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Sources of gains from international portfolio diversification

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Abstract

This paper looks at the determinants of country and industry specific factors in international portfolio returns using a sample of forty eight countries and thirty nine industries over the last three decades. Country factors have remained relatively stable over the sample period while industry factors have significantly increased during the last decade and dropped again since 2000. The importance of industry and country factors is correlated with measures of economic and financial international integration and development. We find that financial market globalization is the main driving force behind the changes in relative magnitude of the different shocks. Country factors are smaller for countries integrated in world financial markets and have declined as the degree of financial integration and the number of countries pursuing financial liberalization has increased. Higher international financial integration within an industry increases the importance of industry factors in explaining returns. Economic integration of production also helps in explaining returns. Countries with a more specialized production activity have higher country shocks.

JEL classification: G11; G15; F36
Keywords: International diversification; Country/industry effects; Financial integration; Global linkages; Cross-listings; ADR

1. Introduction

The purpose of this paper is to provide some light in the underlying reasons that drive diversification benefits from international investment. The evolution of country or industry specific

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returns to investment should reflect the underlying shocks that affect the expected future cash-flows from investment in their corresponding economic activities. Country specific returns should be large relative to the world market portfolio when economic activity in that country is more isolated from world economic activity and more subject to specific shocks to that country's economic situation. The same way, industry specific returns will differ from the world market portfolio when investments in that industry are more subject to correlated shocks across countries.

The degree of economic integration of investment activities arises as the key candidate to explain the evolution of industry and country returns. At the country level, a higher degree of integration of the country's economy with the world implies more exposure to international economic shocks and a higher correlation of national business cycle activity with the world business cycle (Backus et al., 1992). Existing evidence also highlights the role that financial market liberalization and integration into the world market has in making domestic investments more correlated with world market factors in a multi-factor framework (Bekaert and Harvey, 2000; Fernandes, 2003). At the same time, a higher degree of international integration of industrial activity implies higher correlation of industrial shocks among countries and an increase in the importance of industry shocks in explaining international investment returns. A higher integration of input and output markets in an industry will imply a faster transmission of shocks to the industry across countries and a higher importance of industry factors in explaining industry returns.

In this paper we study the determinants of the evolution of country and industry specific returns in world financial markets over the last three decades. Using a dataset for a broad sample of forty eight countries and thirty six industries, we decompose investment returns into three determinants: a world portfolio, industry specific factors and country specific factors. Consistent with other work in this area, we document the increasing importance that industry factors had relative to country factors in explaining investment returns in the last decade and the descent in their relative importance since 2000. The main contribution of this paper is in the second step of the analysis. We explain the time-series variation, as well as the cross-sectional differences in factors across countries and industries, using fundamental data at the country and industry level. Specifically, we examine the role that international trade, globalization of financial markets, trading activity, concentration of production and economic development have on country and industry shocks to returns.

The benefits of international diversification have been widely documented. Early studies in the seventies documented the relatively low level of correlation among national equity markets (Grubel, 1968; Levy and Sarnat, 1970). Since then researchers have widely recognized this fact, but they disagree on the causes of this low correlation. Is it a result of national diversity or industry diversity? One of the early papers that discussed this issue was Lessard (1974). He looks at portfolios of stocks from 16 developed countries, and concludes that national risk factors were more important than industry factors, and that "diversification across countries, even if within a single industry, results in greater risk reduction than diversification across industries". Country specific environments, namely local fiscal and monetary policies and regulations, have traditionally been considered the main determinant of stock returns. Using different samples of countries and industries, several studies have documented the dominance of country factors (Heston and Rouwenhorst, 1994; Beckers et al., 1996; Griffin and Karolyi, 1998; Serra, 2000). Even in a more integrated market such as the EU, country factors seem to dominate (Rouwenhorst, 1999).

More recent studies began to cast doubts over this issue. Cavaglia, Brightman, and Aked (2000) and Baca, Garbe, and Weiss (2000) use the Heston and Rouwenhorst (1994) decomposition and find that industry effects have been growing in importance, and may now dominate country factors. Using a different volatility decomposition method Ferreira and Gama (2005) also find that industry volatility has been rising relative to country volatility in the late 1990s.

This evidence is consistent with Diermeier and Solnik (2001), who show that the greater the proportion of international sales, the greater the response of a company to world factors. They suggest that as companies' internationalization expands, they become more related through industry factors.

Our results show that financial market integration, and globalization of economic activity are impacting the relative balance between country and industry factors. The globalization process of the last few decades has brought global product and capital markets closer together. We use measures of economic and financial integration and development as determinants of the different shocks to equity returns. The importance of country factors is higher for poorer countries and decreases with the degree of international financial integration of the country. Country factors are also more important in countries with a high degree of production specialization and more active financial markets. At the industry level, higher international financial integration increases the importance of industrial factors. Geographic concentration of industrial activity in a few countries implies lower industry factors. Our main result concerns financial liberalization and integration. We use firm level data on the level of financial integration and find that the rising importance of industry effects reflects the greater financial integration of world financial markets. The financial liberalization process that developed through the 90s greatly reduced the importance that country level risk has on equity returns. In other words, as capital market integration proceeds, geography becomes less relevant to finance. We also show these results to be robust to the large movements in the stock market valuation in the media, technology and telecommunication industries during the last decade.

The remainder of the paper is organized as follows. Section 2 describes the methodology used to decompose and explain country and industry effects over time. This section also describes the dataset used. Section 3 presents our empirical evidence on the determinants of country and industry effects and the robustness of our results. Section 4 summarizes our findings and draws conclusions.

2. Methodology and Data Description

The stock market data used in this paper is from Datastream. Datastream provides the widest coverage of developed and emerging market equity returns. Indices are calculated based on all stocks covered in the market. For each market an overall index is available. In addition, Datastream uses FTSE Actuaries classifications to allocate companies into industries/sectors, and the Datastream Global Industrial Indices are calculated. For each country several industrial indices are calculated. Each of them includes all domestic stocks that belong to that industry/sector.

The dataset covers 48 countries. One of the main advantages of this dataset is the extensive coverage of emerging market equities. Table 1 contains a list of the countries covered. The sample covers 19 emerging markets and 27 developed countries. The first column has the year in which coverage begins for each country. Columns 2 and 3 present the weight of each country in the world market portfolio in 1990 and 2000. Columns 4 and 5 report the number of industries for which data exists in each country.

We use industrial indices of 36 sectors computed by Datastream. The indices are based on FTSE Level 4 classification. Table 2 provides a list of the sectors used. Columns 1 and 2 present the relative weight of the sector on the world market portfolio in two dates, 1990 and 2000. Columns 3 and 4 report the number of countries where the sector exists.

Datastream provides several variables for each industry/country index. Specifically we use total returns, market capitalization, value traded and number of securities in each index. All data is monthly and in US dollars. Our sample goes from January 1973 to December 2004.

Table 1
List of countries

	Countries	Start	Weight		Number of industries		Pure effects		
		Start date	1990	2000	1990	2000	2000	Mean	S.D.
Developed markets	Australia	1973	1.0%	1.2%	22	27	3.6%	4.1%	1.9%
	Austria	1973	0.2%	0.1%	11	18	2.8%	4.1%	2.0%
	Belgium	1973	0.5%	0.5%	18	25	3.5%	3.4%	1.2%
	Canada	1973	2.1%	2.1%	33	34	5.1%	3.6%	1.2%
	Denmark	1973	0.3%	0.4%	16	21	2.7%	3.8%	1.3%
	Finland	1988	0.1%	1.0%	13	23	7.5%	5.5%	1.8%
	France	1973	2.7%	4.8%	31	33	3.3%	3.6%	1.7%
	Germany	1973	4.5%	4.1%	26	30	3.6%	3.3%	1.1%
	Italy	1973	1.7%	2.6%	26	28	5.1%	4.9%	1.8%
	Japan	1973	36.0%	11.1%	30	31	3.9%	3.5%	1.0%
	Luxembourg	1992	0.0%	0.1%	0	16	6.7%	7.2%	2.2%
	The Netherlands	1973	1.8%	2.4%	24	28	2.9%	2.4%	0.8%
	New Zealand	1988	0.0%	0.1%	12	19	4.2%	4.1%	1.4%
	Norway	1980	0.2%	0.2%	12	19	3.0%	4.6%	1.8%
	Portugal	1988	0.1%	0.2%	12	17	7.2%	4.3%	1.7%
	Singapore	1973	0.4%	0.5%	19	25	4.9%	5.0%	2.4%
	Spain	1987	1.2%	1.2%	21	30	4.5%	3.3%	1.7%
	Sweden	1982	0.4%	1.0%	16	24	5.0%	4.1%	1.3%
	Switzerland	1973	1.1%	2.9%	20	26	2.6%	3.0%	1.0%
	UK	1973	8.9%	9.1%	33	34	1.9%	3.0%	1.7%
	United States	1973	31.5%	47.6%	35	35	2.0%	2.1%	0.9%
	Total developed		94.7%	93.2%	20.5	25.9	4.1%	3.9%	1.5%
Emerging markets	Argentina	1990	0.0%	0.1%	5	21	6.7%	7.4%	2.8%
	Brazil	1994	0.0%	0.7%	0	20	5.1%	6.5%	2.3%
	Chile	1989	0.1%	0.2%	16	20	2.5%	5.4%	2.8%
	China	1993	0.0%	0.0%	0	15	6.7%	7.6%	2.8%
	Colombia	1992	0.0%	0.0%	0	19	7.0%	6.5%	2.3%
	Czech Republic	1993	0.0%	0.0%	0	20	6.7%	7.1%	2.3%
	Greece	1988	0.1%	0.2%	9	20	9.5%	6.4%	2.5%
	Hong Kong	1988	0.9%	2.0%	16	25	5.5%	4.8%	2.0%
	Hungary	1991	0.0%	0.0%	0	19	6.7%	7.6%	2.7%
	India	1990	0.3%	0.4%	18	23	8.7%	6.8%	2.2%
	Indonesia	1990	0.2%	0.1%	10	19	11.5%	8.3%	3.5%
	Israel	1993	0.0%	0.2%	1	18	6.7%	6.9%	2.0%
	Korea	1988	0.8%	0.4%	19	26	8.4%	6.8%	2.7%
	Malaysia	1988	0.5%	0.3%	18	23	7.1%	5.5%	2.8%
	Mexico	1988	0.2%	0.4%	12	19	4.9%	6.2%	2.8%
	Pakistan	1993	0.0%	0.0%	0	19	4.4%	6.4%	2.1%
	Peru	1994	0.0%	0.0%	0	13	6.3%	4.8%	1.4%
	Philippines	1988	0.1%	0.1%	10	16	7.7%	6.1%	1.8%
	Poland	1994	0.0%	0.1%	0	20	9.5%	7.3%	2.9%
	Romania	1997	0.0%	0.0%	0	16	6.7%	7.0%	2.0%
	Russia	1994	0.0%	0.1%	0	12	6.7%	6.8%	2.9%
	South Africa	1991	0.9%	0.4%	19	26	4.8%	4.4%	1.3%
	Sri Lanka	1994	0.0%	0.0%	12	14	6.7%	6.6%	1.9%
	Taiwan	1988	0.9%	0.7%	9	13	6.7%	7.4%	2.6%
	Thailand	1988	0.1%	0.1%	7	15	8.9%	7.5%	2.7%
	Turkey	1988	0.2%	0.2%	11	20	13.6%	10.0%	2.6%
	Venezuela	1990	0.0%	0.0%	7	14	6.7%	7.7%	2.6%
	Total emerging		5.3%	6.8%	7.4	18.7	7.1%	6.7%	2.4%

In Section 2.1 we explain the methodology used to decompose returns into industry and country components. In Section 2.2 we develop the methodology used to explain what drives the evolution of industry and country effects. In Sections 2.3 and 2.4 we describe the data and variables used as determinants of pure effects.

2.1. Decomposing returns

In this paper we focus on the evolution and determinants of industry and country effects over time. In order to separate these two influences of stock returns, we need to isolate them. The return of each index is assumed to depend on a common factor, a global industry factor, a country factor and a residual index-specific disturbance. We use a dummy variable approach (Heston and Rouwenhorst (1994) that assumes that the return of an index of industry i and country k at time t is given by:

$$R_{ik,t} = \alpha_t + \beta_{i,t} + \gamma_{k,t} + \varepsilon_{ik,t} \tag{1}$$

where α_t is a common factor at time t, $\beta_{i,t}$ is the global industry i factor, $\gamma_{k,t}$ is country k factor and $\varepsilon_{ik,t}$ is the idiosyncratic disturbance.

We estimate for each month t the common factor (α), global industry factors (β) and country factors (γ) using a cross-sectional regression of all the indices on country and industry dummies:

$$R_{ik} = \alpha + \beta_1 I_1 + \beta_2 I_2 + \ldots + \beta_{36} I_{36} + \gamma_1 C_1 + \gamma_2 C_2 + \ldots + \gamma_{48} C_{48} + \varepsilon_{ik} \tag{2}$$

where R_{ik} is the return on the value-weighted index of industry i in country k. I and C are the industry and country dummies. $I_1 = 1$ if index ik is from industry 1, and zero otherwise. Similarly C_1 equals 1 if index ik is from country 1, and zero otherwise.

Two issues arise when estimating this equation using industrial indices as dependent variables. First, each index belongs to one industry and one country. This creates an identification problem if we use dummies for all K countries and I industries. To allow identification, the model is estimated with I-1 industries and K-1 countries, via an appropriate transformation relative to a benchmark – world portfolio. Second, the indices used have different market capitalizations. We estimate Eq. (2) using weighted least squares, where the weights are the respective market capitalizations of the indices. In the Appendix we provide a detailed explanation of the estimation procedure.

The estimated pure country return γ_k can be interpreted as the return (in excess of the world market) of country k, free of incremental industrial effects. It is the return that country k would have, if its industrial structure was the same as the world market. Similarly, the pure industry return β_i can be interpreted as the return on an industry i, excluding all geographical influences from consideration. It is the return that industry i would have, if it were present in all countries, with weights similar to the country composition of the world market portfolio.

We have a maximum of 36 different industries and 48 countries. Fitting this equation to each period provides us a monthly time-series of the realizations of the pure country and industry factors. The time-series of β_i and γ_k allows us to analyze the evolution of industry and country effects over time.

This table presents the descriptive statistics on the list of countries. The second column has the starting date of each country returns. Columns 3 and 4 present the relative weight of the country on the world market portfolio. Columns 5 and 6 report the number of industries in each country. Column 7 shows the average absolute value of the industry factor in 2000. Column 8 reports the average absolute industry factor over the sample, and column 9 presents the standard deviation of the yearly factor for each industry.

Table 2
List of sectors

Industries	Start date	Weight industry in world market cap		Number countries where it exists		Pure effects		
		1990	2000	1990	2000	2000	Mean	S.D.
Tradable								
Aerospace, defense	1973	0.7%	1.0%	4	11	6.0%	2.9%	1.3%
Auto and parts	1973	3.5%	2.0%	17	31	4.8%	2.4%	0.9%
Beverages	1973	2.2%	1.6%	22	32	6.8%	2.3%	1.2%
Chemicals	1973	3.8%	1.6%	24	38	4.0%	1.8%	0.8%
Diversified inds	1973	2.1%	3.8%	29	37	3.5%	1.5%	0.7%
Electr. equip.	1973	4.4%	2.9%	18	29	2.3%	2.0%	1.1%
Eng. and machinery	1973	3.0%	1.3%	25	33	2.3%	1.8%	0.7%
Food producers	1973	3.5%	1.8%	28	43	5.2%	1.9%	1.2%
Forestry and paper	1973	1.0%	0.5%	18	30	6.5%	2.9%	1.0%
Hshld gds and textiles	1973	1.7%	1.1%	24	41	2.3%	2.2%	1.0%
Inf. techn. hardw	1973	4.0%	10.5%	15	25	7.1%	3.4%	1.9%
Mining	1973	1.3%	0.6%	11	20	3.8%	3.6%	1.2%
Oil and gas	1973	6.5%	5.5%	21	38	4.2%	2.9%	1.0%
Per. care and hshld	1973	1.4%	1.4%	10	12	6.4%	2.3%	1.2%
Pharm. and biotech	1973	4.4%	9.4%	14	27	4.8%	2.5%	0.9%
Sftwr and comp.serv.	1973	0.7%	5.0%	13	25	9.5%	3.7%	1.8%
Steel and oth. metals	1973	2.2%	0.6%	25	36	4.2%	3.2%	1.1%
Tobacco	1973	1.1%	0.6%	8	15	7.4%	3.9%	1.7%
Total tradable		47.7%	51.0%	18.1	29.1	5.1%	2.6%	1.1%
Non-tradable								
Banks	1973	11.8%	11.2%	34	48	4.6%	1.9%	1.2%
Cons. and bldg mat.	1973	3.9%	1.1%	32	46	3.2%	1.9%	0.6%
Electricity	1973	5.0%	2.6%	19	34	4.8%	2.7%	1.2%
Food and drug retlrs	1973	1.4%	1.3%	13	25	5.9%	2.2%	1.0%
Health	1973	1.1%	1.7%	12	20	4.0%	2.4%	0.8%
Insurance	1973	3.5%	4.2%	21	31	6.3%	2.0%	1.1%
Investment companies	1987	0.2%	0.2%	1	1	1.7%	1.3%	0.6%
Investment entities	1973	0.4%	0.4%	12	26	2.2%	1.5%	0.6%
Leisure+hotels	1973	1.2%	1.3%	15	32	2.5%	2.3%	0.8%
Life assurance	1973	0.6%	1.4%	10	13	5.8%	2.2%	0.9%
Media, entertain	1973	2.2%	2.9%	15	35	3.9%	1.9%	0.8%
Other utilities	1973	1.8%	1.6%	13	25	4.4%	2.3%	1.3%
Real estate	1973	1.5%	1.1%	19	35	3.7%	2.3%	1.0%
Retail, general	1973	3.2%	3.0%	19	31	5.0%	2.4%	0.8%
SPC and oth. finance	1973	4.2%	3.7%	23	33	3.2%	2.4%	1.2%
Support services	1973	0.5%	0.9%	14	22	2.4%	1.9%	0.7%
Telecom services	1973	5.6%	8.8%	15	44	4.3%	2.8%	1.5%
Transport	1973	3.3%	1.5%	31	42	4.6%	1.9%	1.0%
Total non-tradable		51.3%	49.0%	17.7	30.2	4.0%	2.1%	1.0%

This table presents descriptive statistics on the list of industry disagregation used in the analysis. The industrial classification used is FTSE Level 4. The second column has the starting date of each industry series. Columns 3 and 4 present the relative weight of the sector on the world market portfolio. Columns 5 and 6 report the number of countries where the sector exists. Column 7 shows the average absolute value of the industry factor in 2000. Column 8 reports the average absolute industry factor over the sample, and column 9 presents the standard deviation of the yearly factor for each industry.

To gauge the importance of each factor (national or industrial), we use the mean absolute deviation (MAD) metric proposed by Rouwenhorst (1999):

$$\mathrm{MAD}_{\beta}(t) = \sum_{i} w_i \cdot |\beta_t^i| \tag{3}$$

$$\mathrm{MAD}_{\gamma}(t) = \sum_{k} w_k \cdot |\gamma_t^k| \tag{4}$$

where w_i (w_k) are the weights of the industries (countries), and $|\beta_t^i|$ ($|\gamma_t^k|$) are the absolute industry (country) effects in month t. The $\mathrm{MAD}_{\gamma}(t)$ measures the (weighted) mean absolute deviation of country effects. For each month, we weight all absolute values of country effects by their market capitalization. This measure can be interpreted as the average cross-sectional variance indicator in each period. The higher it is, the more disperse are the country returns around the world in that period. Similarly, the $\mathrm{MAD}_{\beta}(t)$ measures the (weighted) mean absolute deviation of industry effects. On each date, we weight all absolute values of industry effects by their market capitalization. The higher the $\mathrm{MAD}_{\beta}(t)$ value, the more disperse are the industry returns in that period.

Fig. 1 plots a 24-month moving average of the monthly industry and country MAD estimates. We can see that through most of the 1990s country factors seemed to be much stronger than industry factors. However, since the end of the 1990s, industry effects seem to dominate. Between 1998 and 2003, the return of a portfolio that is not diversified across industries will on average deviate more from the benchmark, than a portfolio that is not diversified across countries. These

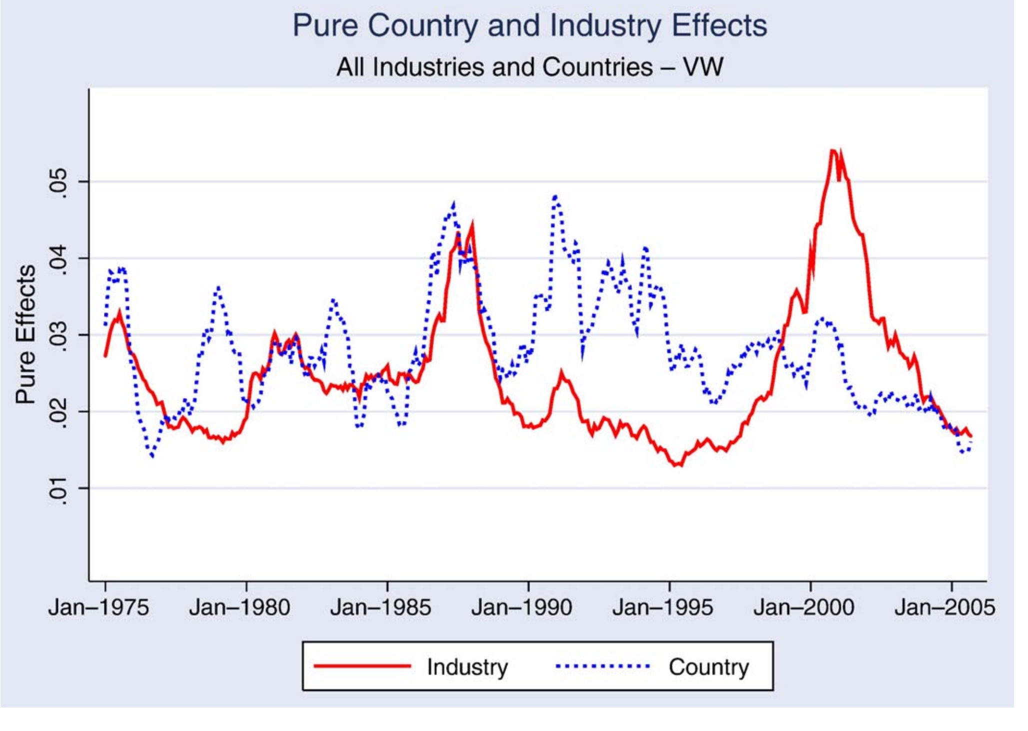

Fig. 1. Mean absolute deviation of country and industry effects with all industries (24-month moving average).

results are similar to those reported by Cavaglia, Brightman, and Aked (2000) and Baca, Garbe, and Weiss (2000). They look at OECD and G7 countries and conclude that industry effects have been growing in importance, and may now dominate country factors. We compute averages of country and industry effects in different subperiods. Comparing the first half of the 80s, with the second half of the 90s, we see that 86% of the industries had increased pure effects. Country effects increased for only 33% of the countries in the same period.

Brooks and Del Negro (2004) show that a large part of the observed increase in industry effects in the last part of the 90s was due to the stock market behaviour of the information and technology industries. To address this issue, we have re-estimated the size of industry and country shocks in a new sample which excluded these industries throughout the full sample period. Fig. 2 presents the mean absolute deviation of country and industry shocks for this new estimation sample. The resulting industry shocks are substantially smaller for the period 1997–2003 than those reported in Fig. 1. It is also the case in our sample that the temporary increase in industry shocks that appears in Fig. 1 in the latter part of the 1990s is in large part due to the behaviour of these industries. However, it is still the case that the size of industry shocks relative to country shocks has increased in the latter part of the sample. Since approximately 1997, industry and country shocks are of approximately equal size.

2.2. Explaining the evolution over time

In the previous section, we decomposed investment returns into three determinants: a world factor, an industry specific factor and a country specific factor. Consistent with other works in this

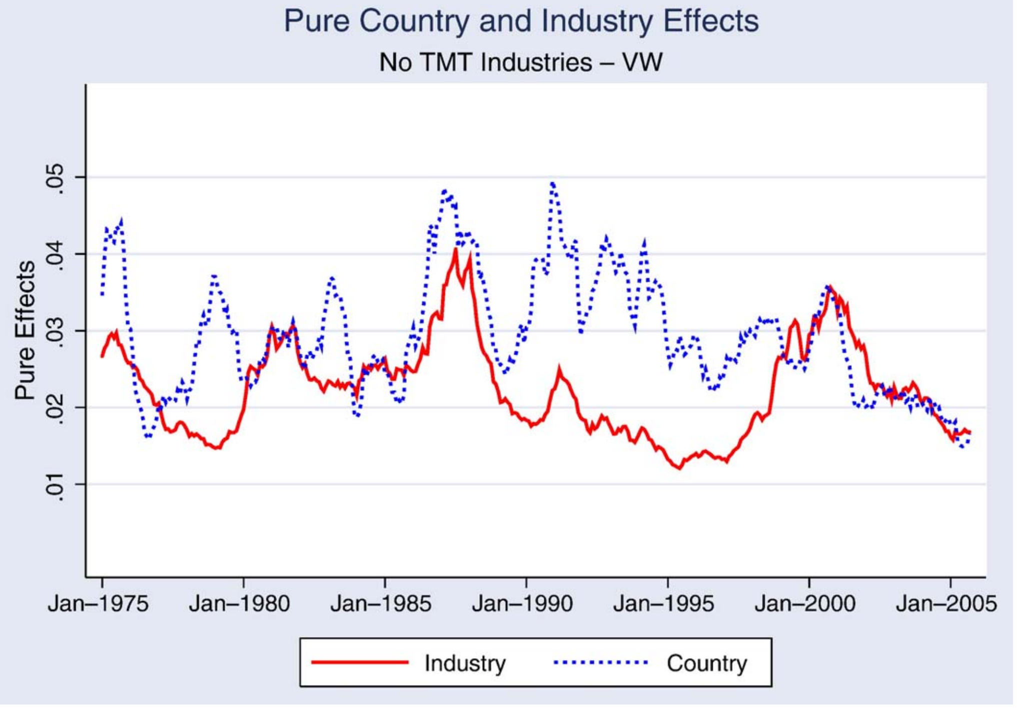

Fig. 2. Mean absolute deviation of country and industry effects without TMT industries (24-month moving average).

area, we find the increasing importance that industry factors have relative to country factors in explaining investment returns, particularly in the last decade.

In this section we describe the methodology used to study the determinants of the evolution of country and industry specific returns in world financial markets. We use measures of economic and financial integration and development as determinants of the likelihood of country and industry returns. The methodology allows us to understand why some countries have such high deviations from the world market (strong country effects), as well as why some industries deviate so much from the average industry (strong industry effects). These variables are described in this section.

To evaluate the relative magnitude of industry and country effects, we perform a pooled time-series cross-sectional estimation, where country (industry) factors vary over time, and so do the country (industry) characteristics.

We now describe the estimation procedure that seeks to explain what drives the time-series and cross-sectional variation of country effects. We examine what drives pure country effects, by modelling pure country effects as a function of country characteristics:

$$\gamma_t^k = \delta + \theta Z_t^k \tag{5}$$

where γ_t^k is the pure effect of country k in year t and Z_t^k is the vector of country characteristics. δ and θ are the parameters to be estimated.

We present results for a pooled time-series cross-sectional estimation (OLS). Taking advantage of the availability of a panel dataset, we introduce a fixed-effect estimator in Eq. (5).

$$\gamma_t^k = \delta_k + \theta Z_t^k \tag{6}$$

This fixed-effect equation estimates a country specific coefficient δ_k. This coefficient might be interpreted as the average absolute country effect over the sample. It is a constant parameter, that captures the fixed part of the pure effect of that country. Since panel estimation treats all variables as deviations from their mean, the rest of the variation can be attributed to time-series variation in the explanatory variables.

Panel estimation, with country fixed effects, may be more appropriate if there are unobservable country characteristics that might explain variability in the pure country effects. This procedure assumes that the unobserved heterogeneity is constant over time. Intuitively, the fixed-effect estimation might be more appropriate if we believe that the main driving force in the evolution of country effects is time-series variation of independent variables and that significant unobserved differences might exist between the levels of country effects across countries.

In order to understand the determinants of pure industry returns, we follow a similar procedure. We examine what drives pure industry effects, by modelling pure industry effects as a function of industry characteristics:

$$\beta_t^i = \delta + \theta Z_t^i \tag{7}$$

where β_t^i is the pure effect of industry i in year t and Z_t^i is the vector of industry characteristics. Also taking advantage of the availability of a panel dataset, we introduce a fixed-effect estimator in Eq. (7) to estimate:

$$\beta_t^i = \delta_i + \theta Z_t^i \tag{8}$$

where δ_i is the fixed-effect of industry i. It can be interpreted as the average absolute industry effect over the sample.

All the exogenous variables that we use are yearly. Therefore, we use the estimates of the monthly industry (β) and country (γ) factors from the previous section, and aggregate them to obtain yearly values for the country and industry factors.

For each country/year, we take the average of the absolute country factor during that year:

$$\gamma_t^k = \frac{1}{12} \sum_{M=ym1}^{ym12} |\gamma_M^k| \tag{9}$$

where γ_t^k is the average absolute factor for country k in year t, ym1 and ym12 are the start and end months of year t, γ_M^k is the month M pure country k factor. It is this yearly aggregate measure that will be used in the cross-sectional analysis (Eqs. (5) and (6)).

Similarly, for each industry, we take the average of the absolute industry factor during a year:

$$\beta_i^t = \frac{1}{12} \sum_{M=ym1}^{ym12} |\beta_M^i| \tag{10}$$

where β_t^i is the average absolute factor for industry i in year t, ym1 and ym12 are the start and end months of year t, and β_M^i is the month M global industry i factor.

The aggregation of the country and industry factors to the annual frequency to perform the second-stage analysis is an estimation choice. An alternative approach would be to use the monthly data and estimate the second stage model with monthly data. Although some of the exogenous variables are available at the monthly frequency, others (mainly the macro variables) are only available yearly. Nevertheless, we do a robustness check in this regard by doing the monthly estimation with the best available frequency and the results are robust to the specification of the frequency. A third alternative procedure would estimate Eq. (2) with yearly returns. However, this would have the effect of smoothing all variability in the country and industry series, which is exactly what we are trying to capture. We thus decided to follow previous literature (e.g. Heston and Rouwenhorst, 1994; Beckers et al., 1996, Griffin and Karolyi, 1998, Rouwenhorst, 1999), and use monthly returns in that decomposition.

The last three columns of Table 1 present some summary statistics on the estimated yearly factors for the 48 countries. Column 6 shows the average absolute value of the country factor in 2000. Column 7 reports the average absolute country factor over the sample, and column 8 presents the standard deviation of the yearly factor for each country. Emerging markets have higher country effects, and are also more volatile. According to these results, the average over the whole sample period (seventh column) of country effects for emerging markets is 6.7%, whereas for developed markets it is 3.9%.

Table 2 presents some summary statistics on the estimated factors for the 36 industries. Column 6 shows the average absolute value of the industry factor in 2000. Column 7 reports the average absolute industry factor over the sample, and the last column presents the standard deviation of the yearly factor for each industry. Industry effects have a higher mean value for tradable industries than for non-tradables. Among the non-tradable industries, only electricity and telecommunications have a larger mean industry value than the average mean value for tradable industries. The values of pure industry effects for the year 2000, are generally larger than the average over the whole sample. This reflects the fact that towards the end of the sample and specially around the large market movements at the end of the last decade, industry factors become more important. Also, comparing Tables 1 and 2, one notices that country effects are larger and more volatile than industry effects, but the difference is less pronounced in the end of the sample.

2.3. Country level variables

In the second stage analysis, we relate the evolution of pure country effects with several fundamental country characteristics. In particular, we focus on measures of economic and financial integration and development as determinants of the magnitude of country effects. In addition, we also investigate the role of trading activity of the country's equities, as well as the industrial concentration within the country. We now define each of these variables.

2.3.1. Country openness

Country specific returns should be large relative to the world market portfolio when the economic activity in that country is more isolated from world economic activity and more subject to specific shocks to that country economic situation. Economic integration, measured by openness, is thus one potential determinant of country effects.

We use openness data from the Penn World Table 6.1 (PWT) and the IMF, International Financial Statistics. For each year, the openness of country k is calculated as the ratio of trade to GDP:

$$\mathrm{OPEN}_t^k = \frac{\mathrm{Exp}_t^k + \mathrm{Imp}_t^k}{\mathrm{GDP}_t^k} \tag{11}$$

where Exp_t^k and Imp_t^k are the year t exports and imports in country k and GDP_t^k is the GDP of country k in year t, all expressed in national currencies.

2.3.2. Financial Integration

Recent research (Miller, 1999; Foerster and Karolyi, 1999; Errunza and Miller, 2000) has documented that firms that list abroad can achieve substantial gains from higher integration in world capital markets. However, the gains from an ADR listing are not only restricted to its issuer and may spillover to other stocks in the country. Fernandes (2003) documents positive spillovers from that cross-listing decision. For a large sample of emerging markets he shows that when a domestic firm cross-lists, it will also increase the integration of other firms in the local market.

Therefore, as a proxy for the degree of financial market integration we use the percentage of stocks cross-listed in the US in each country. We compute the ratio of cross-listed securities to the total number of securities (listed in the home market):

$$\mathrm{FININT}_t^k = \frac{\#\mathrm{ADR}_t^k}{\mathrm{NS}_t^k} \tag{12}$$

where $\#\mathrm{ADR}_t^k$ is the number of cross-listed securities from country k in year t, and NS_t^k is the total number of stocks listed in their domestic market. Data on the total number of listed stocks is from Datastream.

It is not easy to determine which foreign firms are cross-listed in the U.S., when they have initiated and ended their ADR programs. To construct a sample that is not biased toward recent ADR events, we use many different data sources for our cross-listing database. Our database merges data collected from the stock exchanges (NYSE, Nasdaq, AMEX), as well as from the primary depository institutions: Citibank, Bank of New York, JP Morgan, and Deutsche Bank. All the institutions have part of the information, and no individual database includes all ADR programs actually available. Firms regularly change listing type or exchange, and the effective dates available in all databases are associated with their newest listing. We hand-check all active ADR programs to see whether a firm had a previous ADR program. We then supplement the database with all delisted ADRs programs that are not included in the current versions of the different databases.

We can show why this bias correction procedure is important. As of the end of 2004, there were 545 listed ADR programs from 473 different companies. Yet, our sample universe, free of survival bias, includes all ADRs in existence at any time. This procedure basically doubles the number of cross-listings over those active in the end of 2004: 1035 listed ADR programs from 763 different companies that are (or were in the past) listed in the US.

Higher values for this ratio mean that the country's capital market is more integrated into the world. Greater risk sharing should lead to a reduction in country specific variation.

2.3.3. Turnover

Another country characteristic with potential influence on the magnitude of country effects is trading activity. Market microstructure models (e.g. Easley and O'Hara, 1987) predict a positive relation between trading activity and volatility. Empirical evidence exists to support this prediction (Schwert, 1989; Jones et al., 1994; Huang and Masulis, 2003).

We compute for each country a measure of turnover:

$$\mathrm{TURNOVER}_t^k = \frac{\mathrm{VA}_t^k}{\mathrm{MCAP}_t^k} \tag{13}$$

where VA_t^k is the value traded of all securities from country k at month t, and MCAP_t^k is their market capitalization. Monthly data on market capitalization and value traded is from Datastream.

This measure is interpreted as a proxy for the degree of trading activity in a market. Also, turnover has been shown to be correlated with other measures of trading and liquidity (Stoll, 2000). We expect trading activity to be positively related to country shocks. In particular, countries with more active financial markets should have higher country effects.

2.3.4. Concentration

The industrial concentration of a country might also be related to the magnitude of country shocks. We expect a positive relation between the country effects and concentration. More specialized countries are more likely to have large country shocks. Country specific returns should be large relative to the world market portfolio when economic activity in that country is more isolated from world economic activity and more subject to specific shocks to that country economic situation. Previous research (Roll, 1992) has indeed documented a positive relation between concentration and stock market volatility.

We measure industrial concentration in a country as the difference between the weight each industry has domestically ($w_{i,\mathrm{home}}$), and the world weight of that industry ($w_{i,\mathrm{world}}$). According to this measure, a country is diversified if its industrial structure is the same as the world market portfolio. If there are substantial deviations and the country becomes concentrated in certain industries, it leads to increases in the measure of country concentration.

$$\mathrm{CONC}_t^k = \sum_{i=1}^{I_k} \left(w_{i,\mathrm{home}} - w_{i,\mathrm{world}}\right)^2 = \sum_{i=1}^{I_k} \left(\frac{\mathrm{MCAP}_t^{i,k}}{\mathrm{MCAP}_t^k} - \frac{\mathrm{MCAP}_t^{i,w}}{\mathrm{MCAP}_t^w}\right)^2 \tag{14}$$

where I_k is the number of industries in country k, $\mathrm{MCAP}_t^{i,k}$ is the market capitalization of industry i of country k, $\mathrm{MCAP}_t^{i,w}$ is the world market capitalization of industry i, MCAP_t^{k} and MCAP_t^{w} are the market capitalization of country k and the world market.

We construct an index measure of industrial concentration for each country. Data on market capitalization is from Datastream.

2.3.5. Development

There is strong evidence that emerging markets have higher country effects than developed ones. The results from Table 1 clearly support this prediction. The average country effect for emerging markets is 6.7% while for developed markets is 3.9%.

We use the GDP per capita (in USD) as a measure of economic development. This measure is available only annually from 1973 to 2004. The sources are from the World Development Indicators of the World Bank for the years up to 2000, and from the IMF World Economic Outlook from 2001 to 2004.

2.4. Industry level variables

At the industry level, we use the analogue measures of openness, financial integration, trading activity and concentration of the previous section. In addition, we add a variable that captures the size of the industry.

2.4.1. Industry openness

For each year, the openness of industry i is calculated as the ratio of trade to production (value added). We use yearly industrial characteristics from STAN, an OECD database of industrial performance. Estimates of exports and imports are derived from detailed trade in commodities statistics using the ISIC Rev. 3 classification system[2].

2.4.2. Financial Integration

The degree of financial integration of an industry is proxied by the percentage of cross-listed stocks in that industry. We compute the ratio of cross-listed securities from industry i, relative to the total number of securities in that industry across all local markets.

We expect higher financial integration to increase industrial effects. Industry specific returns will differ from the world market portfolio when investments in that industry are more subject to correlated shocks across countries. Financial integration in an industry is more likely to occur in those industries with a higher degree of international integration in their activities via international trade, multinational productions, or common production technologies. A higher degree of international integration of industrial activity implies higher correlation of industrial shocks among countries and an increase in the importance of industry shocks in explaining international investment returns.

2.4.3. Concentration

We construct an index measure of geographical concentration for each industry. This measure is the analog for industries of the concentration measure for countries described in Eq. (14). According to this measure, an industry is diversified if it is geographically spread, with country weights similar

[2] See the U.N.'s classification registry at http://esa.un.org/unsd/cr/registry/regrt.asp for more details. In order to relate the STAN measures with stock market data, we map this classification with FTSE classification. Table A1 presents the conversions used.

to the world market portfolio. If there are substantial deviations and the industry becomes concentrated in certain countries, this leads to increases in the measure of country concentration.

2.4.4. Size

We use the log of world market capitalization (end-period) of the industry as a measure of size.

3. Empirical Results

In this section we analyze the cross-sectional (and time-series) dispersion of country and industry effects. As discussed above, the evidence reported in Tables 1 and 2 shows substantial cross-sectional variation of industry and country effects. Also, there has been substantial time-series variation of these two effects (Fig. 1). We investigate why some countries have such high deviations from the world market (strong country effects), as well as why some industries deviate so much from the average industry.

Table 3 shows the descriptive statistics of the variables used in the analysis. The top panel provides the statistics for the country sample and the bottom panel the statistics for the industry sample. The last two columns of the top panel report the means of each variable for the subset of developed and emerging markets. As expected, developed markets have higher values of financial and economic integration. Developed countries also have a lower level of specialization in their industrial structure. The last two columns of the bottom panel report means of each variable for

Table 3
Descriptive statistics

Panel A: country variables

	All countries				Developed market	Emerging market
	Mean	Median	Min	Max	Mean	Mean
Country effect	0.0537	0.0486	0.0106	0.1627	0.0379	0.0690
FININT	0.0691	0.0419	0.0000	0.3958	0.0702	0.0680
OPEN	0.8037	0.6278	0.1589	3.3496	0.8459	0.7631
TURNOVER	0.0444	0.0305	0.0000	0.3700	0.0424	0.0463
CONC	0.1110	0.0947	0.0108	0.4591	0.0989	0.1227
GDP	15.9879	14.3345	0.3810	69.9294	26.9681	5.4443

Panel B: industry variables

	All industries				Tradable	Non-tradable
	Mean	Median	Min	Max	Mean	Mean
Industry effect	0.0236	0.0205	0.0059	0.0934	0.0216	0.0257
FININT	0.0540	0.0351	0.0000	0.5413	0.0505	0.0578
OPEN	0.7784	0.0263	0.0000	16.2709	0.0036	1.6095
TURNOVER	0.0448	0.0376	0.0002	0.2504	0.0399	0.0501
CONC	0.1087	0.0653	0.0040	0.8036	0.1226	0.0938
SIZE	11.8176	12.0543	7.8182	15.2837	11.7016	11.9421

This table reports the mean, median, minimum and maximum values of the variables used in the second stage. For each panel the definition of the variables are as follows. For the country (industry) panel country (industry) Effect is the absolute value of the country (industry) effects estimated in the first stage. FININT is the percentage of stocks cross-listed in a country (industry), OPEN is the ratio of exports plus imports to GDP (industry sales) of the country (industry). TURNOVER is the turnover of the country (industry), and CONC is the measure of industrial (geographic) concentration. Finally, GDP is the level of GDP per capita in a country and SIZE is the market capitalization of each industry.

tradable and non-tradable industries. There is a very large difference in their mean levels of real integration. More interesting, geographic concentration is also higher in tradable industries than in non-tradable industries. Again, this is to be expected given that tradability is a necessary condition for industry specialization.

Looking at the simple correlations among the variables (not reported) the absolute value of country effects are positively related to concentration. Countries with more specialized production structures have higher country shocks. On the other hand, country effects are negatively related to financial integration, financial development and GDP per capita. It seems that countries that are more financially integrated, as well as more developed (economically and financially) have lower country shocks. This is consistent with the evidence presented in the last columns of Table 1, that emerging markets have higher country shocks than developed ones.

To evaluate the relative magnitude of industry and country effects, we proceed in two directions. First, we correlate country (industry) effects and several structural characteristics of the country (industry). Second, we perform a pooled time-series cross-sectional estimate (also pure cross-section), where country (industry) factors vary over time, and so do the country (industry) characteristics. Specifically, we examine the role of international trade, globalization of financial markets, trading activity, concentration of production and economic development have on country and industry shocks to returns. Section 3.1 presents the results for country effects, while Section 3.2 performs the analysis for industry effects.

3.1. Variation in Country Effects

In this section we study the determinants of country effects. The analysis excludes the US and Canada, since for both countries a measure of cross-listings is not available.

As described in Section 2.2 we use pure country returns and characteristics on all available periods in the sample. We present results for a pooled time-series cross-sectional estimation (OLS), as well as a panel estimation with country fixed-effects. The OLS specification clearly captures part of the cross-sectional impact of the explanatory variables. By introducing fixed-effects, we remove the average of every variable from consideration and focus on the time-series relation. The estimates are thus based on the time-series variability of the independent (and dependent) variables. In order to fully capture the time evolution in the relationship, we also split the sample in 1990 and present the results for two subsamples, with data up to 1990 and from 1991 to 2004.

For the basic specification, we pool all the values of pure country effects, as well as country characteristics and estimate:

$$\gamma_t^k = \delta + \theta_1 \mathrm{FININT}_t^k + \theta_3 \mathrm{OPEN}_t^k + \theta_4 \mathrm{TV}_t^k + \theta_5 \mathrm{CONC}_t^k + \theta_6 \mathrm{GDP}_t^k \tag{15}$$

The first Panel in Table 4 presents the results for the OLS estimation using the full sample, the weighted least square estimation, and the sub-sample periods.

From the OLS estimates we see that a high percentage of stocks cross-listed abroad significantly reduces the magnitude of country shocks. A coefficient of −0.056 (Column (1), Panel A) means that as a country moves from zero stocks cross-listed (FININT = 0) to all home market being traded abroad (FININT = 1), the average absolute country effect is reduced by 5.6%. This result is consistent with the literature on financial market liberalization and integration. Higher integration makes domestic investments more correlated with world market factors, and less subject to idiosyncratic risk of the country (Foerster and Karolyi, 1999; Errunza and Miller, 2000; Bekaert and Harvey, 2000; Fernandes, 2003).

Table 4
Determinants of country shocks

	(1)	(2)	(3)	(4)
	1973–2004	WLS (1973–2004)	1973–1990	1991–2004
Panel A: OLS				
FININT	−0.0560**	−0.0502**	−0.0398	−0.0606**
OPEN	−0.0059**	−0.0039*	−0.0055	−0.0059**
TURNOVER	0.0501*	0.0545**	0.091	0.0422*
CONC	0.0717**	0.0345*	0.0830**	0.0720**
GDP	−0.0000**	−0.0000**	0	−0.0000**
Constant	0.0555**	0.0679**	0.0484**	0.0570**
Obs.	690	690	106	584
R^2	0.1475	0.1111	0.1621	0.1449
Panel B: fixed-effect estimation				
FININT	−0.0550**	−0.0357	−0.0422	−0.0487**
OPEN	0.0043	0.0154*	−0.0376	0.0002
TURNOVER	0.0477*	0.0639**	0.5400**	0.0383
CONC	0.0741**	0.0910**	0.0396	0.0790**
GDP	−0.0000**	−0.0001**	0	−0.0000**
Constant	0.0549**	0.0751**	0.0761**	0.0610**
Obs.	690	690	106	584
R^2	0.0425	0.5074	−0.2912	0.0117

	Emerging markets			Developed markets		
	(1)	(2)	(3)	(4)	(5)	(6)
	1973–2004	1973–1990	1991–2004	1973–2004	1973–1990	1991–2004
Panel C: regression by subsets						
FININT	−0.0550*	−0.0912	−0.0551*	0.0142	−0.1085	0.0484
OPEN	0.0134	−0.039	0.0065	−0.0174*	−0.04	−0.0186*
TURNOVER	0.0819*	0.8604	0.0575	−0.031	0.5291**	−0.014
CONC	0.0546*	0.0534	0.0711*	0.0912**	0.0273	0.0682**
GDP	−0.0001**	0.0002	−0.0001**	−0.0000**	0	−0.0000**
Constant	0.0975**	0.0697	0.1021**	0.0841**	0.1709*	0.1008**
Obs.	352	26	326	338	80	258
R^2	0.2878	0.644	0.3204	0.4657	0.3189	0.5388

This table shows the results of alternative estimations of Eq. (15). The dependent variable is the absolute country effect in each year. FININT is the percentage of stocks cross-listed, OPEN is the openness of the country, TURNOVER is the turnover, CONC is the country concentration and GDP is the level of GDP per capita. Column (1) shows the results for the base specification, using least squares and the percentage of stocks cross-listed as the measure of financial integration. The WLS column shows the weighted least square estimates using the percentage of stocks cross-listed as measure of financial integration. The WLS estimation uses as weights the square root of the t-statistic of the pure country effects estimated in Eq. (2). Finally, the last two columns contain the estimation for the two sub-sample periods 1973–1990 and 1991–2004. Panel A shows the results from a pooled ordinary least square regression. Panel B shows the estimation using country fixed-effects. Panel C presents the results of separate regressions for emerging and developed markets, in different time periods. ** means the significance at the 1% level, and * at the 5% level.

Real economic integration also decreases the importance of country effects. The openness variable is negative and significant. Higher economic development (GDP per capita) is also associated with lower country effects.

On the other hand, concentration and turnover clearly increase country effects. As a country becomes more concentrated in some sectors it has higher country shocks. The evolution of country specific returns should reflect the underlying shocks that affect the expected future cash-flows from investment in their corresponding economic activities. When economic activity is more specialized, it carries an additional idiosyncratic risk that makes it more subject to specific shocks to that country economic situation.

All these effects are robust to the fact that the country effects are estimated variables and therefore, observed with an error. The second specification runs the model using weighted least squares (WLS) instead of OLS. In this case, we weight each country/period observation by the square root of the t-statistic of the pure country effects estimated in Eq. (2)[3]. This weighting scheme gives more weight to country/period observations that are more precisely estimated in the first stage. The weighted least square specification (Column (2), Panel A) provides essentially the same results and significance levels.

Country factors are smaller for countries integrated in world financial markets and have declined as the degree of financial integration and the number of countries pursuing financial liberalization has increased. Country specific returns are large relative to the world market portfolio when economic activity in that country is more isolated from world economic activity and more subject to specific shocks to that country economic situation. We find that countries with a more specialized production activity have higher country factors.

Financial and economic integration have been a significant determinant of lower country effects in the later part of the sample. The coefficient on the financial integration variable, although negative, is not significant for the period 1973–1990. However, it is highly significant in the second part of the sample period. We find exactly the same pattern with our measure of real integration. Openness is also only significant in the second part of the sample.

The fixed-effect estimation (Panel B) shows similar results. Controlling for unobservable country characteristics that influence the magnitude of the shocks, we find that financial integration significantly reduces the magnitude of country shocks, while concentration, and turnover increase country effects. Country effects have declined as the degree of financial integration has increased. GDP per capita is again negative, indicating that country effects are lower in more developed countries. Only the measure of economic openness loses its significance with respect to the least square estimation. We again observe, that most of the effect occurs in the second half of the sample. Both the measure of financial integration and the measure of industry concentration are important in the second half of the sample.

We perform some robustness tests. Financial integration has not been homogeneous across the world during this period. At the beginning of the sample, many developed markets had lower barriers to international capital mobility and also had more developed local financial markets. However, emerging markets experienced a more drastic change in financial openness during this period. We split the sample between developed and emerging markets (Panel C). As expected the increase in financial integration resulted in significantly reduced country effects primarily for emerging markets. Furthermore, this effect was most important during the second half of the sample. Among developed markets is enlightening that the measure of openness is a determinant of the size of country shocks and that these country effects were significantly more important the higher the industrial specialization of activity in the country.

We also use an alternative measure of financial integration, the total number of stocks cross-listed abroad instead of the percentage of stocks cross-listed abroad. The main conclusions are robust to the use of this alternative measure.

[3] For the yearly estimation, we annualize the t-statistic, as with the dependent variable, by taking the average of its absolute values over the year.

Table 5
Country regression — one standard deviation

	OLS estimation		Fixed-effect estimation	
	S.D.	+1 σ	S.D.	+1 σ
FININT	0.08	−0.5%	0.05	−0.3%
OPEN	0.61	−0.4%	0.12	0.0%
TURNOVER	0.05	0.3%	0.03	0.2%
CONC	0.08	0.6%	0.05	0.4%
GDP	737.99	−0.6%	161.71	−0.4%

This table shows the impact that a change of one standard deviation of each independent variable has on the magnitude of pure country effects. The first two columns contain the results for the OLS estimation, and the last two the results for the estimation using country fixed-effects. Columns 1 and 3 (S.D.) have the standard deviation of each independent variable. Columns 2 and 4 (+1 σ) report the change in country effects due to one standard deviation change, normalized by the standard deviation of the dependent variable. FININT is the percentage of stocks cross-listed in a country, OPEN is the openness of the country, TURNOVER is the turnover, CONC is the country concentration and GDP is the level of GDP per capita.

In order to get a better sense of the economic impact of these effects, we estimate the impact that a change of one standard deviation in each independent variable has on the magnitude of pure country effects. We multiply the estimated coefficient from Table 4, by the standard deviation of each independent variable. Table 5 shows the results of this exercise. The first two columns contain the results for the OLS estimation. Columns 3 and 4 contain the results based on the coefficients from the fixed-effect estimation. For the fixed-effect column we took the standard deviation of the independent variables after taking out the fixed effect components. The results from the second column reinforce the conclusions from the regression analysis. A relative one standard deviation change in the level of financial integration can reduce country effects by 0.5%. On the other hand, the effects of trading activity are positive. A one standard deviation change in turnover leads to a 0.3% increase in country shocks. The fixed-effects results provide similar insights. In addition, there are strong positive results for concentration and openness. More concentrated industrial structure in a country, as well as less openness to trade, lead to significant increases (0.6% and 0.4% respectively) in country effects.

3.2. Variation in industry effects

In order to better understand the determinants of industrial effects, we proceed to regress the pure industry returns on the industry characteristics for all available years in the sample. We present results for a pooled time-series cross-sectional estimation (OLS), as well as a panel estimation with industry fixed-effects. Similar to what was done for countries, we also present estimations for two subsamples, 1973 to 1990 and from 1991 to 2004.

For the OLS specification, we pool all the values of pure industry effects, as well as industry characteristics and estimate:

$$\beta_t^i = \delta + \theta_1 \mathrm{FININT}_t^i + \theta_2 \mathrm{SIZE}_t^i + \theta_3 \mathrm{OPEN}_t^i + \theta_4 \mathrm{TV}_t^i + \theta_5 \mathrm{CONC}_t^i \qquad (16)$$

The four columns of Panel A in Table 6 present the results for the OLS and weighted least squares estimation for the full sample, and the two sub-period estimations. The results clearly highlight the role of financial integration in increasing global industrial shocks. A higher degree

Table 6
Determinants of industry shocks

	(1)	(2)	(3)	(4)
	1973–2004	WLS (1973–2004)	1973–1990	1991–2004
Panel A: OLS				
FININT	0.0171**	0.0202**	0.0147	0.0218**
OPEN	0.0016**	0.0015**	0.0008	0.0013**
TURNOVER	0.0583**	0.0801**	0.0536	0.1071**
CONC	−0.0024	−0.001	0	−0.0017
SIZE	−0.0011**	−0.0011*	0.0003	−0.0005
Constant	0.0322**	0.0349**	0.0180**	0.0204*
Obs.	912	912	432	480
R^2	0.1018	0.1801	0.0167	0.1775
Panel B: fixed-effect estimation				
FININT	0.002	0.0038	0.0058	0.0274*
OPEN	0.0022**	0.0024**	0.0026	0.0018**
TURNOVER	0.0395*	0.0500*	−0.0079	0.0978**
CONC	0.0012	−0.001	−0.0106	0.0025
SIZE	−0.0004	0	0.001	0.0034*
Constant	0.0243**	0.0247**	0.0136	−0.0309
Obs.	912	912	432	480
R^2	0.0177	0.3107	−0.0636	0.1053

Panel C: regression by subsets

	Tradable			Non-tradable		
	(1)	(2)	(3)	(4)	(5)	(6)
	1973–2004	1973–1990	1991–2004	1973–2004	1973–1990	1991–2004
FININT	0.0402**	0.0167	0.0836**	0.0073	−0.0151	0.008
OPEN	0.0009**	0.0018**	0	0.0459	−0.0975	0.1224*
TURNOVER	0.1639**	0.0963	0.2525**	−0.0202	0.0448	0.0271
CONC	−0.0002	0.0152	−0.0152	−0.0052	−0.004	0.0099
SIZE	−0.0032**	−0.0018*	−0.0023	0.0001	0.0014*	0.0029**
Constant	0.0517**	0.0372**	0.0333	0.0211**	0.0089	−0.0215
Obs.	440	200	240	472	232	240
R^2	0.2059	0.084	0.2847	−0.0002	0.0242	0.091

This table shows the results of alternative specifications of Eq. (16). The dependent variable is the absolute industry effect in each period. FININT is the percentage of stocks cross-listed in an industry. OPEN is the openness of the industry, TURNOVER is the turnover, CONC is the measure of industry geographic concentration, and SIZE is the log of market capitalization. The first column shows the results for the base specification, using least squares and the percentage of stocks cross-listed as the measure of financial integration. The WLS column shows the weighted least square estimates using the percentage of stocks cross-listed as measure of financial integration. The WLS estimation uses as weights the square root of the t-statistic of the pure country effects estimated in Eq. (2). Finally, the last two columns contain the estimation for the two sub-sample periods 1973–1990 and 1991–2004. Panel A shows the results from a pooled ordinary least square regression. Panel B shows the estimation using industry fixed-effects. Panel C presents the results of separate regressions for tradable and non-tradable industries, in different time periods. ** means the significance at the 1% level, and * at the 5% level.

of international integration in the economic activity of an industry is correlated with a higher financial integration implying an increase in the importance of industry shocks in explaining international investment returns. From the OLS estimates we see that a high percentage of stocks cross-listed abroad significantly increases the magnitude of industry shocks. A coefficient of 0.02

means that as an industry moves from zero stocks cross-listed (FININT = 0) to all stocks being cross-listed (FININT = 1), the average absolute industry effect is increased by 2%.

Similar to what was found with country effects, the measure of real integration also has an impact on the size of industry effects. Indeed, our proxy for the importance of trade at the industry level has a significant positive impact on the magnitude of the industry shocks. This is in contrast with Brooks and Del Negro (2004) which find no evidence that greater goods market integration leads to higher industry shocks.

We find that the measures of industry turnover, and size have a significant effect on the industry factors while the measure of concentration is not significant.

We perform the same robustness tests as in Section 3.1. We run the model using weighted least squares (WLS) instead of OLS. The second column of Panel A shows the WLS estimates using the percentage of stocks cross-listed as measure of financial integration. The main conclusions remain unchanged. Higher financial integration as well as higher openness increases industry effects.

The results for the two sub-samples (Columns 3 and 4 of Panel A) present similar results to those observed for the country shocks. Most importantly, the effects are significant in the second half of the sample period. Again, industries with higher levels of financial and real integration have higher industry shocks. This is consistent with our hypothesis that financial market integration leads to a higher role of fundamentals.

The fixed-effect estimation shows qualitatively similar results (Panel B). Financial integration is again always positive although it now becomes insignificant for the whole sample period (column (1)). Controlling for fixed-effects at the industry level, we find that industry shocks do not appear to have much of a time pattern as the level of financial integration of an industry increases. Nevertheless, when we analyse only the second sub-period, the positive and significant effect of financial integration on industry shocks remains. The measure of openness continues to be positive and significant. The increase in real integration observed during the sample period has resulted in an increase in the size of the industry shocks.

We checked the robustness of our results to the use of an alternative measure of financial integration, the total number of stocks in each industry that are cross-listed abroad instead of the percentage of stocks cross-listed abroad. The main conclusions are robust to these alternative measures.

The importance of financial integration in explaining industry effects is directly related to the existence of a higher correlation of industry shocks across the world. This correlation is dependent on the degree of economic integration within each industry. This economic integration may occur via international trade, multinational activity or the existence of a common production technology internationally available. This implies that industries with a higher degree of international tradability should lead to a higher impact of international integration in the propagation of industry shocks. The positive and significant effects of the measure of industry openness also points in this direction.

Griffin and Karolyi (1998) find that non-traded industries have smaller industry shocks than traded industries. We split the sample among tradable and non tradable industries (Panel C). As expected higher financial integration leads to a larger role for industry effects in tradable industries. The effect for tradable industries has shifted during the sample period. In the first part of the sample financial integration was very small and its effect on industry effects insignificant. Higher financial integration in these industries lead to the existence of higher industry-specific returns and this led to this effect becoming more important during the second half of the sample. In summary, similar to the results on country returns, the relationship between financial integration and industry returns takes place mainly in tradable industries and is most robust during the last decade of the sample, which was precisely when financial market globalization was stronger, as most stocks become available to global investors.

We again estimate the impact that a change of one standard deviation of each independent variable has on the magnitude of pure industry effects. We multiply the estimated coefficient from Table 6, by the standard deviation of each independent variable. Table 7 shows the results of this exercise. The first two columns contain the results for the OLS estimation. Columns 3 and 4 contain the results based on the coefficients from the fixed-effect estimation. The results from the second column reinforce the conclusions from the regression analysis. A relative one standard deviation change in the level of financial integration increases industrial effects by 0.2% and a one standard deviation increase in openness results in a 0.3% increase in industry effects. Similarly, a one standard deviation change in turnover leads to a somewhat smaller 0.2% increase in industry shocks. Another variable that is relevant is industry size. A one standard deviation in the size of the industry reduces industry shocks by 0.2%. Larger industries tend to be more stable and have lower industry shocks. Using the fixed-effect coefficients (column 4) provides similar results.

3.3. Some robustness tests

The analysis so far has shown that the degree of financial integration has a direct impact in the size of country and industry shocks. More financial integration in a country leads to smaller industry shocks while increases in the financial integration of industries result in higher industry shocks. We have also found a very similar pattern with our measure of openness proxying for the degree of real economic integration. Throughout the analysis we have been careful to test that these results were robust to time period, and to different subsets of countries and industries. The effects are more significant for the second half of the sample period, and more robust for emerging than developed markets and for tradable than non-tradable industries.

Nevertheless, given the large dataset, there maybe a number of considerations that may be driving the results. We would like to check that the reported results are robust to our country sample, to the estimation period, to industry composition, and to other specific events related to crisis episodes.

As discussed in the previous section, we had estimated monthly country and industry effects for the sample period. However the results reported aggregated this monthly effects into a yearly

Table 7
Industry regression — one standard deviation

	OLS estimation		Fixed-effect estimation	
	S.D.	+1 σ	S.D.	+1 σ
FININT	0.09	0.2%	0.06	0.0%
OPEN	1.75	0.3%	0.84	0.2%
TURNOVER	0.04	0.2%	0.03	0.1%
CONC	0.15	0.0%	0.07	0.0%
SIZE	1.58	−0.2%	1.39	−0.1%

This table shows the impact that a change of one standard deviation of each independent variable has on the magnitude of pure industry effects. The first two columns contain the results for the OLS estimation, and the last two the results for the estimation using industry fixed-effects. Columns 1 and 3 (S.D.) have the standard deviation of each independent variable. Columns 2 and 4 (+1 σ) report the change in industry effects due to one standard deviation change, normalized by the standard deviation of the dependent variable. FININT is the percentage of stocks cross-listed in an industry, Size is the log of market capitalization, OPEN is the openness of the industry, TURNOVER is the turnover and CONC is the industry concentration.

Table 8
Robustness specifications: monthly data and exclusion of the technology, media and telecommunication industries

	Industries				Countries		
	All	Tradable	Non-tradable		All	Emerging	Developed
Panel A: monthly data							
FININT	0.0164**	0.0410**	0.0048	FININT	−0.0531**	−0.0479**	0.007
OPEN	0.0015**	0.0009**	0.0453	OPEN	−0.0001**	0.0001	−0.0002**
TURNOVER	0.0798**	0.1751**	0.0125	TURNOVER	0.0753**	0.1362**	0.0434*
CONC	−0.0023	−0.001	−0.0045*	CONC	0.0686**	0.0418*	0.0976**
SIZE	−0.0013**	−0.0033**	−0.0002	GDP	−0.0000**	−0.0001**	−0.0000**
Constant	0.0341**	0.0531**	0.0234**	Constant	0.0536**	0.0965**	0.1227**
Obs.	10832	5228	5604	Obs.	8019	4015	4004
R^2	0.036	0.0749	0.0016	R^2	0.045	0.066	0.1192
Panel B: yearly no TMT							
FININT	0.0198**	0.0344**	0.0092	FININT	−0.0580**	−0.0491*	−0.0152
OPEN	0.0019**	0.0013*	0.0192	OPEN	−0.0001**	0.0001	−0.0002**
TURNOVER	0.0496**	0.1345**	−0.0014	TURNOVER	0.0383	0.1022**	−0.0823**
CONC	−0.0058	0.0025	−0.0083*	CONC	0.0416**	0.0306	0.0414**
SIZE	−0.0018**	−0.0038**	−0.0008*	GDP	−0.0000**	−0.0001**	−0.0000**
Constant	0.0399**	0.0586**	0.0302**	Constant	0.0555**	0.0975**	0.0841**
Obs.	806	386	420	Obs.	690	352	338
R^2	0.067	0.1214	0.009	R^2	0.1475	0.2878	0.4657

This table presents the estimation of the second stage analysis on the new estimated country and industry effects. Panel A reports the results of using in the second stage regression the monthly country and industry effects and monthly observations of the exogenous variables. Panel B presents the results of using in the second-stage the estimated country and industry effects from the sample resulting after excluding the technology, telecommunications and media industries from the first-stage country and industry effects estimation.

effect for each country and industry. Given the availability of monthly observations for most of our independent variables in the second stage, we estimated again our models at the monthly frequency. [4] The top panel of Table 8, reports the results of the OLS analysis using the monthly data. The right side of the table shows the estimated coefficients on country effects. Financial and real integration continue to have a negative and significant effect on the size of country shocks and the effect of financial integration is more important for emerging markets. The left side of the table reports the results for the industry effects. Again, the basic message is the same as with the annual data. Industry financial and real integration increases industry shocks and this effect is more important for tradable industries.

A second issue of concern was the impact that the behaviour in stock markets of certain industries in the second part of the sample, related to telecommunications and technology, may have been driving the overall results in the sample. As reported in Fig. 2 above, the large appreciation and later depreciation of technology stocks over the last decade, have resulted in a disproportionate but temporary increase in industry shocks and this maybe driving our results. Brooks and Del Negro (2004) also show in a different sample that the movements in stock prices in the information and technology industries accounted for a large part of the observed increase in industry effects. To answer this issue, we have taken the size of industry and country shocks reported in Fig. 2 that were estimated in the new sample which excluded these industries throughout the full sample period and performed the second stage analysis of the determinants of industry and country effects. The results on the role of financial and economic integration on the size of country and industry effects is clearly robust to this change in sample. The results for the second stage analysis are reported in panel B of Table 8. The estimated negative relationship between financial integration and country effects, and positive relationship with industry effects, remains robust and statistical significance. In fact, all the coefficients in the exogenous variables maintain their sign and significance patterns.

We have also tested the sensitivity of our results to the inclusion of certain crises episodes that resulted in large movements in stock prices and maybe outliers driving our results. We have estimated the second stage specifications in Tables 4 and 6, excluding the years 1997 and 1998 from the sample period. The results remained robust to this adjustment. Furthermore, Fisman and Love (2004) show that high financial development in certain countries may have led to further industry specialization and to allow industries to respond faster to industry specific global shocks. We have checked for this possibility by checking for possible interaction effects among the measures of financial and economic integration and the degree of country and industry specialization. We found that these interaction effects were not statistically significant nor did they impact the main results reported.

4. Conclusion

In this paper we study the determinants of the evolution of country and industry specific returns in world financial markets over the last three decades. Using a dataset for a broad sample of forty eight countries and thirty six industries, we decompose investment returns into three determinants: a world portfolio, industry specific factors and country specific factors. Consistent with other work in this area, we report an increased importance of global industry factors in explaining investment

[4] The measures of openness and GDP were available only annually. For these measures we use for every month in a given year their annual value.

returns, particularly in the last decade, although this effect was somewhat driven by the stock market behaviour during the second part of the 1990s. We then explain the evolution of country and industry factors, and investigate the role that economic and financial integration and development have in this evolution. We use measures of economic and financial integration and development as determinants of the different shocks to international returns.

We find that financial market integration is the main driving force behind the significant rise in global industry shocks. Using firm level data on the level of financial integration, we find that industries that are more globalized tend to have higher industry shocks, and are thus less dependent on overall country level risk. Our country level results support this finding. Country factors are smaller for countries integrated in world financial markets and have declined as the degree of financial integration and the number of countries pursuing financial liberalization has increased. This result is particularly noticeable in emerging markets. As they become more financially integrated, country level shocks are less relevant in explaining returns to investments. We find exactly the same pattern using measures of real economic integration. Country specific returns are large relative to the world market portfolio when economic activity in that country is more isolated from world economic activity.

Industry specific returns differ more from the world market portfolio when investments in that industry are more subject to correlated shocks across countries. Financial integration is one possible way to increase the correlation across countries. Indeed, we find that higher international financial integration within an industry increases the importance of industry factors in explaining returns. Tradability and openness in an industry also determined industry shocks. Industry shocks are more important in tradable industries and higher in the second half of the sample period. Geographic concentration of industrial activity in a few countries leads to lower industry factors.

Financial market activity appears also as one main determinant of the magnitude of country and industry effects. Higher trading activity in a country/industry leads to larger country/ industry shocks. We also find that country specific returns are large relative to the world market portfolio when economic activity in that country is more isolated from world economic activity and more subject to specific shocks to the country's economic situation. Indeed we find that countries with a more specialized production activity have higher country factors.

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Appendix A. Estimation procedure–return decomposition

We estimate for each month t α, β and γ using a cross-sectional regression of all the indices on country and industry dummies:

$$R_i = \alpha + \beta_1 I_1 + \beta_2 I_2 + \dots + \beta_{36} I_{36} + \gamma_1 C_1 + \gamma_2 C_2 + \dots + \gamma_{48} C_{48} + \varepsilon_i \tag{17}$$

where I and C are the industry and country dummies.

Table A1
Industry conversions: STAN–FTSE

FTSE (Datastream) sectors	STAN sectors
Aerospace and defense	Aircraft and spacecraft
Automobiles and parts	Motor vehicles, trailers and semi-trailers
Banks	Financial intermediation
Beverages	Food products and beverages
Chemicals	Chemicals and chemical products
Construction and building materials	Construction
Diversified industrials	Total manufacturing
Electricity	Electricity, gas and water supply
Electronic and electrical equipment	Electrical and optical equipment
Engineering and machinery	Machinery and equipment
Food and drug retailers	Wholesale and retail trade; repairs
Food producers and processors	Food products and beverages
Forestry and paper	Pulp, paper, printing and publishing
General retailers	Wholesale and retail trade; repairs
Health	Health and social work
Household goods and textiles	Textiles
Information technology hardware	Office, accounting and computing machinery
Insurance	Insurance and pension funding
Investment companies	Activities related to financial intermediation
Investment entities	Insurance and pension funding
Leisure and hotels	Hotels and restaurants
Life assurance	Insurance and pension funding
Media and entertainment	Other community, social and personal services
Mining	Mining and quarrying except energy
Oil and gas	Mining and quarrying of energy materials
Personal care and household products	Total manufacturing
Pharmaceuticals and biotechnology	Pharmaceuticals
Real estate	Real estate activities
Software and computer services	Post and telecommunications
Specialty and other finance	Renting of M and Eq and other business activities
Steel and other metals	Basic metals, machinery and equipment
Support services	Other community, social and personal services
Telecommunication services	Post and telecommunications
Tobacco	Tobacco products
Transport	Transport and storage
Utilities, other	Electricity, gas and water supply

This table shows the conversions used for the STAN database. The first column contains the industry names from FTSE, used by Datastream. The second column has the STAN industries associated with the ones from FTSE.

This equation cannot be estimated because there is an identification problem. Each return index belong to one country and one industry. If dummy variables are introduced for every country and industry there is perfect multicollinearity in the equation. The 36 industrial dummies as well as the 48 country dummies add up to a unit vector across firms. In order to solve this problem one needs a benchmark to measure the relative country/industry effects. If we remove one country and one industry from the estimation (e.g. Automobile industry, and Germany), every estimate of the remaining I-1 (C-1) industry (country) dummies will be cross-sectional differences relative to the automobile sector (Germany). In order to avoid specifying an arbitrary benchmark, all the effects will be measured relative to the value-weighted index of all industries/countries, which will be referred to as the world market.

In order to do this we introduce the following restrictions in each month t:

$$\sum_{k=1}^{36} w_{k,t}^{i}\beta_{k,t} = 0 \tag{18}$$

and

$$\sum_{j=1}^{48} w_{j,t}^{c}\gamma_{j,t} = 0 \tag{19}$$

where $w_{k,t}^{i}$ and $w_{j,t}^{c}$ correspond to the weight of industry k and country j in the world market portfolio at month t. $\beta_{k,t}$ is the pure effect of industry k, and $\gamma_{j,t}$ is the pure effect of country j.

Eqs. (18) and (19) say that the weighted sum of the pure industry/country effects add up to zero. The resulting estimates that follow from this benchmark compare the pure performance of each country (industry) to the world portfolio. $\gamma_{j,t}$ is the excess return of a portfolio of country j that is free from industrial specificities of each country. It is the relative performance of a portfolio of stocks of country j that has the same industrial weights as the world portfolio.

We can introduce the restrictions directly in the base Eq. (17). From Eqs. (18) and (19) we have (dropping the time subscript):

$$\beta = -\frac{\sum_{k=2}^{36} w_k^i \beta_k}{w_1^i} \tag{20}$$

and

$$\gamma_1 = -\frac{\sum_{j=2}^{48} w_j^c \gamma_j}{w_1^c} \tag{21}$$

If we introduce these restrictions in Eq. (17):

$$\begin{aligned} R_i = \alpha &+ \left(-\frac{\sum_{k=2}^{36} w_k^i \beta_k}{w_1^i}\right) I_1 + \beta_2 I_2 + \ldots + \beta_{36} I_{36} + \left(-\frac{\sum_{j=2}^{48} w_j^c \gamma_j}{w_1^c}\right) C_1 + \gamma_2 C_2 \\ &+ \ldots + \gamma_{48} C_{48} + \varepsilon_1 \end{aligned} \tag{22}$$

we can rearrange the original independent variables to obtain:

$$\begin{aligned} R_i = \alpha &+ \beta_2\left(I_2 - \frac{w_2^i}{w_1^i} * I_1\right) + \beta_3\left(I_3 - \frac{w_3^i}{w_1^i} * I_1\right) + \ldots + \beta_{36}\left(I_{36} - \frac{w_{36}^i}{w_1^i} * I_1\right) \\ &+ \gamma_2\left(C_2 - \frac{w_2^c}{w_1^c} * C_1\right) + \gamma_3\left(C_3 - \frac{w_3^c}{w_1^c} * C_1\right) + \ldots + \gamma_{48}\left(C_{48} - \frac{w_{48}^c}{w_1^c} * C_1\right) + \varepsilon_i \end{aligned} \tag{23}$$

We estimate this Eq. (23) in each period t. After the estimation, we can obtain the omitted coefficients β_1 and γ_1 (for the first industry and country) by substituting the estimated $\hat{\beta}_i$ and $\hat{\gamma}_c$ (for industries 2 to 36, and countries 2 to 48) into Eqs. (18) and (19).

The variance of the first industry coefficient (β_1) can be obtained by the Delta method:

$$\sigma_{\beta_1}^2 = \frac{\partial R}{\partial \theta'} \Omega_\theta \frac{\partial R}{\partial \theta} \tag{24}$$

where R is the restriction imposed (Eq. (20)), θ is the vector of estimated betas $[\hat{\beta}_2 \ldots \hat{\beta}_{36}]'$, and Ω_θ is the covariance matrix of the estimated coefficients.

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