The Sources of Country and Industry Variations in ASEAN Stock Returns

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Abstract

This paper examines the possible determinants for the sources of variation in ASEAN stock returns across financial crises. Using a comprehensive data of 4043 firms from six ASEAN countries and 40 industries, we find that lagged country return and concentration are among the determinants explaining the country factors in the region, while size proved to be the determinant of industry factors for both tradable and non-tradable industries. In general, a higher previous return and lower industrial concentration would increase the country factors. We documented the loss of explanatory power of these determinants in the presence of crisis effects.

JEL classification: F21; G11; G15

Keywords: International diversification; Country effects; Industry effects; Determinants; ASEAN

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1. Introduction

To date, the debate on country versus industry diversification is still an ongoing subject. The main debate is whether country factors or industry factors facilitate the variation in stock returns. To address this issue, most of the studies follow a decomposition approach made popular by Heston and Rouwenhorst (1994). However, as noted in Baca et al. (2000), because of the uniqueness of each dataset comprising different time periods, countries, breadth of industrial classification, as well as currency effects, the empirical result obtained for each study is deemed exclusive; see for example from the pioneering studies of Heston and Rouwenhorst (1994), Griffin and Karolyi (1998), Serra (2000) and Wang et al. (2003); to the more recent studies of Ferreira and Ferreira (2006), Phylaktis and Xia (2006a) and Campa and Fernandes (2006).

In this context, only a few studies have centered on the determinants of country and industry factors in stock returns. Cavaglia et al. (2001) decomposed the security returns into components of global, domestic and regional industrial sector factors, and regressed those factors to firms' foreign sales data. Covering equities from 22 developed equity markets of the constituents of the FT World Index and utilizing MSCI industry classification from 1990 to 1999, they found that non-domestic factors (global and regional industrial factors) were positively associated with the firms' foreign sales; while domestic factors were negatively associated with the firms' foreign sales; although only the regional industrial factors were statistically significant. Similarly, Brooks and Del Negro (2006) decomposed equity returns into global, country and industry factors; but they investigated a rich set of firms' global operations, proxied by firms' foreign sale ratios, international income ratios, international assets ratios, and whether firms belonged to traded or non-traded goods industries. Using monthly data of 1,239 companies in 20 markets (among which only two are developing markets) over 1985-2002, they found that internationalization characteristics had positive impact on their global factors, but no significant link was found with the country and industry factors; such results are contrary to those from Cavaglia et al. (2001). Phylaktis and Xia (2006b), who explored the cross-sectional links between these factors using firms' accounting data, claimed that the dynamics of firms' global, country and industry factors were different between emerging and developed markets where the country and industry factors were systematically linked to the firms' foreign sale ratios and ADR listings, a proxy for its world integration level, but there were no significant links between foreign sale ratios and industry factors. The study employed 1893 firms from 23 developed markets and 14 emerging markets, based on 24 industry classification, covering monthly data over 1990-2002. Campa and Fernandes (2006) used a dataset for a broad sample of 48 countries and 36 industries spanning from 1973 to 2004, found that financial market integration was the main driving force behind the significant rise in global industry factors, while financial market activity appeared to be another, albeit in annual frequency.

Different from the above literature, this study aims to explain the evolution of both country and industry variations across time by examining both the country-level and industry-level data which encompassed two major financial crises. This is motivated by some of the findings showing that the country and industry effects tend to be more conspicuous during crisis periods due to higher volatility. Phylaktis and Xia (2006a) found that the Asian financial crisis had some impact on the country effects in Asia Pacific countries. Besides, both the effects, as well as the explanatory powers of the determinants, could be influenced by the higher than normal stock market co-movement caused by the financial crises, and to a certain degree, contagious effect. Thus, examining the financial crises would allow us to understand how the explanatory powers of the determinants fare against the industry and country factors across extreme events, rather than assuming that they are homogeneous. The possible driving forces in the lagged return, trading activity, concentration and size are used to explain the variation of stock returns in the Association of Southeast Asian Nations (ASEAN).

The collaborations on economic and investment agreements[1] in place may potentially elevate the integration level in the region. Looking at ASEAN alone could yield a different perspective on the diversification within the region: The results from Grisolia and Navone (2007) implied that the general cross-country diversification suggested in this line of research was a cross-regional phenomenon. Recently, a report from World Bank highlighted the importance of the region's continued growth to the rest of the world, shown by the fact that the East Asia and Pacific region's share in the global economy has tripled in the last two decades.[2] Boosted by the commencement of ASEAN Economic Community (AEC) in 2015, the economies and the investments pouring into the region will be massively expanded. Furthermore, given its relatively young demographics, growing middle class and increased government spending, ASEAN, which constitutes sustainable high growth emerging markets in Asia after China, has always been one of the preferred diversification hubs for international investors amid global economic volatility: The investment-to-GDP levels in Thailand, Malaysia and Indonesia are approaching, and could even surpass, the levels before the Asian financial crisis.

ASEAN is one of the most hard-hit regions during the 1997 Asian financial crisis and is also exposed to the subprime crisis in 2008, albeit the impact is less severe. Having gone through two extreme events in the past two decades, ASEAN provides us a good research platform, since emerging countries are generally more vulnerable to financial crises with higher variation compared to developed nations. In this quest, we also include Vietnam, the fastest emerging ASEAN member since the early 2000s. This is motivated by the rapid surge

[1] ASEAN Free Trade Agreement (AFTA) and ASEAN Comprehensive Investment Agreement (ACIA)
[2] The World Bank, "East Asia and Pacific Economic Data Monitor", October 2012

and increasing significance of its stock market.[3] Inclusion of Vietnam would definitely generate a better proxy for the actual universe of stocks to study ASEAN markets, which are highly lacking in the literature. With Vietnam, our sample size has a total of 4043 firms that allow us to extract more rigorous country and industry factors. In the second stage analysis on the determinants, our panel regression is on monthly series which yield 1295 observations for our panel regression on country factors, and 4357 and 4238 observations for our panel regression on the industry factors on tradable and non-tradable industries, respectively. We allow for the potential biases, which were not addressed in most of the previous studies, by using the more robust estimator for our long panel.

In short, we find that lagged return and concentration are significant determinants for the ASEAN country factors, implying that momentum effect is present in the variation of ASEAN stock return, and that higher industrial concentration is accompanied by lower country shocks. Meanwhile, industry size is the significant determinant for the ASEAN industry factors, including both tradable and non-tradable industries. We show that the explanatory power of none of the proposed determinants prevails during crisis periods. Among other implications of our findings, country diversification remains the better strategy, despite in a diminishing trend.

2. Methodology

We start with the standard decomposition model made popular by Heston and Rouwenhorst (1994) to decompose stock returns into global, country, industry and firm-specific factors. Given that:

$$R_{kt} = \alpha_t + \beta_{ct} + \gamma_{it} + \varepsilon_{kt} \quad (1)$$

[3] The total trading value of Vietnam has increased from about US$1 billion in 2006 to about US$ 29 billion in 2010. (World Development Indicators of the World Bank)

where R_{kt} is the return for firm k, which belongs to industry j and country k, in period t; α_t represents the common factor in period t; β_{ct} is the country factor; γ_{it} is the industry factor and ε_{kt} is a firm specific disturbance. In order to obtain the country and industry factors, a cross-sectional regression of the following specification can be employed:

$$R_k = \alpha + \sum_{c=1}^{C} \beta_c D_{kc} + \sum_{i=1}^{I} \gamma_i D_{ki} + \varepsilon_k \qquad (2)$$

where C is the number of countries and I is the total number of industries in ASEAN from the sample. D_{kc} and D_{ki} are the country dummies and industry dummies respectively, where $D_{kc} = 1$ if firm *k* belongs to country *c*, and zero otherwise; and $D_{ki} = 1$ if firm *k* is from industry *i*, and zero otherwise. To avoid perfect multicollinearity problem between the regressors, it is more appropriate for the factors to be benchmarked relative to the average firm as shown in Heston and Rouwenhorst (1994). In order to arrive at the pure country and industry factors from Equation (2), restrictions and deviant industry corrections are needed.[4] After the decomposition and correction, time series of corrected country and industry factors are obtained, where $\hat{\gamma}_i$ is the corrected industry excess return over ASEAN value-weighted market due to industry specific factors; and $\hat{\beta}_c$ represents the corrected country excess return over ASEAN value-weighted market due to country specific factors.

Using the concept of mean absolute deviation (MAD) proposed by Rouwenhorst (1999), we compare the relative importance of country and industry factors. This measure can be interpreted as the value-weighted average tracking error (shocks) indicator for average return in each period. Basically, the higher the industry or country MADs, the higher the dispersion of industry or country factors. MAD is considered less biased, as MAD does not

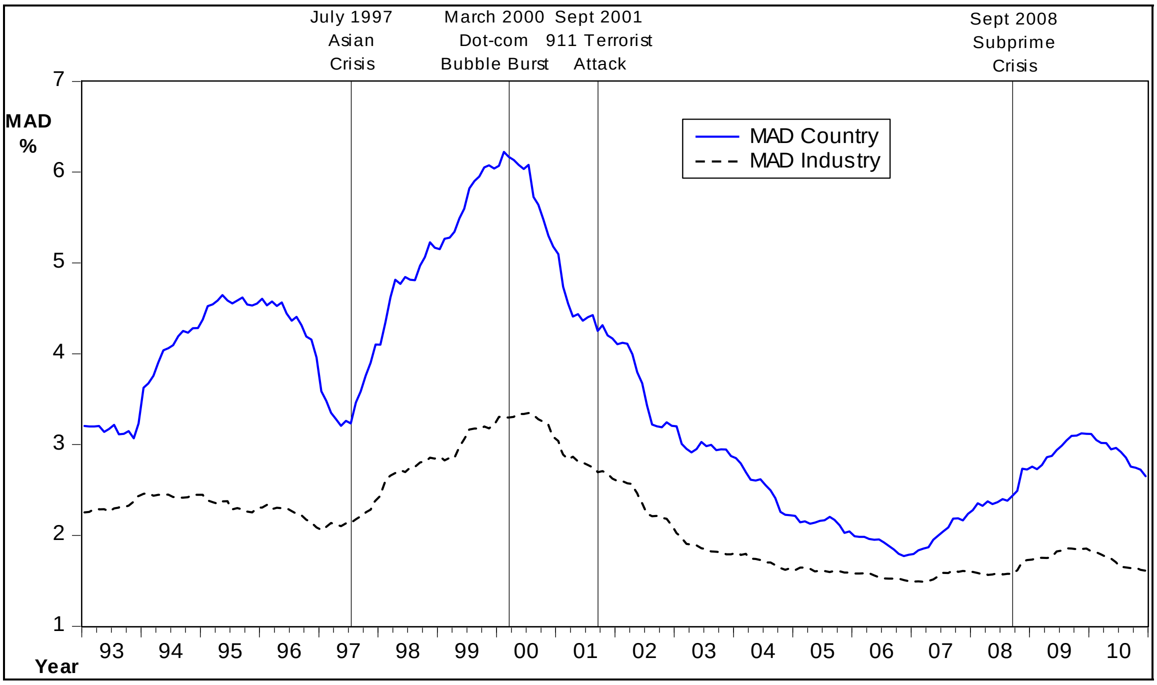
[4] Detailed restrictions and correction for the estimation procedure are explained in the Appendix.

square the distance from the mean. Thus it is less affected by the extreme observations. The country and industry MADs are defined as

$$\sum_{c=1}^{C} wc_c \, |\beta_c| \tag{3}$$

$$\sum_{i=1}^{I} wi_i \, |\gamma_i| \tag{4}$$

where and $|\gamma_i|$ and $|\beta_c|$ are the absolute industry and country factors, respectively.[5] By computing Equation (3) and (4) monthly, time series of value-weighted country and industry MADs are obtained. Noted that γ_i and β_c can be either positive or negative; and equations (3) and (4) would become zero without taking absolute values.



Note: This figure plots the cross-country value-weighted average of the mean absolute deviations (MADs) of the pure country and cross-industry value-weighted average of the mean absolute deviations (MADs) of pure industry factors calculated using a 36-month rolling window. Returns are measured in percent per month.

Figure 1: Mean absolute deviations (MADs) of the pure country and pure industry factors

[5] We use the terms pure country (industry) effects, country (industry) effects and country (industry) shocks interchangeably.

Figure 1 clearly shows that the country and industry MADs are higher during crisis periods, like Asian financial crisis in 1997 and subprime crisis in 2008. Nonetheless, the country and industry MADs are in decline after the peak at 6.22% and 3.35% respectively in the year 2000, when ASEAN economies and stock markets were in the stage of gradual recovery from the crises. Yet, from Figure 1, it is noticeable that the higher MADs compared to normal are due to the fragility to any external shocks and unfavorable news. On the other hand, again, it is confirmed by the graph that the magnitude of the country MADs' dominance is in a diminishing trend since year 2004, due to increasing financial convergence and market integration between the countries.

Our results differ from the findings of Wang et al. (2003), which focused on Asian countries and the U.S. They found that the industry factors have already been somewhat larger than the country factors since early 1995, and have significantly dominated the country factors from the second half of 1999 onwards. The inconsistency of the results could be affected by time period, countries included, breadth of industrial classifications as well as currencies denominated in the sample. Wang et al. (2003) used a narrower industry classification on data spanning from January 1990 to February 2001, which could potentially understate the importance of industry factors. As pointed out by Baca et al. (2000), the relative contributions of country and industry components are affected by the degree of integration among markets. Besides, they denominated the stock price in U.S. currency; while we employed data denominated in local currencies to avoid nominal currency factors influencing the country factors. Yet the results show that country factors are still dominant, despite the absence of currency factors. Despite the fact that financial markets have become more and more integrated, our results confirm that country factors still play a dominant role in explaining the variation in stock returns, while certainly not neglecting the importance of industry factors.

In the second stage analysis, we proceed to examine the driving forces behind the evolution of the country and industry factors. This would allow us to understand the reasons behind the high deviation (strong country factor) or low deviation (low country factor) for some of the countries, as well as the high (low) deviation for some of the industries (strong industry factors). A major concern in international diversification strategy for an investor depends on the risk and return that a particular country (industry) poses. The ultimate objective of an investor is to maximize the return and minimize the risk. Thus, it is important for an investor to understand the possible driving forces behind the variation in a country (industry) factor in order to achieve the objective. Whether the pure country (industry) factors can be explained by the country (industry) specific variables will be tested using the following model:

$$|\hat{\beta}_{ct}| = \delta + \theta Z_{ct} \quad (5)$$

$$|\hat{\gamma}_{it}| = \delta + \theta Z_{it} \quad (6)$$

where subscript t is the month, and Z_{ct} and Z_{it} are the vector of possible determinants for the country and industry factors. δ is the average effect and θ are the parameters to be estimated. The absolute value of the pure country (industry) factors will be used to capture both positive and negative country (industry) factors. Equation (5) and (6) will be estimated using panel analysis. Panel analysis is preferred as it has the upper hand over both pure cross-sectional and pure time series data. Panel data is thought to be more efficient as it involves more informative data which increases the degrees of freedom and reduces the multicollinearity among variables. Besides, panel analysis can take the individual (country and industry) heterogeneity into account by controlling for unobserved variables that exist among them.

Panel data are deemed better in identifying and measuring effects that simply cannot be observed in pure cross-sectional and pure time series data.

As pure country factors capture the country level effects, it shall be related to fundamental country characteristics. In fact, many country-specific variables have been used to explain stock returns, such as goods prices, aggregate output, money supply, real activities, exchange rates, interest rates, political risk, oil prices and so forth. While it is not possible to accommodate all available variables in a model, the selection of variables is based on the previous studies that are closely related to the line of this study. Campa and Fernandes (2006) is the closest literature that examines the determinants of country and industry specific factors. In their research, they tested the effects of international trade, globalization of financial markets, trading activity, concentration of production, as well as economic development on country and industry shocks, to stock returns. They showed that country-specific factors, such as financial integration and country openness, contributed to explaining stock returns, particularly in emerging markets. Unlike Campa and Fernandes (2006), we will attempt to examine the role of the possible determinants in monthly frequency to prevent any loss of information in the process of aggregation.

While many variables have been tested for country factors, only a handful of industry level variables have been tested empirically. The infrequency could be due to scarcity of data or inappropriateness of variables in predicting meaningful information on the predictand. In this study, the predictand is the pure industry factors, which theoretically should be free from country and global factors, and should capture only industry-related information. Thus the variable used should affect the industry factors exclusively. In fact, it is uncommon that researchers examine the determinants for the specific pure industry factor; firm level data are often used in the specification instead. However, there are two related studies in Carrieri et al. (2004) and Campa and Fernandes (2006), where they tested several potential industry-specific variables on industry shocks. Specifically, the variables must be meaningful, logically correlated with the pure industry factors, and observable at the same frequency (monthly) of these factors.

Synchronizing the variables for the country and industry factors, this study would be focused on the measures of lagged return, trading activity, size and concentration in explaining the country and industry shocks. First, employing lagged return as one of the explanatory variables is motivated by the momentum theory in stock returns. If there is a momentum in stock returns, higher current returns in a given country (industry) may lead to a positive country (industry) shock in the next period. Likewise, negative current returns in a given country (industry) may spur a negative country (industry) shock in the subsequent period. The existence of momentum in stock returns is endorsed by both theoretical and empirical evidences throughout the years.[6] Motivated by the use of lagged global industry return to explain the time-varying price of industry risk in Carrieri et al. (2004), this study would examine the existence of momentum in both country and industry returns of ASEAN countries. In particular, the explanatory power of past country and industry returns on the pure country and industry factors remains the key focus. To be exact, one month lagged return is used; and that the absolute values of the pure factors are used in this stage of analysis to capture both the positive and negative dispersions in measuring the shocks; likewise, the absolute value for the lagged return will also be taken, so as to give the same direction for estimation purposes.

$$LR_{c,t-1} = |RI_{c,t-1}| \quad (7)$$

$$LR_{i,t-1} = |RI_{i,t-1}| \quad (8)$$

[6] See for example, (Jegadeesh and Titman, 1993, Rouwenhorst, 1998, Moskowitz and Grinblatt, 1999)

where $RI_{c,t-1}$ is the return index of country *c* while $RI_{i,t-1}$ is the return index of industry *i* in month *t* minus the number of lagged months.

The second determinant proposed is the trading activity. The relation between trading activity and volatility has been tested empirically using various market microstructure models over many years[7]; this has been discussed extensively in Karpoff (1987). Typically, dollar volume and share volume are the most frequent and widely used proxies for liquidity or trading activity. Dollar volume is the share volume multiplied by dollar value of the share price in a given period. Each proxy has its own shortcomings, as using share volume would raise a potential bias when the prices of the shares are not taken into consideration. One might overstate the importance of share volume on volatility for a market with small market capitalization, while dollar volume has its own issue: There is a potential of understating the explanatory power of volume on volatility for countries with small stock markets. Instead, turnover will be used as the proxy for trading activity in explaining the variation in country factors. Turnover is not uncommon in measuring liquidity or trading activity, Rouwenhorst (1999) employed turnover as the proxy for liquidity in explaining return factor; while Campa and Fernandes (2006) employed turnover as a proxy for the degree of trading activity in a market to explain the country factors. Turnover is known as the number of shares traded divided by the number of outstanding shares. Thus, it is not surprising that turnover has been shown to be correlated with other measures of trading and liquidity (Stoll, 2000). Turnover is computed as

$$Turnover_{ct} = \frac{VT_{ct}}{MV_{ct}} \qquad (9)$$

[7] More recent evidences can be found in Huang and Masulis (2003), Chan and Fong (2006), Chuang, Kuan, and Lin (2009), Giot et al. (2010).

$$Turnover_{it} = \frac{VT_{it}}{MV_{it}} \tag{10}$$

where *VT* is the value traded of all securities in month *t*, while *MV* represents the market capitalization in the same month.

Next, the empirical evidences of size effect in stock market have long been verified in various markets using various methods throughout the years[8]. Generally, size effect prevails when small size (market capitalization) firms have higher average returns than large size ones. Although the use of size in explaining stock return and volatility is no stranger in empirical finance, the great debate behind the theory justification is still ongoing. In a recent comprehensive study by Van Dijk (2011), he identified three different aspects of theoretical literature in size effect. Firstly, he attributed the size effect to firm-level investment decisions. Secondly, size which was explained by liquidity factors is an important factor in asset pricing to compensate for liquidity risk undertaken, while the third suggestion is that the size effect could be originated from incomplete information and investor behavior. In most empirical studies, size often refers to the firm size in the model. In this study, the log of market capitalization (end-period) will be used as a measure of size in explaining the country and industry factors, as proposed by Campa and Fernandes (2006) in a similar study. By employing market value as a measure of size, natural log is taken on the market value of each country and industry to normalize the series in a comparable metric. It is believed that a country (industry) of larger size would be more stable, and thus would be better off in weathering crises, resulting in lower shocks. It is also justifiable that most fund managers would prefer to invest in a larger market instead of a smaller one, given its liquidity, stability and market information available.

Size can be expressed as follows:

[8] see, for example (Banz, 1981, Basu,1983, Heston et al., 1999, Barry et al., 2002)

$$Size_{ct} = \ln\,(MV_{ct}) \tag{11}$$

$$Size_{it} = \ln\,(MV_{it}) \tag{12}$$

where MV_{ct} represents the market capitalization of country *c* in month *t* and MV_{it} is the market capitalization of industry *i* in the same month.

The use of concentration as one of the possible explanatory variables on the country and industry shocks is encouraged by Campa and Fernandes (2006), who found that higher industrial concentration would increase country factors. The industry concentration measures the extent to which the listed stocks in a market disperse across industries. It is believed that a more concentrated country is more likely to have a larger country factor, as the country is less diversified and more likely to be subject to specific shocks. On the other hand, the geographical (country) concentration measures the extent to which the listed stocks in an industry disperse across countries. In general, an industry is better diversified if it is geographically spread; and would have a smaller industry factor, as it will less vulnerable to potential shocks than a highly concentrated industry. Following Roll (1992) and Xing (2004), Herfindahl industry and country (geographical) concentration variables are used to explain the country and industry shocks. Generally, the bigger the industry concentration measure, the more concentrated the country is in certain industries. The concentration measures of country and industry are computed at each month as:

$$Con_{ct} = \sum_{i=1}^{I} \left(\frac{MV_{ict}}{MV_{ct}}\right)^2 \tag{13}$$

$$Con_{it} = \sum_{c=1}^{C} \left(\frac{MV_{cit}}{MV_{it}}\right)^2 \tag{14}$$

where MV_{ict} is the market value of industry *i* in country *c* in month *t*, while MV_{ct} is the total market capitalization of country *c* in month *t*. MV_{cit} is the market value of country *c* that is from industry *i* in month *t*, while MV_{it} is the total market capitalization of industry *i* in month *t*.

3. Data

In the first stage analysis, the sample consists of stock prices and market capitalizations of a total of 4043 firms across ASEAN countries with monthly frequency from January 1990 to December 2010 obtained from Thomson Datastream. Stock prices are then converted to percentage returns. Stock prices are obtained in local currency[9], while market capitalizations are obtained in U.S. dollars to allow accurate estimation in assigning relative weights to the ASEAN market as a whole. Monthly frequency is used because it reduces the problems of thin trading that plague penny stocks and small markets. Instead, to avoid survivorship bias, we retain as many firms as possible to create a better proxy for the whole market along the period. Individual firms are grouped using Level-4 industry listings based on the industry classification benchmark (ICB).[10]

In the second stage analysis, lagged return proxied by the return index (RI) of each market and South East Asian industry, respectively, obtained at monthly frequency from

[9] Stock prices are denominated in local currencies to avoid country and industry effects being induced by currency fluctuations. Gerard, Hillion and De Roon (2005) pointed out that exposure to currency risk is a major determinant of international equity returns (see, for example, Dumas and Solnik, 1995, De Santis and Gerard, 1997), however, HR and Griffin and Karolyi (1998) found that exchange rates do not significantly explain the return variation.

[10] The Industry Classification Benchmark ("ICB") is jointly owned by FTSE International Limited ("FTSE") and Dow Jones & Company. Industry structure and definitions can be found in appendix B

Datastream. As for the trading activity, both the value traded and market capitalization of each market and South East Asian industry are obtained directly from Datastream, denominated in U.S. dollar. The measurement of size is proxied by the market capitalization of each market and South East Asian industry respectively. The monthly market value of each industry in a particular country and the total market capitalization of each country will be manually calculated by summing up all the market capitalization of each firm included in our sample. Similarly, the monthly market value of a country from a particular industry and the total market capitalization of each ASEAN country's industry will be manually computed by summing up all the market capitalization of each firm included in our sample. The market capitalization of every single firm is obtained from Datastream and in U.S. dollar. Due to the unavailability of data for Vietnam, the turnover and size are computed manually using aggregated individual firm data and the country return index is obtained from MSCI. Similarly, return indices are then computed into in percentage returns.

4. Empirical Results

4.1 Determinants of Country Factors

Given that the data of Vietnam are only available since December 2006, inclusion of Vietnam in the sample might distort the results of estimation. Besides, making the inference from the full sample and generalizing to Vietnam might be incorrect, as the estimation from 1990 to 2006 includes only the other five countries. In order to account for this issue, we estimate two sub-sample periods to account for the pre- and post-availability of Vietnam data, i.e. 1990-2006 and 2007-2010.

Depicted below is the basic specification of pure country factors and country specific variables.

$$|\hat{\beta}_{ct}| = \delta + \theta_1 LR_{ct} + \theta_2 TRAD_{ct} + \theta_3 SIZE_{ct} + \theta_4 CONC_{ct} \qquad (15)$$

The estimations of pooled and panel regressions with fixed-effects are presented in the following table along with estimations from the two sub-sample periods. Theoretically, both cross-section and period effects need to be controlled to account for the unobserved heterogeneity across country and time. Cross-section fixed-effects can take into account the presence of heterogeneity in country characteristics, ranging from macroeconomic variables such as FDI, GDP, interest rate, currency and national account; to political conditions such as corruption, political stability and institution quality and efficiency. Taking into account the fixed effect would have greatly reduced the bias of variable omission. Meanwhile, period fixed-effects can account for omitted variables that vary over time, such as technological changes and improved education level.

From Table 1, Equation (15) is first estimated using a pooled regression; while the second model shows the result of the two-way fixed effects model. Overall, both the models demonstrate consistent results, except for the change of sign in trading activity from positive to negative, though not significant. From diagnostics, three separate tests are carried out (one for each set of effects, and one for the joint effects) to establish the presence of cross sectional and period effects. We also account for heteroscedasticity and correlations to ensure that we do not understate the standard errors, a common bias in panel data analysis of many articles in leading finance journals as noted in Petersen (2009).[11] Our residual diagnostic tests show that both the contemporaneous correlation and heteroscedasticity do present in our

[11] In most asset pricing model, it is more likely to have contemporaneous correlation as an economic shock would simultaneously affect stock returns across various countries. Since the number of temporal units exceeds that of spatial units (T=253>N=6), our panel data is called "temporal dominant" (Stimson 1985), or "long panel"; and it is susceptible to contemporaneous correlation issue. As we only have six countries, adjusting for contemporaneous correlation, or so called "period clustering" can avoid bias inferences. Peterson (2009) pointed out that the standard error might be biased if the number of clusters is too small (less than 10) and the results of clustering by the more frequent cluster are similar to those by two dimensions.

estimation.[12] So we report only the White (1980) cross-section standard error that is robust to cross-equation (contemporaneous) correlation and heteroscedasticity.

The significance of the lagged country returns suggests that there are momentum effects in stock returns. Generally, a higher current return in a given country may lead to a positive country shock in the next period. Likewise, negative current returns in a given country may spur a negative country shock in the next period. The evidence found is consistent with the hypothesis established in the first place, in which a positive relation is expected. The results hold for both pooled regression and two-way fixed effects model, despite at a lower degree in the latter. However, no significant relationship is found in the two sub-samples.

Secondly, trading activity, which is proxied by the turnover, shows positive, albeit insignificant, relationship with the pure country factors. Unlike the findings from the study by Campa and Fernandes (2006), who found significant positive relations between turnover and the magnitude of country shocks. The results are consistent in the sub-sample period from 1990 to 2006. Next, a negative relation is found between size and country shocks, suggesting on average, the larger the market size, the lower the magnitude of country shocks. This is true as a larger size market is more stable and less sensitive to market turbulence, resulting in a negative relation. This finding prevails in the sub-sample period of 1990-2006, but not the full sample and during 2007-2010.

[12] We follow the Breusch-Pagan LM test of independence and a modified Wald statistic for groupwise heteroskedasticity in the residuals of a fixed-effect regression model, as proposed in Baum (2001).

On the other hand, different from the hypothesis developed in this study, where a positive relation was expected; industry concentration is found to decrease the country factors. This finding contradicts the result from Campa and Fernandes (2006). Negative coefficient on concentration to the pure country factor means a country which is concentrated in certain industries has lower country shocks. Except for the period covering 2007-2010, all the findings are consistent and robust. Similar finding was found in Xing (2004), where he argued that Spain, in contrast to all other countries, has a very heavy weight on utilities industry, which is a very stable one. In this study, most of the countries in ASEAN have a heavy weight on banking industry, which is also a very stable and anchor industry in the region, because ASEAN countries have bank–based financial systems. This is evidenced by the fact that banking industry in the region is less affected by the recent subprime crisis. Hence, on average, the higher industrial concentration in a country, the lower the magnitude of the country shock.

Table 1 Determinants of Country Factors

This table shows the regression results of equation (15) for six ASEAN countries. The country factors measure is the corrected pure country factors obtained from the decomposition in the first stage. The first model estimated using pooled OLS while the second model is using two-way fixed effects model. The first two models are for the full sample while the latter two models are the two sub-sample periods to account for the pre- and post-availability of Vietnam's data. The first two months of results are excluded from the estimations due to insufficient data. The robust standards errors (in parentheses) are corrected using White (1980) cross-section, which is robust to both contemporaneous correlation and heteroskedasticity. Redundant F-test is used in the redundant fixed effects test, assuming a null hypothesis of no fixed effect. *, **, *** Indicates statistical significance at the 10% and 5% and 1% level, respectively.

$$|\hat{\beta}_{ct}| = \delta + \theta_1 LR_{ct} + \theta_2 TRAD_{ct} + \theta_3 SIZE_{ct} + \theta_4 CONC_{ct} \quad (15)$$

where subscript t is the month, $\hat{\beta}_c$ represents the country factors, LR_c is the lagged one month country's index return, $TRAD_c$ is the trading activity of the country's stock market, $SIZE_c$ is the size of the market in capitalization and $CONC_c$ measures the industry concentration of the country's stock market.

(Country)	Pooled OLS	Two-way Fixed	1990-2006 (pre-Vietnam)	2007-2010 (post-Vietnam)
	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Intercept	12.7603	11.7898	17.3534	36.3167
	(1.9878)***	(6.6421)*	(6.0911)***	(28.6186)
Index Return (lag 1)	0.1226	0.0866	0.0774	0.0671
	(0.0322)***	(0.0480)*	(0.0507)	(0.1164)
Trading Activity	0.0963	0.0518	0.1493	-0.0107
	(0.0757)	(0.1432)	(0.0919)	(0.2594)
Size	-0.8322	-0.7437	-1.2897	-2.6670
	(0.1697)***	(0.6419)	(0.5843)**	(2.3816)
Concentration	-5.8610	-3.3724	-3.0025	-20.4399
	(1.0946)***	(1.5396)**	(1.3730)**	(20.3861)
R-Squared	0.0957	0.4858	0.5020	0.4783
Adjusted R-Squared	0.0929	0.3577	0.3715	0.3518
Obs	1295	1295	1007	288
Cross-section fixed effect		35.2747***	25.2267***	1.4917
Period fixed effect		2.4248***	2.8619***	1.4534**
Cross-section/Period		3.0939***	3.4611***	1.4458**

4.2 Determinants of Industry Factors

4.2.1 Tradable and Non-tradable Industries

Categorizing industry into traded and non-traded industries is not uncommon in this line of research. Griffin and Karolyi (1998) classified firms into traded and non-traded industries to measure the relative importance of industry and country factors. They defined non-traded industries as those for which high transportation costs prevent international trade. Previously, there are studies on how the market values of firms in traded and non-traded industries are influenced by exchange-rate fluctuations differently, such as Adler and Dumas (1984), Levi (1994) and Allayannis and Ihrig (1997). Theoretically, a common industry source of variation is more prominent in tradable industries as they are perceived to be exposed to the same exposure such as the fluctuations of input and output prices, as well as that of exchange rate. Not surprisingly, empirical evidences show significant dissimilarity between tradable and non-tradable industries. Griffin and Karolyi (1998) found higher industry factors on tradable industries. In Brooks and Del Negro (2004), they showed tradable industries have higher international sales ratios and higher ratios of international asset; while firms in non-tradable industries are more exposed to country factors. In addition, higher industry factors discovered in tradable industries in Campa and Fernandes (2006) reconfirm the presence of distinction between tradable and non-tradable industries. From here, it is known that the industry factors for both industries group might react differently to respective industry specific variables. In order to account for the distinction, it is wise to classify the industries into two panels which are tradable and non-tradable to test for determinants of industry factors independently. Similar to the industry classification (ICB level 4) used in Campa and Fernandes (2006); this study followed the classification into tradable and non-tradable in Campa and Fernandes (2006), as tabulated in Table 2.

Table 2 List of tradable and non-tradable industries

Tradable	Non-Tradable
Aerospace & Defense	Banks
Alternative Energy	Construction & Materials
Automobiles & Parts	Electricity
Beverages	Financial Services (Sector)
Chemicals	Fixed Line Telecommunications
Electronic & Electrical Equipment	Food & Drug Retailers
Food Producers	Gas, Water & Multiutilities
Forestry & Paper	General Retailers
General Industrials	Health Care Equipment & Service
Household Goods & Home Construction	Industrial Transportation
Industrial Engineering	Leisure Goods
Industrial Metals & Mining	Life Insurance
Mining	Media
Oil & Gas Producers	Mobile Telecommunications
Oil Equipment & Services	Nonlife Insurance
Personal Goods	Real Estate Investment & Services
Pharmaceuticals & Biotechnology	Real Estate Investment Trusts
Software & Computer Services	Support Services
Technology Hardware & Equipment	Travel & Leisure
Tobacco	

As for determinants of industry factors, industry-specific variables such as lagged industry return, trading activity, size and concentration will be employed as the possible determinants of the pure industry factors. Similar to what was done for country factors, pooled OLS and panel regression with fixed effects will be tested. All 39 industries are divided into tradable and non-tradable industries as per discussed while “unclassified” industry is excluded, and then the estimation will be done separately for these two groups of industries. The basic specification for determinants of industry factors are shown as below:

$$|\gamma_{it}| = \delta + \theta_1 LR_{it} + \theta_2 TRAD_{it} + \theta_3 SIZE_{it} + \theta_4 CONC_{it} \qquad (16)$$

4.2.2 *Tradable Industries*

The first set of results presented in Table 3 is for the comparable model used. Using a pooled regression in the first model, significant relations are found in lagged industry return, size and concentration to pure industry factors. Similar to the case of the country factors, theoretically, both the cross-section and period effects are needed in order to account for the unobserved heterogeneity across industry and time in this case. It is believed that there are omitted variables that might affect the pure industry factors. There are immeasurable factors that could affect the pure industry factors of a particular industry over time, not limited to industry life cycles, industry R&D activity, skill level of labor force, technological changes and regulation level. Hence, the control of cross-section effect and period effect is needed in the specification: A two-way fixed effects model is then estimated in the second model. In the diagnostic test, three separate tests carried out (one for each set of effects, and one for the joint effects) further established the presence of cross sectional and period effects in this model. As aforementioned, the violation of OLS assumptions that the errors are to be homoscedastic(equal variances) and are independent of each other could adversely affect the consistency of the model. Similar to what has been done in the previous analysis, in order to obtain a robust and valid statistical inference using panel model, all the models use White (1980) cross-section method as the robust estimator. [13]

In general, significant positive relations are found on size and pure industry factors; while negative relations are observed in all the other variables, despite not being significant. Besides, a change in the sign of size is observed as compared to the pooled model; this shows that without controlling for the unobserved effects, the findings may be biased. This is true as we noticed a negative sign in Campa and Fernandes (2006), which do not control for fixed effects in the estimation for both subsets. Thus, size is the only variable to have significant effects on the pure industry factors for tradable industries, and the same goes to the sub period of 1990-2006. A positive coefficient indicates that the industry with larger size is more volatile, which is different from the findings from the country factors. Alternative explanation could be linked to the hypothesis that the industry of larger size is theoretically more liquid compared to the smaller market as it attracts more investors, thus entailing higher volatility. The results for the two sub-samples are similar to those observed in the determinants of country factors; in which size remains significant in affecting the industry shocks in the earlier period of 1990-2006. Meanwhile, the explanatory power of size becomes insignificant during the sub-sample 2007-2010 when Vietnam is taken into account in Model B4.

[13] The residual diagnostic tests show the errors exhibit both heteroskedasticity and contemporaneous correlation

Table 3: Determinants of Industry factors (Tradable Industries)

This table shows the regression results of equation (16) for 20 tradable industries. The industry factors measure is the corrected pure industry factors obtained from the decomposition in the first stage. The first model estimated using pooled OLS while the second model uses a two-way fixed effects model. The first two models are for the full sample while the latter two are for the two sub-sample periods to account for the pre- and post-availability of Vietnam data. The first two months of results are excluded from the estimations due to insufficient data. The robust standards errors (in parentheses) are corrected using White (1980) cross-section, which is robust to both contemporaneous correlation and heteroskedasticity. Redundant F-test is used in the redundant fixed effects test, assuming a null hypothesis of no fixed effect. **, *** Indicates statistical significance at the 5% and 1% level, respectively.

$$|\hat{\gamma}_{it}| = \delta + \theta_1 LR_{it} + \theta_2 TRAD_{it} + \theta_3 SIZE_{it} + \theta_4 CONC_{it} \qquad (16)$$

where subscript t is the month, $\hat{\gamma}_i$ represents the industry factors, LR_t is the lagged one month South East Asia industry return, $TRAD_t$ is the trading activity of the South East Asia industry, $SIZE_t$ is the size of the South East Asia industry capitalization and $CONC_t$ measures the country concentration of the South East Asia industry.

(Tradable Industries)	Pooled OLS	Two-way Fixed	1990-2006 (pre-Vietnam)	2007-2010 (post-Vietnam)
	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Intercept	2.3075	1.1079	0.6308	0.7564
	(0.2852)***	(0.4960)**	(0.6283)	(1.7938)
Index Return (lag 1)	0.0191	-0.0014	-0.0040	0.0092
	(0.0062)***	(0.0053)	(0.0061)	(0.0103)
Trading Activity	-0.0051	-0.0030	-0.0003	-0.0078
	(0.0032)	(0.0033)	(0.0028)	(0.0310)
Size	-0.1277	0.1975	0.1899	0.1099
	(0.0270)***	(0.0554)***	(0.0753)**	(0.2136)
Concentration	2.2736	-0.4744	0.9173	0.9472
	(0.3228)***	(0.5007)	(0.5868)	(2.0556)
R-Squared	0.0326	0.2402	0.2375	0.3341
Adjusted R-Squared	0.0318	0.1895	0.1838	0.2811
Obs	4357	4357	3407	950
Cross-section fixed effect		23.5106***	17.8118***	8.9061***
Period fixed effect		2.9170***	2.8128***	2.2934***
Cross-section/Period		4.1615***	4.1015***	4.0114***

4.2.3 *Non-tradable Industries*

From Table 4, similar to the tradable industries, first, pooled regression is used as a baseline model, in which significant relations are found on all explanatory variables to pure industry factors. Nevertheless, the model may be misspecified, as it does not control for the unobserved heterogeneity. Similar to the tradable industries, a two-way fixed effects model is then estimated and the diagnostic tests confirm that the control for period fixed effect and cross-section fixed effect is indeed needed. We observe a significant negative relationship on size to pure industry factors, which is the opposite of the results from tradable industries in which a positive relation is uncovered. This result suggests, on average, the larger the non-tradable industry size, the lower the magnitude of industry shocks, this could be explained in the sense that an industry with larger size is more stable and less sensitive to turbulence, thus resulting in a negative relation.

Notably, Campa and Fernandes (2006) also found different signs between size and industry factors for tradable and non-tradable industries, despite in the opposite signs of ours. The reason behind the differences in findings for tradable and non-tradable industries could be due to the different nature of the industries. Most of the tradable industries are more sensitive and vulnerable to industry turbulence, thus it is understandable that positive relationship is found. On the other hand, most of the non-tradable industries including banks, electricity, leisure goods, support services, and so forth are considered non-cyclical industries, where they are less sensitive to industry shocks. Different from tradable industries, the volatility is lower in non-tradable industries as they are less sensitive to industry shocks and industry cycles. Thus, a larger size industry would be more stable as compared to the smaller size one, as uncovered in the results. Scrutinizing the sub-sample period, size is significantly affecting the pure industry factors in the sub-period of 1990-2006, however, this is not robust to contemporaneous correlation and heteroskedasticity. Similarly, the latter sub-period which contains Vietnam data shows no explanatory power on all the variables.

Table 4: Determinants of Industry Factors (Non-Tradable Industries)

This table shows the regression results of equation (16) for 19 non-tradable industries. The industry factors measure is the corrected pure industry factors obtained from the decomposition in the first stage. The first model is estimated using pooled OLS; while the second model uses the two-way fixed effects model. The first two models are for the full sample while the latter two are for the two sub-sample periods to account for the pre- and post-availability of Vietnam data. The first two months of results are excluded from the estimations due to insufficient data. The robust standards errors (in parentheses) are corrected using White (1980) cross-section, which is robust to both contemporaneous correlation and heteroskedasticity. Redundant F-test is used in the redundant fixed effects test assume a null hypothesis of no fixed effect. **, *** Indicates statistical significance at the 5% and 1% level, respectively.

$$|\hat{\varphi}_{it}| = \delta + \theta_1 LR_{it} + \theta_2 TRAD_{it} + \theta_3 SIZE_{it} + \theta_4 CONC_{it} \qquad (16)$$

where subscript t is the month, $\hat{\varphi}_i$ represents the industry factors, LR_t is the lagged one month South East Asia industry return, $TRAD_t$ is the trading activity of the South East Asia industry, $SIZE_t$ is the size of the South East Asia industry capitalization and $CONC_t$ measures the country concentration of the South East Asia industry.

(Non-tradable Industries)	Pooled OLS	Two-way Fixed	1990-2006 (pre-Vietnam)	2007-2010 (post-Vietnam)
	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Intercept	1.8376	3.4523	3.7541	2.4683
	(0.2271)***	(0.6291)***	(0.8599)	(1.8572)
Index Return (lag 1)	0.0338	-0.0060	-0.0119	0.0060
	(0.0075)***	(0.0075)	(0.0092)	(0.0111)
Trading Activity	-0.0181	-0.0045	-0.0042	-0.0272
	(0.0048)***	(0.0064)	(0.0046)	(0.0261)
Size	-0.1444	-0.1262	-0.1227	-0.1179
	(0.0220)***	(0.0605)**	(0.0935)	(0.1609)
Concentration	3.0912	0.1010	-0.1874	0.9582
	(0.2301)***	(0.4719)	(0.5891)	(1.4455)
R-Squared	0.0908	0.2916	0.2901	0.2805
Adjusted R-Squared	0.0899	0.2434	0.2394	0.2216
Obs		4258	3346	912
Cross-section fixed effect		22.5322***	19.0718***	5.3067***
Period fixed effect		2.7282***	2.6217***	2.7907***
Cross-section/Period		4.2314***	4.1174***	3.6275***

4.3 The Impact of Crisis

Looking at the results of the sub-sample period during 2007-2010, we observe that the explanatory powers of all variables are not robust. This is true for three set of panels consisting of country, tradable and non-tradable industries. A natural and convenient explanation could be put down to the inclusion of Vietnam in the sub-sample of 2007-2010. Alternatively, we could also attribute this phenomenon to the subprime crisis which hit the global economy and stock markets severely. It is logical that all the variables are unable to explain the country shocks during crisis period, as the market downturn happens at the macro-level and is increasingly affected by external factors.

Table 5: Determinants of Country and Industry Factors (Crisis periods)

This table shows the regression results of the no explanatory power of all variables on for six ASEAN countries, 20 tradable industries and 19 non-tradable industries during crisis periods. The country and industry factors measures are the corrected pure country and industry factors obtained from the decomposition in the first stage. All the models are estimated using the two-way fixed effects model. The first three models from the left are the results from the sub-sample period of 2007-2010 covering the Sub-prime crisis, while the latter three models are the sub-sample periods of 1997-2000 covering the Asian financial crisis for the determinants of country factor as per Equation (15), the determinants of tradable industries as per Equation (16) and the determinants of non-tradable industries as per Equation (16). The first two months of results are excluded from the estimations due to insufficient data. The robust standards errors (in parentheses) are corrected using White (1980) cross-section, which is robust to both contemporaneous correlation and heteroskedasticity. Redundant F-test is used in the redundant fixed effects test, assuming a null hypothesis of no fixed effect. **, *** Indicates statistical significance at the 5% and 1% level, respectively.

$$|\hat{\beta}_{ct}| = \delta + \theta_1 LR_{ct} + \theta_2 TRAD_{ct} + \theta_3 SIZE_{ct} + \theta_4 CONC_{ct} \qquad (15)$$

$$|\hat{\gamma}_{it}| = \delta + \theta_1 LR_{it} + \theta_2 TRAD + \theta_3 SIZE_{it} + \theta_4 CONC_{it} \qquad (16)$$

where subscript t is the month, $\hat{\beta}_c$ represents the country factors, $\hat{\gamma}_i$ is the industry factors, *LR* is the one month lagged return, $TRAD$ is the trading activity, $SIZE$ is the size of the country and industry capitalization respectively, and $CONC$ is the industry concentration and country concentration, respectively.

Sub-periods (Crisis)	2007-2010 (S.P. Crisis)	2007-2010 (S.P. Crisis)	2007-2010 (S.P. Crisis)	1997-2000 (A. Crisis)	1997-2000 (A. Crisis)	1997-2000 (A. Crisis)
	Country	Tradable	Non-Tradable	Country	Tradable	Non-Tradable
Two-way Fixed	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Intercept	36.3167	0.7564	2.4683	24.8824	0.4149	-0.8121
	(28.6186)	(1.7938)	(1.8572)	(17.0761)	(1.5157)	(3.5463)
Index Return (lag 1)	0.0671	0.0092	0.0060	0.0138	0.0060	-0.0090
	(0.1164)	(0.0103)	(0.0111)	(0.0892)	(0.0111)	(0.0148)
Trading Activity	-0.0107	-0.0078	-0.0272	0.2892	-0.0080	-0.0113
	(0.2594)	(0.0310)	(0.0261)	(0.4688)	(0.0267)	(0.0653)
Size	-2.6670	0.1099	-0.1179	-1.5746	0.2476	0.4945
	(2.3816)	(0.2136)	(0.1609)	(1.7080)	(0.1708)	(0.4099)
Concentration	-20.4399	0.9472	0.9582	-17.9519	1.9339	0.1622
	(20.3861)	(2.0556)	(1.4455)	(13.2866)	(2.6132)	(1.7680)
R-Squared	0.4783	0.3341	0.2805	0.4856	0.2728	0.3570
Adjusted R-Squared	0.3518	0.2811	0.2216	0.3318	0.2055	0.2958
Obs	288	950	912	240	804	772
Cross-section fixed effect	1.4917	8.9061***	5.3067***	9.8578***	6.0454***	8.0443***
Period fixed effect	1.4534**	2.2934***	2.7907***	2.0712***	2.9116***	2.7085***
Cross-section/Period	1.4458**	4.0114***	3.6275***	3.0780***	3.7606***	4.5686***

To examine whether crisis effect affects the results, we re-estimate the model in a sub-sample period of 1997-2000, covering the Asian financial crisis; and compare to the sub-sample period of 2007-2010, which covers the subprime crisis for further verification and robustness. From Table 5, none of the possible determinants is able to provide meaningful statistical inference on the country factors during the two major crises. This establishes the fact that crisis effect does exist in the specification. Thus, the results for determinants of both country and industry factors could not be generalized to crisis periods.

5. Conclusion

In view of the regional diversification prospects in ASEAN stock markets, we reconfirm the evidence on the dominance of country over industry factors. Different from previous studies that focus on ASEAN region, where Vietnam is often excluded from the analysis; we take the initiative to cover Vietnam in our analysis, given the rapid rise and fast developing in the country's stock market and overall economy. On the other hand, the dominance of the country factors in a lesser scale in recent subprime crisis compared to that in the Asian financial crisis signifies the improved market structure and the increasing convergence of stock markets among ASEAN countries.

In the second stage analysis, the importance of the driving forces behind both the pure country and the pure industry factors are examined, where the two-way fixed effects model is used for the estimation. The explanatory variables used were lagged return, trading activity, size and concentration for the pure country factors and the pure industry factors. For the determinants of pure country factors, momentum effects are observed in stock returns. The lagged return shows that a higher current return in a given country may lead to a positive country shock in the next period. Besides, given that the industry is relatively stable, the industry concentration is found to decrease the country factors, suggesting that the country with higher industrial concentration would tend to have a lower magnitude of country factors. Both findings are robust to the contemporaneous correlation and heteroscedasticity. We also uncover that none of the variable is able to explain the country shocks during crisis periods. This also holds for the industry level results. The loss of explanatory power on the variation of stock returns can be attributed to the fact that the general market would tend to fall as a whole during crisis periods, coupled by the irrational exuberance among investors.

In terms of the determinants of industry factors, the results are divided into tradable and non-tradable industries. Size appears to be able to determine the pure industry factors in

ASEAN region. For the tradable industries, an industry with larger size would have larger industry shocks, as a larger industry would tend to be more liquid, and hence, more volatile. However, for the non-tradable industries, a larger industry signifies lower industry shocks. Both findings are robust to the contemporaneous correlation and heteroscedasticity. The reason for the dissimilarity is that a larger industry is more stable; and also that the non-tradable industries are less sensitive to the industry turbulence and industry cycles, whereby most of the non-tradable industries are non-cyclical industries. Similarly, the crisis effect which causes the loss of explanatory power of the determinants does happen in the industry level analysis as well.

Our findings imply that traditional top-down approach has not lost its grounds in the region. The importance of the country specific factors prevails in the variation of stock returns in ASEAN. However, with the continuation in the trend towards global integration of economic and financial markets, the importance of the country factors is diminishing, suggesting that looking at the country specific factors alone might not be sufficient. Furthermore, our second stage analysis results proved that country and industry shocks during crisis periods are unexplained by these variables. Apart from extreme events, the more concentrated country would have smaller country shocks. Thus, if one is looking to search for the country possessing lower country factors, concentration measure is one of the determinants they might want to scrutinize. Besides, the presence of momentum effects in the variation of stock returns does give some insights to investors on what to expect in the next period. As for the industry factors, a larger industry would increase the industry shocks of tradable industries; while lower the industry shocks of non-tradable industries. These results implied that the tradable and non-tradable industries are driven by different determinants. If one wishes to go for an industry with lower shocks, a smaller size of a tradable industry and a larger size of a non-tradable industry might be their preferences. Hence, the changes in the magnitude of industry factors are driven by the size of the industry.

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APPENDIX

Restrictions shown in Equation (A1) will be imposed on Equation (2) to normalize the value-weighted sums to zero, as suggested by Suits (1984) and Kennedy (1985). Under these restrictions, all of the coefficients from Equation (2) can now be fully identified; whereby the regression intercept represents the proxy for the ASEAN value-weighted index, which is free from country and industry factors.

$$\sum_{c=1}^{C} WC_c \beta_c = 0 \qquad and \qquad \sum_{i=1}^{I} WI_i \gamma_i = 0 \qquad (A1)$$

where WC_c and WI_i are the value weights of country *c* and industry *i* in the ASEAN markets, respectively, and $\sum_c WC_c = \sum_i WI_i = 1$. We will then come to

$$R_k = \alpha + \sum_{c=1}^{C-1} \beta_c \left(D_c - \frac{WC_c}{WC_{BC}} D_{cBC}\right) + \sum_{i=1}^{I-1} \gamma_i \left(D_i - \frac{WI_i}{WI_{BI}} D_{iBC}\right) + \varepsilon_k \qquad (A2)$$

where BI and BC are the (arbitrary) specific industry *i* and country *c* on which the restrictions are normalized. Estimating Equation (A2) across time will generate time series of pure industry factors and pure country factors. However, it is worth noting that both the factors carry the weights that are proportional to their market values and there are significant differences between the industry (country) weights in country c (industry i) and the industry (country) weights in ASEAN. If a country's industry weights differ from the weight in the overall ASEAN market and a industry's country weights differ from the weight in the ASEAN market, the deviant industry structure is corrected as per

$$\hat{\beta}_c = R_c - \hat{\alpha} - \sum_{c=1}^{C} (WI_{ic} - WI_i)\, \hat{\gamma}_i D_{ic} \qquad (A3)$$

$$\hat{\gamma}_i = R_i - \hat{\alpha} - \sum_{i=1}^{I} (WC_{ci} - WC_c)\, \hat{\beta}_c D_{ci} \qquad (A4)$$