First Draft: January 14th 2002
Current Draft: August 26th 2003
Forthcoming: Review of Economics and Statistics

Firm-Specific Variation and Openness in Emerging Markets

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We are grateful for helpful comments from Yiorgos Allayannis, Robin Brooks, John Campbell, Kristen Forbes, Ben Esty, William Goetzmann, Larry Harris, Andrew Karolyi, Wei Li, Ashoka Mody, Robert Shiller, René Stulz, and James Tobin as well as participants at the American Economic Association Washington meeting in 2003 and the International Monetary Fund pre-conference on Global Linkages in Washington D.C. We thank Hali Edison and Frank Warnock, as well as Abdul Abiad and Ashoka Mody, for providing their capital openness measures, and for other helpful comments. We are grateful to Timothy Vogelsang for providing the gauss code for his algorithm. Special thanks are owing to John Campbell and Ashoka Mody for serving as discussants at the AEA and IMF, respectively. Timely research assistance by Abigail Hornstein is also greatly appreciated. Randall Morck gratefully acknowledges partial funding from the SSHRC.

Abstract:

This paper compares the comovement of individual stock returns across emerging markets. Campbell *et al.* (2001) and Morck *et al.* (2000) show that the US in the post war period saw rising firm specific stock return variations and thus declining comovement. We detect a similar, albeit weaker, pattern in most, but not all, emerging markets. We further find that higher firm-specific variation is associated with greater capital market openness, but not goods market openness. Moreover, this relationship is magnified by institutional integrity (good government). Goods market openness is associated with higher market-wide variation.

The price system is just one of those formations which man has learned to use (though he is still very far from having learned to make the best use of it) after he has stumbled upon it without understanding it.

Friedrich August von Hayek (1945)

1. Introduction

The extent to which individual stock prices move independently varies both across countries and over time. Morck *et al.* (2000) find the ratio of idiosyncratic (firm-specific) variation to total variation in individual stock returns to be higher in higher-income economies in the mid 1990s. Campbell *et al.* (2001) and Morck *et al.* (2000) find a long-term rise in idiosyncratic variation in US stock returns. A series of studies, including Wurgler (2000), Bris *et al.* (2002), Bushman *et al.* (2002), Durnev *et al.* (2004, 3a,b), and others, relate greater idiosyncratic variation, or lower comovement in individual stock returns, to a range of measures of the institutional development, regulatory sophistication, and capital allocation efficacy of the stock market. Other work, too extensive to list, documents a relationship between financial development and economic openness. This study documents a strong statistical correlation between capital market openness in emerging markets and idiosyncratic stock return variation. We focus on emerging markets because developed stock markets are fully open to foreign investors for the full period over which large panels of returns data are available.

We first show that the findings of Campbell *et al.* (2001) and Morck *et al.* (2000) of rising idiosyncratic variation in US stocks are also evident in the majority of emerging markets over the 1990s. We then show that higher idiosyncratic variation is significantly correlated with greater capital market openness in emerging market economies with sound institutions. However, capital market openness and poor institutions may actually increase comovement. Trade openness generally increases comovement.

The remainder of the paper is arranged as follows. Section two describes our conceptual starting points. Section three describes our methodology and section four presents our empirical findings. Section five presents a case study and section six concludes.

2. Individual Stock Return Comovement and Openness

The total variation in an individual stock return can be decomposed into idiosyncratic variation, which is specific to the stock, and systematic variation, which is explained by market returns. A natural measure of comovement is thus systematic variation as a fraction of total variation. Since comovement can be large either because systematic variation is large or because idiosyncratic variation is small, it also makes sense to look at these quantities explicitly. For brevity, we refer to all of these variables as measuring "comovement"."

Campbell *et al.* (2001) and Morck *et al.* (2000) document rising absolute and relative firm-specific variation in US stocks. Morck *et al.* (2000) also find that firm-specific variation is a greater part of total variation in more developed countries. They are unable to explain these differences with differences in macroeconomic stability, country or market size, economy structure, or firm-specific variation in fundamentals (returns on assets). Rather, greater official corruption is highly correlated with more comovement; and, in countries with below average corruption, stronger investor protection laws are associated with higher firm-specific variation.

Comovement and related phenomena matter for two general classes of reasons. These reasons interact with the increasing global integration of capital markets, as documented by Bekaert and Harvey (1995, 1997) and others.

The first class of reasons relates to portfolio risk. Campbell *et al.* (2001) note that many investors are not fully diversified, and so are exposed to greater risk when firm-specific variation is greater. They further show that greater firm-specific variation means investors need larger portfolios to diversify fully and argue that greater firm-specific variation should affect option prices, which depend on firm-specific plus market-related variation in the return of the underlying asset.

Chen and Knez (1995) argue that, as barriers to capital flows drop, cross-border arbitrage affects asset prices across markets. Thus, information about industries, exposures or discount rates that affects prices in one country also affects prices elsewhere. Some of this information is about the whole market, but much is about sectors, and should show up as idiosyncratic risk.

The second class of reasons has to do with the real economy. We now review each of these reasons in turn.

First, La Porta *et al*. (1999) find most large publicly traded firms outside the United States and United Kingdom organized into corporate groups. A single controlling shareholder, usually a very wealthy family, controls all the firms in such a group – directly or indirectly. Group firms finance each other, do business with each other, adopt common strategies, and otherwise coordinate decisions. This could give their fundamentals a common component. Such intercorporate dealings might steadily transfer wealth from one group firm to another, and public shareholders of a wealth-losing group firm understandably view this as a corporate governance problem, which Johnson *et al*. (2000) dub *tunneling*. Perhaps comovement gauges the importance of corporate groups, and of tunneling.

As Coffee (2002), Karolyi and Stulz (2003), Morck *et al.* (2000b), Rajan and Zingales (2003), Stulz (1999), and others note, capital market openness pressures regulators to adopt international best practices in disclosure, governance, and regulation. It also creates local demand for information professionals, like accountants and analysts. Both changes might render tunneling more difficult. The result might be less comovement in both firm fundamentals and returns.

Second, economic growth arises from technological progress. Schumpeter (1912) holds that this occurs as innovative firms rise to displace established industry leaders in a process he dubs *creative destruction*. More intense creative destruction thus causes the fundamentals of innovative and laggard firms to differ more.

Caves (1982) argues that openness to outward foreign direct investment (FDI) raises the rewards to innovators by allowing greater economies of scale, and that openness to inward FDI allows technology spillovers from multinationals to local firms. Rajan and Zingales (2003) and Morck *et al.* (2000b) argue that foreign portfolio investment (FPI) openness bolsters local technological progress by letting entrepreneurial upstarts obtain financing from abroad. Thus, general capital market openness might let innovative firms outpace sedate rivals faster, magnifying firm specific differences in returns.

Third, neoclassical trade theory links trade openness to specialization. Trade openness should thus reduce an economy's diversification across industries, perhaps turning industry factors into market factors and raising fundamentals comovement. Also, if capital openness accompanies trade openness, a positive correlation between capital openness and comovement might ensue.

However, tunneling, innovation, and specialization all affect returns comovement only by affecting fundamentals comovement. Morck *et al.* (2000) cannot explain returns comovement with fundamentals (return on assets) comovement.[1] Either their fundamentals comovement measure is inadequate, a possibility given the low frequency of fundamentals data, or some other explanation is paramount.

The latter possibility leads them to consider alternative explanations. Comovement may be symptomatic of market inefficiencies, such as bubbles or herding. If more open capital markets experience fewer bubbles and less herding, they might exhibit less comovement. Alternatively, critics of globalization argue that openness spreads crises. For example, the Bernama News Agency quoted Malaysian Prime Minister Mahathir Mohamad blaming Malaysia's economic crisis on international financiers who "robbed the Palestinians of everything, but in Malaysia they could not

[1] Morck *et al.* (2000) run market-model analog regressions on returns on assets, defined as earnings plus depreciation plus interest over net assets. This allows them to estimate firm-specific and systematic fundamentals variation. Controlling for these variables does not affect their results.

do so, hence they do this, depress the ringgit."[2] More sagaciously, Bhagwati (1998) argues that capital market openness can spread financial crises, and that only product market openness is justified; and Forbes and Rigobon (2002) study contagion as a factor in market fluctuations.

However, Morck *et al.* (2000) and Campbell *et al.* (2001) show that changes in comovement are due, in part at least, to changes in idiosyncratic variation, as opposed to market wide variation. Roll (1988) argues that idiosyncratic variation reflects trading by investors with private firm-specific information, and Morck *et al.* (2000) and Durnev *et al.* (2004) speculate that more idiosyncratic variation reflects periods of especially intense trading by such investors, and hence more accurate pricing, at least in the short term. However, Campbell *et al.* (2001) dispute this, noting correctly that West (1988) links less information to higher returns variation. Their intuition is that as information is revealed, the previously more erroneously priced stock exhibits larger return fluctuations.

Regardless, a growing body of empirical work links greater idiosyncratic variation to variables that, on the surface at least, are plausible proxies for the information content of stock prices. Some of this work links higher firm-specific return variation to variables readily interpretable as gauging informed arbitrage. Greater idiosyncratic variation is evident in countries with stronger insider trading prohibitions (Beny, 2000), more developed financial analysis industries and a freer press (Bushman *et al.* 2002), and fewer short sales restrictions (Bris *et al.* 2002). Other work looks at the information content of stock returns more directly. Durnev *et al.* (2003b) find significantly higher firm-specific returns variation following a major historical tightening in US disclosure law for affected stocks, but not for others. Durnev *et al*. (2003a) find returns more accurately predicting future earnings changes in industries whose stocks move more idiosyncratically. Collins *et al.* (1987) and others regard such predictive power as gauging the 'information content' of stock prices.

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[2] From an October 10th 1997 speech to Muslim villagers, quoted in "Malaysia Premier Sees Jews Behind Nation's Money Crisis," by Seth Mydans, *New York Times*, October 16, 1997.

Yet more work links greater idiosyncratic variation to better quality capital allocation. Wurgler (2000) finds capital flows more responsive to value-added in countries where returns commove less. Durnev *et al.* (2004) show US industries in which idiosyncratic variation is higher exhibiting fewer signs of both overinvestment and underinvestment. Tobin (1982) defines the market as *functionally efficient* if price changes induce efficient capital allocation, and the two studies speculate that less comovement and greater idiosyncratic variation signify more functionally efficient markets. Reconciling these findings with the West (1988) framework and related literature, such as Campbell and Shiller (1987), is an exciting avenue for future research.

Our objective here is more limited - to see if the US pattern of rising idiosyncratic variation extends to emerging markets, and to see what factors correlate with the magnitudes of this change across countries. In doing this, we need to consider factors that affect many countries, but to differing degrees.

One such factor is the increasing globalization of capital markets. We make no pretense that globalization is the only such factor. However a study of all possible factors is beyond the scope of this effort. We focus on globalization because economic openness, especially to capital flows, has changed to different degrees in different countries over the past decade, and in ways that can be measured – albeit with difficulty. By considering how capital market openness might interact with the different explanations of comovement advanced above, we can explore their validity and implications.

3. Methodology

Estimating the Comovement Variables

Our main comovement measures are based on modified market model regressions for individual securities. Let the return on stock j in period t be $r_{jt.,}$ the domestic market return for country n at t be

r_{nt}, and the US market return at t be r_{mt} (converted to local currency). To assess the comovement of individual stocks in country n during period τ, we run the regression

$$r_{jt} = \beta_{j,0} + \beta_{j,1} r_{njt} + \beta_{j,2} r_{mt} + \varepsilon_{jt} \qquad [1]$$

separately for each stock $j \in n$ using all T_j observations $t \in \tau$. The transformed domestic market return, r_{njt} is the equal-weighted average return of all stocks in n except j itself,

$$r_{njt} \equiv \frac{\sum_{i \in n, i \neq j} r_{it}}{J_{nt} - 1} \qquad [2]$$

where J_{nt} is the number of stocks in country n at time t. We thus use a different domestic market return for each regression. This is because we are interested in the comovement of stock j with other stocks, not with itself. In economies with a small number of traded stocks, this eliminates a potential upward bias in our comovement measures.

A simple variance decomposition expresses the sum of squared variation in r_{jt}, denoted $s^2_{j\tau}$, as the sum of the squared variation explained by [1], ${}_m s^2_{j\tau}$, and the residual variation ${}_\varepsilon s^2_{j\tau}$. The systematic variation in stock j during interval τ is ${}_m\sigma^2_{j\tau} = \frac{1}{T_j - 1} {}_m s^2_{j\tau}$, the firm-specific variation is ${}_\varepsilon\sigma^2_{j\tau} = \frac{1}{T_j - 1} {}_\varepsilon s^2_{j\tau}$, and the total variation is $\sigma^2_{j\tau} = \frac{1}{T_j - 1} s^2_{j\tau}$ where T_j is the number of return observations for firm j in during τ.

To estimate country-level analogs, we take an average of the J_n firm-level measures in each country n weighted by the number of observations on each firm. Thus, the *average absolute firm-specific return variation* for stocks in country n during interval τ is

$${}_\varepsilon\sigma^2_{n\tau} = \frac{\sum_{j \in n} {}_\varepsilon s^2_{j\tau}}{\sum_{j \in n} T_j - J_n} \qquad [3]$$

We interpret a larger ${}_\varepsilon\sigma^2_{n\tau}$ as signifying less comovement in individual returns.

An analogous procedure generates the *average absolute systematic return variation* for stocks in country n during time interval τ,

$$_m\sigma^2_{n\tau} = \frac{\sum_{j\in n} {}_m s^2_{j\tau}}{\sum_{j\in n} T_j - J_n} \qquad [4]$$

We interpret a greater $_m\sigma^2_{n\tau}$ as signifying more comovement in individual returns.

Scaling firm-specific by total variation, $\sigma^2_{n\tau}$ obtained analogously as in [3] and [4], we obtain the average R^2 statistic of regression [1] for stocks in country n during time interval τ,

$$R^2_{n\tau} \equiv \frac{_m s^2_{n\tau}}{s^2_{n\tau}} = \frac{_m\sigma^2_{n\tau}}{\sigma^2_{n\tau}} \qquad [5]$$

To gauge the importance of systematic variation as a fraction of total variation in country n, we can define a country-level analog,

$$R^2_{n\tau} \equiv \frac{_m s^2_{n\tau}}{s^2_{n\tau}} = \frac{_m\sigma^2_{n\tau}}{\sigma^2_{n\tau}} \qquad [6]$$

the *average relative systematic variation* in the stocks of country n during interval τ. We take a lower $R^2_{n\tau}$ as signifying less comovement.

To construct these measures, we download a time series of Wednesday-to-Wednesday returns for every stock in DataStream, deleting returns with zero or missing volume at either endpoint. Using weekly returns economizes on downloading time. DataStream contains coding errors, especially for Latin America, due to misplaced decimal points. An algorithm checks for such errors and drops affected observations.

Regression Framework

We seek to explain comovement with measures of openness to the global economy, taking into account the different levels of institutional development in different countries. We thus run panel regressions of the form

$$\begin{bmatrix} comovement \\ measure \end{bmatrix} = \begin{bmatrix} fixed \\ effects \end{bmatrix} + \beta_1 \begin{bmatrix} openness \\ measure \end{bmatrix} + \beta_2 \begin{bmatrix} openness \\ measure \end{bmatrix} \times \begin{bmatrix} institutional \\ development \end{bmatrix} + \eta_{n\tau} \quad [7]$$

We follow Morck *et al.* (2000) in using as dependent variables the natural logarithms of country-level average firm-specific variation, $\ln\left({}_{\varepsilon}\sigma^2_{n\tau}\right)$, systematic variation, $\ln\left({}_{m}\sigma^2_{n\tau}\right)$, and the difference between them, which we denote by the Scandinavian letter $\varnothing_{n\tau}$.[3] Note that $\varnothing_{n\tau}$ is a logistic transformation of the R^2 measure, for

$$\varnothing_{n\tau} \equiv \ln\left({}_{m}\sigma^2_{n\tau}\right) - \ln\left({}_{\varepsilon}\sigma^2_{n\tau}\right) = \ln\left(\frac{R^2_{n\tau}}{1-R^2_{n\tau}}\right) \quad [8]$$

Since ${}_{m}\sigma^2_{n\tau}$ and ${}_{\varepsilon}\sigma^2_{n\tau}$ are bounded below by zero, and $R^2_{n\tau}$ is in the unit interval, these transformations are necessary to provide approximately normal dependent variables.

We use several alternative measures to capture different aspects of openness.

We define *trade openness* as suggested by Frankel (2000),

$$\begin{bmatrix} trade \\ openness \end{bmatrix}_{n\tau} \equiv \frac{M_{n\tau}}{Y_{n\tau}} - \left(1 - \frac{Y_{n\tau}}{\sum_n Y_{n\tau}}\right) \quad [9]$$

where $M_{n\tau}$ is total imports and $Y_{n\tau}$ is gross domestic product (GDP). If national borders do not affect buying patterns, imports over GDP equals one minus the nation's share of world production, leaving the value of the openness measure zero. In a completely closed economy the variable's value is minus one plus the country's GDP as a fraction of world GDP. As the country becomes more open, the measure rises towards zero. Trade openness can rise above one for an entrepôt state. Frankel (2000) recommends this measure in lieu of the traditional imports plus exports over GDP, which tends to be larger for smaller economies.

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[3] Pronounced about halfway between "*oe*" and "*oy*".

We construct the variable using data from *World Development Indicators 2002*, produced by the World Bank. For our sample, the variable is always negative. Note, however, that we exclude the city-states of Singapore and Hong Kong, which are probably the most important entrepôt countries. Hong Kong is a particularly unique case because of its switch from a UK colony to a Chinese special administration region during our sample period.

Measuring capital market openness is more difficult, for investment stock and flow measures are often highly problematic. We therefore use a carefully developed *capital market openness measure* provided by Edison *et al.* (2002). This is a direct measure of the openness of each country's stock market to foreign investors. Essentially, it reflects the value of stocks that can be purchased by foreign investors as a percentage of total domestic market capitalization.[4] It is closer to one if a market is more open and closer to zero if it is more closed.

The index is available for most emerging markets from 1990 through 2001, though it is unavailable for some in the very early 1990s. Since developed country stock markets are essentially fully open to foreign investors throughout the 1990s, the index has no variation for these markets. Consequently, we restrict our attention to emerging markets.

The capital and trade openness are not highly correlated (ρ = -0.001, p = 0.99). Although

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[4] This measure is based on an "investable" index, reflecting the market as available to foreign investors, divided by a "global" index, reflecting the whole market. Both are from the International Finance Corporation (IFC). To control for "asymmetric shocks to investable and non-investable stocks", the measure is adjusted using price indices computed by IFC for the two categories of stocks. Since the stocks available to foreigners may trade at different prices than the stocks available to locals, the value of stocks available to foreigners can, in theory, exceed total domestic stock market capitalization. The index used in Edison *et al.* (2002) is actually one minus this openness ratio, and measures the intensity of capital controls.

many countries with open capital markets have open goods markets, there are notable exceptions: Indonesia (capital market openness rises, while trade openness shows no consistent trend), Malaysia and the Philippines (capital market openness shows no consistent trends, but trade openness rises), and Pakistan (capital market openness rises while the goods market becomes more closed).

To assess institutional development, we use the *good government* measure constructed by Morck *et al.* (2000). This measure sums three variables from La Porta *et al.* (1999) that gauge: the respect a country's government shows for the rule of law, the efficiency of a country's legal system, and the freedom of its government and civil servants from corruption. Each individual measure ranges from zero to ten, so good government lies between zero and thirty, with higher numbers connoting better institutions. This variable is available only as a cross-section.

All our regressions control for country, year, and crisis fixed effects.

Including country fixed effects nets out own-country averages. We do this because Morck *et al.* (2000) link comovement to a variety of variables having to do with economy structure, economy size, and fundamentals comovement. We have no reliable measures of how these factors change through time for each country, and therefore subsume them into general fixed effects. We recognize that this may not capture their full effects. If their changes are correlated with changing openness, our openness variable might pick up effects that, more properly, should be ascribed to changes in these other variables. If these other effects are, themselves, also associated with economic openness, this is defensible. If they are not, we must interpret our openness variable more broadly, as perhaps capturing part of a broader range of institutional or other changes. Year fixed effects capture global macroeconomic factors, and control for any general time trend in our data.

A number of emerging economies experienced financial crises during the 1990s. Hence, we include three crisis dummies to capture transitory changes in comovement associated with the unusual conditions prevailing in the affected markets. An Asian crisis dummy is one for East Asian countries in 1997 and 1998, and zero otherwise. A Mexican peso crisis is one for Latin American countries in 1995, and zero otherwise. Finally, a Brazilian real crisis dummy is one for Latin American countries in 1998, and zero otherwise.

Sample

Table 1 lists the countries in our final sample. The list of countries in Table 1 is the intersection of those for which the Edison *et al.* (2002) capital openness measure is available, those for which the good government index is available, and those for which DataStream stock returns are available. We go back only to 1990s because stock return data for earlier years are unavailable on DataStream for many countries. We thus have annual comovement measures from 1990 to 2001 for most countries. We require that five years of comovement data be available to include a country in our panel. Our trade openness variable is unavailable for Taiwan (ROC).

The resulting panel contains annual measures for seventeen countries from 1990 to 2001 with 183 country-year observations. We have less than a full panel because data for some countries are unavailable in the early 1990s. Table 1 displays univariate statistics.

4. Findings

Figure 1 summarizes the pattern across all emerging economies. Panel A, weighting each country equally, reveals falling $R^2_{n\tau}$ and ${}_m\sigma^2_{n\tau}$, and rising ${}_\varepsilon\sigma^2_{n\tau}$, though none are monotonic. Panel B, weighting each stock equally with no regard to its country, reveals a similar picture.

Table 2 presents a statistical description of the patterns in Figure 1. Because we have only twelve observations, lag estimation and unit root tests are problematic. Still, Panel A shows consistent positive trend point estimates in tests with and without 1st order lags and both assuming and disavowing a unit root. Unfortunately, statistical significance is only sporadic. For comparison, we present the same tests using US data for 1990 to 2001, and obtain similarly inconclusive findings, and even a *positive* trend in R^2. When we extend the US data back to 1963 (not shown), we reproduce the trends detected by Campbell *et al.* (2001) and Morck *et al.* (2000) - a rising σ_{ε}^2 and a declining R^2.

Panel B estimates ${}_{\varepsilon}\sigma_{n\tau}^2$, ${}_{m}\sigma_{n\tau}^2$, and $R_{n\tau}^2$ from firm data for the first and last halves of our sample period – dropping the middle two years to mitigate autocorrelation problems. F tests show an unambiguous rise in firm specific variation, a smaller rise in systematic variation, and a resultant decline in $R_{n\tau}^2$ – all highly significant. As a robustness check, we conduct a bootstrapping (B) test by recalculating the average first subperiod ${}_{\varepsilon}\sigma_{n\tau}^2$, ${}_{m}\sigma_{n\tau}^2$, and $R_{n\tau}^2$ in each country one hundred times using thirty randomly selected stocks each time. This generates a distribution for the first subperiod average firm-specific variation. The p-level for rejecting equal average firm-specific variation in the two subperiods is the tail of this distribution beyond the second subperiod sample ${}_{\varepsilon}\sigma_{n\tau}^2$, ${}_{m}\sigma_{n\tau}^2$, or $R_{n\tau}^2$. These tests show a significant rise in firm-specific variation in emerging markets as a whole, a smaller increase in systematic variation, and an insignificant decline in R^2. Analogous US figures for the same period show a rise in ${}_{m}\sigma_{n\tau}^2$, and $R_{n\tau}^2$ in the 1990s, however this is again a short term phenomenon. Similar techniques applied over a longer time-series of US data, from 1963 to 2001, confirm the rising ${}_{\varepsilon}\sigma_{n\tau}^2$ and falling $R_{n\tau}^2$ noted by Campbell *et al.* (2001) and Morck *et al.* (2000).

The last panel of Table 2 reproduces the trend tests and subsample tests from Panels A and B for each individual emerging market. Of the sixty-eight trend point estimates, forty-seven are positive, and eight are statistically significant - consistent with broadly rising firm-specific variation. In contrast, only two of the twenty-one negative trend estimates are significant. F-tests and bootstrapping tests are more definitive, indicating significantly higher firm-specific variation in twelve of our seventeen emerging markets - Colombia, India, Indonesia, Korea, Malaysia, Mexico, Pakistan, Philippines, Portugal, South Africa, Taiwan, and Thailand. F-tests indicate declining firm-specific variation only in Brazil, Chile, Greece, Peru, and Turkey; and bootstrapping tests are significant only for Chile, Peru, and Turkey.

Space constraints prevent the inclusion of detailed descriptions of our other co-movement variables. Twelve of our seventeen countries show a decline in $R^2_{n\tau}$ measured analogously. In eleven countries, ${}_m\sigma^2_{n\tau}$ rises. During crisis years, ${}_\varepsilon\sigma^2_{n\tau}$ and ${}_m\sigma^2_{n\tau}$ both spike. Because the latter rises more, $R^2_{n\tau}$ also spikes. These observations are unsurprising, at least on the surface.[5]

As a robustness check, we repeat the F and B tests in Table 2 using the first and last pairs of years of data for each country, rather than the first and last halves of the sample period, and generate broadly similar results. Unit root invariant trend tests, as suggested by Vogelsang (1998), indicate uniform insignificance, but are barely identified.

Our focus is on how openness and institutions correlate with comovement. These same factors may affect the virility and incidence of crises, so crises cannot really be disentangled from them. However, a thorough analysis of the interactions of crises with institutions, openness, and stock return variation is beyond the scope of this study, though we are pursuing it elsewhere. Nonetheless, we clearly must control for transitory effects during crises when we evaluate the determinants of their more permanent levels. We return to this issue below.

Table 3 reports our regression results. The leftmost panel shows no relationship between trade openness and absolute firm-specific variation. Capital openness and its cross product with

[5] Economic crises, by their very nature, are systematic. They affect broad swaths of firms and industries simultaneously, and so are apparent as elevated systematic variation. Firm-specific variation can rise too, for the crisis may affect some firms or sectors more than others, and may even present opportunities to some firms. If crises also correspond to manias and panics, market swings due to noise trading might also heighten comovement.

good government are both significantly related to higher firm-specific variation. When both are included in 3.6, the individual coefficients are insignificant and capital openness *per se* switches sign. Although an F test shows the two to be jointly significant, collinearity problems make interpreting the point estimates problematic. If we ignore such problems, a good government index above eleven induces a positive relationship between capital openness and absolute firm-specific variation.

The center panel shows openness in trade significantly *positively* related to absolute systematic variation and unrelated to firm-specific variation. The cross term between trade openness and *good government* in 3.9 is also positive and statistically significant. Trade openness is associated with greater market-wide variation.

The rightmost panel shows that trade openness is positively related to the comovement measure $\varnothing_{n\tau}$. When we include both trade openness and its cross term with *good government* in 3.17, trade openness has a positive coefficient while the cross term has a negative one; both insignificant. However, the F-statistic indicates joint significance. In contrast, capital market openness is significantly associated with lower systematic variation relative to the total. Again, the cross product with institutional development is significantly negative. Both remain significant when included together in 3.20, however, capital openness takes a positive sign and the cross term becomes negative. Including both trade and capital openness and both cross terms in 3.21 leaves the point estimates of the two capital openness terms virtually unchanged from 3.20. The point estimates in 3.21, which are both individually and jointly significant, imply that a good government index greater than nineteen makes the overall effect of capital openness on comovement negative. The mean value for the good government measure is nineteen.

Robustness Checks

We repeat all our results using comovement measures estimated with a simple domestic market model, rather than [1]. Our results remain qualitatively similar, by which we mean the signs and statistical significance of regression coefficients in analogues to the tables shown are preserved. Likewise, using DataStream's global market return, rather than the US market return, as the second factor in [1] produces qualitatively similar results. Using value-weighting, rather than equal weighting, in constructing the local index also yields qualitatively similar results.

As alternative comovement measures, we employ the average correlation between all possible pairs of thirty stocks, randomly selected in each country for each period, and the fraction of stocks moving with the market. Regressions explaining logistic transformations of these measures of comovement closely resemble the regressions explaining $\varnothing_{n\tau}$.

To ascertain that our results are not due to comovement changes associated with crises, we repeat our regressions dropping all observations for which any of the three crisis dummies described above is one. The results are virtually unchanged, and the panel regression R^2s rise. Dropping the crisis dummies and including all observations also generates results similar to those shown, as does including only country fixed effects.

As a further robustness check, we use an alternative capital openness measure constructed by Abiad and Mody (2002).[6] Unfortunately, this is available only to 1996. It yields a pattern of signs and coefficients similar to those shown, but with much lower significance levels, probably due to the smaller intersection of that measure with our comovement estimates.

Substituting the simple trade openness measure of imports plus exports over GDP for the Frankel (2000) trade measure generates similar patterns of signs and significance to those shown.

Cook's D statistics indicate that outliers are not driving our results. Tests for

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[6] This measure adds score for aspects of capital openness: directed credit/reserve requirements, interest controls, entry barriers/pro-competition measures, regulation/securities markets, privatization, and international capital flows openness. See Abiad and Mody (2002) for details.

heteroskedasticity reject the need for modified t-tests.

5. A Case Study

A case in point to illustrate the situation is the contrast between two Eastern European countries, Poland and Czech. Both countries experienced a flurry of new legislation in 1991 and 1992 establishing basic market economy institutions. However, Glaeser *et al.* (2001) show that the two countries then followed very different trajectories. The judicial systems remained ill developed in both countries. However, strict Polish regulatory enforcement contrasted starkly with the hands-off regulation inspired by the libertarian philosophy of the Czech government. Glaeser *et al.* (2001) argue that this stunted the development of the Czech financial system relative to that of Poland, and stress the need for law enforcement, by either the judiciary or regulators, to make markets work.

Neither country is included in our sample because of the unavailability of complete stock market and institutional development data. However, by downloading daily data from DataStream and following precisely the same procedure outlined in section 3, we are able to construct a set of bimonthly comovement measures for these countries.[7]

Figure 2 shows an upward trend in firm-specific variation in Poland and a downward trend in the Czech Republic in the latter years of the 1990s, as both opened their economies in preparation for accession to the European Union. This is confirmed in Table 4, where Polish data shows a highly significant positive trend in σ_ε^2 and negative trends in systematic variation, both absolute and relative to total variation. Since a unit root cannot be rejected in the last of these measures, unit root invariant tests are used to confirm a significant negative trend in R^2. In contrast, Czech shows no trend in σ_ε^2. F-tests and bootstrapping (B) tests akin to those in Table 2 show an even greater

[7] We are slowly constructing higher frequency comovement measures for more countries.

contrast, indicating an actual decline in σ_ε^2 for Czech stocks.

Poland's R^2 is much higher than its Czech counterpart early on, and falls to levels comparable with the latter as Polish market-wide variation abates. However, simple convergence cannot be a complete explanation because Panel B shows Polish firm-specific variation concordantly rising from 0.000954 to 0.001414; while Czech firm-specific variation falls from 0.000828 to 0.000573. The contrast illustrates how opening is associated with reduced comovement and higher firm-specific variation only if the institutions protect private property rights.

6. Conclusions

Firm-specific variation in individual stock returns rises, though not monotonically, during the 1990s in most, but not all, emerging markets. Thus, the rising firm-specific variation detected by Morck *et al.* (2000) and Campbell *et al.* (2001) in US stocks is an international phenomenon.

This effect seems related to globalization. Greater capital market openness is associated with higher firm-specific variation and hence lower comovement in countries with institutional integrity (good government). In contrast, goods market openness is generally associated with higher systematic variation, and hence greater comovement.

Unfortunately, individual stock returns are not electronically available in most countries before 1990. This means we cannot control meaningfully for sectoral shocks and the like, and that the power of time series tests is low. Thus our finding must be taken as preliminary. Moreover, the interrelations among our openness variables, and between them and other measures of development, are doubtless complicated. It may be that our openness measures are proxies for other more nuanced aspects of development. With these caveats in mind, we can tentatively consider possible implications of our results.

Although there is near uniform agreement among economists that trade openness is welfare enhancing, capital openness is subject to debate, with many, such as Bhagwati (1998) arguing that capital openness creates scope for destabilizing market-wide fluctuations – so-called 'hot money' problems. Our results suggest that such concerns can be overstated. We find market-wide fluctuations associated with trade openness, not capital openness. In retrospect, this is reasonable, for trade openness is thought to induce greater specialization, converting industry effects into market-wide fluctuations. If this is really happening, further study along these lines seems warranted.

Why capital openness is associated with higher firm-specific variation and lower comovement is at present unclear. Candidate explanations include reduced tunneling due to greater transparency, a faster pace of creative destruction causing greater differences between innovators and laggards, less investor herding, and perhaps presently ill-understood differences in the cost structure of information and hence in the activity of informed arbitrageurs. Nevertheless, Wurgler (2000), Durnev *et al.* (2004), and others find higher firm-specific variation related to greater stock market functional efficiency, which Tobin (1982) defines as asset prices inducing an efficient distribution of capital goods.

Given these findings, and keeping the above mentioned caveats in mind, the magnitude of firm-specific variation in a country's stocks presents itself as an interesting variable with which to examine institutional development, as suggested by the Czech-Poland comparison above. Better institutions should cause the market to make a sharper distinction between firms with good prospects and firms with poor prospects and thus to allocate capital more efficiently. We believe that these findings suggest a new and potentially useful measure of the effectiveness of reforms in different countries. We tentatively propose that increasing firm-specific variation might be regarded as a gauge of the extent of real institutional reform.

The view outlined here is not new. In the *Pure Theory of Capital*, Hayek (1941, p. 6) argues that "[The] stock of capital is not an amorphous mass, but possesses a definite structure, that it is organized in a definite way, and that its composition of essentially different items is much more important than its aggregate ‘quantity’.” In a healthy economy, Hayek argues, different companies undertake different investments because their managers possess different levels of entrepreneurial ability, openness to innovation, and foresight. Some firms succeed and others fail as the economy grows through this ongoing process of creative destruction.

We recognize that ours is not the final word, and invite alternative explanations of the patterns we detect. We welcome ideas about how to distinguish such possibilities from the economic underpinnings we propose.

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Table 1. Sample Descriptive Statistics

Comovement is measured by average market model R squared, $R^2_{n\tau}$, average firm-specific variation, ${}_{\varepsilon}\sigma^2_{n\tau}$, and average systematic variation, ${}_{m}\sigma^2_{n\tau}$. Capital openness is value-weighted fraction of the market open to foreign investors. Trade openness is imports over GDP relative to GDP over world GDP. Good government is a cross-section index taking low values where corruption is worse. Data are for 1990 through 2001.

Market	$R^2_{n\tau}$	${}_{\varepsilon}\sigma^2_{n\tau}$	${}_{m}\sigma^2_{n\tau}$	Capital openness	Trade openness	Good government
Brazil	0.1757	0.0080	0.0018	0.74	-0.87	20.24
Chile	0.1625	0.0033	0.0007	0.81	-0.70	19.60
Colombia	0.1448	0.0040	0.0007	0.66	-0.79	18.97
Greece	0.2874	0.0054	0.0025	0.81	-0.74	21.01
India	0.2516	0.0078	0.0027	0.19	-0.85	18.44
Indonesia	0.1837	0.0093	0.0025	0.56	-0.71	15.40
Korea	0.3006	0.0080	0.0028	0.36	-0.65	22.20
Malaysia	0.4342	0.0037	0.0033	0.75	-0.10	22.76
Mexico	0.2463	0.0036	0.0013	0.65	-0.72	18.61
Pakistan	0.1987	0.0072	0.0018	0.59	-0.78	13.47
Peru	0.1652	0.0077	0.0017	1.01	-0.82	14.92
Philippines	0.1963	0.0085	0.0023	0.49	-0.54	12.94
Portugal	0.1172	0.0039	0.0005	0.68	-0.62	24.85
South Africa	0.0965	0.0087	0.0009	1.00	-0.77	23.07
Taiwan	0.3922	0.0032	0.0027	0.23	.	25.13
Thailand	0.2701	0.0065	0.0024	0.38	-0.53	20.17
Turkey	0.3753	0.0087	0.0056	0.99	-0.75	18.13
Mean	0.2352	0.0063	0.0021	0.64	-0.69	19.41
Std	0.0978	0.0023	0.0012	0.25	0.18	3.67
Minimum	0.0965	0.0032	0.0005	0.19	-0.87	12.94
Maximum	0.4342	0.0093	0.0056	1.01	-0.10	25.13

Table 2. Changes in Comovement Measures Between 1990 and 2001

Comovement is measured by average market model R squared, $R^2_{n\tau}$, average firm-specific variation, ${}_\varepsilon\sigma^2_{n\tau}$, and average systematic variation, ${}_m\sigma^2_{n\tau}$.

Panel A. Trends in comovement from 1990 to 2001 are estimated with annual data assuming unit roots and then assuming their absence. Because small samples render augmented Dickey-Fuller (DF) unit root tests problematic, we report both. Figures shown are estimates x 10^2.

Sample	Dependent variable	Trend estimates and p-levels				DF p-level
Emerging markets stocks, firm-week observations weighted equally	Absolute firm-specific variation, ${}_\varepsilon\sigma^2_{n\tau}$	**0.0630** **(0.00)**	0.0325 (0.30)	0.0304 (0.66)	0.0163 (0.82)	0.69
	Absolute systematic variation, ${}_m\sigma^2_{n\tau}$	0.0126 (0.17)	**0.0183** **(0.02)**	-0.0053 (0.89)	0.0118 (0.77)	0.30
	Relative systematic variation, $R^2_{n\tau}$	-0.0105 (0.11)	-0.0033 (0.31)	-0.0167 (0.43)	-0.0091 (0.61)	**0.00**
Emerging markets stocks, countries weighted equally	Absolute firm-specific variation, ${}_\varepsilon\sigma^2_{n\tau}$	**0.0210** **(0.08)**	0.0080 (0.55)	0.0020 (0.96)	**0.343** **(0.05)**	0.57
	Absolute systematic variation, ${}_m\sigma^2_{n\tau}$	-0.0002 (0.98)	0.0046 (0.41)	-0.0173 (0.54)	-49.3 (0.14)	0.12
	Relative systematic variation, $R^2_{n\tau}$	-0.00577 (0.11)	-0.205 (0.28)	-1.35 (0.34)	**-27.9** **(0.00)**	**0.00**
United States stocks	Absolute firm-specific variation, ${}_\varepsilon\sigma^2_{n\tau}$	0.0013 (0.91)	-0.0003 (0.98)	-0.002 (0.70)	0.001 (0.73)	0.56
	Absolute systematic variation, ${}_m\sigma^2_{n\tau}$	**0.0016** **(0.02)**	0.0018 (0.13)	0.0008 (0.68)	2.19 (0.95)	0.43
	Relative systematic variation, $R^2_{n\tau}$	**0.479** **(0.01)**	**0.552** **(0.07)**	0.328 (0.45)	19.7 (0.60)	0.61
Unit root assumed in estimation		no	no	yes	yes	
Lagged dependent variable included		no	yes	no	yes	

Panel B. Tests to reject equal firm-specific mean variation across subperiods. F-test degrees of freedom correspond to firm observations. Bootstrap (B) test rejects equal average firm-specific variation in the two subperiods recalculate average first subperiod firm-specific variations one hundred times using thirty randomly selected stocks each time. This provides a probability distribution for first subperiod average firm-specific variation. The p-level is the mass in the tail of this distribution beyond the second subperiod sample average firm-specific variation. Subperiods are noncontiguous to mitigate autocorrelation and are of equal length. All emerging market stocks are weighted equally regardless of country. Variation figures are estimates x 10^2.

	Emerging Markets			**United States**		
Comovement measure	${}_\varepsilon\sigma^2_{n\tau}$	${}_m\sigma^2_{n\tau}$	$R^2_{n\tau}$	${}_\varepsilon\sigma^2_{n\tau}$	${}_m\sigma^2_{n\tau}$	$R^2_{n\tau}$
Mean variation, 90 to 94	0.629	0.169	0.242	0.310	0.0062	0.0483
Mean variation, 97 to 01	1.236	0.308	0.234	0.295	0.0173	0.0723
Change in mean variation	**0.607**	**0.138**	**-0.008**	**-0.015**	**0.0111**	**0.0240**
F-test p-level to reject no change	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**
B- test p-level to reject no change	**(0.00)**	**(0.00)**	(0.41)	(0.44)	**(0.00)**	**(0.03)**

Panel C. Trends and changes in firm-specific variation by emerging market. Trends are estimated as in Panel A, changes as in Panel B.

Country	Period	Trend estimates and p-levels [a]				DF test p-level	Sub-period	${}_{\varepsilon}\sigma^2_{n\tau}$ [a]	$\Delta_{\varepsilon}\sigma^2_{n\tau}$ [a]	F test p-level	B test p-level
Brazil	95-01	0.687	-0.028	-0.034	-0.019	0.65	95-97	1.538	**-0.136**	**0.00**	0.31
		(0.18)	(0.72)	(0.30)	(0.46)		99-01	1.402			
Chile	91-01	0.067	-0.054	-0.010	**-0.028**	**0.00**	91-95	0.655	**-0.180**	**0.00**	**0.07**
		(0.24)	(0.34)	(0.22)	**(0.08)**		97-01	0.475			
Colombia	93-97	-0.072	-0.021	0.006	-0.003	0.15	93-94	0.489	**0.583**	**0.00**	**0.00**
		(0.60)	(0.59)	(0.29)	(0.68)		96-97	1.072			
Greece	90-01	0.178	-0.065	0.002	-0.021	**0.08**	90-94	0.646	**-0.019**	**0.00**	0.44
		(0.31)	(0.42)	(0.93)	(0.33)		97-01	0.628			
India	90-01	0.159	0.016	0.021	**0.026**	0.18	90-94	0.924	**0.540**	**0.00**	**0.03**
		(0.55)	(0.81)	(0.25)	**(0.10)**		97-01	1.463			
Indonesia	90-01	0.439	0.026	0.061	**0.082**	0.35	90-94	0.714	**0.990**	**0.00**	**0.00**
		(0.12)	(0.90)	(0.27)	**(0.08)**		97-01	1.703			
Korea	90-01	0.372	0.055	0.020	**0.126**	0.66	90-94	0.308	**1.411**	**0.00**	**0.00**
		(0.11)	(0.74)	(0.68)	**(0.02)**		97-01	1.722			
Malaysia	90-01	0.134	0.004	0.013	0.014	**0.07**	90-94	0.386	**0.185**	**0.00**	**0.00**
		(0.32)	(0.95)	(0.34)	(0.20)		97-01	0.571			
Mexico	90-01	0.135	0.004	0.014	**0.013**	0.12	90-94	0.455	**0.260**	**0.00**	**0.02**
		(0.41)	(0.91)	(0.12)	**(0.05)**		97-01	0.716			
Pakistan	93-01	0.136	0.033	0.009	0.021	0.17	93-96	0.903	**0.795**	**0.00**	**0.09**
		(0.70)	(0.63)	(0.60)	(0.29)		98-01	1.699			
Peru	92-01	0.099	-0.063	-0.081	**-0.102**	**0.02**	92-95	1.447	**-0.469**	**0.00**	**0.00**
		(0.18)	(0.42)	(0.24)	**(0.00)**		98-01	0.977			
Philippines	90-01	0.386	0.017	0.023	**0.047**	0.66	90-94	1.015	**0.551**	**0.00**	**0.00**
		(0.11)	(0.82)	(0.34)	**(0.01)**		97-01	1.566			
Portugal	90-01	-0.117	0.004	0.002	0.004	**0.00**	90-94	0.705	**0.197**	**0.00**	**0.09**
		(0.61)	(0.89)	(0.88)	(0.61)		97-01	0.902			
South Africa	90-01	0.142	0.066	**0.079**	**0.095**	0.92	90-94	0.884	**0.646**	**0.00**	**0.00**
		(0.31)	(0.23)	**(0.02)**	**(0.00)**		97-01	1.530			
Taiwan	90-01	0.063	-0.003	**0.029**	0.020	0.47	90-94	0.287	**0.228**	**0.00**	**0.00**
		(0.22)	(0.94)	**(0.00)**	(0.15)		97-01	0.515			
Thailand	90-01	0.371	-0.010	0.017	0.043	0.47	90-94	0.517	**1.064**	**0.00**	**0.00**
		(0.16)	(0.95)	(0.53)	(0.20)		97-01	1.581			
Turkey	90-01	0.470	-0.046	-0.023	-0.029	0.13	90-94	1.231	**-0.394**	**0.00**	**0.01**
		(0.15)	(0.58)	(0.32)	(0.07)		97-01	0.837			
Unit root assumed		yes	yes	no	no						
Dependent variable lag included		yes	no	yes	no						

a. Trend and variation figures are estimates x 10^2.

Table 3. Panel Regressions

Independent variables include *capital openness*, a value-weighted fraction of the market open to foreign investors; *trade openness*, imports over GDP relative to GDP over world GDP; and interactions with *good government*, a cross-section index taking low values where corruption is worse. The Peso crisis dummy is one for Latin American countries in 1995, and zero otherwise. The Asian Crisis dummy is one for Asian countries in 1997 and 1998, and zero otherwise. The Real crisis dummy is one for Latin American countries in 1998, and zero otherwise. Data are for 1990 through 2001. The dependent variables are as indicated. All regressions include year and country fixed effects.

Dependent variable	Logarithm of idiosyncratic variation, ${}_{\varepsilon}\sigma^2_{n\tau}$							Logarithm of systematic variation, ${}_{m}\sigma^2_{n\tau}$							Logistic transformation of systematic variation as fraction of total variation, $R^2_{n\tau}$						
Regression	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	3.10	3.11	3.12	3.13	3.14	3.15	3.16	3.17	3.18	3.19	3.20	3.21
Trade openness	1.18 (.19)		-2.04 (.52)				.28 (.93)	**3.15 (.00)**		-0.03 (.99)				.38 (.92)	**1.97 (.01)**		2.02 (.48)				.11 (.97)
Trade openness x good government		-.07 (.12)	.17 (.29)				.05 (.77)		**.17 (.00)**	.17 (.39)				.16 (.44)		**.10 (.02)**	- .0026 (.99)				.11 (.46)
Capital openness				**.78 (.00)**		-.88 (.51)	-1.50 (.34)				.35 (.29)		1.84 (.32)	1.45 (.46)				**-.43 (.08)**		**2.72 (.05)**	**2.96 (.04)**
Capital openness x good government					**.04 (.00)**	.08 (.21)	.11 (.15)					.01 (.37)	-.07 (.41)	-.04 (.64)					**-.02 (.03)**	**-.15 (.02)**	**-.15 (.03)**
Peso Crisis Dummy	.46 (.05)	.46 (.05)	.47 (.05)	.44 (.05)	.44 (.05)	.45 (.05)	.44 (.05)	1.10 (.00)	1.11 (.00)	1.11 (.00)	1.08 (.00)	1.09 (.00)	1.08 (.00)	1.08 (.00)	.64 (.00)	.64 (.00)	.64 (.00)	.64 (.01)	.65 (.01)	.63 (.01)	.64 (.00)
Asian Crisis Dummy	.47 (.01)	.47 (.01)	.49 (.01)	.37 (.03)	.38 (.02)	.39 (.02)	.46 (.01)	.63 (.00)	.66 (.00)	.66 (.00)	.57 (.01)	.58 (.01)	.56 (.02)	.61 (.01)	.16 (.30)	.18 (.24)	.16 (.31)	.20 (.25)	.20 (.24)	.17 (.31)	.15 (.35)
Real Crisis Dummy	-.15 (.58)	-.15 (.58)	-.14 (.60)	-.11 (.68)	-.10 (.70)	-.09 (.72)	-.13 (.63)	.20 (.55)	.20 (.53)	.20 (.54)	.30 (.40)	.30 (.40)	.29 (.42)	.19 (.56)	.35 (.15)	.35 (.15)	.35 (.15)	.41 (.13)	.41 (.13)	.38 (.15)	.32 (.18)
F Statistic for openness terms	.19	.12	.24	**.00**	**.00**	**.00**	**.00**	**.00**	**.00**	**.01**	.29	.37	.41	**.02**	**.01**	**.02**	**.05**	**.08**	**.03**	**.01**	**.02**
Regression R^2	.59	.60	.60	.63	.63	.63	.63	.72	.72	.72	.67	.67	.67	.73	.75	.75	.75	.72	.72	.73	.77
Sample	136	136	135	150	150	149	133	136	136	135	150	150	149	133	136	136	135	150	150	149	133

Table 4. Trend Tests for Czech and Polish Data

Panel A. Trends in firm-specific variation from 1990 to 2001 in each country, estimated using bimonthly data. Estimates assuming no unit root are coefficients on time index in regressions of levels. Estimates assuming a unit root are intercepts in regressions of first differences.

	Czech Republic			Poland		
	${}_{\varepsilon}\sigma^2_{n\tau}$	${}_{m}\sigma^2_{n\tau}$	$R^2_{n\tau}$	${}_{\varepsilon}\sigma^2_{n\tau}$	${}_{m}\sigma^2_{n\tau}$	$R^2_{n\tau}$
Augmented Dickey Fuller p-level	**0.00**	**0.00**	**0.00**	**0.03**	**0.07**	0.22
Trend tests assuming no unit root						
Dependent variable lag structure [a]	1, 3, 4	5	0	1	1	1
Trend estimate x 10^5	-3.87 [b]	**-2.28** [b]	**-0.00216**	**6.51** [b]	**-4.16** [b]	**-0.0486**
P-level	(0.14)	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**
Trend tests assuming unit root						
Dependent variable lag structure [a]					1	1, 6
Trend estimate x 10^5					2.90 [b]	-0.00494
P-level					(0.84)	(0.61)
Unit root invariant tests [c]						
1% p-level if statistic < -2.65	-0.447	-0.135	-0.722	-0.149	-0.0123	-1.43
2.5% p-level if statistic < -2.15	-0.677	-0.302	-1.13	-0.288	-0.0688	**-2.24**
5% p-level if statistic < -1.72	-0.852	-0.471	-1.44	-0.414	-0.178	**-2.87**

a. Dependent variable lags of one through six two-month periods are assumed initially. A stepwise algorithm eliminates the least significant lag, reruns the regression, and repeats until all remaining lags are significant at 10% p-levels. Zero indicates all were eliminated. Czech sample is 44 bimonthly observations (Sept./Oct. 94 to Nov./Dec. 01); Polish is 45 observations (July/Aug. 94 to Nov./Dec. 01).
b. Reported value is estimate multiplied by 10^6.
c. Using the method of Vogelsang (1998).

Panel B. Tests rejecting equal firm-specific variation across subperiods. F-test degrees of freedom correspond to firm observations. Bootstrap (B) test recalculates average first subperiod firm-specific variations one hundred times using thirty randomly selected stocks each time. This provides a probability distribution for first subperiod average firm-specific variation. The p-level is the mass in the tail of this distribution beyond the second subperiod sample average firm-specific variation. Subperiods are noncontiguous to mitigate autocorrelation and are of equal length. All emerging market stocks are weighted equally regardless of country.

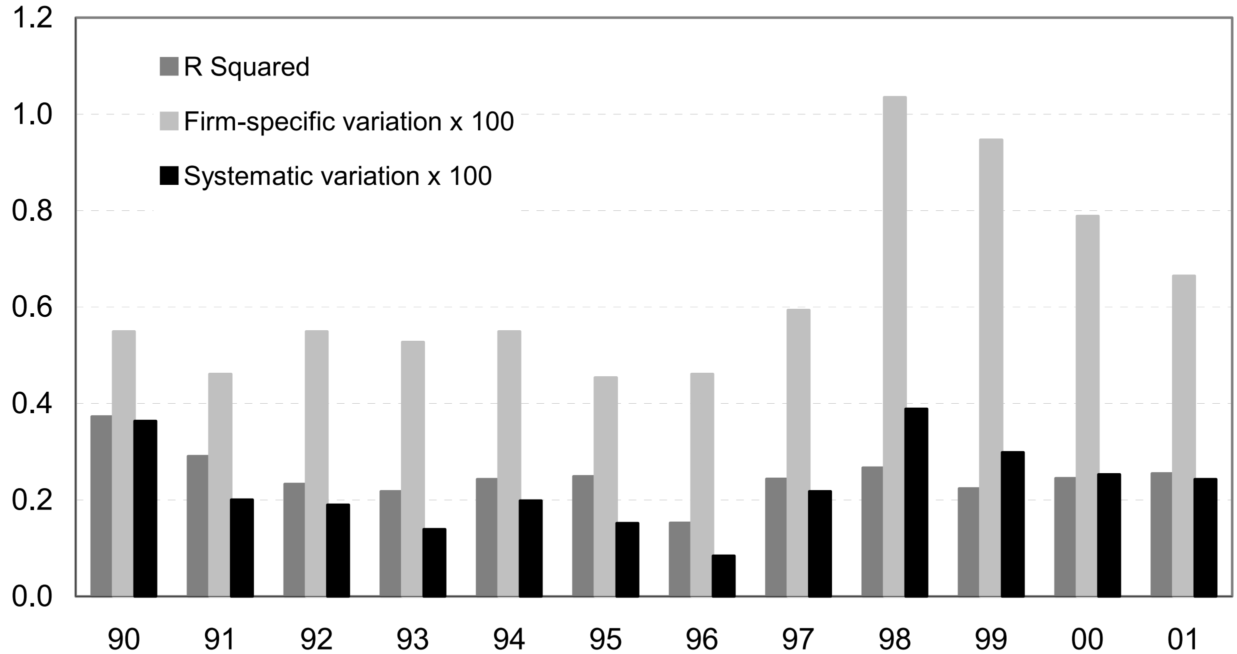
	Czech Republic			Poland		
Comovement measure	${}_{\varepsilon}\sigma^2_{n\tau}$ [a]	${}_{m}\sigma^2_{n\tau}$ [a]	$R^2_{n\tau}$	${}_{\varepsilon}\sigma^2_{n\tau}$ [a]	${}_{m}\sigma^2_{n\tau}$ [a]	$R^2_{n\tau}$
Mean variation, 95 to 97	8.28	0.340	0.0418	0.0954	0.0425	0.346
Mean variation, 99 to 01	5.73	0.080	0.0121	0.1414	0.0119	0.095
Change in mean variation	**-2.55**	**-0.260**	**-0.0297**	**0.0460**	**-0.0306**	**-0.251**
F-test p-level to reject no change	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**
B- test p-level to reject no change	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**

a. Reported absolute variations are estimates x 10^4.

Figure 1. Changing Comovement in Individual Stocks in Emerging Market

Annual comovement measures are derived from market model regressions of weekly individual stock returns on domestic and US market returns, and include the average regression R^2, the systematic (explained) variation in the average stock's returns, and the firm-specific (residual) variation in the average stock's returns.

Panel A. Averages with each country weighted equally



Panel B. Averages across all stocks without regard for country

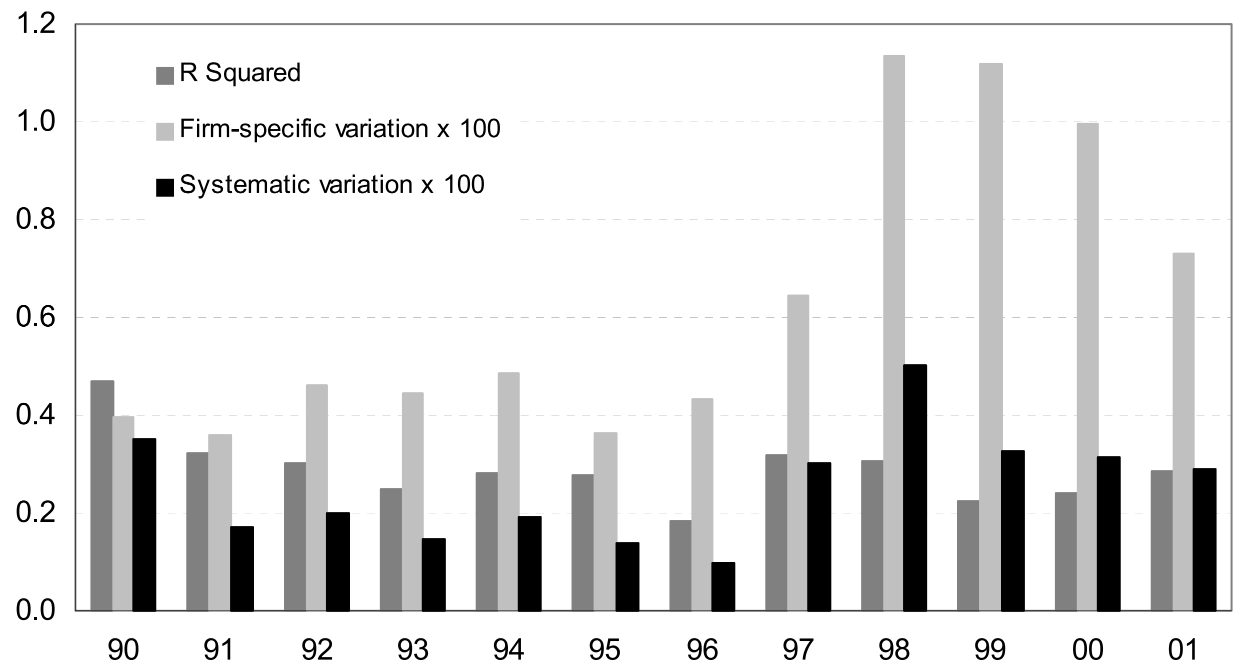
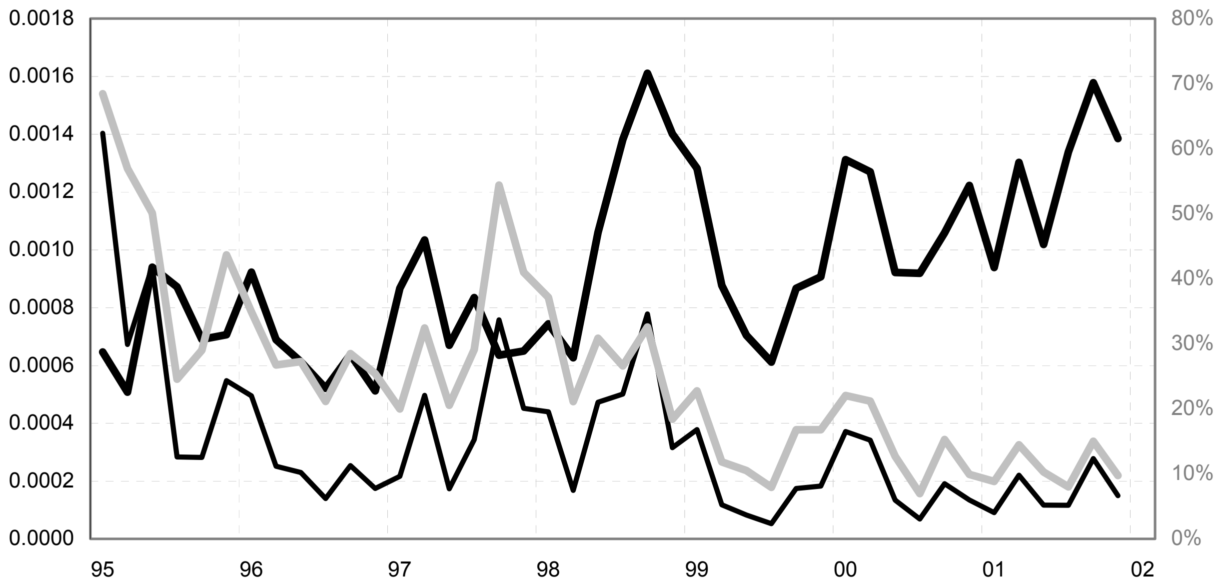


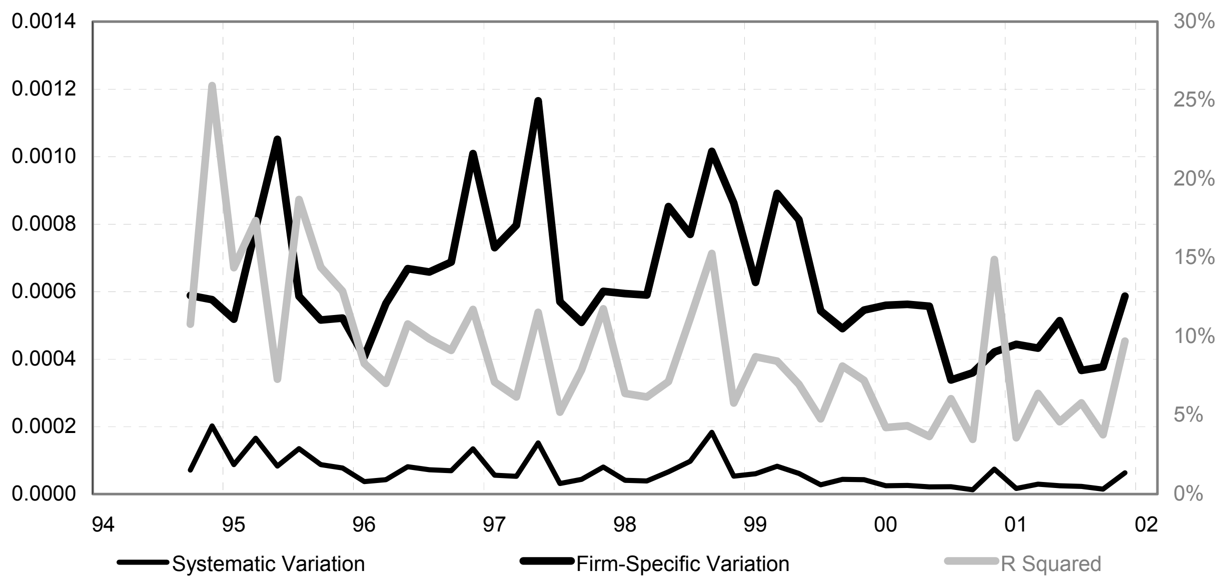
Figure 2. Variance Decomposition of Individual Stock Returns in Poland and the Czech Republic

Bimonthly comovement measures are derived from market model regressions of daily individual stock returns on domestic and US market returns, and include the average regression R^2, the systematic (explained) variation in the average stock's returns, and the firm-specific (residual) variation in the average stock's returns.

Panel A. Poland



Panel B. The Czech Republic



Note: Systematic and firm-specific variation are plotted on the left axis, R squared is on the right axis. Table 4 variation tests are based on a single regression for each firm across each subperiod, and are therefore not directly comparable with the annual regression figures displayed here.