Sources of Firms' Industry and Country Effects in Emerging Markets

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Abstract

The paper compares the dynamics of global, country and industry effects in firm level returns between emerging and mature markets. Based on 1,893 firms in MSCI global index from 1990 to 2002 from 37 countries our results show that the global and industry effects are still dominated by the country effects in emerging markets in contrast to developed markets. The results are robust to controlling for variables which might have significant impact on firms' factor effects, such as the firm's business globalization, financial market integration and TMT sector affiliation. Our findings have important implications for international portfolio diversification.

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1. Introduction

A recently revived topic in the international finance literature is the study on the relative importance of country versus industry effects in explaining the global equity market movements. Traditionally, the country effects have dominated the industry effects (see, for example, Lessard, 1974; Solnik, 1974; Heston and Rouwenhorst, 1994, 1995; and Griffin and Karolyi, 1998). However, more recently Baca et al (2000), Cavaglia, Brightman and Aked (2000), L'Her et al (2002), Brooks and Del Negro (2004), Flavin (2004) and Phylaktis and Xia (2003) have shown that the industry effects have levelled or even surpassed the country effects in recent years, suggesting that international diversification across industries may now provide greater risk reductions than the traditional diversification across countries[1].

The change in the relative importance of country and industry effects in recent years raises the following question: what are the driving forces of this change? Is such shift embedded in the ongoing process of business globalization and financial market integration, or is it due to some temporary reasons such as IT bubbles at the turn of the century? During the last decade, the worldwide businesses have forged through an increasing process of globalization. Firms have sought to consolidate and rationalize business activities globally through the expansion of existing affiliates as well as through a wave of mergers and acquisitions[2]. As a result, firms have become more diversified across countries in their revenues and operations so that country-specific economic shocks should now affect domestic equity markets less than before. On the other hand, the worldwide financial markets have been increasingly integrated with each other during the last decade. Empirical evidence shows that market co-movements are currently higher.[3] These developments would have blurred the national borders, diminished the country effects, and increased the global and industry effects, ceteris paribus.

Indeed, papers by Cavaglia, Cho and Singer (2001) and Brooks and Del Negro (2003) have documented evidence on the connection of the dynamics of country and industry

[1] A detailed literature review can be found in Phylaktis and Xia (2003).
[2] For example, as quoted in Cavaglia, Cho and Singer (2001), cross-border mergers and acquisitions rose from an average of $40 billion per year over the 1989-1993 period to an average of $400 billion per year over the 1994-2000 period.
[3] See, for example, Freimann (1998) and Goetzmann, Li and Rouwenhorst (2001).

effects in firm level returns with the firms' international activities, which is employed as a proxy for business globalization. Cavaglia, Cho and Singer (2001) develop a risk model, which decomposes the security returns into components of global, domestic and regional industrial sector factors and regress the loadings on those factors, obtained via a two-stage methodology similar to the iterative approach of Marsh and Pfleiderer (1997), on the firms' foreign sale ratios. Using weekly excess return data of FT World Index constituents in 22 developed countries from 1990 to 1999 they find that while the non-domestic factors (the global and regional industrial sector factors) are positively associated with the firms' foreign sales, the domestic factors are negatively associated with the firms' foreign sales. However, only the coefficients on the regional industrial sector factors are statistically significant.

Brooks and Del Negro (2003) on the other hand estimate a factor model that decomposes the equity returns into global, country and industry specific factors using the maximum likelihood procedure to estimate the factor betas and their links to firms' global operations proxied by firms' foreign sale ratios, international income ratios, international assets ratios, and whether firms belong to traded or non-traded goods industries. Using monthly data of 1,239 companies in 20 markets (of which only two are developing markets) from January 1985 to February 2002, they find that the global factors are positively and the country factors negatively related to those global proxies. However, contrary to Cavaglia, Cho and Singer (2001), they do not find any statistically significant link between the industry factors and the extent to which firms operate internationally.

The studies mentioned above focus on advanced markets. Little is known about the sources driving the structure of country/industry effects in emerging markets. It has been shown that returns of emerging markets have vastly different characteristics from those of developed markets (e.g. Bekaert, 1995; Harvey, 1995; and Bekaert and Harvey, 1995, 1997, 2000). Bekaert and Harvey (1997) point out at least four distinguishing features of emerging market returns: higher sample returns, low correlations with developed market returns and amongst emerging markets, more predictable returns, and higher volatility. Given those facts, one would expect the dynamics of country versus industry effects in emerging markets to be different from those in developed markets. Indeed, using Dow Jones Global Indexes data over the

period of 1992-2001, Phylaktis and Xia (2003) show that the industry effects are still dominated by the country effects in emerging market returns.[4] However, the literature has not examined whether the sources that impact the dynamics of country/industry effects in developed market returns are the same as the sources that affect the structures of country/industry effects in emerging market returns.

The purpose of the current paper and the main contribution to the literature is to examine the reasons for the different behaviour of Emerging Markets relative to developed markets by comparing the dynamics of their global, country and industry effects at the firm level. Our analysis examines the sources driving these factor effects by exploring the cross-sectional differences in the factor effects across firms using information on their characteristics. In particular, we examine the impact of firms' foreign sale ratios used as a proxy for the firms' business globalisation and the role of firms' ADR listings used as a proxy for financial market integration. The role of firms' ADR listings has not yet been explored in the literature on the country/industry effects in cross-sectional analysis at the firm level. ADRs and other forms of cross-border listings overcome many of the regulatory restrictions, cost and information problems that inhibit international investment and thus allow some indirect market integration[5]. In fact, various papers have documented that ADR listings in aggregate foster greater integration of international capital markets (see e.g. Errunza, Hogan and Hung, 1999; Foerster and Karolyi, 1999; Errunza and Miller, 2000; Hargis, 2002; Bekaert, Harvey and Lumsdaine, 2002; Karolyi, 2003; and Fernandes, 2005)[6]. For example, Karolyi (2003) indicates that the increasing number of new ADRs, their market cap and trading volume in emerging markets, are positively associated with the pace of international capital flows and market integration. Therefore, if ADR listings facilitate the acceleration of market integration, one would expect domestic factors to matter less and global factors including industry ones to matter more for ADR firms.

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[4] Serra (2000) also finds that emerging markets' returns are mainly driven by country factors, and the industry factors play little role in the cross-market correlations.

[5] According to the Bank of New York, worldwide ADRs in the US market were 285 prior to the year 1992. By the year of 2001, they rose to 1726. See the bank's ADR website: http://www.adrbny.com

[6] For a good survey on the literature of ADRs, see Karolyi (1998, 2004)

Finally, we examine whether a firm's TMT - Technology, Telecommunication and Media - affiliation has an impact on the dynamics of the global, country and industry effects and in particular, whether the increase of industry effects is due to IT bubbles. Brooks and Del Negro (2004) claim that the recent increase of industry effects is only confined to TMT sectors and such increase is due to IT bubbles.

The following sections are structured as follows: Section 2 introduces our model and estimation procedures. Section 3 provides details of our data. Section 4 presents our analysis and key empirical results, while Section 5 points out the implications of our findings for international diversification. The final section concludes our paper.

2 Modelling and methodology

2.1 Firm level global, country and industry effects

The majority of papers which examine the industry and country effects concentrate on explaining the behaviour of the aggregate market indexes (Heston and Rouwenhorst, 1994; Griffin and Karolyi, 1998). In this paper, we focus on the firm level evidence. We ask how much of the movement of Honda equity return is due to the fact that Honda is in the automobile industry and how much is due to the fact that Honda is a Japanese firm. Exploring the firm level evidence not only provides new empirical contents to the study of the importance of country versus industry effects, but also has the advantage of allowing us to employ individual firm's accounting data to examine the cross sectional links between firms' country and industry effects and the extent to which firms operate globally.

Our starting point is the standard factor model which decomposes returns into global, country, industry and firm-specific factors. Denoting R_{nt} the return on equity n in country c and industry i in period t, where n goes from 1 to N and t goes from 1 to T, we have

$$R_{nt} = \beta_n^G f_t^G + \beta_n^C f_t^C + \beta_n^I f_t^I + e_{nt} , \qquad (1)$$

where f_t^G is the return on the global factor, f_t^C and f_t^I are the returns on the country factor c and industry factor i , respectively, and e_{nt} represents the idiosyncratic

shock to the return on equity *n*, all in period *t*. β_n^G, β_n^C and β_n^I represent loadings on the global, country and industry factors respectively.

In estimation of model (1), most papers such as Heston and Rouwenhorst (1994), Griffin and Karolyi (1998) and many others, have imposed restrictions that β_n^G =1 and β_n^C =1 if equity *n* belongs to country *c* and 0 otherwise, and β_n^I =1 if equity *n* belongs to industry *i* and 0 otherwise. Implicitly, their estimation is the fixed effects model in econometric terms. However, constraining the factor loadings as above, as argued in Marsh and Pfleiderer (1997), may result in an unnecessary loss of information. For example, if two firms are identical in every aspect except that one has higher leverage than the other, then the two must have different sensitivities to the country and industry factors. It is also hardly convincing to assume that firms like Nokia, which accounts for about 60% of the total market capitalization of Finland, has the same loadings as other smaller firms in the country on the country and industry factor returns. In addition, Harvey, Solnik, and Zhou (1994) demonstrate that differences in risk loadings are important in accounting for the cross-sectional variation in industry and country equity returns.

In view of this, we relax the constraints that all β s are unity in our estimation. In econometric terms, we move from a fixed effects model to a random effects one. There are two papers which have applied this random effects model into their analysis. Brooks and Del Negro (2003) which uses the Lehmann and Modest (1985) EM algorithm to obtain the maximum likelihood estimates of the factor loadings in model (1); and Cavaglia, Cho and Singer (2001), which employs an iterative estimation approach suggested by Marsh and Pfleiderer (1997). However, the maximum likelihood method can only be applied to balanced panel data. Estimation based on this method might lose much essential information as many firms will be excluded from the model due to their lack of full data coverage. Since we have unbalanced panel data we follow the methodology in the spirit of the iterative approach of Marsh and Pfleiderer (1997).

In particular, a two-step approach is adopted: the first step is to obtain the pure global, country and industry factor returns which are, by construction, orthogonal with each

other. The estimation is similar to the fixed effects model of Heston and Rouwenhorst (1994) and Griffin and Karolyi (1998)[7]. Namely, the values for the factor loadings are initially assumed as either unity or zero, and a cross-sectional regression yielding the pure global, country and industry factor returns is estimated at each time point. In the second step, the time series of the pure factor returns are standardized (unity variance) and used in ordinary least squares (OLS) estimates of Model (1) to obtain the new factor loadings (unconstrained betas) for each firm. The unconstrained betas indicate the sensitivities of a firm's returns to the respective pure global, country and industry factors. Our estimation of betas are expected to be little biased by the interactions among the factor returns for they are extracted from the pure global, country and industry factor returns, which are orthogonal by construction .[8]

Having obtained the unconstrained betas of global, industry and country factors for each firm, we can decompose the firm's total variance into the sum of the variances attributed to those factors and the idiosyncratic components:

$$Var\ (R_{nt}) = (\hat{\beta}_n^G)^2 + (\hat{\beta}_n^C)^2 + (\hat{\beta}_n^I)^2 + \sigma_n^2 \qquad (3)$$

where $Var(R_{nt})$ represents the variance of returns on Equity *n*, $\hat{\beta}_n^G$, $\hat{\beta}_n^C$ and $\hat{\beta}_n^I$ are the unconstrained betas on the returns of pure global factor, country factor *c* and industry factor *i* respectively, and σ_n^2 is the squared residuals. The variance decomposition in model (3) enables us to gauge the relative importance of those factors by determining how much of a firm's total variance can be explained by the respective global, country, industry and firm-specific factors.

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[7] The detailed estimation procedure is outlined in Heston and Rouwenhorst (1994) and Griffin and Karolyi (1998). As there are 37 countries and 24 industries in the sample, our model is in the following form:

$$R_{nt} = \beta_n^G f_t^G + \sum_{c=1}^{37} \beta_{nc}^C f_t^C + \sum_{i=1}^{24} \beta_{ni}^I f_t^I + \varepsilon_{nt} \qquad (2)$$

[8] The country and industry factor returns are orthogonal ex ante by construction, but they may be interacting with each other ex post. However, we find that the average ex post correlations among them to be very small.

2.2 Cross-sectional analysis

The ultimate purpose of this paper is to explore whether the relative importance of firms' factor effects (global, country and industry) and the driving forces behind those effects are different across firms in emerging markets compared to those in developed markets. We first run a cross-sectional regression of each factor effect on emerging market dummy variable to document the differences between emerging and developed markets:

$$P_n = \alpha_0 + \alpha_1 EM + \eta_n \qquad (4)$$

where P_n represents a firm's respective global, country or industry effects. Each effect is calculated as the proportion of a firm's total variance accounted for by the respective factor betas obtained from model (3). EM is the dummy variable, which takes the value of 1 if the firm belongs to an emerging country and 0 otherwise. α_0 is the intercept and η_n the error term.

We then proceed to investigate the robustness of the above differences by controlling for some of the firms' specific characteristic variables. Those variables include the firms' foreign sale ratios, ADR listing status and TMT sector affiliations. So the models are in the following form:

$$P_n = \alpha_0 + \alpha_1 EM + \alpha_2 FR + \alpha_3 ADR + \alpha_4 TMT + \eta_n \qquad (5)$$

where *FR* denotes the variable of the firms' foreign sale ratios. *ADR* is the dummy variable which equals 1 if the firm is listed as ADR and 0 otherwise. *TMT* is also the dummy variable with a value of 1 for the firm which belongs to TMT sector and 0 otherwise.

3. Data

The individual firm constituents of MSCI global index at the end of year 2002 define our data sample. There are altogether 2,179 firms from 23 developed markets and 27 emerging markets, covering the period from Jan 1990 – Dec 2002. Firms with fewer than 3 years of data and countries with fewer than 5 firms are excluded in order to

minimize any estimation bias. After the data screening, there are a total of 1,893 firms included in our analysis representing 37 countries out of which 14 are emerging markets. The firms' weekly price and market cap data in US dollars are extracted from Datastream. Each firm's industry affiliation is based on the GICS (General Industry Classification Standard) provided by MSCI. We focus on the broad classification which includes 24 industry groups.

It should be pointed out that our data may be deficient subject to survivorship bias as we examine only those firms which are included in the MSCI global index at the end of our sample period. This means that only firms surviving through the full sample period are covered. However, this problem may be partly offset by the fact that not only some large firms but also many small firms are omitted from our sample. Nevertheless our sample covers roughly 85% percent of the total market capitalization in all the countries included in the analysis. Because the data comprises the largest and most actively traded firms in both developed and emerging markets, it can be reasonably deemed as quite representative from the point view of global investors.

Table 1 presents the coverage of firms both across countries and industries. Generally, firms are not evenly distributed. Panel A shows that smaller countries have fewer representations, with Argentina and Austria having only 9 firms. On the other hand, large countries are better represented. There are 380 firms in the US and 309 firms in Japan. In Panel B, while Capital Goods and Material industries include nearly 200 firms, industries like Food and Staple Retail, and Household and Personal Products, are composed of only 31 and 19 firms respectively.

The information of firms' foreign sale ratios and ADR listings are also required in our analysis. Firms' annual foreign sale ratios (foreign sales over total sales) are collected from Thompsons Financial, Bloomberg and the individual firm's websites. Out of the total sample examined, there are 1,262 firms which have reported their foreign sale ratios and these are available for the last five years (1998-2002). The simple five-year average is used in our analysis. We check however the robustness of our results with different alternatives. Firm's ADR information is taken from the website of Bank of New York. The total number of ADR firms in our sample is 532. As the listing years are different across firms, we choose 1996 as the cut off point to differentiate ADR

from non ADR firms. Once again we check the robustness of our results by anchoring on different cutting points.

4. Empirical results

This section reports our major results. It is divided into two sub-sections. Section 4.1 presents the analysis for our full sample period, whereas Section 4.2 reports the result for the sub-periods which show the changes of the factor effects over time. In each sub-section, we focus first on the variance decomposition of firms' global, country and industry factor effects to gauge and compare their relative importance, and then move on to the cross-sectional analysis to explore the differences between emerging and developed markets, and the quantitative links between firms' factor effects and the firms' characteristic variables.

4.1 Full sample period

4.11 Variance decomposition

In our analysis we are primarily concerned with the issue of how much of a firm's total variance is explained by the respective global, country and industry factors. So we decompose the firm's total variance based on model (3) into proportions accounted for by each of these factors to gauge their respective importance.

Figure 1 reports the value weighted averages of the global, country and industry effects across all the firms in our full sample period. On average, the global effects explain 15.69% of firms' total variance, which is the highest out of the three factor effects. This suggests that during our 1992-2002 sample period, the global effects have played a more important role than the country effects in explaining the variation of international equity returns. This could reflect the increasing integration of the global capital markets in the last decade. A similar finding is also reported in other papers. For example, L'Her et al (2002) in their modelling of the global, country and industry effects find the global effects, explicitly identified as size, book-to-market and price momentum, to have increased during their sample period 1992-2000 and to be currently more significant than the country and industry effects.

As far as the country versus industry effects are concerned, the former have a value of 12.86% and the latter 11.54%. Clearly the country effects have dominated the

industry effects in our sample period. Yet the gap between the two is very small. The two effects have a ratio of 1.11:1, indicating that the industry effects are almost levelling the country effects. In short, the higher level of global effects and the catching-up industry effects point favourably to our intuition that the ever increasing globalization and market integration have systematic impacts on the dynamics of those factor effects.

On the whole, the three factor effects explain 40.09% of firms' total variance with the rest being attributed to firm specific factors, indicating that firm's specific shocks are the most important determinants of the international equity movements. Similar results are found in L'Her et al (2002), where firm specific effects are over 70%. The dominance of firm specific effects confirms the relevance of investing in a portfolio rather than in a single equity, given that the equity specific component can be significantly reduced by forming a portfolio of non-perfectly correlated securities. In related paper, Campbell et al (2001) decompose the firms' returns into market, industry and firm specific components to study the volatility at the market, industry and firm levels, and find that the firm level volatility is the most important component of the firm's total volatility.

Figure 1 also reports the average variance decomposition across firms in both emerging and developed markets. For firms in developed markets, the global, country and industry effects are 16.94%, 12.27% and 14.71% respectively. The global effects are the highest and the industry effects surpass the country effects, confirming the results of other recent studies in the literature, which have concentrated on developed markets. The situation is, however, reversed for firms in emerging markets: the country effects (27.06%) dominate both the global effects (7.65%) and the industry effects (3.49%). As a result, the country effects are the most important determinant of the equity return variation in emerging markets. In the next section we test whether these differences in factor effects between emerging and developed markets are statistically significant.

4.1.2 Cross-sectional analysis

We report the cross sectional regression result of each factor effect against the emerging markets dummy variable in Panel A of Table 2. The negative signs on the

global and industry effects as well as the positive sign on the country effects suggest that firms in emerging markets have lower global and industry effects and higher country effects than in developed markets. Those differences in factor effects between the two markets are significant not only statistically, but also economically. The mean difference between the two markets is -6.8 for the global effects, 6.0 for the country effects and -3.7 for the industry effects. In other words, if the global, country and industry effects for the developed markets are 12%, 8.8% and 4.9% respectively, the corresponding figures for the emerging markets will be 5.2%, 14.8% and 1.2%.[9]

The significance of the above differences between the two markets does not change even after controlling for some of the firms' characteristic variables: foreign sale ratios, ADR listings and TMT sector affiliations (see Panel B of Table 2). Emerging markets have lower global and industry effects and higher country effects than developed markets.

As far as the controlling variables are concerned, the coefficients of foreign sale ratios have a positive sign on the global effects and a negative sign on the country effects and both are statistically significant. Those signs are as expected and confirm our prior hypotheses: an increase in the extent to which firms operate globally raises their global effects and reduces their country effects. Specifically, a 10% increase in the level of firm's foreign sales over its total sales can induce an increase of global effects by 0.17% on the one hand, and a decrease of country effects by 0.71% on the other hand. However, the coefficient on the industry effects is insignificant, although it has the expected positive sign. This finding is consistent with what has been found in Brooks and Del Negro (2003), although we applied in this paper a different methodology.

The variable of ADR has a significant relationship with each of the three factor effects. Both the global and industry effects have the right signs and conform to our prior hypotheses: firms listed as ADRs increase their global and industry effects. However, the country effects have an unexpected positive sign, which means that firms listed as ADRs exhibit higher country effects than non-ADR firms. One possible reason could

[9] In fact, the values of those factor effects for the developed markets are the intercepts in the regressions based on equation (4).

be that ADR firms in many countries are often large companies which account for a substantial proportion of domestic market indexes, and their returns tend to be more correlated to the domestic market returns compared to those of non-ADR firms[10].

Turning now to the TMT variable we find it to be positively related to the global effects given the global nature of the so-called "new economy", but the coefficient is statistically insignificant. The variable has a statistically significant positive link with the country effects, which means that firms in TMT sectors have higher country effects than non-TMT sectors. On the other hand, it has a negative but insignificant link with the industry effects and thus provides no support for the proposition that the increase in industry effects is only confined to TMT sectors (see Brooks and Del Negro, 2004).

In summary, our cross-sectional regression estimation reveals that there are significant differences between emerging markets and developed markets. Emerging markets have higher country effects and lower global and industry effects than developed markets, and those differences are robust after controlling for some of the firms' characteristics such as firms' foreign sale ratios, ADR listings and TMT sector affiliations. The latter characteristics paint a picture of what drives the factor effects of firms.

4.1.3 Robustness checks

As it was pointed out previously our controlling variables such as foreign sale ratios and ADRs may be subject to measurement errors. So we have checked the robustness of our results against alternative specifications. For the variable of foreign sales ratios, we replace the 5-year simple average by the latest 3-year average, the latest single annual figures, and the average of annual percentage increases. No major changes are found and our results generally hold. As for the ADR, we have tried different cutting points from the single year of 1995 through to 1999, and the results are once again qualitatively the same.[11]

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[10] Similar findings are also reported in Choi and Kim (2000) and Patro (2000). For example, Patro (2000) studies the return behaviour and pricing of ADRs and shows that ADR firms have a significant exposure to the home-market risk even after controlling for the global market risk.

[11] Results can be made available by the authors.

4.2 Sub sample period analysis

Our analysis up to now spans the whole period 1990 to 2002. Studies have found, however, that the industry and country effects have been changing and it is not until recently that industry effects have caught up with or even surpassed the country effects in importance in the international equity markets. In this section, we conduct our analysis for different sub-periods to investigate whether the full sample results are still valid.

We divide our sample into 4 sub-periods of roughly the same length, Jan 1990-Dec 1993, Jan 1994 to Dec 1996, Jan 1997 to Dec 1999 and Jan 2000 to Dec 2001. For each sub-period, we re-calculate the firms' factor effects for the period and regress each of them cross-sectionally on emerging market dummy variable as well as other controlling variables. In the case where the data of those controlling variables such as foreign sale ratios are not available for a particular sub-period, we use the next sub-period information instead.

4.2.1 Variance decomposition

The average variance decomposition across all the firms is shown in Figure 2. Several points can be made: first, the full sample period result that the global effects are higher than the country effects holds for most of the sub-periods (except for the second one). Second, none of the three factor effects exhibit any upward or downward trend, but a cyclical pattern. Third, in terms of the relative importance of country versus industry effects, the former still dominates the latter in all the sub-periods; however, the two effects are drawing closer. The ratio of country over industry effects drops from 2.31:1 in the first period down to 1.19:1 in the last period. Finally, all the sub-periods show that less than half of firms' total variance is explained by the above three factor effects, and the rest is due to firms' specific factors.

The variance decomposition for both emerging and developed markets is also reported in Figure 2. In emerging markets, the country effects dominate the other two effects across all the sub-periods, consistent with what has been found in our full sample

analysis. However, the ratio of country to industry effects drops significantly in the last sub-period. A similar downward trend of the ratio is generally also observed in developed markets.

4.2.2 Cross-sectional analysis

The results of the cross sectional regressions for the sub-periods are shown in Table 3. In Panel A, the coefficients of the emerging market dummy variable have the same signs in all the sub-periods as in the full sample analysis: negative on global and industry effects and positive on country effects. In other words, the global and industry effects are lower while the country effects are higher in emerging markets relative to developed markets. As Panel B shows those differences between the two market groups are still prominent even after controlling for other variables, such as foreign sale ratios, ADR and TMT, which might have significant impacts on the dynamics of firms' factor effects.

The results for the control variables of foreign sale ratios and ADR remain the same in all the sub-periods and are consistent with those of the full sample period. A firm raising its international sales tends to increase its exposure to the global shocks and decrease its exposure to domestic shocks. Similarly ADR listing increases a firm's global and industry effects, yet it raises the firm's country effects as well.

The results for the variable of TMT are volatile across the different sub-periods. As a result of the boom and burst of IT bubbles which occurred during the last two sub-periods, one would expect the industry effects for TMT sectors to be higher. Our estimation shows however that during the last two periods, the coefficients on the industry effects are negative (the one in the last period is significant), meaning that the industry effects are lower for firms in TMT sectors than for those in non-TMT sectors. This suggests that the recent increase of industry effects identified in the literature is not only confined to TMT sectors. In fact, it is more prominent in the non-TMT sectors.

5. Implications for International Portfolio Diversification

Our findings in this paper have important implications for international diversification. First, our firm level evidence shows that the country effects, compared to the industry

effects, are still more important in explaining the variation of firm level equity returns. Therefore, asset allocation strategy should be based on the country-oriented approach and diversification across countries is still superior to diversification across industries in portfolio management. Particularly, diversification across emerging markets would be more efficient as we find that emerging markets, compared to mature markets, tend to have higher country effects and lower global and country effects. However, diversification across industries cannot be neglected in the future for we find the industry effects in firm returns to be increasing and country effects to be decreasing in recent years.

Second, in composing portfolios and selecting individual equities, consideration should be given to the firms' various characteristics, such as their level of global business and ADR listing status. We find in this paper that a firm's level of foreign sales is negatively related to the firm's country effects. In other words, an increase in a firm's global operations decreases its exposure to shocks from the domestic market. As more international firms tend to have lower country effects than other firms, it would be advantageous for the country-oriented diversification to choose and include less international firms that have lower levels of foreign sales. On the other hand, our analysis indicates that ADR listing increases a firm's exposure to domestic risks, thus confirming the diversification benefits of ADR investment found in studies such as Choi and Kim (2000) and Patro (2000). However, ADR listing also increases a firm's global and industry effects at the same time. So an efficient way would be to choose firms that are cross-listed as ADRs, less international in business reach, and primarily from emerging markets.

6. Conclusions

In this paper we investigate the sources and the dynamics of global, country and industry effects in firm level returns between emerging and mature markets. Previous literature has concentrated on developed markets.

In the first stage of our analysis, we measure the global, country and industry effects in firm level returns by applying a factor model in the spirit of Cavaglia, Cho and Singer (2001) and Marsh and Pfleiderer (1997) to a sample data of 1,893 firms representing 37 countries within 24 industry categories from Jan 1990 to Dec 2002.

We note first the differences in factor effects between emerging and developed markets. We subsequently test whether these differences in factor effects are statistically significant by regressing each of these factor effects cross-sectionally on a dummy, which differentiates emerging from developed markets. We check the robustness of our results by controlling for other firm characteristics, such as a firm's extent of business globalization using the firm's foreign sale ratios as a proxy, a firm's degree of financial integration using whether the firm has ADRs or not, and finally, whether a firm belongs to TMT sector. We repeat the exercise by dividing the sample into sub-periods to study the dynamics and sources of the various factor effects over time.

Our paper brings out the differences between emerging and developed markets. Comparing to developed markets, emerging markets have higher country effects and lower global and industry effects. Those differences are significant not only statistically but also economically and can explain why it has been found that the global and industry effects surpass the country effects in developed markets whereas the country effects still dominate the global and industry effects in emerging markets when using market level return data. The significance of such differences is robust to controlling for variables which might have significant impacts on firms' factor effects, and to different sub-sample periods.

In this paper we have also shown that even though the dynamics of firms' global, country and industry effects are different between emerging and developed markets, they are systematically linked to the firms' foreign sale ratios and ADR listings. On the one hand, a rise in a firm's foreign sale ratios increases the firm's global effects and decreases the country effects, and such relations are statistically and economically significant. However, no significant links are found between foreign sale ratios and industry effects, which is consistent with Brooks and Del Negro (2003). On the other hand, ADR listings are positively related to the firms' global and industry effects. This is consistent with our prior expectations. However, what is inconsistent with our expectations is that ADR listing increases, rather than decreases, a firm's country effects. A tentative explanation would be that ADR firms in many countries are large companies accounting for a substantial proportion of domestic market indexes, and their returns are usually more closely correlated to the domestic market returns

compared to those of non-ADR firms. All the above results are robust across the four sub-periods.

Third, the link between the firms' factor effects and the TMT sectors is volatile and unstable over time: the signs of the coefficients switch across different time-periods. This volatile and unstable relationship minimizes the possibility that the increase of industry effects is the direct result of IT bubbles. Especially during the last two sub-periods when the IT bubbles were rampant and burst, we find that the relationship between TMT sectors and the industry effects is negative, suggesting that the increase of industry effects in recent years is not confined to TMT sectors, but is an industry-wide phenomenon, and thus not due to IT bubbles. This firm level evidence confirms the findings of Phylaktis and Xia (2003), where they focus on the market level evidence and conclude that the increase of industry effects are not the consequence of IT bubbles.

Our findings have important implications for the international diversification. First, at the asset allocation level, diversification across countries, especially across emerging economies, is more efficient than diversification across industries. However, diversification across industries should not be neglected in the future as the industry effects are becoming more important over time. Second, at the individual equity selection level, consideration should be taken into account on the firms' various characteristics such as their level of international business and ADR listing status. An efficient way to diversity would be to choose firms that are cross-listed as ADRs, less international in business operations, and primarily from emerging markets.

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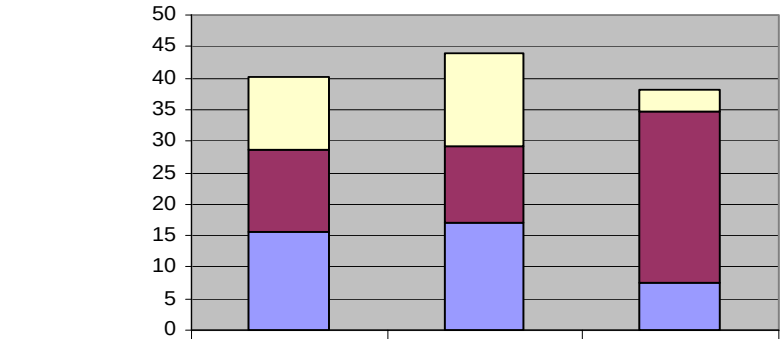
Figure 1 Variance decomposition for all firms, developed vs. emerging markets: full sample



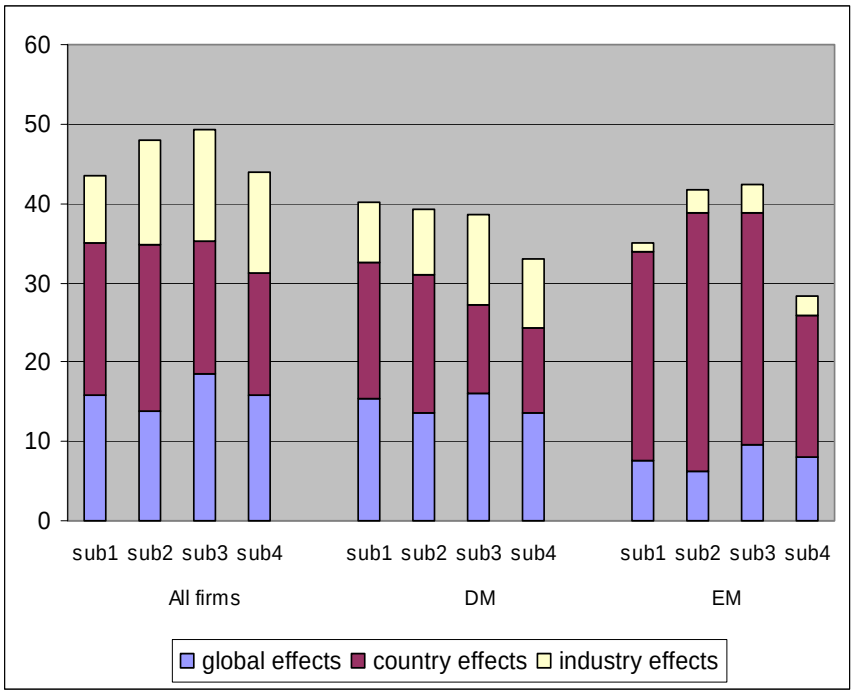
	All firms	DM	EM
Industry effects	11.54	14.71	3.49
Country effects	12.86	12.27	27.06
Global effects	15.69	16.94	7.65

Note: 1. The graph and the table show the proportions (%) of total variance in firm level returns accounted for by the respective global, country and industry factors. Those proportions are the value weighted averages across all firms, developed markets or emerging markets and are measured via Equation (1) and Equation (3).

2. The time period examined is from Jan 1990 to Dec 2001.

3. DM denotes developed markets whereas EM represents emerging markets.

Figure 2 Variance decomposition for all firms, developed versus emerging markets: sub-periods



Note: 1. The graph and the table show the proportions (%) of total variance in firm level returns explained by the respective global, country and industry factors across four different sub-periods. Those proportions are the value weighted averages across all firms, developed markets and emerging markets and are measured via Equation (1) and Equation (3).

2. The four sub-periods are Jan 1990- Dec 1993, Jan 1994-Dec 1996, Jan 1997-Dec 1999 and Jan 2000- Dec 2001.

3. DM denotes developed markets whereas EM represents emerging markets.

Table 1 Firm distribution across countries and industries

A. by country

Country	No of firms	Country	No of firms
Argentina*	9	Ireland	11
Austria	9	Italy	39
Australia	61	Japan	309
Belgium	16	Korea*	74
Brazil*	36	Mexico*	17
Canada	70	Malaysia*	62
Switzerland	33	Netherlands	24
Chile*	20	Norway	17
China*	36	New Zealand	10
Germany	44	Philippines*	15
Denmark	21	Portugal	10
Spain	27	Sweden	32
Finland	18	Singapore	33
France	52	Thailand*	26
UK	123	Taiwan*	83
Greece	21	US	380
HK	26	Israel*	26
Indonesia*	14	South Africa*	36
India*	53		
		Total	1893

(Note: * denotes emerging markets)

B. by industry (GICS industry group)

Industry	No of firms	Industry	No of firms
Energy	65	Household & Personal Products	19
Materials	195	Health Care Equipment & Services	48
Capital Goods	198	Pharmaceuticals & Biotechnology	63
Commercial Services & Supplies	49	Banks	130
Transportation	78	Diversified Financials	86
Auto & Components	52	Insurance	54
Consumer Durables & Apparels	74	Real Estate	60
Hotels, Restaurants & Leisure	45	Software & Services	73
Media	77	Tech Hardware & Equipment	111
Retailing	84	Semiconductors & Equipment	41
Food & Staples Retail	31	Telecomm Services	66
Food, Beverage & Tobacco	104	Utilities	90
		Total	1893

Table 2 Globalization vs. emerging markets: full sample

	Dependent variables		
	Global effects	Country effects	Industry effects
A. On emerging markets variable			
EM	-0.068	0.060	-0.037
	(-20.02)	**(9.72)**	**(-9.79)**
$\overline{R}^2$ (%)	17.43	4.71	4.78
B. Adding controlling variables:			
EM	-0.049	0.029	-0.014
	(-14.18)	**(4.64)**	**(-3.64)**
FR	0.017	-0.071	0.004
	(3.46)	**(-8.05)**	(1.10)
ADR	0.028	0.059	0.015
	(7.70)	**(8.79)**	**(3.66)**
TMT	0.004	0.030	-0.002
	(1.27)	**(4.76)**	(-0.52)
$\overline{R}^2$ (%)	28.53	15.76	20.51

1. The global, country and industry effects are the proportions of firms' total variance explained by the respective global, country and industry betas based on model (3)

2. Panel A shows the cross sectional regression results of each of the firm's factor effects (global, country and industry effects) on the emerging market dummy variable (EM) which takes the value of 1 if the firm belongs to the emerging markets and 0 otherwise.

3. Panel B shows the above links after controlling for the firm's characteristic variables: FR, ADR and TMT. FR is the firm's foreign sale ratios. ADR is the dummy variable which equals 1 if the firm is listed as ADR and 0 otherwise. TMT is also the dummy variable which is equal to 1 if the firms belong to TMT sectors and 0 otherwise.

4. *t* statistics are shown in parentheses. The figures highlighted represent the significance at 5% level or less.

5. Each of the regressions includes a constant term and regressions in Panel B include a US dummy variable which equals 1 if the firms belong to US and 0 otherwise.

Table 3 Globalization vs. emerging markets: sub-periods

	Subperiod1 (90.1- 93.12)			*Subperiod2 (94.1- 96.12)*			*Subperiod3 (97.1-99.12)*			*Subperiod4 (00.1- 02.12)*		
	Dependent Variable			Dependent Variable			Dependent Variable			Dependent Variable		
	Global	country	industry	Global	country	Industry	global	country	industry	global	country	industry
A. On emerging market variable												
EM	-0.094	0.098	-0.022	-0.051	-0.010	-0.029	-0.054	0.017	-0.039	-0.045	0.080	-0.028
	(-17.04)	**(10.60)**	**(-5.00)**	**(-14.11)**	**(12.11)**	**(-6.75)**	**(-11.56)**	**(24.79)**	**(-9.19)**	**(-13.00)**	**(11.43)**	**(-9.36)**
$\overline{R}^2$ (%)	16.47	7.03	1.61	10.53	7.94	2.58	6.60	24.60	4.25	8.16	6.41	4.38
B. Adding controlling variables:												
EM	-0.079	0.077	-0.10	-0.043	0.064	-0.011	-0.029	0.014	-0.019	-0.026	0.058	-0.014
	(-13.30)	**(8.03)**	**(-2.22)**	**(-11.06)**	**(7.40)**	**(-2.34)**	**(-6.15)**	**(19.31)**	**(-4.27)**	**(-7.13)**	**(7.81)**	**(-4.64)**
FR	0.024	-0.026	0.001	0.011	-0.067	0.012	0.025	-0.056	0.006	0.032	-0.065	-0.003
	(2.96)	**(-2.00)**	(0.23)	**(2.04)**	**(-5.55)**	(1.86)	**(3.70)**	**(-5.44)**	(0.96)	**(6.48)**	**(-6.26)**	(-0.78)
ADR	0.030	0.071	0.005	0.022	0.097	0.010	0.015	0.048	0.010	0.016	0.042	0.016
	(4.43)	**(6.47)**	**(3.02)**	**(5.37)**	**(10.59)**	**(2.00)**	**(3.19)**	**(6.68)**	**(2.37)**	**(4.65)**	**(6.03)**	**(5.39)**
TMT	-0.027	-0.025	0.001	-0.009	-0.005	0.015	0.014	0.020	-0.007	0.005	0.045	-0.010
	(-4.35)	**(-2.51)**	(0.03)	**(-2.36)**	(-0.57)	**(3.25)**	**(2.81)**	**(2.75)**	(-1.67)	(1.40)	**(5.95)**	**(-3.04)**
$\overline{R}^2$ (%)	19.83	15.74	5.59	14.67	11.57	12.72	16.91	31.69	14.49	18.20	11.74	16.64

Please refer to the explanation in Table 2. For each sub-period, we re-calculate the firms' factor effects for the period and regress each of them cross-sectionally on emerging market dummy variable as well as other controlling variables. In the case where the data of those controlling variables such as foreign sale ratios are not available for a particular sub-period, we use the next sub-period information instead. The figures in parentheses are the t statistics and those in bold terms represent the significance at the 5% level or less.