

Global market integration: industry level versus country level

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ABSTRACT

We propose a method to decompose aggregate market integration into two components, namely, industry-level integration and country-level integration and then investigate their evolution over time as well as across markets while adjusting the bias caused by factor heteroscedasticity and contagion during financial crises using 640 country-industry equity portfolios. We find that country-level market integration is much higher than industry-level market integration over time during stable periods, but the differences of the two types of market integration become small during financial crises in most cases. Besides, country-level market integration has an increasing trend over time, but industry level market integration illustrates different trend across different industries. Finally, the country effects dominant industry effects during normal periods but during crises, the industry effects become strong and play an indispensable role in many industries, including Consumer Goods, Financials, Industrials and Oil & Gas. Our findings provide potential implications on diversification benefits.

Keywords: market integration; decomposition; industry level; country level; country effects; industry effects; diversification benefits

JEL Codes: F15, F21, F36, G11, G12, G15

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1. Introduction

Since the 1980s, many researchers have paid much attention to studying country-level integration¹. Despite employing different methods and sample periods, the extant literature agrees upon some consistent conclusions: 1) markets exhibit the time-varying degrees of integration; 2) the degree of integration for most markets increases over time; 3) there exist significant differences in market integration between emerging markets and developed markets. In recent decades, with reorganization in industries and cross-national economic cooperation (e.g., European Union (EU), Asia-Pacific Economic Cooperation (APEC), North America Free Trade Agreement (NAFTA)), it becomes important to study the dynamics of industry-level market integration. To date, research investigating the degree of industry integration is less extensive (Fedorov and Sarkissian, 2000; Carrieri et al., 2004; Bekaert et al., 2011; and Donadelli and Paradiso, 2014) and there is no clear consensus on the extent of integration at the industry level. This paper distinguishes explicitly between industry-level and country-level financial market integration and seeks to add to our understanding of industry-level integration and particularly how industry integration is affected by the periods of financial crisis.

This research topic of industry-level integration is appealing. First, the importance of country and industry risk factors on international equity returns is one of the core questions in the research field of international finance². Meanwhile, due to export limitations or government controls on foreign ownership, some industries may have lower integration than country-level integration, such as the power-generation industry. However, on the other hand, some industries may be more integrated than country-level integration, such as the tourism industry (Carrieri, et al., 2004). Eiling et al. (2012) state that financial market integration plays a vital role in determining which factors drive portfolio returns. Therefore, investigating whether there is a sizeable difference in integration across industries can further identify the importance of industry factors in international asset pricing models. Second, for investors, research on industry integration has potential implications for portfolio diversification benefits. One of the main purposes of investigating country-level integration is to better understand potential opportunities to diversify risks as broadly as possible. However, with the blurring of national boundaries and the industrial reorganization, the

¹ Lucey et al. (2017) and Patel et al. (2022) provide a detailed review of the market integration literature.

² The debate of the relative importance of country and industry risk factors is still ongoing. On the one hand, many researchers conclude that country factors dominate industry factors, such as Grinold et al. (1989), Heston and Rouwenhorts (1994), Griffin and Karolyi (1998), Ehling and Ramos (2006), Campa and Frenandes (2006), Bekaert et al. (2009), Bai et al. (2012) and Mullen and Berrill (2017). However, some papers suggest that industry factors have become increasingly more important including Cavaglia et al. (2000), Ferreira and Ferreira (2006), Hardouvelis et al. (2007), Baele and Inghelbrecht (2009), Eiling et al. (2012), Marcelo et al. (2013) and Faias and Ferreira (2017).

diversification benefits across countries/markets may be reduced and therefore more beneficial opportunities may exist to diversify risks via investing across industries and countries together, especially in an economically-integrated region (such as EU). Many previous papers suggest that investors should improve their portfolio performance across countries and industries rather than only across countries, see, *inter alia*, Archanapalli et al. (1997), Carrieri et al. (2004, 2012) and Moerman (2008) and Marcelo et al. (2013). Lastly, the degree of market integration is a basic question when we study international asset pricing models. The risk exposure is hard to quantify without the degree of market integration.

Two research questions are examined: 1) What is the extent and what are the dynamics of country market integration and industry market integration across industries? 2) What are the differences in industry factors and country factors in asset pricing models during normal periods and crisis periods? This paper considers industry portfolios in 64 markets and 10 industries. The markets are divided into three groupings based on economic levels: developed markets, emerging markets and frontier markets. According to Datastream Global Equity Indexes (DGEI), ten level 2 industries are: Basic Materials, Consumer Goods, Consumer Services, Financials, Industrials, Health Care, Oil & Gas, Telecommunications, Technology and Utilities. This paper employs the method proposed by Qin et al. (2022) to measure market integration at the aggregate, country and industry levels. This method considers the effects of factor volatility and contagion during financial crises. Furthermore, the market integration of industry portfolios in each market and each industry is decomposed into two parts: country-level integration and industry-level integration³.

We find that country-level integration is much higher than industry-level market integration in developed and emerging markets. Frontier markets, however, are almost entirely segmented irrespective of whether we are considering country-level integration or industry-level integration. Across industries, Financials is the most integrated at the country level. Oil & Gas is the least integrated at the country level but exhibits the highest degree of industry integration. While country market integration has an increasing trend in most countries, industry market integration is characterised by different trends across industries. As for the second research question, country risk factors dominate industry risk factors during normal periods, but industry effects increase during crisis periods and largely account for the portfolio returns in many industries. The phenomenon is more prominent in Consumer Goods, Financials, Industrials and Oil & Gas.

³ The global industry risk factors are estimated from the residuals of regressing portfolio returns on global country risk factors to ensure the two types of global risk factors are orthogonal to each other.

This paper contributes the literature in four aspects. First, it proposes a method to decompose market integration into country level and industry level and provides a detailed analysis of the extent and dynamics of integration over a long global sample from 1973 to 2019. The decomposition of integration is important in fully understanding the differences in and relationship between industry and country market integration over time and across industries. For portfolio investors, this paper could help identify diversification opportunities and improve investment performance. Second, this paper systematically compares the importance of global country factors and global industry factors separately during normal periods and crisis periods. During crisis periods, the internal financial and economic system may change and thus the importance of risk factors could vary. It is therefore necessary to allow for potential time variation in separately analyse the country effects and industry effects during financial crises. Third, controlling the effects of factor volatility and contagion during financial crises, this paper applies an innovative method to examine the dynamics of market integration from three levels: aggregate, country and industry from 64 financial markets and 10 industries, which provides a comprehensive investigation from many aspects. Fourth, it compares the methods of Pukthuanthong and Roll (2009) and Qin et al. (2022) on market integration and illustrates the bias of former method caused by factor volatility and contagion during financial crises.

The reminder of this paper is organized as follows. Section 2 presents the literature review. The Empirical framework is introduced in Section 3. Section 4 describes the data and data processing. The main empirical results can be found in Section 5. Section 6 is the conclusion.

2. Literature review

Stock market integration has been the focus of much research over the past few decades, generating a vast and rich literature. From this, there now exists a common understanding that integration is time varying and heterogeneous across markets. See, *inter alia*, Carrieri et al. (2007), Chambet and Gibson (2008), Pukthuanthong and Roll (2009), Yu et al. (2010), Bekaert et al. (2011), Carrieri et al. (2013), Donadelli and Paradiso (2014), Eiling and Gerard (2015), Lehkonen (2015), Cordella and Ospino Rojas (2017), Akbari et al. (2020), Bekaert and De Santis (2021) and Nardo et al. (2022). More recent work has focussed attention on regional equity market integration, such as Adler and Qi (2003), Hardouvelis et al. (2006), Chi et al. (2006), Park and Lee (2011), Wang and Shih (2013), Guesmi and Nguyen (2014), Boubakri and Guillaumin (2015), Bekaert and Mehl (2019), Caporale et al. (2019), Lee and Kim (2020). However, the market integration at the industry level remains largely unexplored. Researchers demonstrate that the across-country diversification

benefits have lost some superiority due to higher integration across countries and the across-industry diversification benefits become superior in recent years (Phylaktis and Xia, 2006; Ferreira and Ferreira, 2006; Baele and Inghelbrecht, 2009; Marcelo et al., 2013; Apergis et al., 2014; Bessler et al., 2021 and others).

Fedorov and Sarkissian (2000) adopt a conditional asset pricing model to estimate the integration of five industry portfolios in the Russian equity market from October 1995 to November 1997. They find that less diversified industries have a smaller average degree of integration. In addition, the industry portfolios with more stocks which are cross-listed on foreign exchanges or more firms which sell their output internationally have higher strength of integration. However, their model does not consider the possibility of global industry exposure and assumes the price of risk is invariant. Carrieri et al. (2004) study the differences of market integration at country and industry levels for 18 local industries in G7 countries from January 1991 to October 1999. Based on Bekaert and Harvey (1995), they propose an asset pricing model with world, country and global industry risk factors to estimate the estimate market integration. They suggest that four global industries in the US are dynamically integrated: electricity, food, diversified industrials and insurance and provide an implication for investors that they can get higher diversification benefits by investing both across markets and across certain industries. However, their model also assumes that the prices of world and country risks are time-invariant. Caporale et al. (2019) apply a panel convergence approach to measure equity market integration and find that 3 out of 10 industries do not experience convergence over the whole sample (1998-2018). However, many papers have pointed out that correlation measures are biased⁴. Bekaert et al. (2011) propose a new, model-free approach of measuring segmentation in 38 industries across 23 developed countries and 46 emerging markets between 1980 and 2005⁵. Industry segmentation is measured as the absolute differentials in earning yields between a country-specific industry and the corresponding global industry. They illustrate those different industries have different integration processes in their sample. They find that 21 industries experience a decrease in segmentation and 17 industries an increase over the last two decades. The banking, general retailers and insurance sectors were the most segmented in the early years of the sample due to heavy regulation but are now found to be highly integrated. The software and computer services industry are the least segmented among industries in recent years while the forestry & paper, industrial metals, travel & leisure and mining sectors are the most segmented. Moreover, they also find the average

⁴ See, Forbes and Rigobon (2002), Carrieri et al. (2007), Pukthuanthong and Roll (2009), Eiling and Gerard (2015).

⁵ They choose Level 4 of the Industry Classification Benchmark (ICB) to classify the industries.

segmentation of developed markets increases from the middle of 2007 to the end of 2008 and after that, the level drops back to pre-crisis level in 2009. Focussing on emerging markets, Donadelli and Paradiso (2014) investigate the dynamics of financial integration at country and industry levels from January 1994 to July 2012 in Asia, Eastern Europe and Latin Americas⁶. Their integration index is measured by the proportion of the variance of industrial equity market excess returns explained by the first principal component which is calculated by Principal Component Analysis (PCA). At the industry level, the integration in emerging regions is quite low and the shape of the integration process is not homogeneous across industries. They find that Financials and Basic Materials both have higher integration than other industries while Consumer Goods and Utilities have lower integration compared with most industries in emerging regions.

Although Fedorov and Sarkissian (2000) and Carrieri et al. (2004) measure industry integration based on a conditional asset pricing model, Bekaert et al. (2011) highlight issues with the international asset pricing model and that model misspecification could increase estimation error. Instead, they use a simple, model-free method to measure industry-level integration. However, their approach relies on reported earnings data. Consequently, cross country differences in accounting standards may result in data errors and bias. Further, their approach just measures the dynamics of integration in a whole industry across markets. In other words, industry-level integration in an individual market cannot be estimated by their method. Donadelli and Paradiso (2014) focus on the same 10 industries as this paper, but they mainly focus on industry-level integration across regions not across markets. Specific-country industry returns do not necessarily have the same dynamics as global or regional industry returns. Also, they do not consider the effects of factor volatility and contagion during crises on their method. Our method avoids present methods' limitation and we decompose aggregate market integration into two components and focus on examining industry-level integration across markets and therefore we can establish whether it exhibits different dynamics.

3. Empirical framework

3.1 The factor model

Bekaert et al. (2009) use a mean squared error criterion (MSE) to examine the performance of four model specifications: the CAPM, the Fama-French model, the APT model and the Heston

⁶ The industry classification is based on Level 2 of ICB.

and Rouwenhorst (1994) model and conclude that the APT model best fits the covariance structure. Inspired by their paper, we establish an APT model in this paper.

For each calendar year Y :

$$R_{ij,t} = (\beta_{ij,t}^0)' + (\beta_{ij,t}^{glo})' F_t^{glo} + (\beta_{ij,t}^{ind})' F_{i,t}^{ind} + (\beta_{ij,t}^{loc})' F_{j,t}^{loc} + \epsilon_{ij,t} \quad (1)$$

where $R_{ij,t}$ is the return on industry i in market j in calendar year Y ; F_t^{glo} refers global risk factors in year Y ; $F_{i,t}^{ind}$ refers global industry risk factors on industry i in year Y ; $F_{j,t}^{loc}$ refers local factors in market j in year Y . When $\beta_{ij,t}^{loc} = 0$, the model becomes a world APT and the market j is fully integrated. When $\beta_{ij,t}^{glo} = \beta_{ij,t}^{ind} = 0$, the model becomes a local APT and the market j is totally segmented. In this paper, we estimate the explanatory power of global and industry risk factors on returns, so we do not discuss the estimation of local factors and the asset pricing model itself.

We use Principal Component Analysis (PCA) to estimate global and industry risk factors each calendar year. We choose the returns of 17 developed markets for which data is available for the entire sample period and which account for the large proportion of world market capitalization to establish the return matrix. Following Bekaert et al. (2009), we consider the first three principal components as global risk factors. We test that the first three factors can explain above 60% of total return variance on average. In each industry, in order to estimate industry factors, we first choose the markets whose returns are included in the return matrix. The criteria are 1) to choose the markets with the longest history in each industry; 2) to guarantee the number of main markets is not less than 10. Table 3.1 summarises the markets which are used to estimate principal components at the global level and 10 industries. We can see that the last four industries: Oil & Gas, Technology, Telecommunications and Utilities, start in later years compared to other industries. The last column reports the average percentage of market capitalization accounted by the chosen markets. The data of market values are all downloaded from Datastream. We find that in most of the industries, the percentages are above 80%. Second, we establish the return matrix including the returns of chosen markets in each industry to calculate the principal components each year. We consider the first principal components which could explain 50%-60% of total variance as the pure industry-specific risk factors.

<Insert Table 3.1 here>

Carrieri et al. (2004) propose a conditional asset pricing model where market returns are determined by world factors, country factors and pure industry factors. To ensure the pure industry factors are orthogonal to the world and country risk factors, they employ the estimated residuals via regressing returns on the world and country factors as pure industry factors. Bekaert et al. (2009) estimate orthogonal regional shocks in their asset pricing model from a regression of market returns on the world shocks. Bekaert et al. (2014) also utilise three types of risk factors which are orthogonal to each other. In our model, we run the regressions of market-industry return on global risk factors and consider the residuals as industry-specific risk factors. More specifically, we run the following regression on industry i in market j :

$$R_{ij,t} = (\alpha_{ij,t}^0)' + (\alpha_{ij,t}^{glo})' F_t^{glo} + \omega_{ij,t} \quad (2)$$

$\omega_{ij,t}$ can be considered as the returns excluding the effects of global risk factors. Then we use $\omega_{ij,t}$ of the chosen markets in Table 3.1 to establish covariance return matrix and estimate the common factors each year in industry j , which are the pure industry risk factors. So, the industry risk factors are orthogonal to the global risk factors. Since $E(\omega_{ij,t}) = 0$, the expected value of $\beta_{ij,t}^{ind}$ is zero.

3.2 Decomposition of market integration

Pukthuanthong and Roll (2009) propose a new measure of market integration though estimating the explanatory power of a multi-factor model. They estimate the principal components from 17 developed markets' returns mentioned in previous sub-section and add the first ten principal components as global risk factors in their multi-factor model. The explanatory power of this model based on the ten global risk factors is the level of market integration. We develop this approach further to decompose market integration into global integration and industrial integration. In Equation (1), we separately add two groups of common factors: global risk factors and industry risk factors. The factors in the first group are orthogonal to the factors in the second group. Since industry risk factors exclude global risks, aggregate market integration can be completely decomposed into global integration and industry integration. More specifically, we measure the explanatory power of global risk factors on market-industry return as global integration and measure the explanatory power of pure industry risk factors on market-industry returns as industry integration.

In order to estimate integration, we estimate the following regression to calculate the explanatory power of all risk factors, global risk factors and industry risk factors on market-industry return.

$$R_{ij,t} = (\beta_{ij,t}^0)' + (\beta_{ij,t}^{glo})' F_t^{glo} + (\beta_{ij,t}^{ind})' F_{i,t}^{ind} + \varepsilon_{ij,t} \quad (3)$$

The fitted values explained by all risk factors, global risk factors and industry risk factors are separately:

$$\hat{R}_{ij,t}^{agg} = (\hat{\beta}_{ij,t}^0)' + (\hat{\beta}_{ij,t}^{glo})' F_t^{glo} + (\hat{\beta}_{ij,t}^{ind})' F_{i,t}^{ind} \quad (4)$$

$$\hat{R}_{ij,t}^{glo} = (\hat{\beta}_{ij,t}^0)' + (\hat{\beta}_{ij,t}^{glo})' F_t^{glo} \quad (5)$$

$$\hat{R}_{ij,t}^{ind} = (\hat{\beta}_{ij,t}^0)' + (\hat{\beta}_{ij,t}^{ind})' F_{i,t}^{ind} \quad (6)$$

The explanatory power of all risk factors in Equation (3) is

$$EP_{ij}^{agg} = \frac{\sum_{t=1}^T (R_{ij,t} - \hat{R}_{ij,t}^{agg})^2}{\sum_{t=1}^T (R_{ij,t} - \bar{R}_{ij})^2} \quad (7)$$

where, $\bar{R}_{ij} = \frac{1}{N} \sum_{t=1}^T R_{ij,t}$.

Since, in Equation (3), global risk factors (or industry risk factors) are orthogonal to industry risk factors (or global risk factors) and errors, the explanatory power of global risk factors or industry risk factors is

$$EP_{ij}^{glo} = \frac{\sum_{t=1}^T (R_{ij,t} - \hat{R}_{ij,t}^{glo})^2}{\sum_{t=1}^T (R_{ij,t} - \bar{R}_{ij})^2} \quad (8)$$

$$EP_{ij}^{ind} = \frac{\sum_{t=1}^T (R_{ij,t} - \hat{R}_{ij,t}^{ind})^2}{\sum_{t=1}^T (R_{ij,t} - \bar{R}_{ij})^2} \quad (9)$$

and,

$$EP_{ij}^{agg} = EP_{ij}^{glo} + EP_{ij}^{ind} \quad (10)$$

3.3 Adjustments during Crises

As mentioned by Qin et al. (2020), the approach of Pukthuanthong and Roll (2009) is affected by various bias during the periods of financial crisis. Therefore, in order to accurately measure integration during these periods, this paper adjusts for the bias caused by changes in factor loadings, factor heteroscedasticity and residual heteroscedasticity on explanatory powers in a multi-factor model during financial crises.

For orthogonal variables in the regression, the explanatory power of this model is the sum of correlations between each factor and dependent variable. So, the explanatory power of Equation (3) can be expressed as:

$$EP_{ij}^{agg} = EP_{ij}^{glo} + EP_{ij}^{ind} = \sum_{p=1}^3 \left(\rho_{f_p^{glo} R_{ij}} \right)^2 + \sum_{q=1}^{m_i} \left(\rho_{f_{i,q}^{ind} R_{ij}} \right)^2 \quad (11)$$

where, $\rho_{f_p^{glo} R_{ij}}$ is the correlation between each global risk factor (f^{glo}) and market-industry return (R_{ij}); $\rho_{f_{i,q}^{ind} R_{ij}}$ is the correlation between each industry risk factor (f_i^{ind}) and market-industry return (R_{ij}); m_i is the number of industry risk factors in industry i .

According to Qin et al. (2022), the relationship between the conditional correlation (named $\rho_{fR_{ij}}^*$) and the unconditional correlation (named $\rho_{fR_{ij}}$) with each risk factor f :

$$\rho_{fR_{ij}}^* = \rho_{fR_{ij}} \frac{(1+\delta_{\beta_f})[(1+\delta_f)]^{1/2}}{\left\{ 1 + \sum_{i=1}^N [(1+\delta_{\beta_f})^2 (1+\delta_f) - 1] \rho_{fR}^2 + \frac{\delta_{\varepsilon} \sigma_{\varepsilon\varepsilon}^l}{\sigma_{R_{ij}R_{ij}}^l} \right\}^{1/2}} \quad (12)$$

In order to explain the definition of variables in Equation (12), we consider two periods for each crisis: the stable period and the crisis period. During each period, separately regress Equation (3) to calculate changes in factor loadings (δ_{β_f}), changes in factor volatility (δ_f) and changes in residual volatility (δ_{ε}). More specifically, $\delta_{\beta_f} = \frac{\beta_f^h}{\beta_f^l} - 1$, $\delta_f = \frac{\sigma_{ff}^h}{\sigma_{ff}^l} - 1$ and $\delta_{\varepsilon} = \frac{\sigma_{\varepsilon\varepsilon}^h}{\sigma_{\varepsilon\varepsilon}^l} - 1$, where σ_{ff} is the variance of risk factor f ; $\sigma_{\varepsilon\varepsilon}$ is the variance of residuals ε ; h means crisis period and l means stable period.

Following the previous literature (Forbes and Rigobon, 2002; Rigobon, 2003; Bekaert et al., 2014; Filoso et al., 2017), we consider six main financial crises in our sample. They are 1987 US crisis, 1994-1995 Mexican crisis, 1997 Asian crisis, 1998 Russian crisis including Long-Term Capital Management (LTCM) crisis, 2007-2007 Global Financial crisis (GFC) and 2009-2014 European Sovereign Debt crisis (ESDC). Table 3.2 presents the crisis periods and stable periods.

<Insert Table 3.2 here>

4. Data

We focus on 64 markets and 10 industries in total. The daily market and industry equity indices are downloaded from DGEI (Datastream Global Equity Indices). Based on Level 2 Industry Classification Benchmark (ICB), in each market, all stocks are classified into 10 industries⁷. The ten industries include Basic Materials, Consumer Goods, Consumer Services, Financials, Health Care, Industrials, Oil & Gas, Technology, Telecommunications, and Utilities.

To eliminate exchange rate noise, all indexes are denominated in the U.S. dollars. Salomons and Grootveld (2003) mention that although local currency returns are the purest form of returns, results based on them are less interesting for international investors. Most literature considers market returns expressed by the same currency, such as De Jong and De Roon (2005), Pukthuanthong and Roll (2009), Bekaert et al. (2011) and Donadellia and Paradiso (2014).

In addition, as noted by Pukthuanthong and Roll (2009), care needs to be taken to ensure the sample only includes trading days to avoid introducing spurious asynchronicity which may seriously bias downward any measure of market integration. To estimate the integration as precisely as possible, we remove holidays and other non-trading days from the sample⁸. In appendix, Table A describes the markets' sample period and their index identification. We consider zero returns in one of the 17 markets as holidays.

In order to condense the results, we categorise the 64 markets into four groups. The first group includes all markets. The last three groups are divided according to economic level following Standard & Poor's market classification: developed markets, emerging markets and frontier markets. Table 3.3 lists the markets included in each group. We see that our sample includes 25 developed markets, 24 emerging markets and 15 frontier markets.

<Insert Table 3.3 here>

Table 3.4 presents the average returns and their standard deviation across industries in four groups during the whole period. We can see that in the first group, Telecommunications has the highest returns and volatility compared other industries. In developed markets, the values of average returns and volatility are at the similar levels in all industries. We can also find the similar results in emerging markets except in Telecommunication with high average returns and high

⁷ ICB is jointly created by FTSE and Dow Jones. Actually, the classification consists of six levels. Level 1 is the market index, which covers all the sectors in each region or country. Level 2 divides all stocks into 10 industries. Level 3-6 subdivide the Level 2 classifications into sector classifications in increasing detail. To see the details, please read 'Datastream Global Equity Indices User Guide' on the official website of Datastream - <http://extranet.datastream.com/data/Equity%20indices/DSGlobalEquityIndices.htm>. This paper focuses on Level 1 and Level 2.

⁸ Table A in the appendix provides the details of each markets sample period and their index identification.

volatility. However, frontier markets provide a different picture. The average returns have obvious differences across industries. For example, the average return is 2.6061 with a standard deviation of 3.1657 for Telecommunications, but the return is 6.8929 with a standard deviation of 5.3957 for Utilities. Typically, for each industry, average returns are lower in developed markets than in emerging or frontier markets. In line with expectation, volatilities in developed markets are low compared to emerging or frontier markets. Table B in the appendix shows the descriptive statistics of each market.

<Insert Table 3.4 here>

5. Empirical analysis

We estimate country-level, industry-level and aggregate market integration across industries for each market. To condense the results, Table 3.5 reports the average values of each market integration across industries. On average, country integration is substantially greater than industry integration across industries although in frontier markets, they are almost fully segmented both at country and industry level. Developed markets are the most integrated at the country level, followed by emerging markets. Although in developed markets, the industry market integration is slightly higher than other markets, all markets are at a quite low level in most cases. Across industries, Financials has the highest country market integration in all four cohorts. In addition, Oil & Gas displays the highest level of industry market integration and has relatively lower country market integration compared to other industries. Especially, in developed markets, the industry integration is 0.1221 compared with 0.221 of country integration in Oil & Gas.

<Table 3.5 Insert Here>

The following subsections provide an analysis of the bias of Pukthuanthong and Roll (2009)'s method on market integration and the relative importance of industry and country risk factors during financial crises as well as examining the extent of market integration and their dynamics across industries and over time.

5.1 Market integration during financial crises

This section illustrates the bias of P&R measure separately on industry integration, country integration and aggregate integration in each crisis and compares the relative importance of global industry and country risk factors during crises. The six main financial crises considered are the

1987 US crisis, the 1994-1995 Mexican crisis, the 1997 Asian crisis, the 1998 Russian/LTCM crisis, the 2007-2009 GFC and the 2009-2014 ESDC.

5.1.1 The 1987 US crisis

According to Forbes and Rigobon (2002), the 1987 US crisis period is defined as occurring from 17 October 1987 to 4 December 1987 and therefore we measure the stable period from 1 January 1986 to 17 October 1987. Table 3.6 shows market integration measured by Pukthuanthong and Roll (2009)'s method, our adjusted method and the difference between them for each industry. The table reports aggregate market integration in addition to country integration and industry integration. After adjusting explanatory power, the level of integration becomes quite low at the country level. The differences between P&R R^2 and adjusted R^2 are positive and sizeable with the smallest difference being 0.1969 for emerging markets in Basic Materials. At the industry level, the level of integration is quite small and 3 out of 5 cases (based on the P&R measure) are observed to be higher in emerging markets than developed markets. The differences between the P&R measure and our adjusted measure are typically small and positive (Consumer Goods and Oil & Gas are exceptions). Interestingly, in five of nine industries, the adjusted industry integration tends to approach the level of adjusted country integration in developed markets. They are Consumer Goods, Consumer Services, Health Care, Oil & Gas and Technology. The findings reflect that during the 1987 US crisis, industry risk factors increased in importance becoming as significant as global country risk factors in many industries. However, emerging markets provide a different picture. Once the P&R measure is corrected for bias, industry integration falls considerably to very low levels, suggesting the originally identified integration is driven by volatility and contagion during the crisis. Overall, comparing the two levels of market integration, we can see that global country risk factors are dominant over global industry risk factors in emerging markets during this crisis.

<Insert Table 3.6 here>

5.1.2 The 1994-1995 Mexican crisis

Table 3.7 compares market integration measured by the two methods across industries during the 1994-1995 Mexican crisis. The Mexican crisis starts on 19 December 1994 and ends on 31 March 1995. The stable period is from 1 June 1994 to 16 December 1994. The differences of market integration measured by unadjusted and adjusted methods are minimal no matter which category of integration we consider. It suggests that the 1994-1995 Mexican crisis affects equity

markets locally not globally. However, one point to note is that industry factors become important in many industries during this crisis. More specifically, in developed markets, six industries have a significant level of industry market integration, especially Consumer Services, Technology and Telecommunications. Financials, Health Care and Industrials have higher industry-level market integration than country-level market integration in emerging markets. Frontier markets have more industries whose industry integration is greater than their integration at the country level, such as Consumer Goods, Consumer Services, Oil & Gas and Telecommunications.

<Insert Table 3.7 here>

5.1.3 The 1997 Asian crisis

Table 3.8 describes the differences of market integration across industries during the 1997 Asian crisis. The crisis period is between 17 October 1997 and 16 November 1997 and the stable period is between 1 January 1996 and 16 October 1997. The explanatory power of global country risk factors on portfolio returns dramatically decreases after adjusting for all bias caused by factor and residual heteroscedasticity and changes in factor loading during the crisis. Meanwhile, the explanatory power of global industry risk factors also slightly drops in most cases. Technology has similar market integration at the industry and country level in developed markets (0.1086 and 0.1390 separately), which reflects industry factors become as same important as global factors. The same situation also appears in Financials, Technology and Telecommunications in emerging markets. In Consumer Services, the industry risk factors are totally dominant in frontier markets.

<Insert Table 3.8 here>

5.1.4 The 1998 Russian/LTCM crisis

The estimates of market integration during the 1998 Russian/LTCM crisis are presented in Table 3.9. The crisis period runs from 03/08/1998 to 15/10/1998 and the stable baseline period is taken from 01/03/1998 to 01/06/1998. This crisis appears to affect equity markets globally across industries since the bias caused by the crisis are significant on explanatory power both at the country and industry level. Further, after bias adjustments, country market integration becomes lower while industry market integration becomes higher in most cases. In developed markets, five industries tend to narrow the differences between country and industry integration after adjusting, such as Basic Materials, Consumer Services, Financials, Health Care, Industrials, and Technology. The Oil & Gas sector becomes more integrated at the industry level than at the country level. Emerging markets also have five similar cases where industry factors become important for asset

pricing during the crisis. In the case of frontier markets, it can be seen that for the Financials and Health Care sectors the value of market integration is bigger at the industry level than at the country level.

<Insert Table 3.9 here>

5.1.5 The 2007-2009 GFC

Table 3.10 reports the average values of market integration in each industry during the GFC. The crisis period is from 7 August to 15 March 2009 and the stable period is from 1 March 2003 to 31 December 2006. It is observed that country-level market integration decreases considerably after bias adjustments. This implies that the P&R R^2 largely overestimates country-level market integration during crisis periods. The level of industry market integration is low and far smaller than country market integration in most cases with only Oil & Gas exhibiting sizeable industry level integration. In other words, country risk factors dominant industry risk factors during the 2007-2009 GFC and they account for much more percentage on the explanation of portfolio returns than industry risk factors. Similar to previous crises, frontier markets remain almost fully segmented at the industry level across most industries.

<Insert Table 3.10 here>

5.1.6 The 2009-2014 ESDC

The 2009-2014 ESDC stems from Europe and then spreads to other regions. The crisis period is from 1 June 2009 to 23 June 2014 and the stable period is from 1 January 2015 to 31 December 2019. Table 3.11 states the main results of market integration in different industries. We can see that the adjusted values of country-level integration substantially drop after considering bias caused by crisis. At the industry level, the unadjusted values are very low, especially in frontier markets. But after adjustments, the industry market integration increases largely although the values are still lower than country-level market integration. Industry factors tend to be important during the crisis in many industries. In developed markets, Basic Materials, Financials, Health Care and Oil & Gas all have a high level of industry integration during 2009-2014 ESDC. In Industrials and Oil & Gas of emerging markets, the values at the industry level almost approaches to the level of country integration. The industry portfolios are least integrated both at the country and industry level.

<Insert Table 3.11 here>

To sum up, this subsection investigates the bias of market integration measurement proposed by Pukthuanthong and Roll (2009) during six main financial crises and compares adjusted country and industry market integration in each industry. We can find that the country integration considerably decreases after adjusting all bias caused by factor and residual heteroscedasticity and changes in factor loadings during most crises. Industry market integration becomes higher after adjustments in many cases, especially for developed markets. Meanwhile, the industry factors tend to become important in many industries during crises and in some cases, they are dominant country risk factors in explaining asset pricing.

5.2 Dynamics of market integration

This subsection focuses on the dynamics of market integration across industries for developed markets, emerging markets and frontier markets.

Figure 3.1 shows the dynamics of the average market integration of all markets over time. Overall, market integration is much higher at the country level than at the industry level. Country integration is just below the aggregate integration across industries. The industry portfolios are almost fully segmented at the industry level. Compared to other industry sectors, Financials and Industrials are more integrated at the country level. No clear increase in aggregate market integration is observed during the GFC and the ESDC because industry integration tends to increase during these crisis periods. This is most clearly seen in the Consumer Goods, Financials, Industrials and Oil & Gas sectors. During other crises, the same issue can also be seen, although the increases are not as stark due to the short-term nature of those crises. Therefore, country effects dominate industry effects in industry portfolios' returns all the time across industries. Yet during crises, industry effects increase and become indispensable in industry portfolios' pricing in some industries, such as Oil&Gas.

<Insert Figure 3.1 here>

Figure 3.2 plots the dynamics of the average market integration of developed markets across industries. Similarly, country market integration is quite close to aggregate market integration and is much larger than industry market integration over time. But aggregate integration increases during ESDC in many industries. The main reason is that the significant rise in industry-level market integration during the crisis period across industries except for Technology and Telecommunications. The increase of industry integration during crises reflects the risk exposure of global industry risk factors increases. In the international portfolio pricing, global industry risk

factors explain more variance of portfolios' returns. Figure 3.2 illustrates that in developed markets, industry effects become stronger and industry risk factors become important variables in the asset pricing of industry portfolios. In Oil & Gas, industry-level market integration is keeping stable at a relative high level, which is comparable with country-level market integration. At the early years, industry effects are even larger than country effects in Oil & Gas.

<Insert Figure 3.2 here>

Figure 3.3 illustrates the time-varying market integration of emerging markets in each industry over time. We can see that all industry portfolios in emerging markets are segmented at the country and industry level at the early years. But after 2003, aggregate integration experiences an increase until 2016 in many industries, which is caused by a rise in country integration before 2007 and a rise in industry integration after 2008. Donadelli and Paradiso (2014) conclude market integration in emerging markets increases sharply during 2003-2007 in most industries. We find that the level of industry integration tends to increase, becoming similar in magnitude to country integration during crises across many industries. The most notable changes happen during the ESDC due to the long-term nature of the crisis. Industry-level market integration is observed to increase markedly in the Consumer Goods, Industrials and Oil & Gas sectors. In other words, industry risk factors become much more important during the ESDC period and industry effects become much stronger than during normal periods.

<Insert Figure 3.3 here>

Figure 3.4 demonstrates the dynamics of market integration in frontier markets. Apparently, the industry portfolios in frontier markets are almost fully segmented at the industry and country level in most calendar years. In Financials, country and industry integration both increase during the GFC period, which pushes aggregate integration becomes much higher during this period than during other periods. Meanwhile, in the years experiencing the ESDC, industry integration has similar values with country integration in Consumer Goods, Consumer Services and Oil & Gas sectors, which suggests industry and country effects play the similar roles in the asset pricing of industry portfolios although both of them are minimal.

<Insert Figure 3.4 here>

From the four figures above, we can find that developed markets have the highest level of market integration both at the country and industry level over time compared to other markets

with low economic levels. The frontier markets are almost fully segmented to the world. In the normal years, country risk factors dominate industry risk factors over time across industries. But in the crisis years, industry integration become high in many industries, especially during the GFC and ESDC periods. In other words, industry risk factors also play an important role in industry portfolios' pricing during crises in many industries.

In order to test the time trends of market integration in each industry, Table 3.12 reports the coefficients of a time variable and t-values in each cohort. We can see that country integration has an increasing trend for all markets in five industries: Consumer Goods, Financials, Industrials, Oil & Gas and Technology sectors. More specifically, nine of ten industries experience an upward trend in developed markets, ten in emerging market and five in frontier markets. Donadelli and Paradiso (2014) find that except for Basic Materials, Technology and Telecommunications sectors, other industries demonstrate an increasing trend in emerging markets. The extent of growth rate is the highest in developed markets in most industries. However, at the industry level, different industries exhibit different time trends. For example, four industries substantially increase and one industry hugely decrease (Technology) in developed markets. The Health Care and Telecommunications have a downward trend in frontier markets. At the aggregate level, developed and emerging markets are all showing a rise trend in each industry and some industries demonstrate higher increase rate in emerging market than in developed markets, such as Basic Materials, Consumer Goods, Health Care and Technology sectors. There are two industries experiencing a decreasing trend in frontier markets: Health Care and Telecommunications sectors.

<Insert Table 3.12 here>

6. Conclusion

This paper decomposes aggregate market integration into two aspects: country-level integration and industry-level integration while controlling factor volatility and contagion during financial crises. We employ the method in Qin et al. (2022) to estimate the three types of market integration across 640 industry portfolios.

First, the paper estimates the bias of explanatory power in a multi-global risk factor model caused by crises and compares the differences of country and industry integration after adjusting for the bias. The findings are 1) the bias is large and positive at the country level and after adjustments, country integration dramatically drops. In other words, the method of Pukthuanthong and Roll (2009) overestimates the level of market integration at the country level

during crises. 2) During crises, industry integration tends to increase considerably in many industries, especially for developed markets. In some industries, market integration at the industry level reaches to the similar degree of market integration at the country level, such as Consumer Goods, Financials, Industrials and Oil & Gas. The industry risk factors become more important during crises and play an indispensable role on industry portfolios' pricing in many industries. Carrier, Errunza and Sarkissian (2004) also discuss that the global industry risk is significantly priced in some industries.

Then, this paper analyses the extent and dynamics of market integration over time in each industry. The average level of market integration is estimated in each calendar year from 1973 to 2019. On average, Financials has the highest country integration and Oil & Gas has the lowest. In developed and emerging markets, country integration is much higher than industry integration over time, especially during normal periods. It suggests that country effects are dominant over industry effects all the time. But, in the years of GFC and ESDC, the industry integration experiences an obvious increase mainly in Consumer Goods, Financials, Industrials and Oil & Gas. The slight increase of aggregate integration is mainly due to positive changes in industry integration. The phenomenon also appears in other crisis years, but it is not obvious due to short-term crisis periods. In frontier markets, the industry portfolios are almost fully segmented to the world both at the country and industry level. The assets are mainly priced by local factors. The results provides international investors more information to diversify their portfolios across industries and markets especially during crises.

Also, this paper examines the time trends of market integration at the country level, the industry level and the aggregate level in each industry. On average, industry portfolios demonstrate an upward trend on country integration in most industries but at the industry level, the trend are different in different industries. This finding is consistent with Bekaert et al. (2011) who find that 21 sectors decrease and 17 sectors increase.

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Table 1: Main markets

This table shows the main markets included in the global category and industries. ‘Begins’ is the earliest sample start date and ‘Ends’ the sample end date of the main markets. The last column reports the percentage of market capitalization.

Industry	No.	Begins	Ends	Included Markets	Percentage
The World	17	01/01/1973	31/12/2019	Australia, Austria, Belgium, Canada, Denmark, France, Germany, Hong Kong, Ireland, Italy, Japan, Netherlands, Singapore, South Africa, Switzerland, UK, US	91.13%
Basic Materials	14	01/01/1973	31/12/2019	Australia, Austria, Belgium, Canada, France, Germany, Ireland, Italy, Japan, Netherlands, South Africa, Switzerland, UK, US	85.65%
Consumer Goods	10	01/01/1973	31/12/2019	Australia, Denmark, France, Germany, Ireland, Italy, Japan, Netherlands, UK, US	89.22%
Consumer Services	14	01/01/1973	31/12/2019	Australia, Belgium, Canada, France, Germany, Hong Kong, Ireland, Italy, Japan, Netherlands, Singapore, Switzerland, UK, US	93.55%
Financials	17	01/01/1973	31/12/2019	Australia, Austria, Belgium, Canada, Denmark, France, Germany, Hong Kong, Ireland, Italy, Japan, Netherlands, Singapore, South Africa, Switzerland, UK, US	62.96%
Health Care	13	01/01/1973	31/12/2019	Australia, Belgium, Canada, Denmark, France, Germany, Japan, Netherlands, Singapore, South Africa, Switzerland, UK, US	96.57%
Industrials	17	01/01/1973	31/12/2019	Australia, Austria, Belgium, Canada, Denmark, France, Germany, Hong Kong, Ireland, Italy, Japan, Netherlands, Singapore, South Africa, Switzerland, UK, US	91.81%
Oil & Gas	11	01/01/1986	31/12/2019	Australia, Canada, France, Ireland, Italy, Japan, Malaysia, Netherlands, Norway, UK, US	80.55%
Technology	10	01/01/1986	31/12/2019	Canada, France, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, UK, US	88.97%
Telecommunications	10	01/01/1988	31/12/2019	Belgium, Canada, Germany, Italy, Japan, Malaysia, Philippines, Spain, UK, US	69.95%
Utilities	10	01/01/1980	31/12/2019	Australia, Belgium, Canada, Germany, Hong Kong, Italy, Japan, Norway, Switzerland, US	73.93%

Table 2: Financial crises

This table lists the six main financial crises and their corresponding crisis period dates and stable period dates. GFC refers to the Global Financial crisis and ESDC refers to the European Sovereign Debt crisis; LTCM is Long-Term Capital Management.

Crisis	Crisis Period	Stable Period
1987 US crisis	17/10/1987-04/12/1987	01/01/1986-17/10/1987
1994-1995 Mexican crisis	19/12/1994-31/03/1995	01/06/1994-16/12/1994
1997 Asian crisis	17/10/1997-16/11/1997	01/01/1996-16/10/1997
1998 Russian/LCTM crisis	03/08/1998-15/10/1998	02/03/1998-01/06/1998
2007-2009 GFC	07/08/2007-15/03/2009	01/01/2003-31/12/2006
2009-2014 ESDC	01/06/2009-23/06/2014	01/01/2015-31/12/2017

Table 3: Country classification

This table presents markets included in four categories: ‘All Markets’, ‘Developed Markets’, ‘Emerging Markets’ and ‘Frontier Markets’. ‘All Markets’ includes all 64 markets in our sample. The three economic classifications are based on Standard & Poor’s market classification.

Categories	Markets	No.
All Markets	Argentina, Australia, Austria, Bahrain, Belgium, Brazil, Bulgaria, Canada, Chile, China A shares, China H+B shares, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Korea, Kuwait, Luxembourg, Malaysia, Malta, Mexico, Morocco, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Singapore, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, U.K., U.S., United Arab Emirates, Venezuela	64
Developed Markets	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the UK, the US	25
Emerging Markets	Brazil, Chile, China A shares, China H+B shares, Colombia, Czech, Egypt, Greece, Hungary, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Poland, Qatar, Russia, South Africa, Taiwan, Thailand, Turkey, United Arab Emirates, Venezuela	24
Frontier Markets	Argentina, Bahrain, Bulgaria, Croatia, Cyprus, Jordan, Kuwait, Malta, Morocco, Nigeria, Oman, Pakistan, Romania, Slovenia, Sri Lanka	15

Table 4: Statistics summary

This table reports average stock returns and their standard deviation of four cohorts across industries. The four cohorts are All Markets, Developed Markets, Emerging Markets and Frontier Markets. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). The country index average returns are also reported (TM). All data are expressed as US dollars and the values in brackets are standard deviations. Returns are expressed by percentage and the whole sample is 01/01/1973-31/12/2019.

Cohort/Industry	TM	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
All Markets	4.4782 (1.6076)	5.1349 (2.1842)	5.3315 (2.1836)	5.0597 (2.1896)	4.8056 (1.8768)	5.6907 (2.0875)	5.2928 (2.3561)	5.2481 (2.3136)	6.8629 (7.1515)	5.0475 (2.4983)	5.6225 (2.5162)
Developed Markets	4.1130 (1.3577)	4.1000 (1.7880)	4.7030 (1.8630)	4.1954 (1.6000)	4.3319 (1.6049)	5.1780 (1.9109)	4.2902 (1.7042)	4.9066 (2.1370)	4.8724 (2.3114)	4.9739 (2.3315)	5.1313 (1.6087)
Emerging Markets	5.3904 (1.9033)	6.0717 (2.4107)	6.3794 (2.4605)	6.5026 (2.8491)	6.1097 (2.2725)	6.6060 (2.2871)	6.3269 (2.8891)	5.2930 (2.4201)	12.9504 (13.2162)	6.0904 (2.6162)	6.0437 (2.4462)
Frontier Markets	3.6937 (1.6824)	6.7098 (2.8462)	5.0053 (2.4495)	5.0907 (2.3913)	3.5509 (1.7872)	5.7164 (2.3632)	6.5887 (2.9717)	6.2338 (2.5988)	2.6061 (3.1657)	2.4863 (2.7426)	6.8929 (5.3957)

Table 5: Integration summary

This table reports the average of the market integration (country/industry/aggregate) of four cohorts across industries. The four cohorts are All Markets, Developed Markets, Emerging Markets and Frontier Markets. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). The average values are calculated by averaging the market integration of all/developed/emerging/frontier markets during the whole sample. The standard derivation is in parentheses.

Panel A All Markets										
	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
Country	0.2270 (0.1914)	0.1830 (0.1827)	0.2268 (0.1988)	0.2717 (0.2175)	0.2039 (0.1718)	0.2368 (0.2089)	0.1712 (0.1501)	0.2192 (0.1716)	0.1892 (0.1496)	0.1821 (0.1540)
Industry	0.0476 (0.0807)	0.0411 (0.0853)	0.0476 (0.0835)	0.0565 (0.0808)	0.0534 (0.0853)	0.0495 (0.0679)	0.0822 (0.1346)	0.0508 (0.0794)	0.0475 (0.0631)	0.0466 (0.0856)
Aggregate	0.2743 (0.2163)	0.2251 (0.2119)	0.2709 (0.2166)	0.3276 (0.2366)	0.2550 (0.2090)	0.2876 (0.2285)	0.2533 (0.2263)	0.2711 (0.2124)	0.2369 (0.1791)	0.2283 (0.1929)
Panel B Developed Markets										
	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
Country	0.3129 (0.1965)	0.2584 (0.2061)	0.3167 (0.2057)	0.3745 (0.2202)	0.2691 (0.1793)	0.3342 (0.2208)	0.2221 (0.1638)	0.2747 (0.1736)	0.2560 (0.1569)	0.2344 (0.1681)
Industry	0.0579 (0.0965)	0.0521 (0.0904)	0.0483 (0.0726)	0.0648 (0.0983)	0.0719 (0.1032)	0.0525 (0.0627)	0.1221 (0.1603)	0.0652 (0.0932)	0.0711 (0.0813)	0.0683 (0.1097)
Aggregate	0.3706 (0.2174)	0.3121 (0.2383)	0.3651 (0.2226)	0.4363 (0.2372)	0.3378 (0.2206)	0.3916 (0.2351)	0.3443 (0.2510)	0.3420 (0.2194)	0.3278 (0.1912)	0.3021 (0.2137)

(Continued)

(Table 5 Continued)

Panel C Emerging Markets										
	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
Country	0.1642 (0.1336)	0.1306 (0.1220)	0.1522 (0.1317)	0.1800 (0.1458)	0.1205 (0.1055)	0.1491 (0.1251)	0.1533 (0.1244)	0.1364 (0.1100)	0.1503 (0.1132)	0.1329 (0.1081)
Industry	0.0417 (0.0622)	0.0331 (0.0924)	0.0544 (0.1112)	0.0506 (0.0567)	0.0281 (0.0371)	0.0537 (0.0853)	0.0516 (0.1028)	0.0263 (0.0309)	0.0274 (0.0262)	0.0205 (0.0186)
Aggregate	0.2055 (0.1618)	0.1644 (0.1437)	0.1944 (0.1539)	0.2321 (0.1706)	0.1482 (0.1120)	0.2029 (0.1622)	0.2048 (0.1682)	0.1627 (0.1146)	0.1777 (0.1166)	0.1533 (0.1146)
Panel D Frontier Markets										
	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
Country	0.0402 (0.0539)	0.0504 (0.0506)	0.0485 (0.0535)	0.0876 (0.0985)	0.0658 (0.0713)	0.0630 (0.0620)	0.0561 (0.0622)	0.0333 (0.0293)	0.0569 (0.0689)	0.0617 (0.0686)
Industry	0.0207 (0.0290)	0.0225 (0.0220)	0.0305 (0.0370)	0.0379 (0.0370)	0.0203 (0.0173)	0.0283 (0.0214)	0.0310 (0.0531)	0.0163 (0.0150)	0.0212 (0.0181)	0.0216 (0.0308)
Aggregate	0.0609 (0.0612)	0.0729 (0.0595)	0.0791 (0.0637)	0.1276 (0.1062)	0.0861 (0.0794)	0.0915 (0.0690)	0.0872 (0.0999)	0.0496 (0.0335)	0.0781 (0.0755)	0.0833 (0.0867)

Table 6: 1987 US crisis

This table reports market integration estimated by Pukthuanthong and Roll (2009)'s method ('PR') and adjusted method ('Adj') and their differences ('Diff') across industries during 1987 US crisis. The crisis period is from 17 October 1987 to 4 December 1987 and the stable period is from 1 January 1986 to 17 October 1987. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL)⁹. Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. Due to data availability, all markets ('All') are divided into two subgroups based on their economic level: developed markets (Developed) and emerging markets (Emerging). The values are the equally-weighted average of market integration.

		All			Developed			Emerging		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
BM	Country	0.5931	0.1757	0.4174	0.6406	0.1917	0.4488	0.2605	0.0636	0.1969
	Industry	0.0989	0.0372	0.0616	0.0849	0.0420	0.0429	0.1964	0.0036	0.1928
	Aggregate	0.6920	0.2130	0.4790	0.7255	0.2338	0.4917	0.4569	0.0673	0.3897
CG	Country	0.5556	0.1378	0.4178	0.5687	0.1399	0.4288	0.3988	0.1127	0.2861
	Industry	0.1002	0.1051	-0.0048	0.0915	0.1135	-0.0220	0.2051	0.0040	0.2011
	Aggregate	0.6558	0.2429	0.4130	0.6602	0.2534	0.4068	0.6040	0.1168	0.4872
CS	Country	0.5573	0.1540	0.4033	0.5573	0.1540	0.4033	---	---	---
	Industry	0.1246	0.1015	0.0232	0.1246	0.1015	0.0232	---	---	---
	Aggregate	0.6819	0.2554	0.4265	0.6819	0.2554	0.4265	---	---	---
FIN	Country	0.5314	0.1664	0.3650	0.5314	0.1664	0.3650	---	---	---
	Industry	0.1592	0.0636	0.0956	0.1592	0.0636	0.0956	---	---	---
	Aggregate	0.6906	0.2300	0.4606	0.6906	0.2300	0.4606	---	---	---
HC	Country	0.5031	0.1433	0.3598	0.5034	0.1519	0.3516	0.4986	0.0400	0.4586
	Industry	0.1542	0.1347	0.0194	0.1578	0.1429	0.0149	0.1103	0.0370	0.0734
	Aggregate	0.6572	0.2780	0.3792	0.6613	0.2947	0.3665	0.6090	0.0770	0.5320

(Continued)

⁹ Because of lack of data in Telecommunication during 1987 US crisis period, nine industries are reported in this table.

(Table 6 Continued)

		All			Developed			Emerging		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
IND	Country	0.5143	0.1595	0.3548	0.5327	0.1588	0.3739	0.3671	0.1647	0.2024
	Industry	0.1541	0.0767	0.0774	0.1432	0.0846	0.0585	0.2415	0.0129	0.2286
	Aggregate	0.6684	0.2361	0.4323	0.6759	0.2434	0.4324	0.6086	0.1776	0.4310
OG	Country	0.4642	0.1543	0.3099	0.4780	0.1634	0.3146	0.3950	0.1087	0.2863
	Industry	0.1359	0.1569	-0.0210	0.1469	0.1815	-0.0346	0.0809	0.0335	0.0474
	Aggregate	0.6001	0.3111	0.2890	0.6249	0.3449	0.2800	0.4759	0.1422	0.3337
TEC	Country	0.6118	0.1044	0.5074	0.6118	0.1044	0.5074	---	---	---
	Industry	0.0971	0.1393	-0.0423	0.0971	0.1393	-0.0423	---	---	---
	Aggregate	0.7089	0.2438	0.4651	0.7089	0.2438	0.4651	---	---	---
UTI	Country	0.4484	0.2208	0.2277	0.4484	0.2208	0.2277	---	---	---
	Industry	0.1481	0.0201	0.1280	0.1481	0.0201	0.1280	---	---	---
	Aggregate	0.5965	0.2409	0.3557	0.5965	0.2409	0.3557	---	---	---

Table 7: 1994-1995 Mexican crisis

This table reports market integration estimated by Pukthuanthong and Roll (2009)'s method ('PR') and adjusted method ('Adj') and their differences ('Diff') across industries during 1994-1995 Mexican crisis. The crisis period is from 19 December 1994 to 31 March 1995 and the stable period is from 1 June 1994 to 16 December 1994. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. All markets ('All') are divided into three subgroups based on their economic level: developed markets (Developed), emerging markets (Emerging) and frontier markets (Frontier). The values are the equally-weighted average of market integration.

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
BM	Country	0.1788	0.1624	0.0163	0.2112	0.2340	-0.0228	0.1585	0.0942	0.0643	0.0482	0.0223	0.0259
	Industry	0.0483	0.0621	-0.0138	0.0502	0.0727	-0.0225	0.0459	0.0535	-0.0076	0.0489	0.0320	0.0169
	Aggregate	0.2271	0.2245	0.0026	0.2613	0.3066	-0.0453	0.2044	0.1477	0.0567	0.0971	0.0543	0.0428
CG	Country	0.1249	0.1127	0.0122	0.1702	0.1836	-0.0134	0.0900	0.0477	0.0422	0.0604	0.0487	0.0117
	Industry	0.0531	0.0480	0.0051	0.0585	0.0466	0.0119	0.0499	0.0296	0.0203	0.0415	0.1198	-0.0783
	Aggregate	0.1780	0.1607	0.0173	0.2287	0.2302	-0.0015	0.1399	0.0774	0.0625	0.1019	0.1686	-0.0667
CS	Country	0.1939	0.1619	0.0320	0.2447	0.1983	0.0464	0.1386	0.1487	-0.0100	0.1249	0.0388	0.0862
	Industry	0.0910	0.1151	-0.0241	0.0833	0.1513	-0.0680	0.1028	0.0600	0.0428	0.0916	0.1099	-0.0182
	Aggregate	0.2849	0.2769	0.0079	0.3280	0.3496	-0.0216	0.2415	0.2086	0.0328	0.2166	0.1486	0.0679
FIN	Country	0.2000	0.1949	0.0051	0.2485	0.2803	-0.0319	0.1640	0.1114	0.0525	0.0969	0.0853	0.0116
	Industry	0.1038	0.1007	0.0031	0.0931	0.0935	-0.0004	0.1108	0.1224	-0.0115	0.1306	0.0574	0.0731
	Aggregate	0.3038	0.2956	0.0082	0.3415	0.3738	-0.0323	0.2748	0.2338	0.0410	0.2275	0.1427	0.0847
HC	Country	0.1776	0.1988	-0.0212	0.2125	0.2752	-0.0627	0.1144	0.0380	0.0764	0.0121	0.0399	-0.0277
	Industry	0.1098	0.1105	-0.0007	0.1301	0.1172	0.0130	0.0646	0.1012	-0.0366	0.0887	0.0541	0.0346
	Aggregate	0.2873	0.3093	-0.0219	0.3426	0.3924	-0.0497	0.1790	0.1392	0.0398	0.1009	0.0940	0.0069

(Continued)

(Table 7 Continued)

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
IND	Country	0.1751	0.1825	-0.0074	0.2375	0.2590	-0.0215	0.1106	0.1045	0.0060	0.0904	0.0739	0.0164
	Industry	0.1146	0.1484	-0.0338	0.1168	0.1679	-0.0511	0.1216	0.1445	-0.0230	0.0750	0.0568	0.0181
	Aggregate	0.2898	0.3310	-0.0412	0.3543	0.4269	-0.0726	0.2322	0.2491	-0.0169	0.1654	0.1308	0.0346
OG	Country	0.1355	0.1440	-0.0084	0.1525	0.1952	-0.0427	0.1213	0.0617	0.0596	0.0471	0.0532	-0.0061
	Industry	0.0847	0.0828	0.0019	0.0837	0.1006	-0.0169	0.0667	0.0325	0.0343	0.1742	0.1487	0.0255
	Aggregate	0.2202	0.2268	-0.0065	0.2362	0.2958	-0.0596	0.1880	0.0941	0.0939	0.2214	0.2019	0.0194
TEC	Country	0.1687	0.1469	0.0218	0.1764	0.1645	0.0119	0.1425	0.0870	0.0555	---	---	---
	Industry	0.0999	0.0978	0.0020	0.1147	0.1154	-0.0007	0.0495	0.0383	0.0112	---	---	---
	Aggregate	0.2686	0.2447	0.0238	0.2911	0.2799	0.0112	0.1920	0.1253	0.0667	---	---	---
TEL	Country	0.1537	0.1361	0.0176	0.1587	0.1675	-0.0088	0.1568	0.0839	0.0729	0.0536	0.0817	-0.0281
	Industry	0.0980	0.0936	0.0044	0.0895	0.1229	-0.0333	0.0984	0.0370	0.0614	0.2214	0.1073	0.1142
	Aggregate	0.2517	0.2296	0.0221	0.2482	0.2903	-0.0421	0.2553	0.1210	0.1343	0.2750	0.1890	0.0860
UTI	Country	0.1402	0.1377	0.0025	0.1799	0.2112	-0.0313	0.0850	0.0348	0.0502	0.0721	0.0192	0.0530
	Industry	0.0674	0.0531	0.0143	0.0592	0.0710	-0.0118	0.0811	0.0272	0.0539	0.0565	0.0334	0.0231
	Aggregate	0.2076	0.1908	0.0169	0.2392	0.2822	-0.0431	0.1661	0.0620	0.1041	0.1287	0.0526	0.0761

Table 8: 1997 Asian crisis

This table reports market integration estimated by Pukthuanthong and Roll (2009)'s method ('PR') and adjusted method ('Adj') and their differences ('Diff') across industries during 1997 Asian crisis. The crisis period is from 17 October 1997 to 16 November 1997 and the stable period is from 1 January 1996 to 16 October 1997. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. All markets ('All') are divided into three subgroups based on their economic level: developed markets (Developed), emerging markets (Emerging) and frontier markets (Frontier). The values are the equally-weighted average of market integration.

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
BM	Country	0.6308	0.1317	0.4991	0.7653	0.1972	0.5681	0.4752	0.0642	0.4110	0.6373	0.0796	0.5576
	Industry	0.0855	0.0277	0.0578	0.0469	0.0206	0.0262	0.1256	0.0356	0.0900	0.1142	0.0293	0.0849
	Aggregate	0.7163	0.1594	0.5569	0.8122	0.2178	0.5944	0.6008	0.0997	0.5010	0.7515	0.1089	0.6426
CG	Country	0.4821	0.0780	0.4042	0.5789	0.1130	0.4660	0.3892	0.0501	0.3391	0.3899	0.0227	0.3672
	Industry	0.1218	0.0300	0.0918	0.1300	0.0460	0.0841	0.1339	0.0169	0.1170	0.0383	0.0066	0.0316
	Aggregate	0.6040	0.1080	0.4960	0.7090	0.1589	0.5501	0.5231	0.0670	0.4561	0.4281	0.0293	0.3988
CS	Country	0.5559	0.1499	0.4061	0.6766	0.1880	0.4886	0.3931	0.1324	0.2607	0.4652	0.0194	0.4457
	Industry	0.1590	0.0672	0.0918	0.1016	0.0805	0.0211	0.2457	0.0349	0.2108	0.1746	0.1005	0.0741
	Aggregate	0.7149	0.2171	0.4979	0.7782	0.2684	0.5097	0.6388	0.1673	0.4715	0.6398	0.1199	0.5199
FIN	Country	0.6244	0.1739	0.4505	0.7466	0.2224	0.5241	0.4928	0.1231	0.3698	0.4808	0.1110	0.3698
	Industry	0.1126	0.1128	-0.0002	0.0654	0.0994	-0.0340	0.1525	0.1479	0.0045	0.2150	0.0404	0.1746
	Aggregate	0.7370	0.2867	0.4503	0.8120	0.3219	0.4901	0.6453	0.2710	0.3743	0.6958	0.1514	0.5443
HC	Country	0.6093	0.1298	0.4795	0.6851	0.1720	0.5131	0.4554	0.0601	0.3953	0.7877	0.0530	0.7347
	Industry	0.1501	0.0712	0.0789	0.1279	0.0705	0.0574	0.1951	0.0769	0.1181	0.0978	0.0204	0.0775
	Aggregate	0.7594	0.2010	0.5584	0.8130	0.2425	0.5705	0.6504	0.1370	0.5134	0.8856	0.0734	0.8122

(Continued)

(Table 8 Continued)

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
IND	Country	0.5236	0.2160	0.3077	0.7172	0.2149	0.5023	0.4236	0.2573	0.1663	0.2831	0.0787	0.2044
	Industry	0.1938	0.0818	0.1120	0.1068	0.1135	-0.0067	0.2334	0.0734	0.1600	0.3206	0.0156	0.3050
	Aggregate	0.7175	0.2978	0.4197	0.8239	0.3283	0.4956	0.6570	0.3307	0.3263	0.6037	0.0942	0.5095
OG	Country	0.5511	0.1068	0.4443	0.5925	0.1183	0.4742	0.4832	0.0938	0.3894	0.6537	0.0941	0.5596
	Industry	0.0921	0.0501	0.0420	0.0696	0.0837	-0.0141	0.1252	0.0089	0.1163	0.0631	0.0359	0.0272
	Aggregate	0.6432	0.1569	0.4863	0.6621	0.2019	0.4602	0.6084	0.1028	0.5056	0.7168	0.1300	0.5868
TEC	Country	0.5583	0.1094	0.4490	0.6726	0.1390	0.5336	0.2156	0.0205	0.1951	---	---	---
	Industry	0.1193	0.1056	0.0137	0.1011	0.1086	-0.0075	0.1738	0.0967	0.0771	---	---	---
	Aggregate	0.6776	0.2150	0.4626	0.7737	0.2476	0.5261	0.3894	0.1172	0.2722	---	---	---
TEL	Country	0.5611	0.1099	0.4512	0.5680	0.1319	0.4361	0.5073	0.0798	0.4275	0.7984	0.0883	0.7101
	Industry	0.1224	0.0688	0.0536	0.1181	0.0529	0.0652	0.1394	0.0979	0.0415	0.0654	0.0430	0.0224
	Aggregate	0.6835	0.1787	0.5048	0.6861	0.1848	0.5012	0.6467	0.1777	0.4690	0.8638	0.1313	0.7325
UTI	Country	0.4973	0.0858	0.4115	0.4792	0.1138	0.3654	0.4815	0.0548	0.4268	0.7701	0.0506	0.7195
	Industry	0.0953	0.0282	0.0671	0.1063	0.0397	0.0666	0.0818	0.0157	0.0661	0.0912	0.0119	0.0794
	Aggregate	0.5926	0.1140	0.4786	0.5855	0.1535	0.4320	0.5633	0.0705	0.4928	0.8613	0.0625	0.7988

Table 9: 1998 Russian/LTCM crisis

This table reports market integration estimated by Pukthuanthong and Roll (2009)'s method ('PR') and adjusted method ('Adj') and their differences ('Diff') across industries during 1998 Russian/LTCM crisis. The crisis period is from 3 August 1998 to 15 October 1998 and the stable period is from 2 March 1998 to 1 June 1998. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. All markets ('All') are divided into three subgroups based on their economic level: developed markets (Developed), emerging markets (Emerging) and frontier markets (Frontier). The values are the equally-weighted average of market integration.

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
BM	Country	0.3735	0.2444	0.1292	0.4741	0.3341	0.1400	0.2978	0.1706	0.1272	0.1937	0.1088	0.0848
	Industry	0.0629	0.1071	-0.0442	0.0738	0.1306	-0.0568	0.0583	0.0884	-0.0301	0.0292	0.0692	-0.0400
	Aggregate	0.4365	0.3515	0.0850	0.5479	0.4647	0.0832	0.3561	0.2589	0.0972	0.2228	0.1780	0.0448
CG	Country	0.2498	0.1603	0.0894	0.3505	0.1897	0.1608	0.1871	0.1579	0.0292	0.0831	0.0562	0.0269
	Industry	0.0834	0.0702	0.0133	0.1044	0.0871	0.0173	0.0653	0.0509	0.0144	0.0664	0.0726	-0.0061
	Aggregate	0.3332	0.2305	0.1027	0.4549	0.2768	0.1781	0.2524	0.2088	0.0436	0.1495	0.1287	0.0207
CS	Country	0.3620	0.2477	0.1142	0.4438	0.2953	0.1486	0.3314	0.2287	0.1027	0.1416	0.1226	0.0189
	Industry	0.1354	0.1703	-0.0349	0.1094	0.1950	-0.0856	0.1434	0.1530	-0.0096	0.2094	0.1215	0.0879
	Aggregate	0.4974	0.4181	0.0793	0.5533	0.4903	0.0630	0.4748	0.3817	0.0931	0.3509	0.2441	0.1068
FIN	Country	0.3832	0.2769	0.1063	0.5411	0.3725	0.1685	0.2670	0.2263	0.0407	0.1332	0.0695	0.0637
	Industry	0.1056	0.1422	-0.0366	0.0797	0.1634	-0.0837	0.1332	0.1219	0.0113	0.1221	0.1222	-0.0001
	Aggregate	0.4887	0.4191	0.0696	0.6208	0.5360	0.0849	0.4002	0.3482	0.0520	0.2553	0.1917	0.0636
HC	Country	0.3462	0.2528	0.0935	0.3967	0.3256	0.0712	0.2669	0.1526	0.1143	0.3168	0.1256	0.1913
	Industry	0.1109	0.1567	-0.0459	0.1098	0.1602	-0.0504	0.1128	0.1268	-0.0140	0.1102	0.3018	-0.1916
	Aggregate	0.4571	0.4095	0.0476	0.5065	0.4857	0.0208	0.3796	0.2794	0.1002	0.4270	0.4274	-0.0003

(Continued)

(Table 9 Continued)

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
IND	Country	0.3313	0.2539	0.0774	0.4612	0.3301	0.1311	0.2393	0.1885	0.0508	0.0877	0.1455	-0.0578
	Industry	0.1229	0.1554	-0.0325	0.1071	0.1442	-0.0370	0.1364	0.1995	-0.0632	0.1456	0.0676	0.0780
	Aggregate	0.4542	0.4093	0.0449	0.5683	0.4742	0.0941	0.3757	0.3880	-0.0124	0.2333	0.2131	0.0202
OG	Country	0.2398	0.1571	0.0827	0.2352	0.1508	0.0844	0.2767	0.1866	0.0901	0.1383	0.0855	0.0528
	Industry	0.1273	0.1240	0.0033	0.1910	0.2002	-0.0092	0.0761	0.0507	0.0254	0.0620	0.0842	-0.0222
	Aggregate	0.3671	0.2811	0.0860	0.4261	0.3509	0.0752	0.3528	0.2374	0.1155	0.2003	0.1697	0.0306
TEC	Country	0.3527	0.2215	0.1312	0.4247	0.2729	0.1518	0.1817	0.0995	0.0822	---	---	---
	Industry	0.0794	0.1298	-0.0504	0.0688	0.1433	-0.0745	0.1045	0.0977	0.0067	---	---	---
	Aggregate	0.4320	0.3513	0.0808	0.4935	0.4161	0.0773	0.2861	0.1972	0.0889	---	---	---
TEL	Country	0.3540	0.2450	0.1090	0.3700	0.2625	0.1075	0.3346	0.2082	0.1265	0.3416	0.3571	-0.0156
	Industry	0.0918	0.0776	0.0142	0.0970	0.0876	0.0094	0.0926	0.0617	0.0308	0.0308	0.0988	-0.0680
	Aggregate	0.4458	0.3226	0.1232	0.4670	0.3500	0.1169	0.4272	0.2699	0.1573	0.3723	0.4559	-0.0836
UTI	Country	0.2694	0.2198	0.0495	0.2435	0.2570	-0.0136	0.3223	0.1846	0.1376	0.1599	0.1596	0.0003
	Industry	0.1128	0.0643	0.0485	0.1659	0.0735	0.0924	0.0601	0.0591	0.0010	0.0406	0.0309	0.0097
	Aggregate	0.3822	0.2841	0.0981	0.4093	0.3305	0.0788	0.3824	0.2437	0.1387	0.2005	0.1905	0.0100

Table 10: 2007-2008 GFC

This table reports market integration estimated by Pukthuanthong and Roll (2009)'s method ('PR') and adjusted method ('Adj') and their differences ('Diff') across industries during 2007-2009 GFC. The crisis period is from 7 August 2007 to 15 March 2009 and the stable period is from 1 March 2003 to 31 December 2006. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. All markets ('All') are divided into three subgroups based on their economic level: developed markets (Developed), emerging markets (Emerging) and frontier markets (Frontier). The values are the equally-weighted average of market integration.

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
BM	Country	0.4391	0.2384	0.2008	0.5505	0.3698	0.1806	0.4093	0.1701	0.2392	0.1871	0.0318	0.1552
	Industry	0.0405	0.0519	-0.0113	0.0585	0.0535	0.0050	0.0299	0.0660	-0.0361	0.0159	0.0081	0.0078
	Aggregate	0.4797	0.2902	0.1894	0.6090	0.4233	0.1857	0.4392	0.2361	0.2031	0.2030	0.0400	0.1630
CG	Country	0.3860	0.1721	0.2139	0.5085	0.2748	0.2336	0.3317	0.1020	0.2297	0.1725	0.0504	0.1221
	Industry	0.0295	0.0180	0.0116	0.0384	0.0328	0.0056	0.0247	0.0052	0.0195	0.0160	0.0066	0.0095
	Aggregate	0.4155	0.1901	0.2254	0.5469	0.3077	0.2392	0.3564	0.1072	0.2492	0.1886	0.0569	0.1316
CS	Country	0.4069	0.2265	0.1804	0.5419	0.3599	0.1820	0.3563	0.1377	0.2186	0.1443	0.0531	0.0912
	Industry	0.0311	0.0498	-0.0187	0.0297	0.0778	-0.0481	0.0363	0.0308	0.0055	0.0234	0.0141	0.0093
	Aggregate	0.4380	0.2762	0.1618	0.5716	0.4377	0.1339	0.3926	0.1685	0.2241	0.1677	0.0672	0.1005
FIN	Country	0.5101	0.2976	0.2126	0.6441	0.4598	0.1844	0.4618	0.1699	0.2919	0.2561	0.1591	0.0969
	Industry	0.0402	0.0593	-0.0191	0.0479	0.0636	-0.0158	0.0342	0.0519	-0.0177	0.0337	0.0654	-0.0318
	Aggregate	0.5504	0.3569	0.1934	0.6920	0.5234	0.1686	0.4960	0.2219	0.2741	0.2897	0.2246	0.0651
HC	Country	0.3309	0.1735	0.1574	0.3902	0.2604	0.1298	0.2656	0.0873	0.1783	0.2811	0.0626	0.2185
	Industry	0.0368	0.0412	-0.0044	0.0519	0.0496	0.0023	0.0240	0.0381	-0.0141	0.0080	0.0092	-0.0012
	Aggregate	0.3677	0.2147	0.1529	0.4421	0.3100	0.1321	0.2896	0.1254	0.1642	0.2891	0.0718	0.2173

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(Table 10 Continued)

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
IND	Country	0.5036	0.2343	0.2693	0.6819	0.3815	0.3004	0.4250	0.1352	0.2898	0.2112	0.0730	0.1382
	Industry	0.0289	0.0458	-0.0169	0.0292	0.0691	-0.0398	0.0301	0.0243	0.0058	0.0254	0.0340	-0.0086
	Aggregate	0.5325	0.2801	0.2524	0.7111	0.4506	0.2606	0.4551	0.1595	0.2956	0.2367	0.1070	0.1296
OG	Country	0.3989	0.1591	0.2398	0.4898	0.2163	0.2736	0.3910	0.1400	0.2510	0.1593	0.0451	0.1142
	Industry	0.0440	0.0685	-0.0245	0.0717	0.1131	-0.0414	0.0233	0.0399	-0.0166	0.0179	0.0148	0.0031
	Aggregate	0.4429	0.2277	0.2152	0.5616	0.3294	0.2322	0.4144	0.1799	0.2345	0.1771	0.0598	0.1173
TEC	Country	0.4122	0.2342	0.1780	0.4725	0.3048	0.1677	0.3149	0.1191	0.1958	0.2348	0.0336	0.2012
	Industry	0.0233	0.0482	-0.0250	0.0305	0.0668	-0.0364	0.0110	0.0143	-0.0033	0.0053	0.0131	-0.0078
	Aggregate	0.4354	0.2824	0.1530	0.5030	0.3716	0.1314	0.3259	0.1334	0.1925	0.2401	0.0467	0.1934
TEL	Country	0.3645	0.1861	0.1784	0.4168	0.2436	0.1732	0.3414	0.1448	0.1966	0.1253	0.0341	0.0913
	Industry	0.0489	0.0339	0.0150	0.0741	0.0586	0.0155	0.0242	0.0103	0.0139	0.0287	0.0096	0.0190
	Aggregate	0.4134	0.2200	0.1934	0.4909	0.3022	0.1887	0.3656	0.1551	0.2105	0.1540	0.0437	0.1103
UTI	Country	0.3837	0.1662	0.2175	0.4384	0.2272	0.2112	0.3335	0.1124	0.2210	0.2677	0.0243	0.2434
	Industry	0.0452	0.0427	0.0025	0.0762	0.0725	0.0037	0.0122	0.0097	0.0025	0.0055	0.0114	-0.0059
	Aggregate	0.4290	0.2089	0.2200	0.5146	0.2997	0.2150	0.3456	0.1221	0.2235	0.2731	0.0356	0.2375

Table 11: 2009-2014 ESDC

This table reports market integration estimated by Pukthuanthong and Roll (2009)'s method ('PR') and adjusted method ('Adj') and their differences ('Diff') across industries during 2009-2014 ESDC. The crisis period is from 1 June 2009 to 23 June 2014 and the stable period is from 1 January 2015 to 31 December 2019. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. All markets ('All') are divided into three subgroups based on their economic level: developed markets (Developed), emerging markets (Emerging) and frontier markets (Frontier). The values are the equally-weighted average of market integration.

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
BM	Country	0.3670	0.2340	0.1329	0.5623	0.3527	0.2096	0.3342	0.2279	0.1063	0.0619	0.0254	0.0365
	Industry	0.0243	0.0828	-0.0585	0.0327	0.1231	-0.0904	0.0277	0.0752	-0.0476	0.0030	0.0211	-0.0180
	Aggregate	0.3912	0.3168	0.0744	0.5950	0.4758	0.1191	0.3618	0.3031	0.0587	0.0649	0.0465	0.0184
CG	Country	0.3288	0.2372	0.0916	0.5136	0.3915	0.1221	0.2639	0.1957	0.0682	0.1186	0.0408	0.0778
	Industry	0.0144	0.0760	-0.0616	0.0313	0.0844	-0.0531	0.0033	0.0970	-0.0936	0.0036	0.0271	-0.0235
	Aggregate	0.3432	0.3132	0.0300	0.5449	0.4759	0.0690	0.2672	0.2926	-0.0254	0.1222	0.0679	0.0543
CS	Country	0.3175	0.2397	0.0778	0.5214	0.3949	0.1264	0.2507	0.1933	0.0574	0.0631	0.0385	0.0246
	Industry	0.0119	0.0593	-0.0474	0.0151	0.0756	-0.0605	0.0127	0.0564	-0.0437	0.0051	0.0352	-0.0302
	Aggregate	0.3294	0.2990	0.0304	0.5364	0.4705	0.0659	0.2634	0.2497	0.0136	0.0682	0.0738	-0.0056
FIN	Country	0.4261	0.3235	0.1026	0.6196	0.4901	0.1295	0.3712	0.2789	0.0923	0.1657	0.0946	0.0711
	Industry	0.0259	0.0796	-0.0537	0.0311	0.1087	-0.0776	0.0314	0.0732	-0.0419	0.0066	0.0370	-0.0304
	Aggregate	0.4519	0.4030	0.0489	0.6508	0.5988	0.0519	0.4026	0.3522	0.0504	0.1723	0.1316	0.0407
HC	Country	0.2488	0.1935	0.0553	0.3523	0.2802	0.0721	0.2097	0.1657	0.0441	0.0755	0.0370	0.0385
	Industry	0.0197	0.0567	-0.0370	0.0370	0.1060	-0.0691	0.0061	0.0240	-0.0180	0.0073	0.0070	0.0003
	Aggregate	0.2685	0.2503	0.0182	0.3893	0.3863	0.0030	0.2158	0.1897	0.0261	0.0828	0.0440	0.0388

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(Table 11 Continued)

		All			Developed			Emerging			Frontier		
		PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff	PR	Adj	Diff
IND	Country	0.3887	0.2807	0.1080	0.6504	0.5022	0.1482	0.3074	0.1935	0.1140	0.0983	0.0664	0.0319
	Industry	0.0185	0.0832	-0.0647	0.0208	0.0844	-0.0636	0.0237	0.1216	-0.0979	0.0060	0.0155	-0.0095
	Aggregate	0.4073	0.3639	0.0433	0.6712	0.5866	0.0846	0.3311	0.3151	0.0160	0.1043	0.0819	0.0224
OG	Country	0.3193	0.1990	0.1203	0.4738	0.2830	0.1907	0.2778	0.1926	0.0852	0.0924	0.0481	0.0443
	Industry	0.0160	0.1134	-0.0974	0.0228	0.1513	-0.1285	0.0147	0.1112	-0.0965	0.0049	0.0440	-0.0391
	Aggregate	0.3352	0.3123	0.0229	0.4966	0.4343	0.0623	0.2925	0.3038	-0.0113	0.0973	0.0921	0.0052
TEC	Country	0.2724	0.2350	0.0374	0.3583	0.3116	0.0467	0.2169	0.1818	0.0350	0.0214	0.0209	0.0005
	Industry	0.0147	0.0362	-0.0215	0.0207	0.0463	-0.0256	0.0084	0.0299	-0.0216	0.0036	0.0062	-0.0025
	Aggregate	0.2871	0.2712	0.0159	0.3790	0.3578	0.0211	0.2252	0.2118	0.0135	0.0251	0.0271	-0.0020
TEL	Country	0.2410	0.1953	0.0457	0.3704	0.3033	0.0672	0.2039	0.1624	0.0416	0.0604	0.0484	0.0121
	Industry	0.0280	0.0406	-0.0126	0.0547	0.0707	-0.0160	0.0131	0.0261	-0.0130	0.0042	0.0096	-0.0054
	Aggregate	0.2690	0.2359	0.0331	0.4251	0.3740	0.0511	0.2171	0.1885	0.0286	0.0646	0.0580	0.0067
UTI	Country	0.2878	0.2059	0.0818	0.4153	0.2831	0.1322	0.2241	0.1757	0.0484	0.0689	0.0499	0.0190
	Industry	0.0202	0.0508	-0.0305	0.0371	0.0933	-0.0562	0.0074	0.0178	-0.0103	0.0038	0.0114	-0.0076
	Aggregate	0.3080	0.2567	0.0513	0.4524	0.3764	0.0760	0.2315	0.1935	0.0380	0.0727	0.0613	0.0114

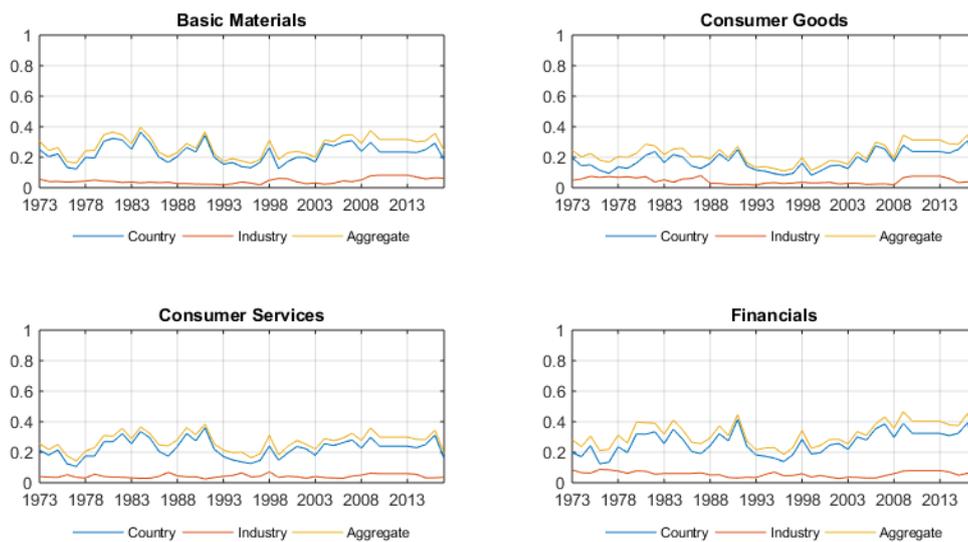
Table 12: Time trend

This table reports the coefficients of a time variable and t values by regressing the level of market integration on a time variable. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTI). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. All markets are divided into developed markets, emerging markets and frontier markets based on economic levels. ***, ** and * indicate significance at the 1%, 5% and 10% level.

		BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTI
Country	All Markets	0.0004 (0.5018)	0.0019*** (3.0053)	0.0007 (0.9625)	0.0025*** (3.0945)	-0.0011 (-1.5285)	0.0026*** (3.6901)	0.0027*** (2.9912)	0.0023** (2.2814)	0.0009 (0.8710)	0.0000 (-0.0193)
	Developed Markets	0.0037*** (4.3862)	0.0059*** (7.1803)	0.0053*** (6.3937)	0.0076*** (8.2521)	0.0011 (1.4289)	0.0085*** (9.7809)	0.0054*** (4.9205)	0.0051*** (4.3858)	0.0039*** (3.1194)	0.0019* (1.7761)
	Emerging Markets	0.0050*** (8.8661)	0.0053*** (5.5342)	0.0030*** (2.7747)	0.0058*** (8.3240)	0.0024*** (4.1935)	0.0030*** (4.1937)	0.0033** (2.7119)	0.0062*** (7.2668)	0.0026** (2.6794)	0.0023** (2.5261)
	Frontier Markets	0.0004 (0.6567)	0.0010** (2.2994)	0.0007* (1.9412)	0.0029 (4.0696)	-0.0018 (-1.4149)	0.0022*** (4.8409)	0.0012* (1.7908)	-0.0022* (-1.9312)	-0.0012 (-1.1205)	0.0018** (2.1819)
Industry	All Markets	0.0007*** (3.7447)	-0.0004 (-1.5676)	0.0002 (1.4653)	-0.0003 (-1.5413)	0.0000 (0.2100)	0.0002 (1.2427)	-0.0002 (-0.4179)	-0.0013*** (-4.6154)	-0.0006** (-2.2574)	-0.0001 (-0.2430)
	Developed Markets	0.0014*** (4.8601)	0.0001 (0.5149)	0.0006*** (3.2629)	0.0001 (1.0748)	0.0010*** (4.4918)	0.0003 (1.4549)	0.0007 (1.1371)	-0.0010*** (-2.8710)	0.0003 (0.6935)	0.0012*** (3.9028)
	Emerging Markets	0.0016*** (10.7046)	0.0016*** (3.2919)	-0.0020** (-2.1465)	0.0004 (0.5986)	0.0000 (-0.0581)	0.0015*** (4.9171)	0.0021*** (4.3774)	0.0003* (1.8415)	0.0002 (0.9619)	0.0000 (0.1820)
	Frontier Markets	0.0000 (0.2449)	0.0003 (1.4040)	0.0002 (0.8158)	0.0004 (1.5228)	-0.0011*** (-2.8205)	-0.0003 (-1.0754)	0.0003 (0.6237)	0.0002 (0.4880)	-0.0015*** (-3.3023)	0.0004 (1.0562)
Aggregate	All Markets	0.0011 (1.4139)	0.0015** (2.1219)	0.0009 (1.2918)	0.0022** (2.6016)	-0.0010 (-1.4230)	0.0028*** (3.8532)	0.0025*** (2.1836)	0.0010 (1.0288)	0.0003 (0.2860)	-0.0001 (-0.0738)
	Developed Markets	0.0051*** (6.2146)	0.0060** (7.0422)	0.0059*** (7.4356)	0.0077*** (8.5327)	0.0021** (2.6583)	0.0088*** (9.9863)	0.0061*** (5.2638)	0.0042*** (3.6753)	0.0042*** (3.1809)	0.0030*** (2.8067)
	Emerging Markets	0.0066*** (10.4210)	0.0069*** (5.7355)	0.0018 (1.2816)	0.0061*** (5.8770)	0.0024*** (3.9133)	0.0045*** (5.3246)	0.0054*** (3.7352)	0.0065*** (7.1900)	0.0028*** (2.8703)	0.0023** (2.5993)
	Frontier Markets	0.0004 (0.6531)	0.0013*** (2.8542)	0.0009* (1.9233)	0.0033*** (3.7009)	-0.0029** (-1.9541)	0.0019*** (3.1671)	0.0015 (1.5615)	-0.0020 (-1.5949)	-0.0027* (-1.9637)	0.0021** (2.1529)

Figure 1: Integration dynamics in all markets

This figure shows the dynamics of the market integration (country/industry/aggregate) of all markets over time. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. The value each year is equally averaged by the level of the market integration of all existing markets in the year. The market integration is calculated by adjusted explanatory power after considering the bias caused by factor and residual heteroscedasticity and changes in factors loadings during financial crises and by the method of Pukthuanthong and Roll (2009) during normal periods.



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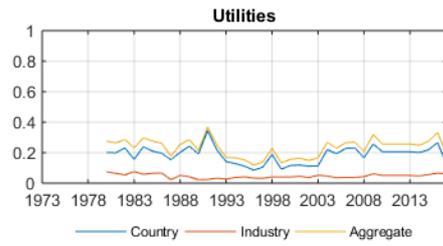
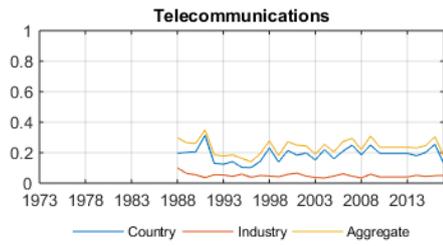
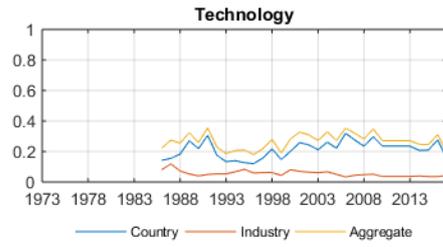
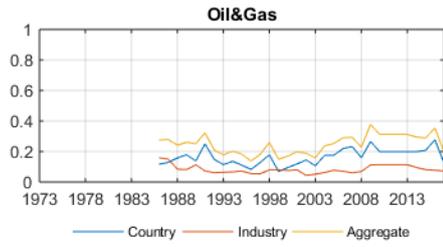
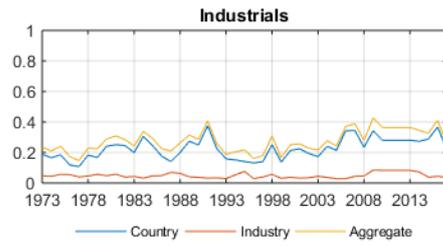
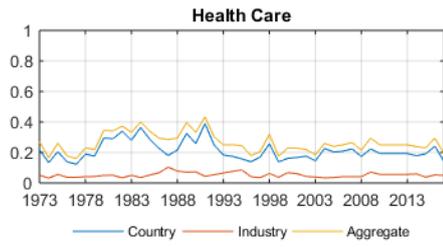
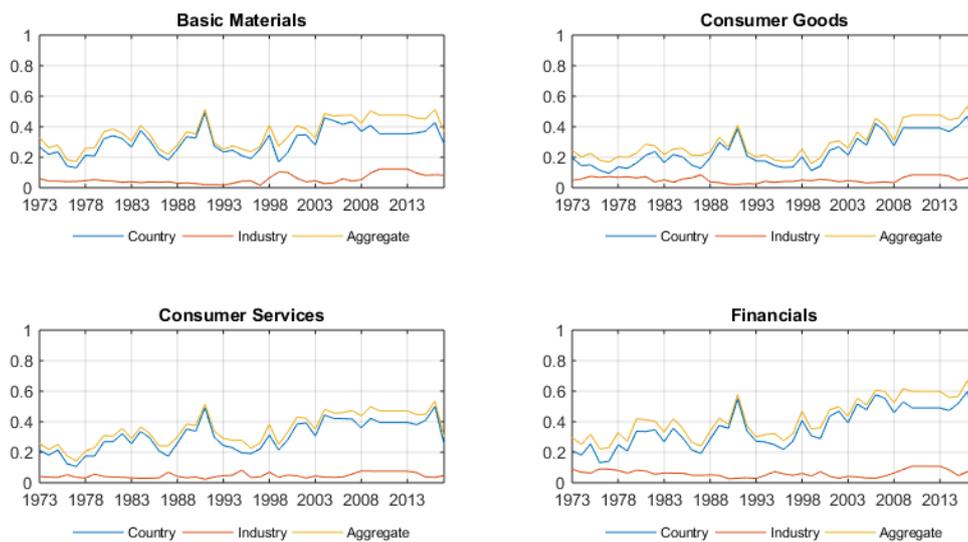


Figure 2: Integration dynamics in developed markets

This figure shows the dynamics of the market integration (country/industry/aggregate) of developed markets over time. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. The value each year is equally averaged by the level of the market integration of all existing developed markets in the year. The market integration is calculated by adjusted explanatory power after considering the bias caused by factor and residual heteroscedasticity and changes in factors loadings during financial crises and by the method of Pukthuanthong and Roll (2009) during normal periods.



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(Figure 2 Continued)

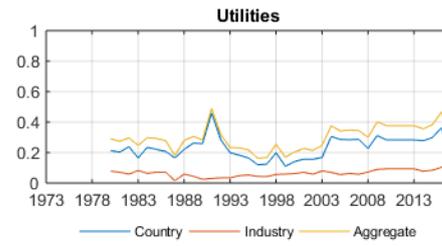
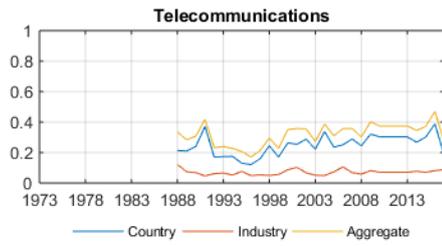
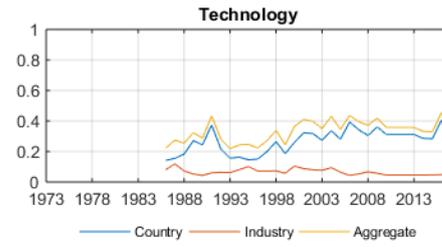
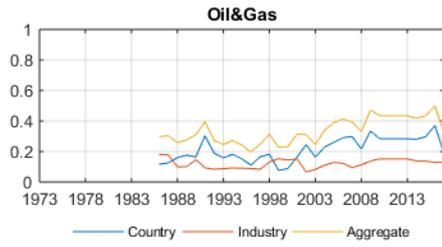
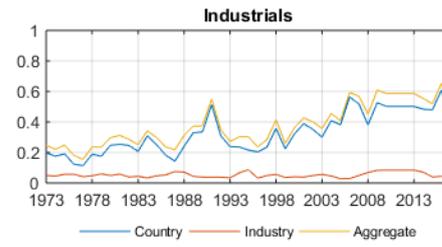
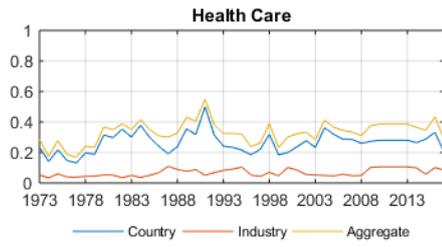
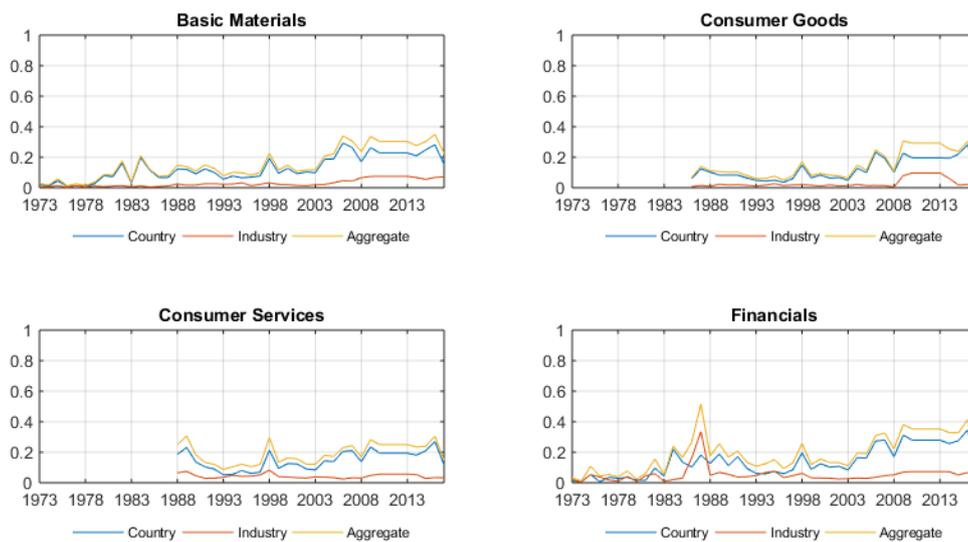


Figure 3: Integration dynamics in emerging markets

This figure shows the dynamics of the market integration (country/industry/aggregate) of emerging markets over time. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. The value each year is equally averaged by the level of the market integration of all existing emerging markets in the year. The market integration is calculated by adjusted explanatory power after considering the bias caused by factor and residual heteroscedasticity and changes in factors loadings during financial crises and by the method of Pukthuanthong and Roll (2009) during normal periods.



(Continued)

(Figure 3 Continued)

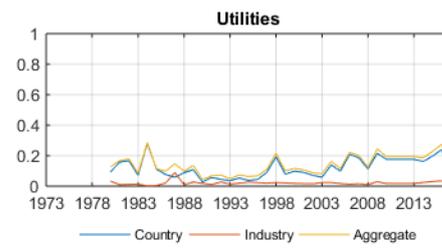
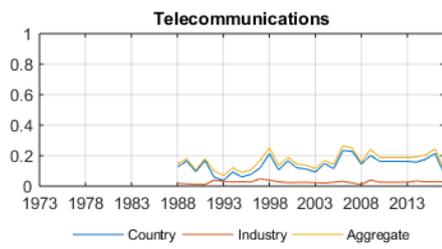
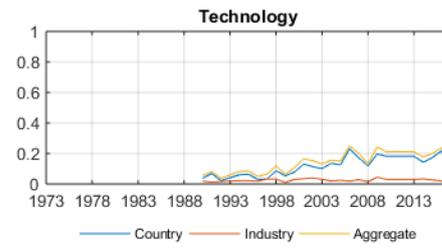
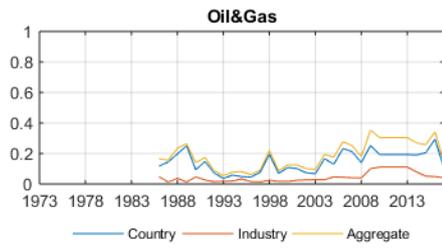
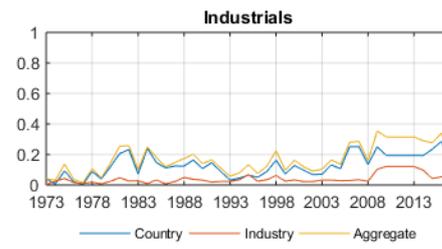
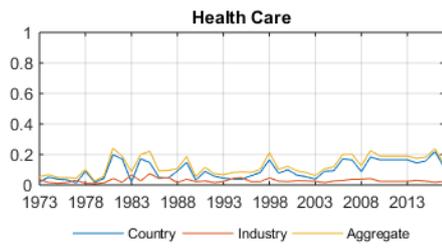
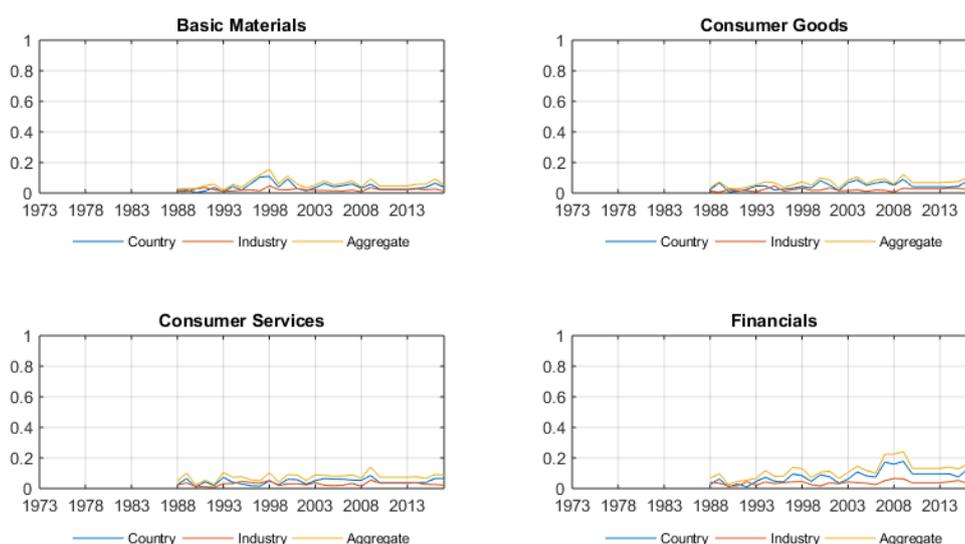


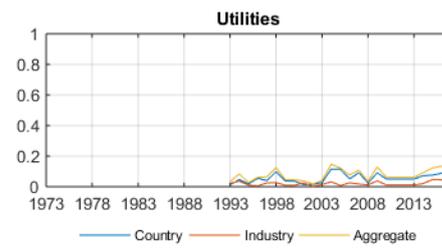
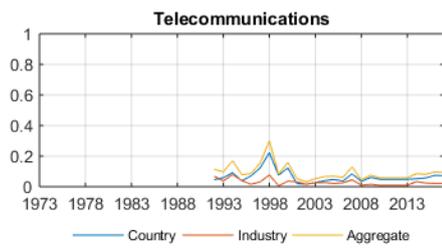
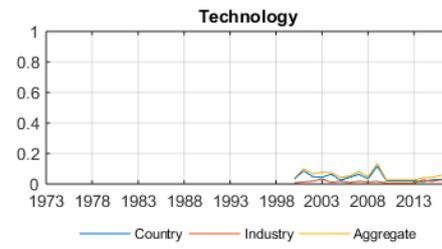
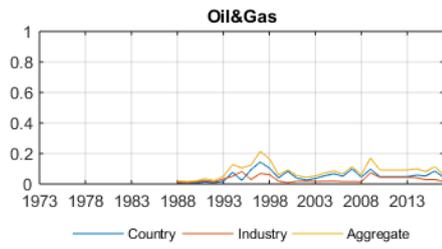
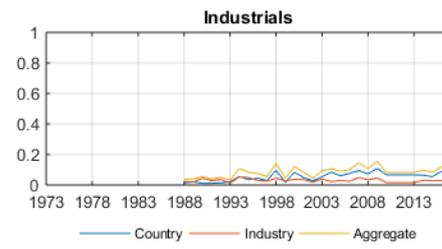
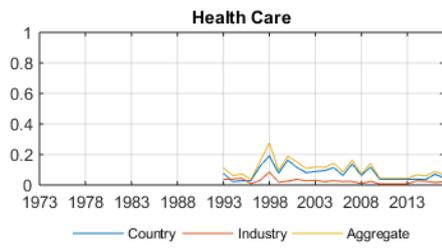
Figure 4: Integration dynamics in frontier markets

This figure shows the dynamics of the market integration (country/industry/aggregate) of frontier markets over time. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Three types of market integration are reported in each industry: country-level, industry-level and aggregate market integration. The value each year is equally averaged by the level of the market integration of all existing frontier markets in the year. The market integration is calculated by adjusted explanatory power after considering the bias caused by factor and residual heteroscedasticity and changes in factors loadings during financial crises and by the method of P Pukthuanthong and Roll (2009) during normal periods.



(Continued)

(Figure 4 Continued)



Appendix

A: Market sample periods and price index identification with local currency

Country	Begins	Ends	Index identification	Datastream mnemonic
Australia	01/01/1973	31/12/2019	AUSTRALIA-DS Market - PRICE INDEX	DPL#(TOTMKAU(PI),8)
Austria	01/01/1973	31/12/2019	MSCI AUSTRIA - PRICE INDEX	DPL#(MSASTRL(PI),8)
Belgium	01/01/1973	31/12/2019	BELGIUM-DS Market - PRICE INDEX	DPL#(TOTMKBG(PI),8)
Canada	01/01/1973	31/12/2019	S&P/TSX COMPOSITE INDEX - PRICE INDEX	DPL#(TTOCOMP(PI),8)
Denmark	01/01/1973	31/12/2019	MSCI DENMARK - PRICE INDEX	DPL#(MSDNMKL(PI),8)
France	01/01/1973	31/12/2019	FRANCE-DS Market - PRICE INDEX	DPL#(TOTMKFR(PI),8)
Germany	01/01/1973	31/12/2019	DAX 30 PERFORMANCE - PRICE INDEX	DPL#(DAXINDX(PI),8)
Hong Kong	01/01/1973	31/12/2019	HANG SENG - PRICE INDEX	DPL#(HNGKNGI(PI),8)
Ireland	01/01/1973	31/12/2019	IRELAND-DS Market - PRICE INDEX	DPL#(TOTMKIR(PI),8)
Italy	01/01/1973	31/12/2019	ITALY-DS Market - PRICE INDEX	DPL#(TOTMKIT(PI),8)
Japan	01/01/1973	31/12/2019	TOPIX - PRICE INDEX	DPL#(TOKYOSE(PI),8)
Netherlands	01/01/1973	31/12/2019	NETHERLAND-DS Market - PRICE INDEX	DPL#(TOTMKNL(PI),8)
Singapore	01/01/1973	31/12/2019	SINGAPORE-DS DS-MARKET EX TMT - PRICE INDEX	DPL#(TOTXTSG(PI),8)
South Africa	01/01/1973	31/12/2019	SOUTH AFRI-DS Market - PRICE INDEX	DPL#(TOTMKSA(PI),8)
Switzerland	01/01/1973	31/12/2019	SWITZ-DS Market - PRICE INDEX	DPL#(TOTMKSW(PI),8)
UK	01/01/1973	31/12/2019	UK-DS Market - PRICE INDEX	DPL#(TOTMKUK(PI),8)
US	01/01/1973	31/12/2019	S&P 500 COMPOSITE - PRICE INDEX	DPL#(TOTMKMP(PI),8)

B: Summary statistics across 64 countries and 10 industries

This table reports average returns and their standard deviation across 64 markets and 10 industries. The 10 industries include Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Financials (FIN), Health Care (HC), Industrials (IND), Oil & Gas (OG), Technology (TEC), Telecommunications (TEL), and Utilities (UTL). Besides, the country index average returns are also reported (TM). The starting time of each data series is determined by data availability and the ending time is 31/12/2019. All data are expressed as US dollars and the values in brackets are standard deviations. Returns are expressed by percentage.

Market/Industry	TM	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
Argentina	8.6053 (3.0736)	9.4518 (3.4254)	6.0822 (3.7335)	4.4786 (1.9927)	4.0445 (2.4118)	--- ---	12.0442 (3.4364)	8.4179 (3.5254)	--- ---	1.4229 (2.6075)	-0.1817 (2.0547)
Australia	3.9456 (1.3466)	3.7083 (1.6037)	7.2036 (1.9591)	4.7324 (1.4301)	4.7211 (1.3649)	5.5600 (1.3029)	4.3993 (1.4547)	3.6240 (1.7026)	7.4917 (2.0690)	4.3882 (1.8598)	6.9897 (1.7893)
Austria	3.9380 (1.1995)	4.5783 (1.5724)	0.6815 (2.2184)	3.7454 (2.1510)	5.1083 (1.3672)	3.3788 (1.8178)	2.2917 (1.4800)	6.7632 (2.0687)	4.3268 (2.6152)	0.9260 (2.0155)	3.5941 (1.6086)
Bahrain	1.3346 (0.7829)	2.0219 (1.1600)	5.3116 (1.1237)	5.8380 (1.2547)	1.4181 (0.9199)	--- ---	11.9176 (7.1982)	--- ---	--- ---	-0.0291 (1.2398)	--- ---
Belgium	4.5521 (1.1563)	4.4436 (1.4532)	5.7936 (1.8705)	5.9447 (1.3131)	4.2673 (1.3405)	6.6611 (1.6954)	4.0501 (1.3765)	5.4422 (1.6290)	6.4030 (2.1552)	6.1182 (2.1423)	4.9723 (1.2157)
Brazil	3.8156 (2.0419)	2.8660 (2.2683)	7.8411 (1.9737)	7.7075 (2.3847)	5.7445 (2.2675)	2.9063 (2.4821)	4.8361 (2.2354)	6.0121 (2.8459)	5.7543 (2.5591)	2.6695 (2.2976)	2.5627 (2.3420)
Bulgaria	6.2222 (1.7071)	16.2051 (2.8769)	2.3462 (3.3187)	14.2983 (3.9060)	6.7350 (1.8777)	12.5929 (3.4880)	19.5038 (6.1421)	11.4342 (4.2652)	6.3313 (1.7854)	18.0485 (7.3748)	9.9466 (3.7905)
Canada	3.1709 (1.0746)	2.4385 (1.5348)	3.6798 (2.2796)	2.5813 (1.0281)	4.3535 (1.1461)	5.4094 (1.6446)	3.7850 (2.0547)	3.2483 (1.5005)	2.6299 (1.9268)	4.3168 (1.1796)	3.2865 (0.9793)
Chile	5.0680 (1.1764)	6.0707 (1.3981)	6.1888 (1.3943)	5.0605 (1.4972)	6.3405 (1.3438)	8.0548 (2.0432)	4.2724 (1.5345)	5.2366 (1.6265)	5.1411 (1.8427)	3.2674 (1.6805)	4.8944 (1.3163)
China A shares	8.4672 (2.2354)	6.7412 (2.4568)	5.8284 (2.3943)	8.0236 (2.7543)	7.9971 (2.2788)	7.2769 (2.0389)	7.5130 (2.1389)	4.9679 (1.9104)	6.2306 (2.1564)	4.7972 (2.4000)	6.1754 (2.2801)
China H+B shares	4.5687 (1.9517)	6.6894 (2.5669)	6.8105 (2.2573)	4.5985 (2.6208)	7.2970 (2.3000)	17.1726 (2.5181)	6.6796 (2.4202)	2.3220 (2.5684)	-3.0134 (2.1375)	3.6691 (2.2909)	5.4261 (2.4402)

(Continued)

(Table B Continued)

Market/Industry	TM	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
Colombia	3.5279 (1.3802)	5.7794 (1.9791)	3.6972 (1.7372)	2.5743 (2.0291)	2.5782 (1.3964)	-0.6557 (1.6097)	0.9728 (2.3741)	2.8582 (2.3337)	3.6423 (1.4527)	5.8847 (2.3269)	9.4919 (1.6485)
Croatia	2.8387 (1.2982)	19.6413 (5.4189)	1.7712 (1.2900)	5.2450 (1.6813)	1.7600 (1.7746)	4.3010 (2.6879)	1.9544 (1.7481)	8.1026 (2.3563)	---	3.0756 (1.4265)	---
Cyprus	1.2437 (1.8233)	8.2254 (3.6376)	1.8002 (2.1326)	6.7095 (1.7155)	0.3338 (2.1091)	---	5.3887 (2.0715)	9.7552 (4.0373)	-4.1905 (3.2654)	-6.2908 (4.1949)	0.4676 (0.5540)
Czech Republic	4.4353 (1.5965)	1.5955 (1.6802)	3.8687 (2.2537)	1.4375 (2.8814)	4.9551 (2.1295)	3.8757 (1.5427)	10.4661 (1.8127)	7.1093 (2.0254)	4.4938 (1.9531)	4.8901 (2.0370)	5.3064 (1.9270)
Denmark	4.3800 (1.2694)	3.8105 (2.3237)	3.6985 (1.8308)	3.1438 (2.0721)	4.9022 (1.3553)	5.5059 (1.3696)	3.3688 (1.8724)	7.1950 (3.5681)	8.3356 (2.4030)	3.4318 (2.0362)	12.0899 (1.5092)
Egypt	4.2718 (1.4574)	4.9623 (1.6347)	2.4067 (1.7248)	24.9657 (9.2178)	4.9112 (1.6981)	12.9737 (1.9961)	6.8395 (1.7773)	5.3104 (1.9131)	515.8096 (129.5921)	7.5864 (2.1510)	---
Finland	4.2524 (1.7801)	2.6220 (1.8746)	9.2062 (2.0337)	3.2014 (1.4501)	5.3275 (1.8774)	3.6694 (1.5265)	3.5948 (1.5636)	8.1933 (2.4745)	6.8925 (2.6877)	5.8579 (2.5302)	5.9008 (1.9894)
France	4.7033 (1.3157)	5.7011 (1.4507)	4.2600 (1.5261)	4.2191 (1.3793)	5.2293 (1.5261)	4.4670 (1.3738)	5.6031 (1.4469)	5.7765 (1.7130)	5.1672 (1.9750)	4.2984 (2.2432)	1.2053 (1.9165)
Germany	3.8900 (1.2211)	4.9057 (1.3630)	4.7831 (1.7046)	3.2351 (1.3312)	3.7410 (1.3639)	4.3234 (1.0572)	3.7323 (1.3783)	-5.7297 (2.5221)	7.8829 (2.1287)	3.8787 (1.7560)	3.6964 (1.1835)
Greece	2.4890 (2.0344)	6.1643 (2.2747)	13.6233 (4.1809)	7.0446 (2.9323)	0.8185 (2.8972)	5.5329 (3.4045)	9.0849 (2.9757)	5.6944 (2.1909)	6.5157 (4.6546)	5.2316 (2.5002)	2.8658 (2.5521)
Hong Kong	5.8288 (1.7328)	4.0697 (2.2650)	6.0002 (1.7022)	4.1120 (1.6446)	6.1663 (1.7810)	17.9579 (2.6877)	5.5213 (2.1610)	8.4785 (3.7124)	9.0007 (2.5083)	4.6563 (1.9927)	8.8099 (1.7061)
Hungary	5.3743 (1.9002)	6.6209 (2.6300)	5.2451 (2.1393)	13.1313 (2.7177)	8.8577 (2.7302)	8.7481 (2.1797)	0.6654 (2.3891)	6.9622 (2.5053)	-2.0141 (2.6323)	2.8920 (2.0855)	7.6118 (2.1649)
India	3.4471 (1.7229)	2.9531 (1.9576)	4.7998 (1.6926)	5.5356 (2.3922)	6.9718 (2.5597)	6.5203 (1.6347)	3.6519 (1.9939)	2.3057 (2.3862)	11.2488 (2.8085)	3.3051 (2.3674)	4.4254 (2.3854)
Indonesia	4.5246 (2.3300)	3.0233 (2.8467)	5.9034 (2.4918)	1.6997 (2.5743)	4.0557 (2.8199)	9.8504 (2.7631)	13.2668 (2.9169)	4.0498 (2.6283)	23.5118 (2.6194)	7.1593 (2.7428)	10.1088 (2.8911)
Ireland	4.6813 (1.3214)	5.7106 (2.9622)	2.2292 (2.4228)	5.5838 (1.4562)	4.7369 (2.2584)	-10.8961 (1.4024)	9.1725 (2.5078)	4.5310 (3.2521)	7.6897 (3.0360)	31.9611 (9.4767)	---

(Continued)

(Table B Continued)

Market/Industry	TM	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
Israel	2.0927 (1.3554)	2.6116 (1.8919)	5.1380 (1.9741)	5.1821 (1.6099)	3.0096 (1.5919)	3.2292 (1.8810)	2.6390 (1.6723)	3.9171 (1.9293)	0.1287 (2.1695)	2.9455 (1.7543)	4.0522 (2.0544)
Italy	3.3149 (1.5059)	2.9480 (1.8152)	3.7523 (1.7793)	2.1176 (1.7561)	3.5858 (1.7331)	3.3713 (1.5472)	2.2250 (1.5579)	3.4573 (1.8775)	0.1634 (2.1632)	3.7040 (1.9512)	4.9872 (1.7684)
Japan	4.0737 (1.2928)	4.1665 (1.4845)	4.9721 (1.4414)	3.5552 (1.2026)	3.9284 (1.5878)	5.0713 (1.2174)	4.4305 (1.4523)	4.2662 (1.8884)	4.6970 (1.7161)	7.3790 (2.0984)	4.4526 (1.4988)
Jordan	-0.5283 (0.8888)	1.4706 (1.8749)	5.4837 (1.1499)	0.3136 (0.6392)	-0.6410 (0.8995)	-1.0629 (1.5925)	0.0463 (1.3619)	3.1036 (1.9011)	---	0.6186 (1.4843)	6.8504 (2.0899)
Korea	3.3850 (2.0718)	4.6998 (2.2929)	4.7292 (2.2826)	1.3560 (2.2288)	2.1338 (2.5082)	8.8585 (2.7005)	4.9598 (2.4556)	5.3588 (2.5121)	4.5392 (3.0852)	5.9973 (2.3006)	2.9294 (2.4406)
Kuwait	2.8678 (1.0260)	3.9878 (1.7017)	4.3567 (2.0200)	2.0243 (2.0892)	3.0875 (1.0518)	5.6454 (1.4555)	3.8567 (1.4227)	7.3695 (2.7197)	---	2.5625 (1.7981)	---
Luxembourg	3.5542 (1.1644)	2.5576 (1.8086)	6.8189 (1.9503)	0.7388 (1.8934)	4.6902 (1.1644)	-33.7154 (1.5323)	1.0311 (1.8593)	1.6294 (1.6332)	5.0724 (2.0240)	6.6147 (4.3199)	7.1391 (1.8138)
Malaysia	5.0797 (1.4369)	4.3747 (1.8220)	5.9666 (1.8937)	5.6123 (1.6383)	5.7060 (1.7054)	12.1883 (1.4963)	4.5595 (1.6840)	6.4042 (1.6808)	22.0349 (2.4884)	3.5296 (2.2721)	3.3504 (1.7408)
Malta	1.8617 (0.9142)	---	6.6426 (1.2502)	2.7025 (1.8700)	1.9611 (1.0032)	---	6.9779 (1.1544)	6.8825 (2.1797)	1.3678 (2.7768)	1.8251 (1.9398)	---
Mexico	5.1582 (1.6953)	5.8465 (2.0250)	1.9264 (2.3910)	5.0863 (1.6725)	8.7410 (2.3979)	5.1855 (2.5125)	2.9884 (1.9919)	---	---	5.3468 (1.9817)	6.0136 (1.7808)
Morocco	4.8731 (0.8439)	5.7592 (1.4334)	4.7372 (1.0137)	7.9503 (2.2736)	5.2118 (0.9567)	3.0662 (1.4959)	4.2296 (1.3672)	3.5280 (1.6395)	3.6619 (2.1769)	6.1088 (1.2535)	10.2830 (1.9310)
Netherlands	4.1731 (1.1920)	2.6084 (1.7388)	5.1291 (1.5125)	4.7161 (1.2293)	3.2549 (1.3241)	3.2130 (1.6978)	4.6446 (1.8406)	5.6027 (1.7143)	7.5723 (2.1288)	2.1910 (2.1711)	8.5627 (1.3625)
New Zealand	3.9605 (1.2347)	3.6738 (1.7807)	4.3833 (1.6085)	4.1857 (1.2670)	3.2061 (1.4749)	5.3981 (1.3627)	7.1396 (1.6811)	9.8582 (1.9197)	14.6190 (2.5129)	5.1304 (1.7712)	6.4413 (1.3339)

(Continued)

(Table B Continued)

Market/Industry	TM	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
Nigeria	0.5237 (1.3467)	6.1793 (2.4223)	1.8961 (1.4123)	-11.8354 (1.8126)	-1.4606 (1.7041)	3.2482 (2.3573)	4.9286 (1.8799)	-3.7390 (1.7159)	-5.3750 (1.5352)	---	---
Norway	4.8138 (1.6427)	5.1746 (1.9917)	5.3600 (1.8763)	8.9962 (3.0004)	6.7066 (2.0100)	-2.3962 (2.3488)	4.5044 (1.9229)	5.2601 (2.0135)	3.9073 (2.5040)	4.6982 (2.3726)	7.9736 (2.1775)
Oman	1.0988 (0.9846)	1.2126 (1.4529)	9.2666 (1.0473)	5.6544 (0.9256)	1.2900 (1.2627)	---	1.3954 (1.4511)	2.0307 (1.2845)	7.1300 (1.4615)	-0.0493 (1.4381)	4.2503 (1.0210)
Pakistan	5.7123 (1.6272)	6.6169 (1.9195)	7.4893 (1.6279)	5.5949 (3.8229)	8.6762 (2.2993)	3.8560 (1.8026)	3.2489 (2.3389)	7.3785 (1.8234)	---	2.6951 (2.4275)	6.3687 (2.3992)
Peru	3.8965 (1.1097)	2.8551 (1.5612)	4.1300 (1.4639)	12.5493 (3.5110)	5.7111 (0.9517)	---	15.3135 (8.3150)	-0.6447 (3.0376)	---	9.3332 (3.7025)	3.9904 (1.2464)
Philippines	4.3311 (1.5604)	9.4636 (3.2997)	5.3046 (1.6983)	2.8930 (2.2590)	3.2507 (1.5896)	2.5769 (1.5734)	3.8074 (2.2562)	1.7025 (2.8427)	12.7520 (3.5030)	3.7997 (2.0794)	6.0242 (2.3371)
Poland	2.3479 (1.9580)	3.7130 (2.2502)	4.1156 (1.8562)	3.9045 (2.1127)	2.6647 (2.1188)	-0.5188 (2.2151)	1.6559 (1.9447)	6.5380 (2.3186)	1.7601 (2.3361)	2.2694 (2.2546)	3.8826 (2.3636)
Portugal	1.7599 (1.2490)	3.1930 (1.4297)	3.7773 (2.1151)	0.8327 (1.6870)	-1.2286 (1.8378)	13.6436 (6.1943)	1.2825 (1.4669)	6.0828 (2.3625)	-1.5841 (2.2625)	2.0162 (1.9708)	3.4940 (1.7080)
Qatar	5.9782 (1.4079)	---	5.1201 (1.7651)	10.6749 (1.8034)	6.7440 (1.5232)	6.9762 (3.1476)	6.1869 (1.7564)	3.7119 (1.9228)	---	5.0422 (1.8266)	9.6018 (2.0820)
Romania	4.0901 (2.3745)	5.0096 (3.1073)	6.7768 (4.9313)	7.1623 (3.4652)	5.5994 (2.4845)	3.4045 (2.3929)	8.4473 (2.3565)	4.6910 (2.4742)	61.0963 (11.4064)	0.0936 (1.3193)	17.7708 (12.5572)
Russia	7.8451 (2.9166)	7.8483 (2.3259)	14.7062 (3.9090)	16.6486 (3.6098)	10.5053 (3.7778)	-2.4417 (2.8652)	3.0529 (3.6196)	8.5459 (3.0914)	25.8257 (10.5767)	7.7136 (3.4961)	8.3738 (3.7096)
Singapore	3.9245 (1.3523)	1.9512 (2.6255)	6.8231 (2.2254)	5.0602 (1.4760)	4.4800 (1.5669)	4.5034 (1.4926)	3.8409 (1.7100)	4.0239 (2.1149)	0.9144 (2.6546)	3.5250 (1.7944)	9.2006 (2.4223)
Slovenia	2.5464 (1.1303)	3.5497 (1.8478)	2.3064 (1.6323)	-0.5328 (1.6160)	1.9097 (1.7998)	6.3509 (1.4805)	2.4405 (1.6137)	3.1582 (1.5984)	2.2469 (2.9185)	-0.9291 (1.8503)	7.7805 (0.4276)
South Africa	6.2928 (1.6775)	5.0175 (2.2936)	6.0702 (2.1852)	6.4826 (1.7058)	7.5048 (1.9138)	6.4899 (1.6085)	6.0735 (1.8257)	5.7545 (1.9658)	113.8199 (1.7128)	9.3600 (2.7561)	5.0285 (2.2159)

(Continued)

(Table B Continued)

Market/Industry	TM	BM	CG	CS	FIN	HC	IND	OG	TEC	TEL	UTL
Spain	3.4321 (1.4041)	2.6014 (1.5732)	0.1172 (2.0985)	3.9005 (1.5756)	3.9329 (1.7186)	3.4644 (1.5568)	2.4658 (1.4682)	3.3034 (1.8002)	3.5808 (4.2424)	4.6850 (1.8463)	5.2303 (1.4464)
Sri Lanka	3.6504 (1.3997)	5.3227 (3.8661)	6.1363 (2.2747)	4.0935 (1.9576)	4.6659 (1.6470)	13.4255 (3.5202)	6.2961 (1.9548)	8.3305 (1.8483)	0.5014 (2.2508)	2.8279 (1.9020)	-1.7799 (2.0132)
Sweden	5.5840 (1.5726)	6.0177 (1.7387)	7.0310 (1.7696)	7.8360 (1.7797)	5.7314 (1.8263)	4.3212 (1.6739)	6.2387 (1.6831)	14.0152 (3.0013)	6.9819 (2.5898)	5.1486 (2.1289)	4.1611 (1.5212)
Switzerland	4.6388 (1.0559)	5.1513 (1.2316)	6.1976 (1.7147)	4.5609 (1.3091)	4.4984 (1.3012)	4.9306 (1.1187)	4.7394 (1.3178)	-8.8459 (2.4697)	2.5158 (1.9351)	4.8556 (1.4395)	4.7523 (1.1307)
Taiwan	3.7246 (1.8567)	3.5045 (1.8798)	4.3983 (2.0552)	2.0650 (2.0303)	2.7775 (2.0858)	8.0893 (2.7689)	5.3079 (2.1286)	5.1114 (1.6603)	8.2185 (2.3229)	3.0687 (1.2030)	--- ---
Thailand	5.0423 (1.8443)	7.3752 (2.2316)	6.3407 (2.2588)	5.8125 (2.0674)	4.3238 (2.2280)	6.9508 (1.9278)	7.3894 (2.5486)	8.3399 (2.4453)	8.6292 (2.7433)	5.2189 (2.4597)	4.4127 (2.0162)
Turkey	8.3235 (2.8194)	9.5071 (3.0435)	6.9118 (2.9382)	11.3462 (3.7949)	9.1452 (3.1916)	8.8419 (3.8707)	10.8873 (3.3667)	12.5943 (3.5682)	10.6458 (3.9838)	12.8386 (4.2565)	7.2817 (3.1870)
U.K.	5.0194 (1.2436)	5.2222 (1.7263)	5.1751 (1.5432)	4.9102 (1.2961)	5.2023 (1.4557)	5.4397 (1.2589)	5.1577 (1.3814)	5.8413 (1.5309)	6.0222 (1.7548)	5.7839 (1.7503)	4.8741 (1.2392)
U.S.	3.6969 (1.0625)	3.9180 (1.3683)	3.0636 (1.1473)	3.7911 (1.1874)	3.8671 (1.3250)	4.4630 (1.0421)	4.3919 (1.1960)	4.1975 (1.4026)	3.5499 (1.5691)	3.9429 (1.1979)	3.3676 (0.9164)
United Arab Emirates	3.7037 (1.2539)	---	3.0662 (1.9264)	2.3590 (1.8389)	4.0657 (1.3713)	6.9118 (2.2773)	-0.0734 (1.9903)	17.0372 (1.8390)	---	6.3465 (1.5371)	-8.4054 (2.2492)
Venezuela	16.2164 (2.6759)	19.9626 (4.4040)	17.1132 (4.6063)	-4.7996 (1.9550)	15.6224 (2.6227)	---	9.3372 (3.5989)	0.9495 (2.7044)	---	21.6768 (4.5797)	17.2077 (4.1424)