an increase in industry effects during the 1990s (time series effect). Moreover, industry effects should be stronger in a sample of EMU countries relative to a broader sample of countries (cross-section effect).

Thus, we primarily address the question of whether industrial factors are becoming more important than country factors in the EMU equity markets. We consider a sample period that is one of the longest used in current studies, consisting of almost 27 years of national industry indexes daily returns. Another significant difference to other studies is the use of daily data. The use of daily data allows a more accurate analysis of sub-periods and is relevant for portfolio managers who are interested in daily returns, volatility, and co-movements across markets. The non-existence of relevant non-synchronous trading hours across the EMU financial markets allow the use of daily data without creating a bias, which is not true for a broader sample of countries.

Using a sample of ten national industry indexes in 11 EMU countries, our findings support the overall dominance of country effects over the 1975–2001 period. This is consistent with the earlier evidence on the relative importance of country and industry effects (Heston and Rouwenhorst, 1994). However, the evolution of the country and industry effects across time shows an increasing relative importance of the industry effect. Furthermore, in the post-euro period (1999–2001), industrial effects have a similar magnitude to country effects. The results obtained for the EMU sample are compared with those from a larger sample, including five more European countries that show a significant level of economic integration with the EMU sample.

We study the portfolio diversification implications of our findings. We confirm that country diversification allows investors to achieve better risk reduction than industry diversification. However, we also find that in the most recent time periods, the industry diversification strategy is becoming more efficient, with results close to those obtained by the country diversification strategy. Our diversification results are consistent with the evidence in Adjaouté and Danthine (2001) who document a significant increase in correlations between EMU countries equity market returns. Our results are also consistent with Eiling *et al.* (2004) who find that country-based EMU equity portfolios provide better risk-return trade-offs in the 1990s, but industry-based strategies perform as well as country-based strategies in the post-euro period.

Finally, we address the question of whether the convergence in interest rates and exchange rates among EMU countries explains the evolution of country and industry effects. We find that the evolution of the ratio of country to industry effects (and also the ratio of country to common effects) is explained by the decrease in the cross-sectional variance of interest rate movements across EMU countries. There is evidence that monetary policy harmonisation in the EMU countries has reduced the differences between national equity markets.

The remainder of the paper is organised as follows. Section 2 describes the data sample and Section 3 presents the methodology. Section 4 contains the empirical results. Section 5 offers a conclusion.

2. Data Description

The data consists of daily price indexes in local currency for ten industry portfolios in 11 EMU countries from 1 January, 1975 to 31 July, 2001 (6935 daily observations per index) collected from Datastream. This study includes Germany, Belgium, France, Ireland, Italy, the Netherlands, Austria, Spain, Greece, Finland, and Portugal, but

excludes Luxemburg.[2] These indexes are considered broad and with a good coverage of market capitalisation. Daily geometric rates of returns in local currency are calculated from the price indexes.[3]

The industry classification is the main concern in using this sample, since it may not provide sufficient cross-sectional variation in returns across industries to extract proper country and industry sources of returns variation. Griffin and Karolyi (1998) argue that tests using aggregated industrial indexes could lead to a neglect of industry effect. Yet, the selected desegregation of industry indexes seems to be sufficient to avoid lumping together heterogeneous industries as reported in Griffin and Karolyi (1998) and Griffin and Stulz (2001).

The results obtained for the EMU countries sample are compared with those including five more European countries (Norway, Sweden, Switzerland, the UK and Denmark) that remain outside the EMU, but show a significant level of economic integration with the EMU financial markets.

Table 1 presents the main characteristics of the EMU sample data and shows that the industrial structure of country indexes varies substantially within the sample. It also shows that the number and size of firms across markets is not uniform. Germany concentrates, on average, 11.3% of the financial sector in the EMU and 40.6% of total EMU market capitalization. Three countries – Germany, France and the Netherlands – concentrate more than 75% of EMU capitalisation. Germany has also the largest number of firms, closely followed by France. Austria, Finland, Greece, Ireland and Portugal represent only 4% of total market capitalisation but 21.6% of the firms listed, which implies a smaller firm size on average.

In terms of industries, Cyclical Services represents 5.5% of total market capitalisation with 195 firms listed, while Basic Industries accounts for 12.3% but with fewer firms, 149. In 2001, eight out of the 11 country indexes were largely concentrated in three industries. In addition, Financials have a substantial weight in four country indexes. These figures support the argument that the industrial composition of country indexes is diverse.

Table 2 shows summary statistics by sub-periods of four years, except for the last period, which has 2.5 years. In the whole sample period (1975–2001) the countries with the worst performance are Portugal and Austria, but with volatilities that are amongst the lowest within the EMU. The most volatile market – Greece – is also the highest performer measured by average daily returns. The fact that the average standard deviation across industries is smaller (0.99%) than across countries (1.16%) could indicate the presence of a pattern or just reflect the industry classification chosen. At the industry level, Information Technology has the best absolute performance but it does not present the best reward-to-risk relationship in the whole sample period. The best reward-to-risk performance is shown by Non-cyclical Consumer Goods, which is the third best in terms of absolute performance. A time

[2]Some countries entered the sample after 1975 because of stock index unavailability. Spain entered in March 1987, Greece in January 1988, Finland in March 1988 and Portugal in January 1990.

[3]We use local currency returns to avoid country and industry effects being induced by the conversion to a common currency (e.g. US dollars). Previous empirical studies show that there is no significant difference in using local or common currency returns (see, e.g., Heston and Rouwenhorst, 1994).

Table 1

Industry composition by countries

This table shows the industry composition of the Datastream industry indexes. Panel A shows for each country by industry the number of stocks included in the index. Panel B shows the average market capitalisation of each country by industry expressed as a percentage of the EMU total market capitalisation.

	Germany	Belgium	France	Ireland	Italy	Netherl.	Austria	Spain	Greece	Finland	Portugal	EMU
Panel A: Number of stocks by industry and country												
Basic Industries	19	10	18	8	18	10	9	24	10	10	13	149
Cyc. Cons. Goods	27	3	15	2	22	7	4	4	0	1	1	86
Cyc. Services	29	8	55	8	18	25	2	20	10	7	13	195
General Industrials	41	9	27	0	16	14	8	11	0	10	3	139
Information Techn.	27	4	15	4	3	14	3	2	3	3	2	80
Non-cyc. Cons. Goods	18	9	29	12	9	12	5	13	6	5	0	118
Non-cyc. Service	7	6	9	1	8	7	1	6	3	5	7	60
Resources	0	0	7	4	4	8	1	2	3	1	0	30
Financials	25	39	23	9	53	32	15	30	14	5	10	255
Utilities	7	2	1	0	6	0	2	7	1	1	1	28
EMU	200	90	199	48	157	129	50	119	50	48	50	1140
Panel B: Average weights by industry and country												
Basic Industries	7.1%	0.7%	2.1%	0.3%	0.5%	0.8%	0.2%	0.4%	0.0%	0.2%	0.1%	12.3%
Cyc. Cons. Goods	4.6%	0.0%	1.8%	0.1%	1.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%
Cyc. Services	1.4%	0.2%	1.6%	0.1%	0.3%	1.5%	0.0%	0.2%	0.0%	0.1%	0.0%	5.5%
General Industrials	10.1%	0.3%	3.1%	0.0%	0.5%	1.6%	0.1%	0.1%	0.0%	0.1%	0.0%	15.9%
Information Techn.	0.4%	0.0%	1.0%	0.0%	0.1%	0.2%	0.0%	0.0%	0.0%	0.5%	0.0%	2.2%
Non-cyc. Cons. Goods	1.7%	0.1%	2.7%	0.2%	0.1%	2.6%	0.1%	0.1%	0.1%	0.1%	0.0%	7.8%
Non-cyc. Service	2.0%	0.2%	1.4%	0.0%	1.3%	0.5%	0.0%	0.7%	0.1%	0.1%	0.1%	6.3%
Resources	0.0%	1.0%	2.6%	0.0%	0.4%	6.9%	0.1%	0.3%	0.0%	0.0%	0.0%	11.3%
Financials	11.3%	1.3%	2.3%	0.4%	4.6%	4.6%	0.3%	1.5%	0.2%	0.1%	0.2%	26.9%
Utilities	1.8%	0.9%	0.0%	0.0%	0.3%	0.0%	0.1%	0.9%	0.0%	0.0%	0.0%	4.1%
EMU	40.6%	4.7%	18.5%	1.0%	9.1%	18.8%	0.8%	4.3%	0.4%	1.2%	0.5%	100.0%

Table 2

Summary statistics of returns by country and industry

Panel A gives the mean and standard deviation of the daily country index returns in local currency for the whole sample period and sub-periods. Panel B gives the mean and standard deviation of the daily value-weighted national industry index returns in local currency for the whole sample period and sub-periods. Returns are measured in percentage per day.

	1975–2001		1975–1978		1979–1982		1983–1986		1987–1990		1991–1994		1995–1998		1999–2001	
	Mean	StdDev	Mean	StdDev	Mean	StdDev	Mean	StdDev	Mean	StdDev	Mean	StdDev	Mean	StdDev	Mean	StdDev
Panel A: Country																
Germany	0.030	0.943	0.037	0.595	−0.007	0.567	0.085	0.896	−0.002	1.256	0.023	0.806	0.066	1.086	0.001	1.261
Belgium	0.032	0.777	0.009	0.624	0.003	0.722	0.096	0.683	0.013	1.059	0.020	0.623	0.090	0.780	−0.025	0.887
France	0.046	1.083	0.056	1.080	−0.002	1.132	0.130	0.951	0.007	1.198	0.026	0.924	0.070	1.077	0.033	1.240
Ireland	0.057	1.082	0.140	1.227	−0.035	0.837	0.117	1.024	0.009	1.405	0.048	0.877	0.096	0.959	0.006	1.142
Italy	0.047	1.334	0.005	1.162	0.099	1.731	0.152	1.312	−0.036	1.106	0.018	1.274	0.074	1.391	0.001	1.214
Netherlands	0.042	0.922	0.034	0.794	0.030	0.885	0.079	0.877	0.005	1.082	0.044	0.602	0.087	1.108	0.005	1.041
Austria	0.012	0.895	−0.061	0.813	−0.037	0.699	0.109	0.801	0.067	1.283	−0.007	0.854	0.005	0.881	0.001	0.745
Spain	0.029	1.143	–	–	–	–	–	–	−0.015	1.131	0.025	1.031	0.105	1.180	−0.020	1.258
Greece	0.070	1.870	–	–	–	–	–	–	0.172	2.360	0.003	1.555	0.123	1.561	−0.026	2.097
Finland	0.043	1.802	–	–	–	–	–	–	−0.081	0.768	0.073	1.287	0.103	1.613	0.035	3.091
Portugal	0.012	0.906	–	–	–	–	–	–	−0.167	0.931	0.022	0.707	0.081	1.002	−0.042	1.001
EMU	0.034	0.768	0.035	0.506	0.002	0.495	0.096	0.637	−0.008	0.921	0.025	0.670	0.076	0.957	0.004	1.109
Cross-country average	0.038	1.160	0.031	0.899	0.006	0.822	0.096	0.818	−0.003	1.234	0.027	0.958	0.082	1.149	−0.003	1.362
Panel B: Industry																
Basic Industries	0.028	0.826	0.018	0.662	−0.003	0.583	0.092	0.792	−0.004	1.056	0.027	0.770	0.038	0.955	0.024	0.887
Cyc. Cons. Goods	0.030	1.016	0.098	1.078	−0.052	0.829	0.123	0.916	−0.042	1.059	0.033	0.882	0.048	1.196	−0.011	1.125
Cyc. Services	0.030	0.813	0.015	0.626	−0.017	0.666	0.095	0.731	0.005	0.995	0.025	0.679	0.077	0.818	0.001	1.175
General Industrials	0.031	0.903	0.036	0.636	−0.002	0.620	0.084	0.801	−0.005	1.139	0.018	0.812	0.055	1.005	0.032	1.259
Information Techn.	0.068	1.827	0.079	2.113	0.023	1.993	0.145	1.680	0.024	1.249	0.039	1.037	0.127	1.752	0.028	2.842
Non-cyc. Cons. Goods	0.044	0.792	0.012	0.577	0.023	0.623	0.100	0.709	0.016	1.050	0.034	0.652	0.085	0.893	0.029	0.977
Non-cyc. Services	0.034	1.082	0.006	0.907	−0.007	0.699	0.090	0.847	−0.011	1.100	0.056	0.873	0.111	1.113	−0.024	1.984
Resources	0.046	1.087	0.052	0.950	0.032	1.191	0.078	1.041	0.023	1.073	0.029	0.775	0.056	1.213	0.055	1.380
Financials	0.038	0.777	0.030	0.436	0.025	0.523	0.115	0.728	−0.020	0.904	0.016	0.692	0.084	1.056	0.009	0.964
Utilities	0.031	0.689	0.040	0.552	−0.006	0.554	0.042	0.589	0.016	0.798	0.038	0.648	0.092	0.801	−0.024	0.874
Cross-industry average	0.038	0.981	0.039	0.854	0.001	0.828	0.096	0.884	0.000	1.042	0.032	0.782	0.077	1.080	0.012	1.347

series analysis of the EMU portfolio shows that the 1975–78, 1983–86 and 1995–98 periods are those with the best reward-to-risk relationship.

Table 3 displays the average correlations across countries and industries returns. Country correlations are lower than industry correlations. This result should be carefully interpreted as industry indexes are biased by the weight of some countries in their composition. A closer analysis shows that Germany, France and the Netherlands have country correlations above average and concentrate 78% of EMU total market capitalisation.

The breakdown of correlations by sub-periods reveals that correlations vary considerably across time. Average correlation shows a positive trend, reaching a maximum in the 1995–1998 period, but then decreasing in the last sample sub-period (1999–2001). These results could indicate a possible trend in the correlations levels. Greece presents the lowest average correlation compared with other countries, which could be related with being the last country to enter the EMU.[4] The last sample sub-period also shows that the difference between average country and industry correlation is narrowing, which can indicate an increase in the importance of industry factors relative to country effects.

Overall, the increase in average correlations, both at the country and industry level, are indicators of a gradual increase in the level of integration in the EMU market. Portugal's average correlation with the other countries is double that of Greece, although the two countries have similar economies and financial markets in terms of size, structure and level of development. The fact that Portugal had an anticipated probability of participation in the EMU considerably higher than Greece during the convergence period supports that idea. On the other hand, country correlations present a large and sudden increase during the 1995–1998 period, which includes the date where a European Council held in Madrid, confirmed the introduction of the single currency on 1 January, 1999.

Table 4 presents cross-industry correlations of returns within each country and cross-country correlations of returns within each industry. Within each country we find that average cross-industry correlations for the whole sample period are at the level of cross-country indexes correlations, but are lower in recent years, suggesting that nowadays a higher degree of diversification can be achieved through an equally-weighted portfolio of industries.

Cross-country correlations within each industry are surprisingly low and far below cross-country indexes correlations, indicating that the best diversification strategy may be to diversify across countries within a specific industry. These results could imply that country specific shocks outdo industrial global effects. Then again, broad industry classification may veil stock returns with low correlations or it could be that industries are less global than we suppose.

It is clear that market indexes have different industrial compositions. However, average industry correlations are higher than country correlations. Moreover, cross-country within each industry correlations are extremely low. The results in Section 4 attempt to determine if, in any case, the low cross-country correlations within each industry have something to do with different country indexes composition.

[4]Greece entered the EMU in January 2001, i.e., two year later than the other countries.

Table 3

Average country and industry return correlations

Panel A shows the average correlations among country index daily returns for the whole sample period and sub-periods. Panel B shows the average correlations among industry index daily returns for the whole sample period and sub-periods.

	1975–2001	1975–1978	1979–1982	1983–86	1987–1990	1991–1994	1995–1998	1999–2001
Panel A: Country								
Germany	0.432	0.142	0.105	0.151	0.405	0.454	0.617	0.583
Belgium	0.355	0.195	0.114	0.135	0.341	0.422	0.588	0.365
France	0.403	0.164	0.097	0.176	0.357	0.419	0.602	0.595
Ireland	0.290	0.079	0.059	0.105	0.317	0.313	0.486	0.353
Italy	0.308	0.052	0.021	0.037	0.314	0.288	0.535	0.528
Netherlands	0.423	0.236	0.161	0.192	0.359	0.418	0.627	0.577
Austria	0.277	0.028	0.004	0.012	0.262	0.384	0.542	0.335
Spain	0.470	–	–	–	0.332	0.385	0.582	0.550
Greece	0.199	–	–	–	0.183	0.158	0.272	0.195
Finland	0.375	–	–	–	0.134	0.199	0.546	0.460
Portugal	0.401	–	–	–	0.156	0.233	0.525	0.455
Cross-country average	0.358	0.128	0.080	0.116	0.287	0.334	0.538	0.454
Panel B: Industry								
Basic Industries	0.651	0.512	0.490	0.545	0.806	0.784	0.786	0.542
Cyc. Cons. Goods	0.567	0.285	0.269	0.450	0.777	0.741	0.781	0.533
Cyc. Services	0.646	0.474	0.440	0.536	0.800	0.768	0.803	0.577
General Industrials	0.675	0.553	0.495	0.564	0.798	0.783	0.805	0.603
Information Techn.	0.403	0.158	0.180	0.161	0.625	0.644	0.692	0.492
Non-cyc. Cons. Goods	0.620	0.467	0.456	0.508	0.785	0.762	0.799	0.444
Non-cyc. Service	0.586	0.337	0.452	0.452	0.740	0.740	0.773	0.545
Resources	0.439	0.360	0.292	0.286	0.607	0.612	0.655	0.289
Financials	0.649	0.519	0.368	0.519	0.783	0.784	0.801	0.602
Utilities	0.501	0.379	0.319	0.338	0.614	0.663	0.646	0.434
Cross-industry average	0.574	0.404	0.376	0.436	0.733	0.728	0.754	0.506

Table 4

Average cross-industry and cross-country return correlations

Panel A shows the average correlations across all industries index daily returns in each country over the whole sample period and sub-periods. Panel B shows the average correlations across all country index daily returns in each industry over the whole sample period and sub-periods.

	1975–2001	1975–1978	1979–1982	1983–1986	1987–1990	1991–1994	1995–1998	1999–2001
Panel A: Cross-industry correlations within each country								
Germany	0.436	0.461	0.496	0.470	0.608	0.468	0.445	0.254
Belgium	0.274	0.167	0.182	0.165	0.373	0.330	0.401	0.281
France	0.484	0.510	0.459	0.448	0.687	0.665	0.633	0.342
Ireland	0.176	0.269	0.137	0.080	0.259	0.162	0.189	0.115
Italy	0.485	0.499	0.450	0.509	0.569	0.599	0.594	0.358
Netherlands	0.446	0.439	0.343	0.435	0.646	0.417	0.523	0.257
Austria	0.254	0.021	0.045	0.146	0.440	0.396	0.321	0.162
Spain	0.382	–	–	–	0.474	0.416	0.556	0.313
Greece	0.528	–	–	–	0.550	0.291	0.482	0.636
Finland	0.264	–	–	–	0.222	0.367	0.313	0.227
Portugal	0.199	–	–	–	0.131	0.151	0.353	0.162
Cross-country average	0.357	0.338	0.301	0.322	0.512	0.434	0.444	0.253
Panel B: Cross-country correlations within each industry								
Basic Industries	0.232	0.101	0.053	0.070	0.229	0.237	0.403	0.222
Cyc. Cons. Goods	0.118	0.042	0.015	0.082	0.219	0.098	0.192	0.087
Cyc. Services	0.161	0.081	0.039	0.079	0.209	0.134	0.279	0.234
General Industrials	0.173	0.083	0.035	0.071	0.168	0.152	0.296	0.192
Information Techn.	0.200	–	–	0.060	0.133	0.087	0.217	0.239
Non-cyc. Cons. Goods	0.155	0.095	0.066	0.051	0.138	0.147	0.287	0.119
Non-cyc. Service	0.236	0.055	0.035	0.080	0.189	0.140	0.264	0.339
Resources	0.134	0.251	0.257	0.065	0.193	0.109	0.153	0.123
Financials	0.282	0.087	0.050	0.076	0.209	0.270	0.465	0.314
Utilities	0.116	0.048	0.013	0.046	0.223	0.254	0.234	0.083
Cross-industry average	0.181	0.094	0.063	0.068	0.191	0.163	0.279	0.195

3. Methodology

The simplest way of showing the role of country and industry effects is to calculate and analyse the correlations of country and industry indexes. However, correlation analysis ignores the differences between the composition of indexes across countries. For instance, Finland and Belgium index returns have a correlation of 0.24 in the 1999–2001 period. Is this relatively low correlation level mostly due to the national differences between the two countries or to the fact that the Finland index return has an Information Technology industry weight of 44% while Belgium's has an inexpressive 0.1% weight? In order to evaluate this subject properly, we adopt a simple factor model assuming that stock returns are determined by country and industry factors. Thus, we are able to measure those changes and to determine which factor has most influence on equity returns.

We measure the relative importance of country and industry factors in explaining return correlations by decomposing the return of a given stock or industry index into a common factor, a country effect, an industry effect and a firm-specific disturbance, as given by the following equation:

$$R_{it} = \alpha_t + \beta_{jt} + \gamma_{kt} + \varepsilon_{it}, \tag{1}$$

where R_{it} is the return on the stock i at time t, α_t is the common factor, β_{jt} is industry j effect, γ_{kt} is country k effect and ε_{it} is the disturbance term. The firm-specific disturbances have a zero mean, finite variance for returns in all countries and industries, and are uncorrelated across firms.

This is the fixed-effects model proposed by Heston and Rouwenhorst (1994) to separate the country performance from the industry performance. The model assumes no interaction between the effects, i.e., ignores the fact that industry effects may be country specific and vice versa. The model also assumes that all individual stocks have equal exposure to domestic and global shocks.

We use national industrial indexes to measure returns instead of individual securities as in Griffin and Karolyi (1998). The empirical challenge is to run a cross-sectional regression capable of extracting those effects, which can be done using a dummy variable regression framework:

$$R_i = \alpha + \sum_{j=1}^{10} \beta_j I_{ij} + \sum_{k=1}^{11} \gamma_k C_{ik} + e_i, \tag{2}$$

where R_i is the return on each index i, I_{ij} is an industry dummy that is equal to one if index i belongs to industry j and zero otherwise, and C_{ik} is a country dummy that is equal to one if index i belongs to country k and zero otherwise.

To avoid perfect multicollinearity, the effects must be measured against a benchmark. Instead of using an arbitrary country and industry as a benchmark, we measure how each industry or country differs from the average return of the sample (intercept), i.e., relative to EMU value-weighted or equally-weighted market portfolios. This definition can be accomplished by imposing the following restrictions for the value-weighted case:

$$\sum_{j=1}^{10} w_j \beta_j = 0, \tag{3}$$

$$\sum_{k=1}^{11} v_k \gamma_k = 0. \tag{4}$$

where w_j and v_k represent the weights of industry j and country k in the EMU market portfolio, respectively. Similarly, for the equally-weighted case:

$$\sum_{j=1}^{10} \beta_j = 0, \tag{5}$$

$$\sum_{k=1}^{11} \gamma_k = 0. \tag{6}$$

We obtain a daily time series of the intercept, country and industry coefficients by running a cross-sectional regression for every day. These estimates can then be used to assess the role of the common and the industry factors in country returns:

$$R_k = \hat{\alpha} + \sum_{j=1}^{10} w_j^k \hat{\beta}_j I_{kj} + \hat{\gamma}_k, \tag{7}$$

where R_k is country k index return and w_j^k is the share of industry j in the total market capitalisation of country k. This share weights the sum of the ten industry effects.

Similarly, the role of the common and country factors in industry returns is given by:

$$R_j = \hat{\alpha} + \sum_{k=1}^{11} x_k^j \hat{\gamma}_k C_{jk} + \hat{\beta}_j, \tag{8}$$

where R_j is industry j index return and v_k^j is the share of country k in the total market capitalisation of industry j. This share weights the sum of the 11 country effects.

We can decompose the country return R_k into a component common to all countries, $\hat{\alpha}$, the average of the industry effects that compose country k index, and a pure country component, $\hat{\gamma}_k$. Similarly, we can decompose the global industry return R_j into a component common to all countries, $\hat{\alpha}$, the average of the country effects that compose industry j index, and a pure industry component, $\hat{\beta}_j$.

The coefficient α represents the average return of the sample, that is, the return on the value-weighted or equally-weighted EMU market portfolio, the benchmark against which we measure up country and industry components of index returns. The estimator of the country and industry coefficients represents the cross-section excess return over that measure in a "pure" fashion. Country pure effects capture the excess return over the EMU market owing to national factors. Industry pure effects measure the excess return over that same benchmark due to industrial global factors.

Other papers use alternative methodologies to the fixed-effects model to study the relative importance of country and industry effects. Ehling and Ramos (2002), Gerard *et al*. (2002), Eiling *et al*. (2004) and Petrella (2005) use mean-variance spanning tests to measure and to test the added benefits of country over industry diversification. In this paper we focus on the evolution and determinants of industry and country effects over time rather than studying the corresponding diversifications benefits directly. The fixed-effects provides us with the required time series estimates of the influence of country and industry effects on equity returns. Ferreira and Gama (2004) propose a

volatility decomposition method to separate country and national industry effects, which also provides time series estimates.

4. Empirical Results

This section presents the results of the decomposition of returns into common, country and global industry components. Results are presented for the sample for EMU countries using both value and equal weights. We also present results for an extended country sample that includes five more European countries, but that do not belong to the EMU.

4.1. *Time series of country and industry effects*

Table 5 presents the time series variances of the components resulting from the decomposition country (industry) returns into a common factor, a pure country (industry) factor and an average of the industry (country) factor for the value-weighted EMU equity market.[5] Panel A presents the results for each country, Panel B for each industry, and Panel C presents averages across country and industry as well as the common factor.

The main finding is the dominance of country effects over industry and common market effects over the whole sample period. The average variance of pure country effects is 1.233%-squared compared with 0.555%-squared for pure industry effects, which implies a ratio of pure country to industry effects of 2.205 for the whole sample period. The average variance of the global market factor (0.590%-squared) is of similar magnitude to the one obtained for the average variance of the industry factor.

There are considerable cross-country differences in the variances of the pure country effects. Germany, the Netherlands and Spain present the smallest country effect variances and Greece, Finland, Italy and Ireland the greatest country effect variances. An opinion poll published in 1998 revealed that only Greece was not expected to participate in the EMU first stage.[6] This market sentiment could explain why Greece has the largest country effects of the EMU. Greece was, in fact, the last country to convert to the euro due to difficulties in terms of nominal convergence. The country effects variances of the largest, well-integrated markets tend to be smaller.

There are also considerable cross-industry differences in the variances of the pure country effects. Information Technology shows the largest industry effects variance, four times greater than the industry average and greater than most countries variances. Resources (e.g. oil, mining and gas) and Cyclical Consumer Goods (e.g. automobiles) also show relative large variances, which could reflect their global nature.

Figure 1 plots the time series variance of pure country, pure industry and common effects calculated using a one-year rolling window. The pure country effect reflects the national determinants of equity returns. The pure industry effect reflects the global industry determinants of equity returns. The common effect (or global market factor) captures broad co-movement across equity returns.

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[5]Similar results using mean absolute deviations of each component of return in alternative to variances are not shown here, but are available upon request.

[6]See McCauley and White (1997).

Table 5

Decomposition of daily index returns into country and industry effects – EMU value-weighted

This table shows the time series variance of the components of the value-weighted country and industry index returns in local currency over the EMU market for the whole sample period and sub-periods. Each country index returns is decomposed in a pure country effect and a sum of ten industry effects. Each industry index return is decomposed in the sum of 11 country effects and a pure industry effect. Returns are measured in percentage per day.

	1975–2001		1975–1978		1979–1982		1983–1986		1987–1990		1991–1994		1995–1998		1999–2001	
	Pure effect	Sum of effects	Pure effect	Sum of effect	Pure effect	Sum of effect	Pure effect	Sum of effect	Pure effect	Sum of effect	Pure effect	Sum of effect	Pure effect	Sum of effect	Pure effect	Sum of effect
Panel A: Country																
Germany	0.216	0.015	0.058	0.010	0.108	0.030	0.233	0.019	0.366	0.009	0.173	0.006	0.284	0.012	0.329	0.023
Belgium	0.602	0.045	0.528	0.042	0.816	0.047	0.713	0.031	0.693	0.021	0.279	0.014	0.441	0.027	0.825	0.185
France	0.674	0.014	1.128	0.024	1.335	0.028	0.822	0.015	0.540	0.007	0.256	0.004	0.255	0.008	0.218	0.014
Ireland	1.310	0.048	1.828	0.026	0.893	0.050	1.455	0.043	1.890	0.018	0.767	0.010	0.779	0.024	1.678	0.227
Italy	1.487	0.031	1.472	0.023	3.412	0.054	1.857	0.045	0.908	0.019	1.041	0.011	0.838	0.017	0.526	0.052
Netherlands	0.274	0.063	0.216	0.055	0.304	0.116	0.326	0.078	0.335	0.054	0.175	0.024	0.283	0.024	0.286	0.106
Austria	0.986	0.053	0.971	0.075	0.851	0.061	1.374	0.044	1.690	0.016	0.496	0.007	0.552	0.010	0.930	0.220
Spain	0.684	0.031	–	–	–	–	–	–	0.922	0.021	0.564	0.037	0.594	0.037	0.657	0.058
Greece	3.709	0.022	–	–	–	–	–	–	5.780	0.026	2.848	0.013	2.680	0.026	4.230	0.028
Finland	2.645	0.411	–	–	–	–	–	–	1.039	0.014	1.997	0.036	2.238	0.279	5.987	1.626
Portugal	0.871	0.043	–	–	–	–	–	–	1.653	0.015	0.751	0.013	0.719	0.045	0.991	0.097

Panel B: Industry																
Basic Industries	0.262	0.021	0.162	0.012	0.158	0.021	0.274	0.030	0.175	0.028	0.112	0.013	0.309	0.024	0.853	0.019
Cyc. Cons. Goods	0.567	0.044	1.133	0.028	0.721	0.032	0.520	0.067	0.146	0.044	0.149	0.038	0.358	0.039	1.138	0.073
Cyc. Services	0.240	0.019	0.234	0.005	0.330	0.011	0.228	0.029	0.188	0.026	0.138	0.022	0.186	0.017	0.456	0.020
General Industrials	0.154	0.032	0.082	0.008	0.111	0.029	0.150	0.039	0.148	0.055	0.070	0.025	0.181	0.033	0.436	0.041
Information Techn.	2.247	0.619	3.255	1.128	3.561	1.335	2.974	0.635	0.831	0.260	0.655	0.113	1.432	0.141	3.459	0.782
N-cyc. Cons. Goods	0.275	0.054	0.156	0.035	0.184	0.061	0.145	0.104	0.149	0.073	0.103	0.029	0.170	0.026	1.432	0.045
Non-cyc. Services	0.511	0.057	0.801	0.021	0.307	0.048	0.478	0.162	0.348	0.081	0.206	0.033	0.287	0.024	1.495	0.013
Resources	0.735	0.121	0.427	0.140	0.756	0.138	0.665	0.203	0.448	0.167	0.302	0.059	0.790	0.064	2.317	0.055
Financials	0.132	0.027	0.082	0.008	0.113	0.076	0.139	0.029	0.082	0.023	0.041	0.015	0.126	0.008	0.454	0.028
Utilities	0.424	0.102	0.242	0.044	0.248	0.079	0.536	0.086	0.444	0.134	0.195	0.098	0.475	0.134	1.046	0.154
Panel C: Averages																
Cross-country	1.233	0.071	0.886	0.036	1.103	0.055	0.969	0.039	1.438	0.020	0.850	0.014	0.878	0.046	1.514	0.240
Cross-industry	0.555	0.110	0.657	0.143	0.649	0.183	0.611	0.138	0.296	0.089	0.197	0.044	0.431	0.051	1.309	0.123
Common Factor	0.590		0.256		0.245		0.406		0.849		0.449		0.917		1.230	
Country/Industry	2.205	0.644	1.348	0.253	1.700	0.301	1.586	0.284	4.860	0.225	4.309	0.316	2.036	0.905	1.157	0.514
Country/Common	2.074		3.458		4.508		2.385		1.694		1.891		0.958		1.231	

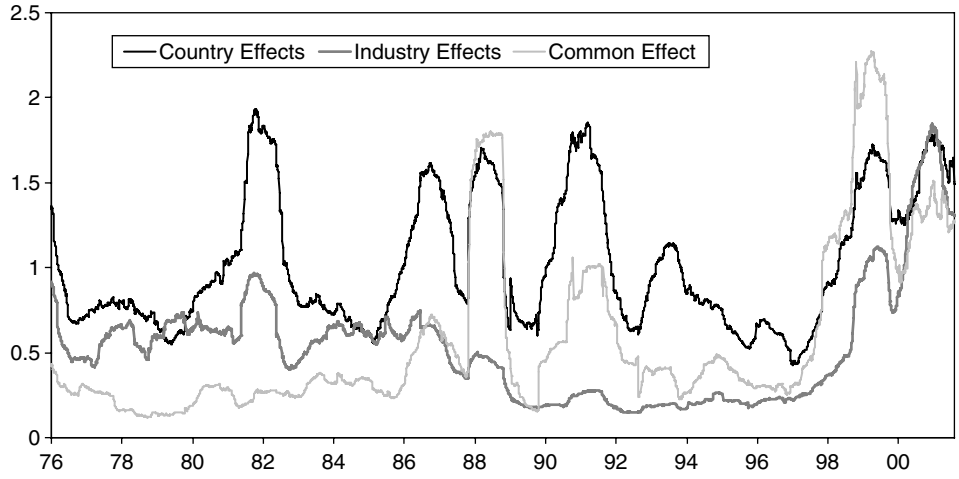

Fig. 1. Variance of country, industry and common effects

This figure plots the cross-country average of the variance of pure country effects, the cross-industry average of the variance of pure industry effects, and the variance of the common effect calculated using a one-year rolling window. The sample period is from 1975 to 2001 and the country sample is the EMU. Returns are measured in percent per day.

The time evolution clearly shows the growing importance of industry effects over national effects, especially after 1996. Also clear is the increased importance of the common effect during crises periods, such as the 1987 stock market crash, the 1991 Gulf war and the 1997–1998 Russian and Asian crisis. This is not surprising given the evidence that the correlation between country equity returns increases during bad times (see, e.g. Longin and Solnik, (2001). Overall, we can observe that the average variances have been increasing in recent years.

Figure 2 plots the time series of the ratio of pure country to industry effects variances and the ratio of pure industry to common effects variance calculated using a one-year rolling window, which illustrates the evolution through time between the relative importance of country, common, and industry effects on equity returns. A decrease in both ratios is consistent with an increase in importance of global factors (industry or common) in explaining the variation in equity returns.

The growing importance of the industry effects over the country effects is even clearer from Figure 2, which shows a ratio of 7.6 in 1990 declining to 1.1 at the end of the sample period. Another result is the clear prevalence of country effects during the 1989–94 period, mostly due to very large country effects from countries such as Greece and Finland. The global market factor is less important in explaining stock returns variation during most of the whole sample period, with the exception of the 1987–1988 and 1997–1999 crisis periods and towards the end of the sample period. In fact, there is a clear negative trend of the ratio of country to common effects, especially in the 1990s, which is consistent with an increase in the importance of global factors as determinants of stock returns.

Even though results based on value-weighted returns make more sense for an investor used to making his financial bets on capitalisation-weighted portfolios, the investor whose strategy would be to pick individual stocks independently of their capitalisation should consider equally-weighted results.

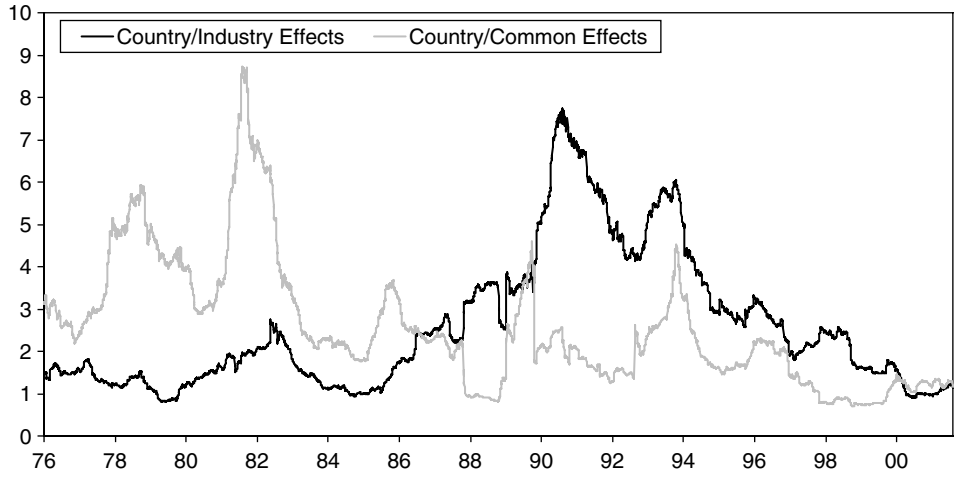

Fig. 2. Ratio of country to industry and common effects variance

This figure plots the ratio of the cross-country average of the variance of pure country effects to the cross-industry average of the variance of pure industry effects and the ratio of the cross-country average of the variance of pure country effects to the variance of the common effect calculated using a one-year rolling window. The sample period is from 1975 to 2001 and the country sample is the EMU. Returns are measured in percent per day.

Table 6 presents the variances of the pure factors estimates for the equally-weighted EMU market portfolio for comparison. The main results remain unchanged with the use of equally-weighted returns. The average variance of pure country effects is 0.823%-squared compared with 0.328%-squared for pure industry effects, which implies a ratio of pure country to industry effects of 2.180 for the whole sample period. Greece, Finland, Italy and Ireland still present the greatest country effects, and Information Technology remains the industry with the largest variance. Overall, the results are in line with those resulting from the value-weighted analysis. Over the whole sample period, they confirm that country effects still rule over industry and common effects.

Figure 3 compares the time series of the ratio of pure country to industry effects variances calculated using a one-year rolling window of equally- and value-weighted returns. There are two different periods in terms of the comparison between equal and value weights: (1) the 1975–1995 period in which country (industry) effects are more (less) pronounced when returns are value-weighted; and (2) the 1995–2001 period in which country (industry) effects are less (more) pronounced when returns are value-weighted. This result suggests that large firms are becoming less exposed to national shocks and increasingly more exposed to global industrial effects. This finding is consistent with the evidence in Cavaglia *et al.* (2001) and Brooks and DelNegro (2003) that large international companies' stock returns have a higher exposure to global effects (common or industry) and lower exposure to country factors than small companies which only operate in their domestic market.

4.2. *Additional results and robustness*

We also consider an extended country sample that includes other European non-EMU countries, specifically: the UK, Norway, Switzerland, Denmark and Sweden.

Table 6

Decomposition of daily index returns into country and industry effects – EMU equally-weighted

This table shows the time series variance of the components of the equal-weighted country and industry index returns in local currency over the EMU market for the whole sample period and sub-periods. In Panel A each country index returns is decomposed in a pure country effect and a sum of ten industry effects. In Panel B each industry index return is decomposed in the sum of 11 country effects and a pure industry effect. Returns are measured in percentage per day.

	1975–2001		1975–1978		1979–1982		1983–1986		1987–1990		1991–1994		1995–1998		1999–2001	
	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects
Panel A: Country																
Germany	0.320	0.003	0.289	0.005	0.284	0.008	0.427	0.005	0.433	0.003	0.202	0.001	0.281	0.000	0.322	0.000
Belgium	0.353	0.006	0.222	0.010	0.410	0.013	0.353	0.009	0.462	0.006	0.236	0.003	0.256	0.002	0.627	0.000
France	0.518	0.013	0.594	0.029	0.625	0.029	0.488	0.021	0.680	0.003	0.410	0.001	0.386	0.002	0.405	0.002
Ireland	0.818	0.017	1.169	0.027	0.732	0.036	1.119	0.027	1.014	0.008	0.475	0.007	0.484	0.006	0.668	0.005
Italy	0.990	0.005	1.141	0.010	1.790	0.014	1.052	0.008	0.594	0.002	0.980	0.001	0.696	0.000	0.496	0.000
Netherlands	0.389	0.004	0.366	0.005	0.344	0.007	0.474	0.006	0.579	0.003	0.187	0.001	0.376	0.002	0.399	0.003
Austria	0.718	0.035	0.874	0.078	0.723	0.094	0.753	0.034	1.156	0.019	0.500	0.007	0.346	0.001	0.638	0.000
Spain	0.653	0.004	–	–	–	–	–	–	1.058	0.004	0.574	0.004	0.366	0.005	0.620	0.002
Greece	2.918	0.013	–	–	–	–	–	–	3.967	0.028	2.320	0.019	1.925	0.002	4.164	0.002
Finland	0.797	0.005	–	–	–	–	–	–	0.699	0.008	1.201	0.007	0.479	0.003	0.762	0.000
Portugal	0.582	0.007	–	–	–	–	–	–	1.109	0.009	0.627	0.007	0.376	0.007	0.631	0.008

Panel B: Industry																
Basic Industries	0.125	0.007	0.104	0.010	0.130	0.008	0.135	0.011	0.126	0.014	0.087	0.005	0.067	0.000	0.282	0.000
Cyc. Consumer Goods	0.353	0.023	0.340	0.025	0.360	0.028	0.356	0.033	0.447	0.034	0.312	0.027	0.248	0.002	0.426	0.004
Cyc. Services	0.151	0.007	0.172	0.010	0.224	0.007	0.131	0.012	0.127	0.009	0.170	0.005	0.091	0.000	0.138	0.000
General Industrials	0.128	0.012	0.099	0.027	0.157	0.017	0.153	0.017	0.131	0.010	0.094	0.007	0.125	0.000	0.141	0.000
Information Techn.	1.617	0.240	3.070	0.594	2.832	0.625	2.322	0.231	0.514	0.096	0.387	0.037	0.449	0.009	1.816	0.003
Non-cyc. Cons. Goods	0.180	0.027	0.180	0.057	0.265	0.070	0.199	0.032	0.172	0.014	0.102	0.005	0.081	0.000	0.301	0.000
Non-cyc. Services	0.298	0.015	0.257	0.015	0.253	0.013	0.229	0.018	0.215	0.030	0.160	0.016	0.140	0.007	1.121	0.001
Resources	0.474	0.046	0.423	0.085	0.800	0.110	0.661	0.059	0.407	0.018	0.205	0.025	0.254	0.008	0.615	0.006
Financials	0.115	0.007	0.113	0.010	0.119	0.007	0.109	0.010	0.099	0.014	0.075	0.005	0.109	0.000	0.212	0.000
Utilities	0.336	0.092	0.424	0.120	0.541	0.146	0.368	0.112	0.281	0.113	0.113	0.064	0.217	0.034	0.451	0.031
Panel C: Averages																
Cross-country	0.823	0.010	0.665	0.024	0.701	0.029	0.667	0.016	1.068	0.008	0.701	0.005	0.543	0.003	0.885	0.002
Cross-industry	0.378	0.048	0.518	0.095	0.568	0.103	0.467	0.054	0.252	0.035	0.171	0.020	0.178	0.006	0.550	0.005
Common Factor	0.388		0.211		0.185		0.225		0.640		0.309		0.596		0.623	
Country/Industry ratio	2.180	0.216	1.284	0.247	1.234	0.279	1.429	0.294	4.239	0.237	4.111	0.266	3.050	0.427	1.608	0.479
Country/Common ratio	2.123		3.156		3.798		2.964		1.668		2.271		0.911		1.420	

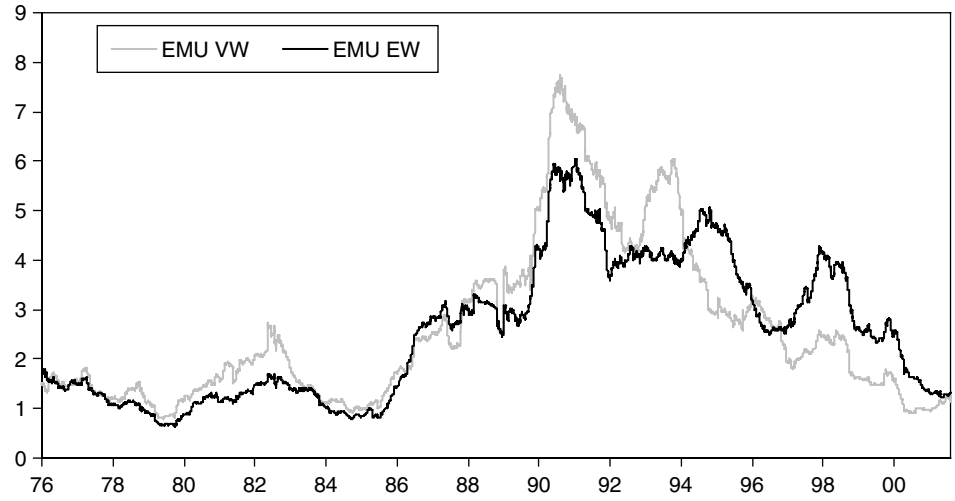

Fig. 3. Ratio of country to industry effects variance: value- vs. equal-weighted

This figure plots the ratio of the cross-country average of the variance of pure country effects to the cross-industry average of the variance of pure industry effects for value- and equal-weighted returns using a one-year rolling window. The sample period is from 1975 to 2001 and the country sample is the EMU. Returns are measured in percent per day.

Table 7 presents the results including both EMU and non-EMU countries (Europe sample). The main results are similar to those using the EMU sample. The countries with the largest equity markets irrespective of being part of the EMU, namely the UK and Germany, tend to have smaller country effects. Information Technology has the largest industry effect, followed by the Resources and Cyclical Consumer Goods industries. These industries are seen by investors as global, which can be at the origin of their large industry effects.

Figure 4 compares the ratio of pure country to industry effects variances calculated using a one-year rolling window for both the EMU and the European sample using value-weighted returns. The comparison is useful for answering the following question: are the results specific to the EMU, or is there a similar trend when we consider other European countries?

Figure 4 shows evidence that results obtained with the European sample are mixed when compared to the EMU sample. The European sample gives more pronounced industry effects in the post-euro period (1999–2001), with a country to industry variance ratio of 1.083, compared to 1.130 obtained for the EMU sample. However, the European sample shows a higher ratio than the EMU sample over the whole sample period, respectively, 2.243 and 2.148.

Overall, the results for the two sample are not significantly different. The similarity of the results allows us to conclude that the increasing importance of industrial influences is not exclusive to EMU countries, being instead shared by other non-EMU European countries.

Table 8 shows the results for equally-weighted returns for the European sample. Switzerland, a non-EMU country, exhibits the smallest country pure effects variance. Sweden and Denmark also present below average country effects variance, despite the fact that they are not EMU members, which may indicate that stronger economies

Table 7

Decomposition of daily index returns into country and industry effects – Europe value-weighted

This table shows the time series variance of the components of the value-weighted country and industry index returns in local currency over the European market for the whole sample period and sub-periods. In Panel A each country index returns is decomposed in a pure country effect and a sum of ten industry effects. In Panel B each industry index return is decomposed in the sum of 11 country effects and a pure industry effect. Returns are measured in percentage per day.

	1975–2001		1975–1978		1979–1982		1983–1986		1987–1990		1991–1994		1995–1998		1999–2001	
	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects
Panel A: Country																
Germany	0.462	0.029	0.464	0.025	0.347	0.056	0.532	0.032	0.698	0.017	0.317	0.014	0.406	0.016	0.478	0.050
Belgium	0.652	0.041	0.648	0.037	0.940	0.045	0.669	0.032	0.847	0.028	0.314	0.023	0.408	0.022	0.779	0.132
France	0.810	0.015	1.276	0.036	1.740	0.029	0.918	0.010	0.687	0.005	0.281	0.004	0.293	0.006	0.291	0.014
Ireland	1.149	0.044	1.446	0.035	0.937	0.067	1.254	0.046	1.583	0.022	0.712	0.012	0.741	0.017	1.485	0.147
Italy	1.632	0.042	1.644	0.048	3.735	0.085	1.917	0.052	0.998	0.028	1.197	0.024	0.953	0.020	0.604	0.038
Netherlands	0.409	0.056	0.551	0.046	0.740	0.112	0.389	0.067	0.400	0.059	0.154	0.028	0.291	0.016	0.301	0.070
Austria	1.052	0.050	1.184	0.061	1.022	0.077	1.263	0.043	1.823	0.024	0.578	0.014	0.527	0.011	0.888	0.163
Spain	0.751	0.028	–	–	–	–	–	–	1.008	0.021	0.630	0.025	0.647	0.031	0.722	0.039
Greece	3.731	0.026	–	–	–	–	–	–	5.832	0.032	2.894	0.018	2.626	0.024	4.304	0.036
Finland	2.579	0.415	–	–	–	–	–	–	0.978	0.015	1.998	0.031	1.999	0.230	6.078	1.728
Portugal	0.879	0.040	–	–	–	–	–	–	1.534	0.017	0.829	0.022	0.718	0.038	0.956	0.081
Denmark	0.997	0.055	0.752	0.105	1.693	0.083	1.207	0.028	1.026	0.021	0.680	0.010	0.586	0.015	1.046	0.057
Norway	2.313	0.080			4.718	0.207	2.770	0.060	2.871	0.051	1.740	0.028	0.885	0.028	1.045	0.079
Sweden	1.143	0.115			1.297	0.214	1.260	0.153	1.077	0.029	1.093	0.026	0.619	0.060	1.898	0.376
Switzerland	0.511	0.069	0.764	0.045	0.483	0.059	0.441	0.042	0.587	0.031	0.430	0.044	0.397	0.053	0.450	0.287
United Kingdom	0.276	0.006	0.717	0.007	0.225	0.005	0.171	0.006	0.255	0.004	0.138	0.003	0.156	0.005	0.270	0.018
Panel B: Industry																
Basic Industries	0.169	0.013	0.098	0.016	0.117	0.011	0.134	0.012	0.095	0.010	0.089	0.006	0.188	0.016	0.627	0.020
Cyc. Consumer Goods	0.600	0.148	1.204	0.220	0.814	0.184	0.562	0.189	0.164	0.163	0.151	0.079	0.356	0.071	1.133	0.123

Table 7
Continued.

	1975–2001		1975–1978		1979–1982		1983–1986		1987–1990		1991–1994		1995–1998		1999–2001	
	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects
Cyc. Services	0.200	0.064	0.254	0.147	0.209	0.073	0.193	0.059	0.125	0.073	0.095	0.031	0.171	0.028	0.434	0.023
General Industrials	0.144	0.042	0.075	0.075	0.146	0.025	0.198	0.040	0.114	0.057	0.060	0.031	0.123	0.024	0.368	0.042
Information Techn.	2.095	0.657	3.328	1.276	3.968	1.750	1.998	0.592	0.631	0.211	0.550	0.119	1.213	0.120	3.446	0.460
Non-cyc. Cons. Goods	0.277	0.034	0.142	0.050	0.191	0.022	0.213	0.037	0.172	0.033	0.167	0.025	0.209	0.031	1.160	0.046
Non-cyc. Services	0.565	0.048	0.719	0.131	0.344	0.030	0.655	0.046	0.392	0.062	0.283	0.030	0.256	0.015	1.711	0.010
Resources	0.771	0.064	0.514	0.134	0.895	0.072	0.618	0.071	0.595	0.077	0.379	0.023	0.578	0.025	2.401	0.036
Financials	0.129	0.015	0.105	0.005	0.138	0.018	0.106	0.020	0.082	0.027	0.066	0.018	0.119	0.004	0.374	0.009
Utilities	0.440	0.141	0.243	0.337	0.221	0.249	0.539	0.200	0.548	0.040	0.397	0.028	0.455	0.041	0.806	0.058
Panel C: Averages																
Cross-country	1.209	0.070	0.945	0.045	1.490	0.087	1.066	0.048	1.388	0.025	0.874	0.020	0.766	0.037	1.350	0.207
Cross-industry	0.539	0.123	0.668	0.239	0.704	0.244	0.522	0.127	0.292	0.075	0.224	0.039	0.367	0.038	1.246	0.083
Common Factor	0.564		0.439		0.378		0.315		0.786		0.407		0.756		1.032	
Country/Industry ratio	2.243	0.568	1.414	0.186	2.115	0.356	2.044	0.376	4.759	0.334	3.907	0.521	2.088	0.985	1.083	2.506
Country/Common ratio	2.144		2.152		3.943		3.386		1.766		2.149		1.013		1.308	

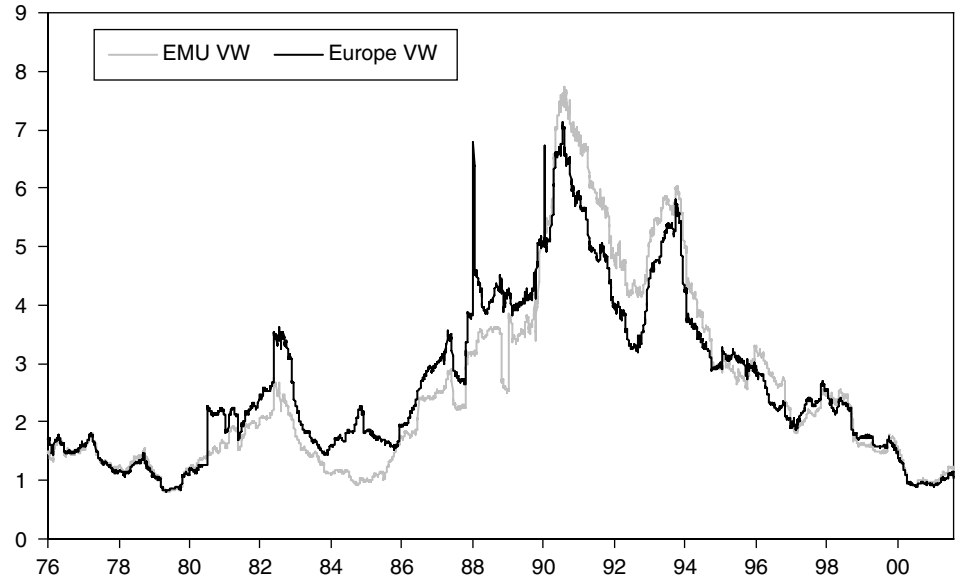

Fig. 4. Ratio of country to industry effects variance: EMU vs. Europe

This figure plots the ratio of the cross-country average of the variance of pure country effects to the cross-industry average of the variance of pure industry effects for the EMU and European samples using a one-year rolling window. The sample period is from 1975 to 2001 and returns are value-weighted. Returns are measured in percent per day.

with well-developed equity markets tend to have smaller country effects independently of their standing as members of the EMU.

Finally, we check the robustness of our results with respect to the stock return frequency. Table 9 presents the results for value-weighted weekly returns for the EMU sample. The average variance of pure country effects is 6.900%-squared compared with 2.937%-squared for pure industry effects, which implies a ratio of pure country to industry effects of 2.349 for the whole sample period. This ratio is similar to the one (2.243) estimated using daily stock returns (see Table 5). The average variance of the global market factor (3.383%-squared) is of similar magnitude to the one obtained for the average variance of the industry factor. Results by subperiods using weekly returns are also consistent with the previous results using daily returns. In particular, the ratio of country to industry effects in the post-euro period is 0.970 using weekly returns compared with 1.130 using daily returns, which again confirms the increase in the relative importance of industry effects towards the end of the sample period.

4.3. *Portfolio diversification implications*

The relative importance of country and industry effects has implications in terms of international portfolio diversification. This section explores the implications of our results in terms of portfolio diversification. We calculate the risk reduction that can be achieved through alternative diversification strategies (country or industry) relative to the average asset (national industry portfolios) variance-diversification ratio.

The diversification ratio of an unrestricted strategy is compared with those arising from restricted strategies: (1) diversify across countries within a specific industry

Table 8

Decomposition of daily index returns into country and industry effects – Europe equal-weighted

This table shows the time series variance of the components of the equal-weighted country and industry index returns in local currency over the European market for the whole sample period and sub-periods. In Panel A each country index returns is decomposed in a pure country effect and a sum of ten industry effects. In Panel B each industry index return is decomposed in the sum of 11 country effects and a pure industry effect. Returns are measured in percentage per day.

	1975–2001		1975–1978		1979–1982		1983–1986		1987–1990		1991–1994		1995–1998		1999–2001	
	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects
Panel A: Country																
Germany	0.326	0.003	0.330	0.004	0.267	0.006	0.447	0.005	0.453	0.002	0.199	0.000	0.273	0.000	0.308	0.000
Belgium	0.368	0.004	0.242	0.006	0.431	0.008	0.359	0.008	0.507	0.004	0.243	0.002	0.259	0.001	0.623	0.000
France	0.543	0.011	0.652	0.032	0.671	0.030	0.547	0.005	0.703	0.002	0.393	0.001	0.388	0.002	0.395	0.002
Ireland	0.802	0.013	1.071	0.017	0.690	0.025	1.164	0.023	0.999	0.007	0.497	0.005	0.468	0.005	0.668	0.005
Italy	1.081	0.004	1.251	0.007	1.982	0.010	1.200	0.008	0.613	0.001	1.052	0.000	0.748	0.000	0.517	0.000
Netherlands	0.379	0.003	0.396	0.004	0.318	0.005	0.485	0.005	0.538	0.002	0.170	0.001	0.369	0.002	0.374	0.003
Austria	0.726	0.020	0.859	0.045	0.666	0.048	0.754	0.024	1.258	0.013	0.518	0.005	0.346	0.000	0.645	0.000
Spain	0.690	0.003							1.135	0.003	0.589	0.003	0.393	0.004	0.647	0.002
Greece	3.042	0.008							4.123	0.018	2.390	0.011	2.022	0.003	4.374	0.002
Finland	0.799	0.003							0.705	0.006	1.234	0.005	0.461	0.002	0.740	0.000
Portugal	0.599	0.005							1.108	0.006	0.658	0.005	0.388	0.005	0.641	0.005
Denmark	0.645	0.021	0.404	0.072	0.753	0.042	1.133	0.009	0.680	0.007	0.430	0.005	0.390	0.005	0.758	0.005
Norway	0.897	0.007			0.891	0.019	1.069	0.011	1.256	0.005	1.006	0.003	0.418	0.002	0.655	0.002
Sweden	0.718	0.009			0.937	0.047	0.968	0.024	0.678	0.007	0.878	0.002	0.421	0.000	0.522	0.000
Switzerland	0.278	0.006	0.313	0.010	0.200	0.010	0.259	0.010	0.463	0.004	0.212	0.002	0.194	0.002	0.314	0.004
United Kingdom	0.600	0.002	1.488	0.004	0.714	0.005	0.492	0.004	0.591	0.001	0.273	0.000	0.204	0.000	0.350	0.000

Panel B: Industry																
Basic Industries	0.085	0.004	0.065	0.005	0.086	0.005	0.090	0.004	0.075	0.007	0.054	0.003	0.048	0.000	0.228	0.000
Cyc. Consumer Goods	0.244	0.020	0.274	0.030	0.280	0.032	0.258	0.032	0.244	0.019	0.189	0.016	0.157	0.001	0.326	0.002
Cyc. Services	0.102	0.004	0.104	0.005	0.150	0.009	0.128	0.007	0.080	0.004	0.094	0.003	0.057	0.000	0.100	0.000
General Industrials	0.076	0.006	0.060	0.016	0.094	0.008	0.085	0.007	0.069	0.005	0.053	0.003	0.072	0.000	0.109	0.000
Information Techn.	1.257	0.219	3.111	0.652	2.672	0.631	0.685	0.103	0.265	0.041	0.237	0.019	0.314	0.006	1.654	0.001
Non-cyc. Cons. Goods	0.115	0.014	0.098	0.031	0.131	0.035	0.121	0.016	0.098	0.011	0.065	0.003	0.059	0.000	0.295	0.000
Non-cyc. Services	0.242	0.016	0.208	0.011	0.166	0.015	0.178	0.025	0.176	0.029	0.115	0.019	0.116	0.005	1.002	0.001
Resources	0.385	0.038	0.320	0.078	0.690	0.071	0.547	0.050	0.292	0.020	0.161	0.019	0.190	0.007	0.560	0.009
Financials	0.089	0.004	0.072	0.007	0.079	0.007	0.084	0.004	0.070	0.007	0.067	0.003	0.101	0.000	0.183	0.000
Utilities	0.259	0.060	0.268	0.124	0.331	0.091	0.301	0.080	0.193	0.049	0.107	0.029	0.250	0.014	0.422	0.013
Panel C: Averages																
Cross-country	0.781	0.008	0.701	0.020	0.710	0.021	0.740	0.011	0.988	0.005	0.671	0.003	0.484	0.002	0.783	0.002
Cross-industry	0.285	0.038	0.458	0.096	0.468	0.090	0.248	0.033	0.156	0.019	0.114	0.012	0.136	0.004	0.488	0.003
Common Factor	0.368		0.207		0.150		0.179		0.652		0.315		0.550		0.598	
Country/Industry ratio	2.736	0.202	1.530	0.210	1.518	0.235	2.986	0.345	6.332	0.276	5.876	0.269	3.550	0.603	1.605	0.780
Country/Common ratio	2.123		3.386		4.733		4.138		1.516		2.128		0.879		1.310	

Table 9

Decomposition of weekly index returns into country and industry effects – EMU value-weighted

This table shows the time series variance of the components of the equal-weighted country and industry index returns in local currency over the European market for the whole sample period and sub-periods. In Panel A each country index returns is decomposed in a pure country effect and a sum of ten industry effects. In Panel B each industry index return is decomposed in the sum of 11 country effects and a pure industry effect. Returns are measured in percentage per week.

	1975–2001		1975–1978		1979–1982		1983–1986		1987–1990		1991–1994		1995–1998		1999–2001	
	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects	Pure effect	Sum of effects
Panel A: Country																
Germany	1.073	0.083	0.334	0.048	0.578	0.166	1.477	0.106	1.973	0.046	0.704	0.036	1.042	0.070	1.616	0.125
Belgium	3.400	0.273	2.951	0.225	4.309	0.285	4.396	0.178	4.642	0.166	1.693	0.072	1.846	0.173	4.362	1.124
France	3.634	0.080	6.031	0.153	7.033	0.125	4.915	0.075	3.217	0.043	1.226	0.026	1.212	0.062	0.902	0.075
Ireland	7.803	0.271	12.861	0.151	5.717	0.248	9.288	0.223	8.982	0.098	5.140	0.050	4.141	0.131	8.621	1.408
Italy	8.327	0.176	8.037	0.141	19.783	0.232	10.179	0.284	4.964	0.141	6.210	0.079	4.200	0.098	2.778	0.301
Netherlands	1.487	0.359	1.096	0.274	1.437	0.644	1.875	0.456	2.301	0.298	0.895	0.147	1.281	0.139	1.535	0.672
Austria	6.638	0.280	4.772	0.369	4.540	0.329	12.120	0.261	13.038	0.092	2.966	0.036	2.297	0.053	6.050	0.973
Spain	3.793	0.087	–	–	–	–	–	–	5.362	0.058	2.969	0.038	3.118	0.116	3.848	0.135
Greece	19.857	0.144	–	–	–	–	–	–	35.132	0.185	15.746	0.092	12.858	0.124	19.451	0.206
Finland	14.358	2.255	–	–	–	–	–	–	6.788	0.085	12.055	0.198	11.907	1.312	29.589	9.320
Portugal	5.525	0.261	–	–	–	–	–	–	10.860	0.108	4.753	0.105	4.554	0.258	6.349	0.562

Panel B: Industry																
Basic Industries	1.558	0.162	1.010	0.065	0.828	0.124	1.685	0.183	1.088	0.460	0.686	0.064	1.818	0.116	5.078	0.105
Cyc. Consumer Goods	3.518	0.294	6.614	0.163	5.086	0.165	2.802	0.419	0.826	0.537	1.175	0.237	2.120	0.202	7.188	0.349
Cyc. Services	1.340	0.134	1.181	0.024	1.962	0.058	1.161	0.146	1.072	0.408	0.817	0.106	1.044	0.084	2.599	0.101
General Industrials	0.817	0.197	0.451	0.051	0.583	0.167	0.785	0.226	0.866	0.509	0.422	0.114	0.988	0.139	2.094	0.164
Information Techn.	10.108	4.086	14.017	6.031	12.269	7.033	14.167	3.985	4.909	6.317	3.136	0.585	6.634	0.765	19.011	3.927
Non-cyc. Cons. Goods	1.752	0.291	0.765	0.169	0.964	0.343	0.926	0.521	0.639	0.502	0.600	0.156	0.999	0.121	10.549	0.197
Non-cyc. Services	2.764	0.387	3.458	0.118	1.283	0.231	2.791	0.935	1.562	0.951	1.170	0.169	1.578	0.120	10.013	0.071
Resources	4.268	0.698	2.151	0.766	4.360	0.691	3.971	1.120	2.784	1.258	1.740	0.295	4.092	0.300	14.469	0.330
Financials	0.808	0.220	0.579	0.040	0.454	0.446	0.878	0.140	0.595	0.620	0.363	0.088	0.976	0.037	2.366	0.143
Utilities	2.438	0.634	1.217	0.200	0.942	0.508	2.582	0.531	3.001	1.121	1.199	0.505	3.079	0.701	6.368	1.012
Panel C: Averages																
Cross-country	6.900	0.388	5.154	0.194	6.199	0.290	6.321	0.226	8.842	0.120	4.942	0.080	4.405	0.231	7.736	1.355
Cross-industry	2.937	0.710	3.144	0.763	2.873	0.976	3.175	0.821	1.734	1.268	1.131	0.232	2.333	0.259	7.973	0.640
Common Factor	3.383		1.637		1.267		2.141		5.496		2.728		4.089		7.759	
Country/Industry ratio	2.349	0.546	1.639	0.255	2.158	0.297	1.991	0.275	5.098	0.095	4.370	0.345	1.888	0.892	0.970	2.116
Country/Common ratio	2.040		3.148		4.893		2.953		1.609		1.812		1.077		0.997	

(country strategy); (2) diversify across industries within a specific country (industry strategy). The diversification ratio for the alternative strategies is given by the portfolio variance relative to the average asset variance using equal weights:

$$\frac{\text{Var}\left(\sum_{i=1}^{N} R_i\right)}{\frac{1}{N}\sum_{i=1}^{N} \text{Var}(R_i)} = \frac{1}{n} + \left(\frac{n-1}{n}\right)\frac{\overline{\text{Cov}(R_i, R_s)}}{\overline{\text{Var}\ (R_i)}}, \tag{9}$$

where n denotes the number of assets and the upper bars indicate averages.

Equation (9) shows that a portfolio combining a large number of indexes (n) with zero correlations between them practically means a 100% risk diversification. As the number of industries (countries) within each country (industry) increases, the equally-weighted portfolio variance becomes smaller, in terms of the average variance of a single market.

The EMU sample results are presented in Figure 5, for the whole sample period and sub-periods. Diversification ratios are presented for an unrestricted strategy, which diversifies randomly within the sample limits, and for country and industry strategies.

With regard to the whole sample period, the strategy that diversifies across industries within a country reduces portfolio variance to 43% of the average asset variance. On the other hand, country diversification within a single industry reduces the portfolio variance by 29%, a value that is close to that obtained by the unrestricted portfolio, 26%. Nevertheless, the results obtained for the most recent sub-periods show that a more efficient risk reduction can be achieved through the industry diversification strategy, when compared with the earlier sample sub-periods. In fact, the variance reduction obtained from the industry portfolio has considerably improved from 58% in the 1987–1990 period down to 36% of the average asset variance in the post-euro period. Although the most recent time periods show better results for the industry strategy, our results over the whole sample clearly confirm the benefit of a geographical diversification strategy over industrial diversification in terms of risk reduction.

Recently, Ehling and Ramos (2002) addressed the issue of comparing the benefits from country and industry investment allocation strategies using a sample of European countries and weekly returns. The results obtained using a spanning test introduced by Khan and Zhou (2001) in general confirm those presented in previous work, which favour country allocation. Even so, results obtained for the euro period (1999–2001) revealed the equivalence between the two strategies, which is consistent with our results.

4.4. *Can nominal convergence explain country and industry effects?*

This section investigates the role of monetary policy in explaining the time series behaviour of country and industry effects in the EMU countries. The EMU countries have been subject to a progressive interest rate and exchange rate harmonisation process (nominal convergence) that lead to the euro in 1999. In particular, we investigate whether the evolution of the ratio of pure country to industry effects can be explained by a reduction in the cross-sectional (equally-weighted) variance of interest rates and foreign exchange rate changes. Results for the ratio of pure country to common effects are also presented.

We use the monthly changes in the 3-month London interbank interest rate (middle rate) of each country to calculate the cross-sectional variance of short-term interest rates (CVI). The monthly geometric return of the exchange rate of each country currency against the British pound is used to calculate the cross-sectional variance of the exchange rates (CVFX). The source of both the interest rate and foreign exchange rate data is Datastream.

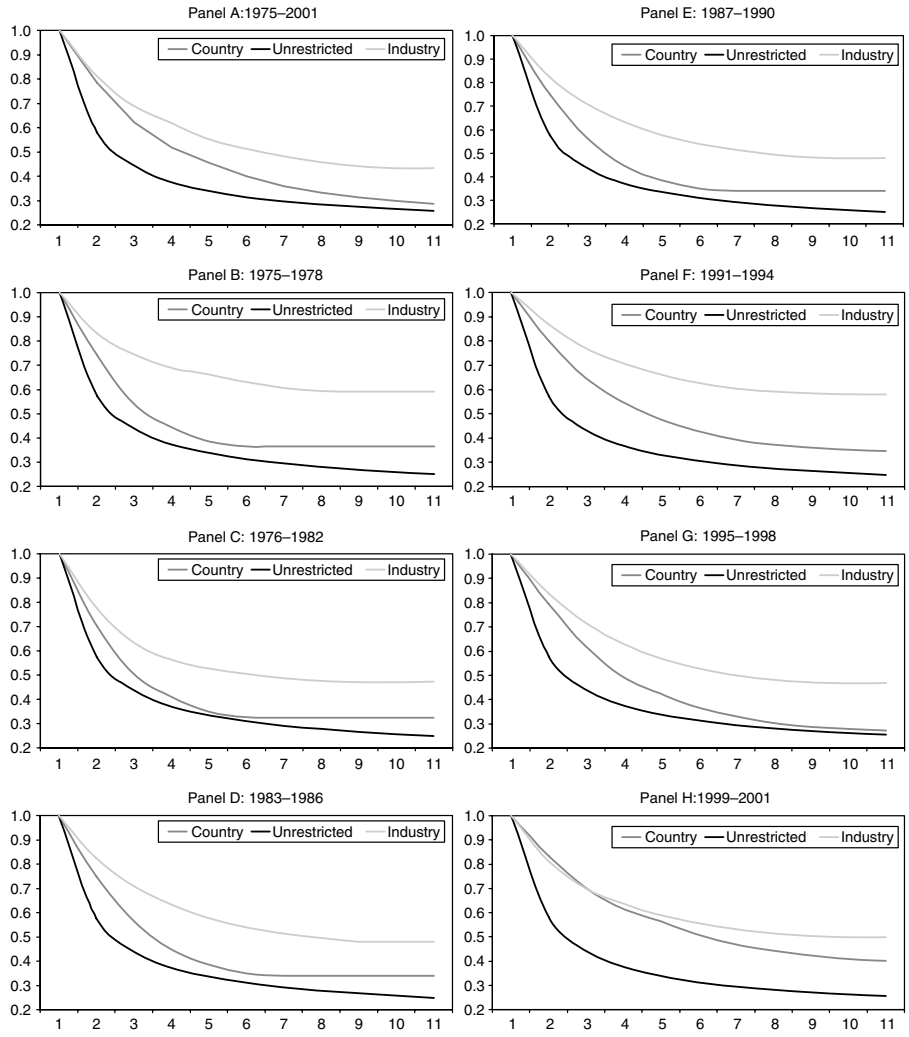

Fig. 5. Benefits of international diversification against number of assets

This figure plots the ratio of the portfolio variance relative to the average asset variance using equal weights against the number of assets in the portfolio. The diversification ratio is presented for an unrestricted strategy and restricted strategies that diversify across countries within a specific industry (country strategy), and diversify across industries within a specific country (industry strategy).

The monthly ratio of country to industry effects is calculated from the following monthly measures. We calculated the average of absolute country pure effects ($\hat{\gamma}_k$) for each country in each month and then average them across countries. We calculate the average of absolute industry pure effects ($\hat{\beta}_k$) for each industry in each month and then average them across industries.[7] As an alternative, we consider the monthly ratio of country to common effects.

[7]We use average absolute effects instead of variances because the former usually have better statistical properties than the latter.

We estimate the following time series regression over the 1975–2001 period:

$$\text{RATIO}_t = \theta_0 + \theta_1 t + \theta_2 I_{t\geq 92:02} + \theta_3 I_{t\geq 99:01} + \theta_4 \text{CVI}_{t-1} + \theta_5 \text{CVFX}_{t-1} + \varepsilon_t, \quad (10)$$

where RATIO is alternatively the ratio of pure country to industry effects and the ratio of pure country to common effects; $I_{t\geq 92:02}$ is a dummy variable that equals one after the signing of the Maastricht treaty in February 1992 and zero otherwise; and $I_{t\geq 99:01}$ is a dummy variable that equals one after the adoption of the euro and fixed currency rates were established in January 1999 and zero otherwise. We estimate the regression for combinations of the right-hand side variables to separate their contributions in explaining the variation in the ratio of country to industry or common effects. The results are reported in Table 10. Intercept, slope coefficients, Newey-West robust t-statistics, and R-squares are reported.

Panel A of Table 10 presents the results for the ratio of country to industry effects. The regression in line (4) uses only the trend coefficient and event dummy variables as explanatory variables. The trend coefficient is positive and significant over the 1975–2001 period, although the ratio of country to industry effects decreased in the late 1990s. As expected, both event dummy variables have a negative coefficient, but only the euro dummy variable has a statistically significant coefficient. Thus, the Maastricht treaty and, especially the euro adoption, have contributed to a decrease in the relative importance of country effects to industry effects.

The regressions in lines (5)–(7) analyse whether the cross-sectional variance of interest rates CVI and exchange rates CVFX contribute to explaining the ratio of country to industry effects. When CVI is used jointly with the trend and event dummy variables, the coefficient of CVI is positive and significant (t-statistic of 3.288). The coefficients and t-statistics for the time trend and dummy variables remain basically unchanged. The regression using CVFX in line (6) tells a similar story, i.e., the coefficient of CVFX is positive and significant (t-statistic of 2.217). However, when we include both CVI and CVFX as explanatory variables (see line (7)), the coefficient of CVFX drops considerably and it is no longer significant. The coefficient and t-statistic of CVI are only marginally smaller than in line (5).

Thus, there is evidence that the harmonisation of interest rates in the EMU has contributed to a decrease in the dominance of country over industry effects. A reduction in the cross-sectional variance of interest rates across EMU countries have enhanced stock market integration, Dewachter *et al.* (2004). The establishment of fixed exchange rates and, consequently, the reduction of the cross-sectional variance of exchange rates seem to have a much smaller role in the increase in the importance of global factors (industry and common). This is consistent with the work of Heston and Rouwenhorst (1994), De Santis *et al.* (1999), and Larsen and Resnick (2000) that currency effects have a small role in explaining the relative importance of country and industry effects.

Panel B of Table 10 presents similar estimates to Panel A for the ratio of country to common effects. The main finding is again that the coefficient of CVI is positive and significant in lines (5) and (7). This results is consistent with the finding for the ratio of country to industry effects that the increase in importance of global factors (industry and common) is explained by a decrease in the cross-sectional variance of interest rates. The results of Panel B also confirm the minor role of exchange rates in explaining the time series of country and industry effects. The main difference of the results for the ratio of country to common effects in Panel B relative to the ratio of country to industry effects in Panel A is related to the trend and dummy variables coefficients. The trend coefficient is negative, but insignificant when we include

Table 10

Time series regression of the ratio of country to industry and common effects

Estimates of the intercept and slope coefficients of:

$$\text{RATIO}_t = \theta_0 + \theta_1 t + \theta_2 I_{t\geq 92:02} + \theta_3 I_{t\geq 99:01} + \theta_4 \text{CVI}_{t-1} + \theta_5 \text{CVFX}_{t-1} + \varepsilon_t$$

are shown where RATIO alternatively is the monthly ratio of the average absolute country pure effects to the industry pure effects (Panel A) and common effects (Panel B). $I_{t\geq 92:02}$ is a dummy variable that equals one after the sign of the Maastrich treaty and $I_{t\geq 99:01}$ is a dummy variable that equals one after the adoption of the euro and fixed currency rates were established. CVI is the cross-sectional variance of the monthly changes in the 3-month interest rate of each country. CVFX is the cross-sectional variance of the monthly geometric return of the exchange rate of each country currency against the British pound. The sample period is from 1975 to 2001. Newey-West *t*-statistics with six lags are in parentheses.

	Const	t	$I_{t\geq 92:02}$	$I_{t\geq 99:01}$	CVI_{t-1}	CVFX_{t-1}	R^2 (%)
Panel A: Ratio of country to industry effects							
(1)	1.2560	0.0011					6.77
	(14.272)	(1.830)					
(2)	1.3823		0.1303				2.67
	(26.447)		(1.251)				
(3)	1.4718			−0.4415			11.70
	(30.887)			(−5.224)			
(4)	1.0803	0.0029	−0.1117	−0.8297			38.09
	(15.150)	(5.862)	(−1.055)	(−6.570)			
(5)	0.9583	0.0033	−0.1370	−0.8067	0.0948		40.72
	(14.011)	(7.051)	(−1.387)	(−6.463)	(3.288)		
(6)	1.0251	0.0031	−0.1576	−0.7747		7.1041	39.07
	(13.087)	(6.161)	(−1.476)	(−5.977)		(2.217)	
(7)	0.9361	0.0034	−0.1634	−0.7769	0.0848	4.2666	41.14
	(13.086)	(7.198)	(−1.586)	(−5.939)	(2.813)	(1.228)	
Panel B: Ratio of country to common effects							
(1)	1.6468	−0.0019					12.90
	(12.051)	(−3.218)					
(2)	1.4457		−0.3099				8.83
	(19.656)		(−3.287)				
(3)	1.3729			−0.3906			5.36
	(23.259)			(−5.164)			
(4)	1.6308	−0.0018	0.0062	−0.1084			13.21
	(9.513)	(−1.603)	(0.044)	(−1.102)			
(5)	1.4505	−0.0013	−0.0222	−0.0649	0.1526		18.84
	(8.422)	(−1.191)	(−0.169)	(−0.704)	(3.050)		
(6)	1.6153	−0.0018	−0.0075	−0.0734		3.7862	13.99
	(8.710)	(−1.602)	(−0.053)	(−0.746)		(0.735)	
(7)	1.4591	−0.0013	−0.0120	−0.0764	0.1565	−1.6502	18.88
	(8.303)	(−1.205)	(−0.091)	(−0.776)	2.7871	(−0.285)	

additional controls in the regressions (see lines (4)–(7)). The Maastricht and euro dummy variables are also negative, but insignificant when we include additional controls in the regressions (see lines (4)–(7)).

Overall, there is strong evidence that interest rate harmonization across EMU countries helped stock market integration.

5. Conclusion

The main purpose of this paper is to study the historical evolution of industry versus country diversification strategies in the EMU equity markets. The market deregulation and the harmonisation of economic, monetary and fiscal policies, suggest an increasing integration of financial markets. Accordingly, there should be a rise in the relative importance of industry factors over country factors in explaining equity returns. We evaluate the relative importance of country and industry factors in explaining return correlations by decomposing the return on a given stock or industry index into a common, a country and an industry effect.

Using a sample of ten industry indexes in 11 EMU countries over the 1975–2001 period, where we should expect to find stronger evidence in favour of industry factors, the results nevertheless confirm the overall dominance of country effects over the industry and common market factors. A closer analysis shows that there are considerable cross-country and cross-industry differences in the variances of the pure effects: (1) the largest, well-integrated markets tend to have smaller country effects variances; (2) the Information Technology sector has the largest industry effect variance. Although our findings over the whole sample period (1975–2001) demonstrate that country effects have been relatively more important in determining equity returns, evolution through time reveals an increasing relative importance of industrial effects. In the post-euro period (1999–2001), industrial effects have become similar in magnitude to country effects. The results obtained for the EMU countries are very similar to those from a sample including five more European (non-EMU) countries, which allows us to conclude that the increasing importance of industrial influences is not exclusive to EMU members, being instead shared by other European countries.

A comparison of the diversification benefits between country and industry allocation strategies confirm that country diversification allows investors to achieve a better risk reduction than industry diversification. However, we also find that in the post-euro period, the industry diversification strategy is becoming more efficient, with a risk reduction magnitude similar to the country diversification strategy. Finally, the reduction in the cross-sectional variance of interest rates across EMU countries has contributed to a decrease in the ratio of country to industry effects in the EMU. Thus, there is strong evidence that nominal convergence has enhanced stock market integration.

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