THE WILLIAM DAVIDSON INSTITUTE
AT THE UNIVERSITY OF MICHIGAN BUSINESS SCHOOL

The Information Content of Stock Markets: Why do Emerging Markets have Synchronous Stock Price Movements?

By Randall Morck, Bernard Yeung, and Wayne Yu

Working Paper Number 44a
February 1999

Comments Welcome

First Draft: May, 1997
Third Draft: Jan 14th, 1999
Comments Welcome

The Information Content of Stock Markets:

Why Do Emerging Markets Have Synchronous Stock Price Movements?

Randall Morck* Bernard Yeung** and Wayne Yu***

*University of Alberta, randall.morck@ualberta.ca, (403) 492-5683
**University of Michigan, byeung@umich.edu, (734) 763-6391
***Queens University, wyu@business.queensu.ca, (613) 545-2366
This research was supported by the NTT Fellowship program at the University of Michigan Business School and by the Center for International Business Studies at the University of Alberta. We are grateful for superb computer work by Rade Mladenov, and for helpful assistance from Datastream. We also thank Alan Deardorff, Roger Gordon, Mark Huson, Vikas Mehrotra, Ted Neave, Gerard Roland, Andrei Shleifer, Jan Svejnar, Kathy Terrell, Rob Vishny, David Weinstein and participants in the June 1997 William Davidson Institute research workshop. We also thank seminar participants at the University of Arizona, the British Columbia, George Mason University, Texas A & M University, Queen's University, Tulane University, the University of Maryland, the European International Business Association 1997 Meetings, the Western Economic Association 1998 Meetings and the 1998 joint NFA/APFA conference.
JEL classification codes: G38 (financial economics - government policy and regulation); N20 (economic history - financial markets and institutions); O16 (economic development - financial markets); P16 (political economy of capitalism)

The Information Content of Stock Markets:

Why Do Emerging Markets Have Synchronous Stock Price Movements?

Randall Morck, Bernard Yeung, and Wayne Yu

Abstract

Stock prices move together more in low income economies than in high income economies. This is because they capitalize both more market-wide risk and less firm-specific risk in low income economies. This finding is clearly not due to market size differences, and is only partially explained by slightly higher fundamentals fluctuation in low income economies. However, variables measuring investor protection and government honesty do appear to explain these differences. We conjecture that a country's institutional development affects the returns to gathering firm-specific and market-wide information differently, and promotes informed trading as opposed to noise trading.

1. Introduction

Stock returns reflect new market-level and firm-level information. Intuitively, as more firm-specific information is incorporated in stock prices, they should move together less. We find that stock prices in high *per capita* GDP economies do move in a relatively unsynchronized manner. In contrast, stock prices in low *per capita* GDP economies tend to move up or down together. A time series of stock price synchronicity for the U.S. market also shows that the degree of co-movement in U.S. stock prices has declined, more or less steadily, through the 20th century.[1]

These findings are clearly associated with income, not economy or stock market size. The stock markets of small high income countries typically have much lower stock price co-movement than stock markets in large developing economies, on which several-fold more stocks are nonetheless traded.

We consider two plausible classes of explanations for our finding. The first of these hinges on inherent economic reasons for stock return synchronicity. For example, in a small, undiversified economy, firms' earnings may be naturally highly correlated. Stock prices in such an economy should arguably move in tandem. We call such stories *structural explanations*. Although low income economy stocks do have slightly more structurally based risk, these explanations cannot fully account for differences in stock return synchronicity across countries. The second class, which we call *institutional explanations*, hinges on highly synchronous stock returns reflecting a paucity of firm-specific information relative to macro-economic fluctuations. That is, emerging markets may capitalize firm-specific information poorly and stock price co-movement differences reflect differences in the information content of stock prices.

In our formal statistical analysis, we examine both sorts of explanations of the relationship between *per capita* GDP and stock price synchronicity. Economies with more volatile fundamentals do have stock markets with more market-wide risk, but our best efforts to control for this effect do not render *per capita* GDP insignificant. Adding institutional variables that measure investors' legal protection from corporate insiders and the extent of official corruption does render *per capita* GDP insignificant

We show that shareholder protection laws are associated with increased firm specific-price variation, while property rights respecting government lowers market-wide price variation more than firm-specific price variation. We conjecture that poor investor protection lets corporate insiders appropriate firm-specific abnormal profits and that this impedes capitalization of firm-specific information by discouraging risk arbitrage on individual stocks. Unless corporate insiders can collude across the entire economy, they could not similarly appropriate market-wide abnormal profits, so the capitalization of market-wide information need not be impeded. Moreover, we further conjecture that official corruption might render effort to profit from firm-specific and market-wide economic information futile. This could discourage informed trading based on economic fundamentals, and thereby render stock markets vulnerable to fluctuations driven by political factors (and possibly noise traders).

While our econometric evidence is consistent with these conjectures, we recognize that our proof is incomplete. We invite alternative explanations of our very robust finding that stock returns are synchronous in low income economies and asynchronous in high income economies, regardless of economy size and after controlling for many aspects of fundamentals volatility. Yet, the anomaly dissipates when we include variables measuring investors' protection against rapacious corporate insiders and the level of honesty of government. Alternate explanations must explain the importance of shareholder rights laws and honest government in explaining stock price synchronicity.

In the next section, we review the stylized facts that motivated this research. In section three, we develop our synchronicity measures. In section four, we discuss the plausible explanations for observed stock price synchronicity, and thus the independent variables we adopt. In the fifth and sixth sections, we present our empirical specifications, report our results, and conduct various robustness checks. Section seven concludes.

2. A New Anomaly?

Emerging Markets and Developed Economies

Table 1 compares the synchronicity of stock returns in some representative stock markets during the first 26 weeks of 1995. Note that in emerging markets like China, Malaysia, and Poland, most stock prices routinely move in the same direction during a given week. In these markets, it is not atypical for well over 80% of stocks to move in the same direction in a given week. In Poland, 100% of traded stocks move in the same direction during three of the twenty six weeks. In contrast, in Denmark, Ireland and the United States, there are no instances of more than 57% of the stocks moving in the same direction during any one week in this period despite an ongoing "bull market" in the United States. Figure 1 shows the sharp contrast between Chinese, Malaysian and Polish stocks on the one hand, and U.S. stocks on the other. (Danish and Irish stocks are not shown to make the contrast clearer, but would resemble the line for U.S. stocks)

[Figure 1 and Table 1 about here.]

Note that we can cleanly reject the trivial explanation, based on the Law of Large Numbers, that markets with many stocks should show less dispersion around the mean. First, the stock markets of Denmark and Ireland resemble the US market, despite listing substantially fewer securities than China or Malaysia. Below we shall show that stock price co-movement is negatively correlated with *per capita* income, regardless of market or economy size. Second, the contrast between the U.S. market and emerging markets is too stark to be a statistical artifact. The null hypothesis that the fraction of stocks moving together in the U.S. is the same as in the merging markets can be rejected in 43 out of 52 weeks for China, 37 for Poland and 45 for Malaysia, but only 18 for Denmark and New Zealand, and 2 for Ireland.[2]

The differences are economically as well as statistically significant. Using the weekly data for the whole of 1995, 79% of the stocks in China move together in an average week.[3] The same calculation gives 77% of the stocks in Malaysia moving together, and 81% in Poland. In contrast, in the United States, Denmark and Ireland, the fraction of stocks gaining value in a given week typically roughly equals the fraction losing value.

The United States as an Emerging Economy?

Figure 2 plots the fraction of U.S. stocks that move together (excluding stocks whose prices do not move) against time, from 1926 to 1995. In the earlier half of this period, the fraction of stocks that move together is comparable to the emerging market's fractions in Table 1. Clearly, as the U.S. economy developed, price synchronicity decreased.

[Figure 2 about here.]

The number of stocks traded in the U.S. has increased over time, so the fraction moving together should fall towards the theoretical mean of 50% (assuming that weekly return is approximately zero) under the hypothesis of independence. Figure 2 addresses this problem by graphing the fraction of 400 randomly selected stocks that move together each year. The same decline remains apparent. The decline in synchronicity in U.S. stock prices is not due to the increase in the number of traded stocks.

As a robustness check, we develop an alternative measure of stock price synchronicity using the linear regression

$$r_{i,t} = \alpha_i + \beta_t \, r_{m,t} + \epsilon_{i,t} \tag{1}$$

where $r_{i,t}$ is stock i's return in week t and $r_{m,t}$ is a market index return. A high R^2 in such a regression indicates a high degree of stock price synchronicity. Figure 3 graphs the average R^2 across stocks, based on monthly returns, for each non-overlapping 5-year period from 1926 to 1995 using all available stocks, and then graphs the average R^2 constructed using the largest 300 stocks (ranked at the beginning of each 5-year period) and an equally-weighted market index based on those stocks only. A decline in both R^2s from the 1930s to the present is apparent.

[Figure 3 about here.]

Thus, the behavior of U.S. stock prices earlier in the twentieth century was similar to that of emerging market stock prices now.

3. Stock Price Synchronicity Measures

The most direct measure of synchronicity in stock price movements in a given country is a formalization of the discussion surrounding Table 1. We therefore construct a stock price synchronicity measure for country j, denoted f_j, based on the fraction of stocks in each week in each market that have returns of the same sign,

$$f_{jt} = \frac{\max[n_{jt}^{up}, n_{jt}^{down}]}{n_{jt}^{up} + n_{jt}^{down}} \tag{2}$$

where n_{jt}^{up} is the number of stocks in country j whose prices rise in period t and n_{jt}^{down} is the number of stocks whose prices fall. (We drop stocks whose prices do not move in a given period to avoid bias due to non-trading.) We define f_j as the average value of f_{jt} across all relevant periods. The values of f_j must lie between .5 and 1, and the middle panel of Table 2 ranks countries by this variable.[4] Figure 4a illustrates these rankings with their respective countries labeled.

The leftmost panel of Table 2 ranks countries by *per capita* GDP. Generally, high income countries have low f_js and the US has the lowest f_j. In contrast, low income economies have the highest f_js. The five highest f_js are for Poland, China, Taiwan, Malaysia and Turkey. Figure 5a graphs each country's f_j versus the logarithm of its *per capita* GDP, illustrating a clear and statistically significant negative correlation (ρ = -.571, prob-value = .001).

[Table 2 and figures 4a to 5b about here.]

An alternative way to distinguish firm-specific stock price movements from market-wide price movements is to run the regression

$$r_{it} = \alpha_i + \beta_{1,i}\, r_{m,jt} + \beta_{2,i}[r_{US,t} + e_{jt}] + \epsilon_{it} \tag{3}$$

where i is a firm index, j a country index, t a two week period time index, $r_{m,jt}$ is a domestic market index, and $r_{US,t}$ is the U.S. market return. The rate of change in the exchange rate per U.S. dollar is e_{jt}.[5]

We add the U.S. stock market return because most economies are at least partially open to foreign capital. The expression $r_{US,t} + e_{jt}$ translates U.S. stock market returns into local currency units. We use biweekly returns to overcome thin trading problems. These are compounded from daily *cum* dividend returns. Newly listed or recently delisted stocks are included only if we have more than 30 weeks of data for the year.[6] For stock markets in the Eastern hemisphere, we lag U.S. market returns by one day to account for time zone differences. Thus, if the biweekly stock return in Japan used data from May 7 1995 to May 21 1995, the contemporaneous U.S. market return uses data from May 6 1995 to May 20 1995. When we look at the U.S., we set $\beta^T_{2,i}$ to zero.

Our daily *cum dividend* stock returns are for all companies listed in *Datastream* as of January 1997. *Datastream* also allowed us access to data for companies no longer traded, but whose prices were formerly covered. This yields a total cross section of 15,920 firms spanning 40 countries. *Datastream* returns are either unavailable or seriously incomplete until the mid 1990s for most countries, so we focus on 1993 through 1995, and use only 1995 data in our international cross-sectional analysis, although we reproduce our results using 1993 and 1994 data as a robustness check.

Datastream claims that its stock returns are adjusted for splits and other unusual events, but our data do contain some very large stock returns. If these reflect coding errors, they could add noise or bias our results. On the assumption that coding errors are over-represented in extreme observations, we trim our data by dropping biweekly observations where a stock's return exceeds 25% in absolute value.

The R^2 of regression (3), R_{ij}^2, measures the percent of the variation in the biweekly returns of stock i in country j in year T explained by variations in country j's market returns and the U.S. stock market's returns.

Given this, we define

$$R_j^{2\,T} = \frac{\sum_i R_{i,j}^{2\,T} \times SST_{i,j}^T}{\sum_i SST_{i,j}^T} \tag{4}$$

as an alternative stock price synchronicity measure, where $SST_{i,j}$ is the sum of squared total variations.

The right most panel of Table 2 ranks countries by their R_j^2s, and Figure 4b graphs this ranking. The five lowest R^2s are for the U.S., Ireland, Canada, the United Kingdom, and Australia. OECD countries' R^2s tend to be below the median. The only rich countries with notably high R^2s are Japan, whose stock market is regarded by many practitioners as notoriously bubble-prone; Italy, which Zingales (1994) shows to have an extraordinarily poorly functioning stock market; and Spain. With these exceptions, low income economies account for the higher R^2s. The five highest are for Poland, China, Malaysia, Taiwan and Turkey. Figure 5b graphs each country's R^2 versus the logarithm of its *per capita* GDP, again making a clear and significant negative correlation evident ($\rho = -.394$, prob-value < 0.02). In short, the R^2s and f_js behave similarly.

In summary, we find a negative relationship between stock price synchronicity and *per capita* income.

4. Explanations

What explains the highly significant negative correlation between stock price co-movement and *per capita* GDP? *Per capita* GDP is a general measure of economic development. In this section, we hypothesize that particular economy characteristics, or dimensions of economic development, might plausibly be related to stock price synchronicity, and that *per capita* GDP might proxy for these effects. Our strategy is to see which development measures are most correlated with stock price synchronicity and to ask whether they render *per capita* GDP insignificant in multivariate regressions. From this exercise, we hope to learn what economic linkages might underlie the correlation between stock price synchronicity and *per capita* income.

Stock Price Synchronicity Dependent Variables

Our two stock price synchronicity measures, f and R^2, are unsuitable as dependent variables in regressions because they are bounded by the intervals [0.5, 1] and [0, 1] respectively. We therefore adopt a standard econometric remedy to such problems and apply logistic transformations to these variables. Our left hand side variables are thus

$$\Psi_j = \log\left(\frac{f_j - .5}{1 - f_j}\right) \tag{5}$$

$$\Upsilon_j = \log\left(\frac{R_j^2}{1 - R_j^2}\right) \tag{6}$$

Ψ_j maps f_j from the interval [0.5,1] to $\mathbf{R}$, the set of real numbers from negative to positive infinity. Υ_j similarly maps R^2_j from the unit interval to $\mathbf{R}$. The construction of R^2_j and f_j are as described in Section 3. Both variables are based on 1995 data.

Controlling for Stock Market Size

By construction, the co-movement measures (R^2 and f) decrease with the number of securities in a country's stock market. If the sign of stock return is random, the Law of Large Numbers pushes f_j to 0.5 as the number of stocks trading becomes large because

$$f_j = E[f_{jt}] = E\left[\frac{\max[n_{jt}^{up}, n_{jt}^{down}]}{n_{jt}^{up} + n_{jt}^{down}}\right] \rightarrow \frac{1}{2} \tag{7}$$

for a short window in which market return is close to zero. Also, the market index on the right-hand side of equation 3, the basis of the construction of our R^2 price synchronicity variable, is a weighted average of the individual stock returns used as dependent variables. This produces a similar spurious correlation between number of securities listed and this price synchronicity variable. Intuitively, in a market with few securities, each individual security is a more important part of the market index. Thus, higher synchronicity might simply reflect fewer traded stocks. To control for this, we use the *logarithm of the number of listed stocks* in 1995 in each stock market, from *Datasteam*. However, a correlation between synchronicity and market size may also reflect better functioning stock markets acquiring more listings. By controlling for number of listings, we perhaps bias downward the significance of variables that measure stock market quality.

Regression Framework

In the following analysis, we propose hypotheses as to why certain economy characteristics might be related to stock price synchronicity. We construct a vector $\mathbf{x}_j$ measuring these characteristics, and include it in regressions of the form

$$\Psi_j \text{ or } \Upsilon_j = c_0 + c_1 \log y_j + c_2 \log n_j + \mathbf{c} \cdot \mathbf{x}_j + u_j \tag{8}$$

where Ψ_j and Υ_j are our logistically transformed price synchronicity variables, y_j is per capita GDP, n_j is the number of listed stocks, and u_j is a random error term. Our objective is to see which characteristics significantly explain stock price synchronicity and render *per capita* GDP. insignificant.

5. Structural Explanations

The first class of explanations we propose to explain the negative correlation between stock price co-movement and *per capita* income depend on some economies being innately more prone to economy-wide shocks. We consider some specific ***structural variables*** that might indicate such a vulnerability: economy size, macroeconomic volatility, and economy diversification. Since these may not encompass all sources of market-wide price movement, we also construct a measure of earnings co-movement for each economy using standardized firm-level accounting data.

Structural Explanation Independent Variables

A description of each structural independent variables follows.

Economy's geographical size

The geographical size of the economy (rather than the number of listings in its stock market) may matter in at least two ways. First, economic activity in small economies may be concentrated in a small geographical area, allowing local "acts of God" to have market-wide asset pricing effects. Second, small economies may be more culturally homogenous, allowing for less divergence of beliefs about stock prices.

To capture any tendency of smaller economies to have more highly synchronous stock returns, we use the *logarithm of geographical size* (in square kilometers) for each country. We use the *logarithm of population* as a robustness check.

Macroeconomic Instability

Some economies may have unstable market fundamentals because of macro-economic instability. In these economies, mercurial market fundamentals may overwhelm firm-specific information in determining stock prices, so that stock prices tend to move together. If poor economies are more volatile, our finding could follow.

To measure macroeconomic instability, we use the *variance of per capita GDP growth* for each country, with *per capita* GDP measured in nominal US dollars, estimated from 1990 to 1994. We use the *variance of inflation* across the same period as a robustness check.

Economy diversification

High stock price co-movement may also reflect a lack of diversity among listed firms. In some economies, listed firms may be concentrated in a few industries. Consequently, listed firms' fundamentals may be highly correlated and their stock prices highly synchronous. Undiversified economies should therefore exhibit more stock price synchronicity than diversified ones. If poor countries are relatively undiversified, this might explain our finding.

Alternatively, some economies may be dominated by a few very large firms. If most other firms are suppliers or customers of these dominant firms, a high degree of stock price synchronicity may ensue. If poor countries' economies depend disproportionately on a few large firms, our finding could follow.

To capture these effects, we construct an *industry Herfindahl index* and a *firm Herfindahl index* for each country. These are constructed using 1995 *Datastream* sales data. The *industry Herfindahl index* is based on *Datastream*'s industry classification (roughly equivalent to 2 or 3 digit SIC codes). High values of the Herfindahl indexes indicate a lack of industry diversity and the dominance of a few large firms respectively.[7]

Synchronous fundamentals

Firm fundamentals might move together more in some economies than in others. For example, this should occur if highly diversified conglomerates account for a larger fraction of listed firms. Widespread intercorporate ownership might also cause firm fundamentals to move together, as this implicitly causes some firms' performance to depend on that of other firms. Generally, if factors such as geographical size, volatility, diversification; or other economy characteristics cause firms' fundamentals to be more synchronized in poor economies than in rich ones, our result might ensue.

To capture directly the general synchronicity of firm-level fundamentals, we construct an *earnings co-movement index.* To do this, we first regress

$$ROA_{i,j,} = a_i + b_i \times ROA_{m,j,} \tag{9}$$

for each firm i in each country j. $ROA_{i,j}$ is a firm's returns on assets, calculated as annual after tax profit plus depreciation over total assets.[8] $ROA_{m,j}$ is the value weighted average across all firms in the sample. We then average the R^2s of these regressions to construct a weighted average R^2 for each country, which is our *earnings co-movement* measure.

$$Earnings\ Co\text{-}movement\ Index = \frac{\sum_i R_{i,j}^2(ROA) \times SST_{i,j}(ROA)}{\sum_i SST_{i,j}(ROA)} \tag{10}$$

This is fully analogous to using the R^2 from equation 3 as a stock price synchronicity measure, but measures the synchronicity of firm fundamentals instead. We expect fundamentals synchronicity to be positively related to stock return synchronicity.

Firm level accounting data are sparse for some countries, and completely unavailable in a few, especially prior to the mid 1990s. Using more years of data arguably allows better regression estimates, but also worsens Datastream's backfill problem. We use five years of data from 1993 to 1997. Due to missing date, we can run firm-level *ROA* regressions in only 24 countries.[9] To avoid the loss in sample size, we conduct our empirical investigation both with and without the earnings co-movement index.

The Relationship of Stock Price Synchronicity to the Structural Variables

The first two panels of Tables 3a and 3b display univariate statistics and simple correlation coefficients for our stock price synchronicity variables, the logarithms of *per capita* GDP and the number of listed stocks, and the structural variables listed above. The logarithm of the number of listed stocks is negatively correlated with price synchronicity, as predicted.

[Tables 3a and 3b about here]

The signs of the correlations of stock price synchronicity with the structural variables are largely as expected. Price synchronicity is negatively correlated with a country's geographical size and positively correlated with both GDP growth variance and earnings co-movement, though these correlations are insignificant. However, more diversification is not consistently correlated with less stock price synchronicity. Overall, these correlations suggest that no one structural variable is likely to explain the link between *per capita* GDP and stock price synchronicity.

Table 3b also shows that *per capita* GDP is significantly negatively correlated with a country's geographical size, and essentially uncorrelated with diversification. Clearly, our basic result is not due to low income countries being small and undiversified.

Table 4 displays multivariate regressions, as in equation 7, to see if our structural variables, acting in concert, might explain the link between *per capita* GDP and stock price synchronicity. First, note that there is indeed a "small country effect" in this multivariate setting - stock prices move together less in larger countries. However, this does not explain away the correlation between price synchronicity and *per capita* GDP, as that variable remains highly significant. F-tests indicate that the structural variables taken together are highly significantly correlated with stock price synchronicity. Including them does not, however, render *per capita* GDP insignificant. This suggests that *per capita* GDP is not proxying for any or all of our structural variables, and that factors beyond our structural explanations underlie the negative relationship between *per capita* GDP and stock price synchronicity.

[Table 4 about here]

Robustness Checks

Some *caveats* are in order. First, we can never categorically reject the structural hypothesis using regressions of this sort. Additional structural variables can always be found, and some combination of these may explain price synchronicity and render *per capita* GDP insignificant. Second, our structural variables are doubtless noisy. Third, earnings co-movement is not necessarily successful in capturing fundamentals co-movement, as stock prices are based on expected future cash flow, not current earnings. The dependence of price fundamentals on accounting variables, as well as historical macroeconomic variables, can be complicated.

Since we are running country-level cross-sectional regressions, our sample size is quite limited. We cannot add variables indefinitely without exhausting our degrees of freedom. Our robustness tests therefore consist of statistical fit tests, replacing structural variables with alternatives or adding only a small number of additional variables at a time.

Outliers

We are concerned that our regression results are driven by outliers. We conduct diagnostic checks on the residuals obtained in Table 4. We find no outliers using *Student R* and *Cook's D* measures.

Transitory Effects in 1995

One way to check whether our results are due to transitory time effects is to repeat our regressions using other years' data. We can only repeat the regressions using 1993 and 1994 data because of missing data problems in Datastream for earlier years. We obtain identical conclusions using the two earlier years.

The major transitory event in 1995 was the Mexican Peso depreciation. This very major macroeconomic event could have driven up the synchronicity of stock prices in Latin American countries. We repeated our regressions dropping all Latin American countries in our sample. Our results are not affected.

Alternate Stock Return Synchronicity Measures

Our stock return synchronicity indexes are necessarily arbitrary. However, both Ψ_j, and Υ_i give qualitatively similar results, despite their very different construction.

The index, Υ_i, is a logistic transformation of the stock return R^2, which is estimated using value-weighed market return indexes. Our results are qualitatively unaffected whether we use value-weighted or equal weighted market return indices.

In estimating the stock return R^2, we incorporate the possibility that stock prices in other economies are influenced by the US market. Capital flow barriers may isolate some emerging markets, however this is not a serious problem. If these stock markets are indeed isolated, adding the US return should not increase the R^2 for such countries. Also, Ψ_j, does not have this problem, yet it behaves like Υ_i. The US stock return R^2 is constructed without allowing for the influence of foreign markets on US stock prices. That could create a downward bias in the estimated US R^2. However, our results are also qualitatively unchanged if we drop the U.S. from our sample.

Alternative Ways of Dealing with Market Size

By construction, the synchronicity indices are affected by the number of stocks in a market. We control for this by explicitly introducing the logarithm of the number of listed stocks as an independent variable. Another way to overcome the influence of number of stocks is to constrain the number of stocks we use to construct our synchronicity indices. The median number of stocks in the stock markets in our sample is 300. For countries with fewer than 300 stocks, we use all stocks to construct the information content measures. For countries with more than 300, we randomly select 300 stocks. We then recalculate Table 4 twenty times using different randomly drawn firms each time. In every run, the results are qualitatively identical to those we have reported.

Alternate Measures of Country Size

Using the logarithm of population rather than that of geographical area does not affect our results.

Unstable Monetary Policies

If poor countries' stock markets are volatile because of swings in monetary policy, the *variance in the inflation rate* might be a better variable than the variance of GDP growth for explaining stock price synchronicity. This variable, like GDP growth variance, enters with the right sign but is even more insignificant than the variable it replaces.

Commodity-Based Economies

If poor countries are disproportionately dependent on raw materials production, and these industries are more pro-cyclical than others, our basic finding might follow. Including either the fraction of the stock market capitalization due to raw materials producers, or a dummy set to one if raw materials are the country's most important sector, also changes nothing. This structural theory is also apparently not responsible for our basic finding.[10]

Alternative Measures of Fundamentals Co-movement

Our earnings co-movement variable is doubtless noisy. Using too many years of data makes the variable too dependent on the past, which is likely inappropriate for fast changing economies. On the other hand, using too few years of data makes it difficult to estimate the variable precisely. The earnings co-movement variable is constructed using five years of annual data. We experimented using six and seven years of data instead. Both generate qualitatively similar results to those reported. We use asset value weighted ROA market indices. Equal weighting also leads to similar findings, as does using industry average *ROA*s regressed on an economy average.

As another measure of disparity in firm fundamentals, we use the cross-sectional variance of firm *ROA* (returns on assets) in each country. We average these cross-sectional variances over 1992, 1993, and 1994. Adding this variable does not change our results.

In conclusion, after treating an exhausting list of robustness concerns, we find that our results remain intact.

6. Institutional Explanations

Stock value is affected by information. Grossman (1976) shows how public investors who accumulate information can gain by trading against less informed investors. This trading moves prices, and consequently informed traders' information is capitalized into stock prices. Our institutional explanations are based on the hypothesis that this process of capitalizing information into stock prices depends on an economy's institutional structure.

Information Capitalization

In theory, investors should value stocks using both macroeconomic and firm-specific information. Macroeconomic information (e.g., inflation forecasts, new international trade rules, new tax rules, etc.) affects many firms' prices simultaneously and often in the same direction.[11] In contrast, firm-specific information (e.g., signs of better management, an impending lawsuit, a competitor's innovation, etc.) affects the value of only one, or at most a few, firms. Firm-specific information also allows investors to forecast firm-level impacts of macro-economic information, so that it can raise some firms' prices and lower those of other firms.

When investors obtain new information, they revise their expectations about a firm's future cash flows and their present value. This capitalization of information, especially firm-specific information, underlies all event studies (MacKinley, 1997). For our purposes, an event study decomposes stock returns into two orthogonal components: $P[r_{it} \mid r_{mt}]$, a projection of r_{it} on the market return, and e_{it}, the component due to firm-specific factors, where

$$r_{it} = P[r_{it} \mid r_{mt}] + e_{it} \tag{11}$$

Although such decompositions also underlie classical asset pricing models, we prefer to approach the topic from the perspective of event studies because this highlights the role of stock markets as information processors, as in Grossman (1976), rather than their arguably simpler role as adjudicators of tradeoffs between risk and return.

Let the variance of $P[r_{it} \mid r_{mt}]$ be σ_m^2 and that of e_{it} be σ_ϵ^2. Fraction $\frac{\sigma_m^2}{\sigma_m^2 + \sigma_\epsilon^2}$ of the variance of r_{it} is attributable to information about market-wide factors, while fraction $\frac{\sigma_\epsilon^2}{\sigma_m^2 + \sigma_\epsilon^2}$ is due to firm-specific information. By construction, the values of R_j^2 in Table 2 are estimates of the weighted average of $\frac{\sigma_m^2}{\sigma_m^2 + \sigma_\epsilon^2}$ for all firms in country j. Hence, R_j^2 measures the extent to which variations in stock returns reflect market-wide information rather than firm-specific information. *Ceteris paribus*, the more readily firm-specific information is incorporated into stock prices, the less synchronous stock price movements should be and the lower the R^2_j should be. The same logic applies to f_j the fraction of stocks whose prices move together. In this sense, R^2_j and f_j measure the relative dearth of firm specific-information in stock prices.

The incorporation of information into stock prices depends on the ability of outside investors first to acquire it and second to benefit from it. Traders who gather and process information, seeking mispriced stocks or portfolios are called "risk arbitrageurs". Risk arbitrageurs accumulate information until the marginal cost of an additional unit exceeds its marginal return (Grossman, 1976). There is a fundamental difference between the marginal costs of trading on proprietary firm-specific information and trading on proprietary market-wide information. Holding a large position in a single stock exposes an arbitrageur to both firm-specific and market risk, while holding a market portfolio of equal value exposes her to market risk only. *Ceteris paribus*, risk-averse risk arbitrageurs should prefer plays based on proprietary information about market-wide effects to plays based on firm-specific information. If both sorts of information cost the same to gather and process, traders should prefer gathering market-wide information, and market-wide information should thus enter prices more readily than firm-specific information.

Some factors may affect the returns of plays based on firm-specific information and returns of plays based on market-wide information differently. This could alter the balance of firm specific and market-wide information capitalized into stock prices. On this basis, we conjecture that the institutional structure of an economy should affect the balance of firm-specific to market-wide information in stock prices through several channels.

First, rules and regulations that insure reliable accounting data essentially put large amounts of firm-specific information in the public domain. Without reliable accounting data, the already higher risk in firm-specific risk arbitrage is perhaps magnified. Thus, good accounting information, to the extent we can measure this concept, should reduce stock price synchronicity.

Second, the widespread abuse of public investors by corporate insiders might impede the capitalization of firm-specific information into stock prices. La Porta *et al.* (1998) show that many countries with otherwise advanced government and legal systems neglect investor protection. In such countries, corporate insiders could readily appropriate abnormally high firm-specific profits with public investors none the wiser. In contrast, corporate insiders who appropriated their firm's share of abnormally high market-wide profits would be exposed as even less trustworthy custodians of public investors' money - unless corporate insiders in all other firms acted similarly, a collusion that may be difficult to guarantee. For example, corporate insiders whose firms need new capital might release some of the abnormally high profits to public investors to make their firms' shares more attractive. Since corporate insiders need not collude across firms in this way to appropriate firm-specific abnormally high profits, public investors would not have uncontested property rights over such returns. Consequently, predicting which firms might have abnormally high firm-specific returns would be of little profit to risk arbitrageurs, but predicting economy-wide economic fluctuations might still remain profitable. The widespread abuse of public investors could therefore lead to a relative reduction in the amount of firm-specific information capitalized into stock prices and a consequent increase in stock return synchronicity.

Third, a general disrespect for property rights might affect stock price behavior. In many low income economies, governments and courts are mercantilist devices for redirecting wealth towards an entrenched elite. This lets politicians "shut down [a] business, kick it out of its premises, or even refuse to allow it to start" (Shleifer, 1994, p. 97) using a variety of tactics including open legislation, licensing requirements, repudiating of commitments, and nationalization. Corporate value can also be affected by ill-advised legislation and government interventions stemming from random and unchecked pro-activism combined with a lack of respect for private property rights. In such a setting, corporate earnings are difficult to predict, being driven more by rent-seeking, corruption, and government intervention than by economic fundamentals.

Risk arbitrageurs might see little profits from heavy investment in forecasting either economy-wide or firm-specific abnormal profits in pervasively corrupt economies. Economic fundamentals may be largely irrelevant to the fortunes of companies, and political factors may be too mercurial to justify extensive risk arbitrage. And even if risk arbitrageurs did predict political events successfully, their property rights over their arbitrage profits may be tenuous in a generally corrupt economy, leaving them a meager and uncertain return. Public investors might buy and hold diversified stock portfolios if the stocks have appropriately low prices; betting on the future development of the country's institutions. As a consequence, emerging economy stocks may behave like contingent claims on the country's institutional structure. Stocks in such a country might be buffeted by both economy-wide and firm-specific risk due to changing perceptions about political factors, though one might expect political factors to have predominantly market-wide effects. These additional components of stock return risk might explain the higher share price synchronicity in emerging markets.

Endemically corrupt institutional environments might therefore impede the capitalization of information of any sort into stock prices. Delong *et al.* (1989, 1990) argue that stock markets bereft of informed traders might be characterized by large fluctuations due to noise trading. If these fluctuations are primarily market-wide, as they propose, endemically corrupt economies should have more stock price synchronicity.

Institutional Explanation Independent Variables

This reasoning suggests an empirically testable negative relationship between our measures of stock price synchronicity and the measures of the sophistication of an economy's institutions. We use the following variables, from LaPorta *et al.* (1997a, b), to capture a country's level of institutional development.

Accounting Standards Index

The variable *accounting standards* is high when a country's disclosure rules make firm-level accounting information relatively useful and trustworthy. It ranges from 36 to 83 and was created by La Porta *et al.* (1998) based on 1990 data from *International Accounting and Auditing Trends, Center for International Financial Analysis* and *Research Inc.* A high index indicates more detailed disclosure requirements.

Anti-director Rights Index

The variable *anti-director rights* is high when corporate insiders are legally accountable to shareholders. This variable is a score card of shareholders' rights against directors in various countries compiled by La Porta *et al.* (1998). It takes values from zero to five according to whether or not shareholders (i) can vote by mail, (ii) are barred from selling the stock a few days prior to a shareholder meeting, (iii) can use cumulative voting for directors, (iv) have legal standing to sue directors or to force the company to buy back their shares, (v) call extraordinary shareholder meetings relatively easily. This variable captures the extent to which public shareholders are protected from unscrupulous corporate insiders.

Good Government Index

The variable we use to capture property rights establishment is *good government.* It is the sum of three indexes from La Porta *et al.* (1998), each ranging from zero to ten, and measuring (i) government corruption, (ii) the risk of expropriation by the government, and (iii) the risk of the government repudiating contracts. All three indices are based on *International Credit Rating*'s assessments between 1982 and 1995. This variable is a measure of the respect government has for property rights, which we take as an indicator of the presence of property rights. We generate similar empirical result when we use a "rule of law" or a "judicial efficiency" index, which are also obtainable from La Porte et al. (1998).

Regressions of Stock Price Synchronicity on the Institutional Variables

Our *good government* and *anti-director rights* variables are available for all countries except China, the Czech Republic, and Poland. The *accounting standards* variable is also unavailable for Indonesia, Ireland, and Pakistan. Our tests each use as many observations as possible.

Tables 3a and 3b report univariate statistics for our institutional variables, as well as their simple correlations with the stock price synchronicity indices Ψ_j and Υ_j, *per capita* income, market size, and the structural variables.

The pattern of the simple correlation coefficients is consistent with better protection of shareholder rights and good government promoting the incorporation of relatively more firm-specific information into stock prices. High stock price synchronicity accompanies low levels of *good government* and *anti-director rights*, and these relationships are highly statistically significant. Synchronicity is also negatively correlated with *accounting standards*, but this relationship is only statistically significant in one-tailed tests.

Table 3b also shows that *Anti-director Rights* are not correlated with good government, consistent with the finding of La Porta *et al.* (1998) that good government does not necessarily imply better protection for investors. Also notice that the institutional environment variables are all significantly correlated with market size (*log number of stock listed*), consistent with more institutionally advanced economies having more listed stocks.

Table 5 shows that the good government and anti-director rights indices remain significantly negatively correlated with stock price synchronicity after controlling for the structural variables (excluding the fundamentals co-movement index, which is available only for a smaller sample of countries), but the accounting standards index becomes insignificant. The structural variables do not remain jointly significant in general when the institutional variables are included, though the probability levels on the joint tests are often below 20%. Notably, the logarithm of *per capita* GDP also becomes completely insignificant when the institutional variables are all included, as in regressions 5.4 and 5.8.

[Tables 5 and 6 about here]

Table 6 reproduces the same regressions, but also includes the fundamentals co-movement index, which reduces the sample from 37 or 34 to only 25 countries. Significance levels are greatly reduced across the board, but good government remains negatively significantly correlated with stock price synchronicity, and *per capita* GDP is insignificant when this variable is included.

In summary, highly synchronous stock prices accompany weak institutions, especially a lack of respect for property by governments. Poor protection of outside shareholders from abuse by corporate insiders is also related strongly to stock price synchronicity in some specifications. Accounting standards appear not to matter greatly. These findings are consistent with these aspects of institutional development underlying our stylized fact that stock prices in low income countries are more synchronous than in high income countries. GDP *per capita* appears to proxy for institutional sophistication.

More Robustness Checks

The results in Tables 5 and 6 survive all the same robustness checks discussed above in connection with Table 4. They are not due to outliers, transitory effects, alternative synchronicity measures, alternative ways of dealing with different size markets, monetary instability, commodity dependence, alternative fundamentals co-movement measures, or fundamentals volatility effects.

Nor are the results in Tables 5 and 6 due to multicollinearity between the institutional variables. The coefficients and significance levels of each institutional variable are preserved when the other two are dropped, as in regressions 5.1 through 5.3 and 5.5 through 5.7.

It would be desirable in principle to add more institutional variables. However, this is impractical given our limited degrees of freedom. We therefore substitute alternate institutional variables for those in Tables 5 and 6. In general, other measures of property rights protection, like the *rule of law index* or *judicial efficiency index* constructed by La Porta *et al.* (1998), behave very much like the good government index. In contrast, we have found no close substitute for the anti-director rights index, so it is perhaps capturing a unique effect related to investor protection.

The size of a country's stock market may be a function of its institutional maturity. We already include the logarithm of the number of listed stocks. Adding *stock market capitalization* or its logarithm as an additional variable does not change our results in either Table 5 or Table 6.

7. Less Firm Specific Risk or More Market Risk?

Our basic finding is that developed economy stocks move together much less than stocks in emerging markets. The good government and anti-director rights indexes appear to be the best measures of institutional development in this context, as including them in regressions renders *per capita* GDP insignificant.

We proposed several institutional explanations above. We first conjectured that poor protection for outsiders from corporate insiders' abuse (and flawed accounting data) might reduce the return to gathering firm-specific information relative to that from gathering market-wide information. We further conjectured that a general disrespect for private property rights might lead to stock return synchronicity because market-wide political risk factors are then dominant. Finally, we conjectured that such a dearth of property rights protection might discourage information capitalization in general, and leaves markets subject to fluctuations due to noise trading. Our results so far are consistent with our conjectures. In this section, we attempt to distinguish these explanations from each other.

One of our measures of stock price co-movement is the R^2s from regressions of stock returns on market indices. When $R^2 = \sigma_m^2/(\sigma_m^2 + \sigma_\epsilon^2)$ is high, is this because σ_ϵ^2 is low or because σ_m^2 is high? Resolving this question allows us to probe more deeply into the reasons why institutional structure matters. If stocks in countries that give public shareholders weak property rights have low values of σ_ϵ^2, which in turn lead to high values of R^2, this is consistent with less firm-specific information being capitalized. In contrast, if high R^2 values are instead associated with high values of σ_m^2 in countries with poor institutions, this is consistent with market-wide political risk factors causing high stock price synchronicity. Note that if some political risks are not market-wide, a slightly higher σ_ϵ^2 might accompany the substantially higher σ_m^2. Finally, if high R^2s are associated with high values of

σ_m^2, we cannot exclude the possibility that market-wide swings in the stock markets of countries with poor institutions might be due to noise trading.

[Figure 6 about here]

Figure 6 addresses this question by displaying the average unexplained variation, σ_ϵ^2, and variation explained by market, σ_m^2, in U.S. stock returns from 1926 to 1995. Each bar represents a 3 year average. It is apparent from Figure 6 that declines in R^2s in the post-war period are mainly due to markets incorporating more firm-specific information, although the size of the variation due to market-wide factors clearly also fell.

[Figure 7 about here]

Figure 7 graphs σ_ϵ^2 and σ_m^2 vs. R^2s for the cross-section of countries in our sample. Both a negative relation between firm-specific price movements and R^2s and a positive correlation between variation explained by market indices and R^2s are discernable.

[Table 7 about here]

Tables 7 and 8 address the cross-section in more detail. Table 7 shows the simple correlations of σ_ϵ^2 and σ_m^2 with our other variables. Stock price synchronicity is positively correlated with high market risk, but not with low firm-specific risk. In contrast, *anti-director rights* is significantly positively correlated with firm-specific risk, but uncorrelated with market-wide risk. *Accounting standards* is correlated with neither risk component, though the signs are negative. The structural variables are uncorrelated with either measure, with the sole exception of large geographical size corresponding to high firm-specific variation.

[Table 8 about here]

Table 8 displays regressions like those in Tables 5 and 6, but using the logarithms of explained and unexplained variances, $\log(\sigma_m^2)$ and $\log(\sigma_\epsilon^2)$, as dependent variables. As in the simple correlations, stronger anti-director rights are associated with more firm-specific price variation. This association is only of borderline significance, however, having a prob-value of .07 in a one-tailed test. The result is consistent with more firm-specific information being capitalized in countries that provide public shareholders better protection against corporate insiders' abuse. Good government, which measures governments' respect for private property, is significantly negatively related to both market-wide stock price variation, $\log(\sigma_m^2)$, and firm-specific stock price variation, $\log(\sigma_\varepsilon^2)$. The former relationship is stronger, which is consistent with the results reported in Table 5 and 6.

The results in Tables 7 and 8 are robust to the same specification changes discussed above in connection with Tables 4, 5, and 6.

In summary, our findings are consistent with the view that stock returns are more synchronous in institutionally deficient countries because of both less firm-specific information and more market-wide fluctuation in stock prices. More firm-specific information appears to enter stock prices in countries that better protect public investors' rights against dishonest corporate insiders. Market-wide fluctuations rise more than to firm-specific price variation in countries whose governments do not respect private property rights. Accounting standards are either poorly measured by our proxy, or do not matter.

8. Conclusions

We present empirical evidence that stock returns are more synchronous in emerging economies than in developed economies. We show that this is not an artifact of structural characteristics of economies, such as market size, economy size, economy diversification, or the volatility or co-movement of stock value fundamentals. Though several of these factors contribute to stock return synchronicity, a large residual effect remains, and this is correlated with measures of institutional development. In particular, stronger shareholder rights against corporate insiders accompany less stock price synchronicity, and this appears to be due to more firm-specific price variation rather than less market-wide variation in stock prices. Also, good government is associated with lower stock price synchronicity, but this effect is due to relatively less market-wide stock price variation. High accounting standards *per se* appear unimportant. We also show that the degree of stock price synchronicity in U.S. stock prices has fallen steadily since the late 1920s, and that this is due to both a fall in market-related variation and a rise in firm-specific price variation.

Grossman (1976) and others argue that firm-specific risk signifies traders capitalizing firm-specific information into stock prices. From this perspective, our results can be interpreted as follows.

1. More firm-specific information is capitalized into stock prices in developed economies than in emerging markets, and this effect is closely associated with the legal protection many developed economies give public shareholders in disputes with corporate insiders.

2. High income economies' stock prices are subject to fewer market-wide fluctuations than are stocks in emerging economies, and this effect is most closely associated with the level of respect governments show for private property rights. These findings are consistent with such fluctuations being due to political factors rather than economic fundamentals. If so, investments in an emerging market are best thought of as bets on improvements in the country's institutional structure. However, we cannot reject the alternative conjecture that, by deterring information capitalization, poor property rights protection renders emerging stock markets vulnerable to swings caused by noise trading.

3. The insignificance of our accounting standards variable suggests that *de jure* standards are of little use without a general climate of accountability.

4. US stock markets once resembled today's emerging markets in these dimensions.

We cautiously suggest that stock markets in emerging economies may be less efficient as processors of economic information than are stock markets in advanced economies. Schumpeter (1934, 1950), Solow (1956), Romer (1986) and others stress the importance of optimal capital accumulation for economic growth. The function of an efficient stock markets is to process information, and thereby guide capital towards its best economic use. To augment the efficiency of their stock markets, countries need laws protecting investors' from rapacious corporate insiders and corrupt officials. In their absence, spastic invisible hands in stock markets may allocate capital poorly and thereby slow economic growth.

Finally, we recognize that these interpretations, though supported to some extent by our findings, remain conjectures. We invite alternative explanations of our highly robust econometric findings.

References

De Long, J. Bradford. Shleifer, Andrei. Summers, Lawrence H. Waldmann, Robert J. (1989) The Size and Incidence of the Losses from Noise Trading. *Journal of Finance* Jul, v44n3, p. 681-696.

De Long, J. Bradford. Shleifer, Andrei. Summers, Lawrence H. Waldmann, Robert J.(1990a) Noise Trader Risk in Financial Markets. *Journal of Political Economy* August, v98n4, p. 703-738.

Grossman, Sanford, (1976) "On the Efficiency of competitive Stock Markets Where Traders Have Diverse Information" *Journal of Finance,* Vol. 31, No. 2 pp. 573-585.

Hayek, Friedreich A. von, (1945) "The Use of Knowledge in Society," *American Economic Review,* Vol. 35 No. 4, pp. 519-30.

La Porta, Rafael, Florencio Lopez de-Silanes, Andrei Shleifer and Robert W. Vishny, (1998) "Law and Finance," *Journal of Political Economy,* forthcoming.

La Porta, Rafael, Florencio Lopez de-Silanes, Andrei Shleifer and Robert W. Vishny, (1997) "Legal Determinants of External Finance," *Journal of Finance,* Vol. 52, No. 3. (July), pp. 1131 - 1150.

MacKinley, Craig A. (1997), "Event Studies in Economic and Finance," *Journal of Economic Literature,* Vol. 35, No. 1, March, pp.13-39.

Roll, Richard, (1992), "Industrial Structure and the Comparative Behavior of International Stock Market Indices", *Journal of Finance,* Vol. 47 No. 1, March, pp. 3-41.

Romer, Paul M. (1986) Increasing Returns and Long Run Growth. *Journal of Political Economy.* October. Vol. 94, No. 5, pp. 10002-1037.

Schumpeter, Joseph A., (1934), *The Theory of Economic Development,* Cambridge Mass: Harvard University Press.

Schumpeter, Joseph A., (1950) *Capitalism, Socialism and Democracy*, 3rd ed. New York: Harper.

Shleifer, Andrei, (1994), "Establishing property rights," *World Bank Research Observer*: Annual Conference Supplement. pp. 93-117.

Shleifer, Andrei and Vishny, Robert W, (1993) "Corruption," *Quarterly Journal of Economics*, Vol. 108 no. 3. (Aug) p. 599-617.

Solow, Robert (1956) A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, February, Vol. 70, pp. 65-94.

Zingales, L. 1994. "The Value of the Voting Right: A Study of the Milan Stock Exchange Experience." *Review of Financial Studies*, 7(1) 125-148.

Table 1. Typical stock return movements in selected emerging and developed stock markets.

	CHINA(N=308)			MALAYSIA(N=349)			POLAND(N=38)			Denmark(N=233)			Ireland(N=57)			U.S.(N=6,889)		
Week	%Up	%Down	%Same	%Up	%Down	%Same	%Up	%Down	%Same	%Up	%Down	%Same	%Up	%Down	%Same	%Up	%Down	%Same
1	32	61	7	18	73	9	97	3	0	50	29	21	39	46	16	47	29	24
2	4	89	6	8	86	6	5	95	0	45	25	30	33	32	35	47	38	15
3	6	88	7	22	69	9	59	31	10	36	33	31	32	40	28	49	37	13
4	7	88	5	1	95	3	3	92	5	27	36	37	33	32	35	54	32	14
5	84	8	7	80	11	9	3	97	0	48	33	18	44	26	30	33	53	15
6	7	50	42	92	2	6	100	0	0	41	30	29	42	39	19	44	43	14
7	59	31	10	77	14	10	15	77	8	41	30	28	42	40	18	57	30	13
8	18	73	9	47	39	13	10	90	0	29	35	36	28	35	37	48	38	14
9	71	22	7	28	60	12	82	13	5	40	33	27	37	42	21	42	43	15
10	93	4	4	13	77	11	95	5	0	23	36	41	25	30	46	44	42	14
11	9	88	3	12	78	9	3	95	3	31	38	31	26	39	35	33	52	15
12	41	51	7	66	23	11	0	92	8	30	37	33	28	39	33	50	37	13
13	89	7	4	53	34	13	15	67	18	21	36	42	35	39	26	41	44	15
14	84	9	6	41	50	8	100	0	0	28	37	35	32	44	25	50	35	15
15	21	73	5	15	73	12	100	0	0	27	43	30	33	39	28	47	37	15
16	18	75	7	23	66	11	56	38	5	30	52	18	28	46	26	45	40	15
17	29	63	8	56	25	19	90	10	0	34	40	26	42	37	21	41	44	15
18	5	92	3	6	87	6	8	92	0	48	33	18	47	37	16	50	35	15
19	35	56	9	33	57	10	41	49	10	39	36	26	35	44	21	46	40	14
20	29	60	11	94	3	3	87	10	3	41	36	22	40	35	25	49	37	14
21	89	8	3	21	72	7	0	100	0	39	35	26	46	37	18	42	44	14
22	21	76	4	51	42	7	92	5	3	38	33	29	40	44	16	46	39	15
23	16	79	5	78	17	5	74	23	3	34	40	26	49	44	07	47	39	14
24	55	37	8	16	77	7	36	51	13	24	40	36	40	33	26	44	41	15
25	4	84	12	72	18	9	41	49	10	22	41	37	49	33	18	52	34	14
26	73	20	7	30	60	9	82	5	13	26	40	34	39	49	12	47	39	14

Based on Datastream daily cum *dividend stock returns.*

Table 2: Countries sorted in the left, center and right panels by *per capita* GDP, the fraction of stocks moving together each week, and the average R^2 of firm-level regressions of bi-weekly stock returns on market indexes in each country, respectively. Returns are trimmed at ±25%.

country	*number of listed stocks*	*1995 per capita US$ GDP*	*country*	*% stocks moving in step (f_j)*	*country*	R^2_j	σ^2_ϵ	σ^2_m
Japan	2276	33,190	United States	57.9	United States	.021	.174	.004
Denmark	264	27,174	Canada	58.3	Ireland	.058	.073	.005
Norway	138	25,336	France	59.2	Canada	.062	.190	.013
Germany	1232	24,343	Germany	61.1	U.K.	.062	.068	.005
United States	7241	24,343	Portugal	61.2	Australia	.064	.149	.010
Austria	139	23,861	Australia	61.4	New Zealand	.064	.111	.008
Sweden	264	23,861	U.K.	63.1	Portugal	.068	.084	.006
France	982	23,156	Denmark	63.1	France	.075	.087	.007
Belgium	283	21,590	New Zealand	64.6	Denmark	.075	.059	.005
Holland	100	20,952	Brazil	64.7	Austria	.093	.061	.006
Singapore	381	20,131	Holland	64.7	Holland	.103	.051	.006
Hong Kong	502	19,930	Belgium	65.0	Germany	.114	.067	.009
Canada	815	19,149	Ireland	65.7	Norway	.119	.086	.012
Finland	104	18,770	Pakistan	66.1	Indonesia	.140	.127	.021
Italy	312	18,770	Sweden	66.1	Sweden	.142	.084	.014
Australia	654	17,327	Austria	66.2	Finland	.142	.113	.019
U.K.	1628	17,154	Italy	66.6	Belgium	.146	.047	.008
Ireland	70	14,186	Norway	66.6	Hong Kong	.150	.118	.021
New Zealand	137	12,965	Japan	66.6	Brazil	.161	.143	.027
Spain	144	12,965	Chile	66.9	Philippines	.164	.145	.029
Taiwan	353	10,698	Spain	67.0	Korea	.172	.174	.036
Portugal	90	9,045	Indonesia	67.1	Pakistan	.175	.140	.030
Korea	461	7,555	South Africa	67.2	Italy	.183	.073	.016
Greece	248	7,332	Thailand	67.4	Czech	.185	.125	.028
Mexico	187	3,944	Hong Kong	67.8	India	.189	.132	.031
Chile	190	3,361	Philippines	68.8	Singapore	.191	.102	.024
Malaysia	362	3,328	Finland	68.9	Greece	.192	.103	.024
Brazil	398	3,134	Czech	69.1	Spain	.192	.067	.016
Czech	87	3,072	India	69.5	South Africa	.197	.074	.018
South Africa	93	2,864	Singapore	69.7	Columbia	.209	.095	.025
Turkey	188	2,618	Greece	69.7	Chile	.209	.086	.023
Poland	45	2,322	Korea	7.3	Japan	.234	.111	.034
Thailand	368	2,186	Peru	7.5	Thailand	.271	.109	.041
Peru	81	1,920	Mexico	71.2	Peru	.288	.128	.052
Columbia	48	1,510	Columbia	72.3	Mexico	.290	.129	.052
Philippines	171	880	Turkey	74.4	Turkey	.393	.218	.141
Indonesia	218	735	Malaysia	75.4	Taiwan	.412	.084	.058
China	323	455	Taiwan	76.3	Malaysia	.429	.079	.059
Pakistan	120	424	China	8.0	China	.453	.079	.066
India	467	302	Poland	82.9	Poland	.569	.118	.156

Due to rounding errors, R^2_j does not exactly match $\sigma^2_m/(\sigma^2_\epsilon + \sigma^2_m)$.

Table 3a: Univariate statistics and simple correlation coefficients between price sychronicity indices, Ψ_j and Υ_j, and structural and institutional variables.

variables	mean	standard deviation	minimum	maximum	Simple Correlation with Ψ	Simple Correlation with Υ_j
Stock Co-movement Indices						
Average Fraction of Stocks Moving the Same Direction as the Market (f_j)	.659	.052	.569	.772	.993 (.00)	.900 (.00)
Logistic Transformation of f_j for country j (Ψ_j)	-.808	.501	-1.84	0.180	1.00 (.00)	.909 (.00)
R square of market model based on weekly data for country j	.169	.099	.0211	.429	.888 (.00)	.949 (.00)
Logistic transformation of R_j^2 for country j (Υ_j)	-1.76	.758	-3.84	-.284	.909 (.00)	1.00 (.00)
Logarithm of Per Capita GDP	8.94	1.30	5.71	10.4	-.512 (.00)	-.457 (.00)
Logarithm of Number Listed Stocks	5.61	1.06	3.81	8.89	-.381 (.02)	-.307 (.06)
Sructural Variables						
Logarithm of Geographical Size	12.7	2.11	6.46	16.12	-.160 (.34)	-.105 (.54)
Variance in GDP growth	.000136	.000215	.0000007	.00120	.0703 (.68)	.0999 (.56)
Industry Herfindahl Index	.113	.0559	.0314	.281	.0116 (.94)	-.0351 (.84)
Firm Herfindahl Index	.0482	.0505	.000123	.219	-.00125 (.99)	-.126 (.46)
Earnings Co-movement Index	.383	.164	.055	.777	.0555 (.80)	.201 (.35)
Institutional Variables						
Good Government Index	23.9	4.98	12.9	29.6	-.552 (.00)	-.527 (.00)
Anti-director Rights Index	2.54	1.24	0	5	-.280 (.09)	-.351 (.03)
Accounting Standards Index	63.7	10.9	36.0	83	-.237 (.18)	-.230 (.19)

Sample is 37 countries, except for the accounting standards index, which is available for 34 countries and the earnings co-movement index, which is available for only 25 counties. Numbers in parenthesis are probability levels at which the null hypothesis of zero correlation can be rejected.

Table 3b: Simple correlation coefficients of structural and institutional variables.

	a	b	c	d	e	f	g	h	i
a. Logarithm of Per Capita GDP	1.00 (.00)								
b. Logarithm of Number of Stocks Listed	**.364** **(.03)**	1.0 (.00)							
Structural variables									
c. Logarithm of Geographical Size	**-.371** **(.02)**	.111 (.51)	1.0 (.00)						
d. Variance in GDP growth	-.018 (.91)	-.196 (.24)	.006 (.97)	1.0 (.00)					
e. Industry Herfindahl index	.025 (.88)	**-.674** **(.00)**	-.214 (.20)	.115 (.50)	1.0 (.00)				
f. Firm Herfindahl index	-.018 (.91)	**-.573** **(.00)**	-.038 (.82)	.091 (.59)	**.710** **(.00)**	1.0 (.00)			
g. Earnings Co-movement	-.030 (.88)	.105 (.63)	.109 (.61)	-.100 (.64)	-.168 (.43)	-.325 (.12)	1.0 (.00)		
Institutional variables									
h. Good Government Index	**.919** **(.00)**	**.335** **(.04)**	**-.298** **(.07)**	-.010 (.96)	-.039 (.82)	.011 (.95)	-.126 (.56)	1.0 (.00)	
i. Anti-director Rights Index	-.008 (.96)	**.282** **(.09)**	.089 (.60)	**-.461** **(.00)**	-.171 (.31)	-.034 (.84)	**-.356** **(.09)**	.075 (.66)	1.0 (.00)
j. Accounting Standards Index	**.442** **(.01)**	**.427** **(.01)**	-.093 (.60)	-.265 (.13)	**-.552** **(.00)**	-.267 (.13)	.035 (.87)	**.554** **(.00)**	**.417** **(.01)**

Sample is 37 countries, except for the accounting standards index, which is available for 34 countries and the earnings co-movement index, which is available for only 25 counties. Numbers in parenthesis are probability levels at which the null hypothesis of zero correlation can be rejected.

Table 4: OLS regressions of stock price synchronicity variables, Ψ_j and Υ_j, on log(per capita GDP) and structural variables. A control for market size, log(number of stocks), is included in all regressions. The structural variables are log(geographical size), variance of GDP growth, industry Herfindahl index, and the firm Herfindahl index. Regressions 4.2 and 4.4 include, as an additional structural variable, the earnings co-movement index.

Dependent Variable	*Ψ is a logistic transformation of the average fraction of stocks moving together*		*Υ is a logistic transformation of the R_j^2 s of regressions of stock returns on market indices*	
	(4.1)	(4.2)	(4.3)	(4.4)
Intercept	5.71 (.00)	10.2 (.00)	6.25 (.03)	10.1 (.05)
Logarithm of Per Capita GDP	-1.40 (.02)	-2.20 (.01)	-1.72 (.06)	-2.39 (.07)
Logarithm of Number of Stocks Listed	-.198 (.08)	-.215 (.12)	-.297 (.10)	-0.387 (.08)
Logarithm of Geographical Size	-.814 (.06)	-1.80 (.03)	-.868 (.20)	-1.64 (.19)
Variance in GDP growth	56.8 (.87)	-249 (.50)	210 (.70)	-98.6 (.87)
Industry Herfindahl index	-2.38 (.28)	-4.22 (.10)	-2.15 (.54)	-5.64 (.17)
Firm Herfindahl index	-.559 (.79)	1.49 (.56)	-3.88 (.25)	1.04 (.80)
Earning comovement index		.374 (.50)		1.10 (.23)
Joint Significance F test for the structural independent variables	3.54 (.01)	3.15 (.03)	2.63 (.04)	2.28 (.08)
sample size	37	25	37	25
R^2	.414	.564	.3443	.484

Numbers in the parentheses are the p-values for two-tailed significance tests. Intercept terms (not shown) are included in all regressions. Institutional variables are missing for China, the Czech Republic, and Poland. We drop these countries to make the results in this table comparable to those in subsequent tables. Regressions 4.2 and 4.4 also exclude Columbia, Hong Kong, Indonesia, Ireland, Malaysia, New Zealand, Pakistan, Peru, the Philippines, Singapore, South Africa, and Thailand because Datastream does not provide a long enough time series for us to calculate their earning co-movement indices.

Table 5: OLS regressions of stock price synchronicity variables, Ψ_j and Υ_j, on the log of *per capita* GDP, institutional, and structural variables (excluding earnings co-movement). A control for market size, log(number of stocks), is included in all regressions.

Dependent Variable	*Ψ is a logistic transformation of the average fraction of stocks moving together*				*Υ is a logistic transformation of the R_j^2s of regressions of stock returns on market indices*			
	(5.1)	(5.2)	(5.3)	(5.4)	(5.5)	(5.6)	(5.7)	(5.8)
log(GDP per capita)	.598	-1.54	-1.78	-.312	1.82	-1.98	-2.14	.353
	(.59)	(.01)	(.01)	(.78)	(..31)	(.03)	(.06)	(.84)
Logarithm of Number of Stocks Listed	-.214	-.15	-.231	-.186	-.325	-.208	-.336	-.239
	(.05)	(.18)	(.04)	(.09)	(.06)	(.24)	(.07)	(.16)
Institutional Variables								
Good Government Index	-.069	-	-	-.066	-.12	-	-	-.117
	(.05)			(.05)	(.03)			(.04)
Anti-director Rights Index	-	-.112	-	-.096	-	-2.09	-	-.202
		(.10)		(.17)		(.05)		(.07)
Accounting Standards Index	-	-	-.007	.005	-	-	-.009	.0137
			(.50)	(.60)			(.58)	(.40)
Joint Significance F-test for the institutional variables	4.22	2.95	.477	2.46	5.31	4.15	.313	3.30
	(.05)	(.10)	(.50)	(.09)	(.03)	(.05)	(.58)	(.04)
Structural Variables								
Logarithm of Geographical Size	-.789	-.848	-.968	-.893	-.823	-.931	-1.082	-.945
	(.05)	(.04)	(.02)	(.02)	(.19)	(.15)	(.12)	(.121)
Variance in GDP growth	70.3	-206	-169	-267	235	-279	-93.0	-323
	(.83)	(.57)	(.62)	(.44)	(.64)	(.62)	(.87)	(.55)
Industry Herfindahl index	-3.71	-2.52	-4.62	-4.20	-4.50	-2.42	-5.08	-4.08
	(.09)	(.24)	(.09)	(.10)	(.19)	(.47)	(.25)	(.31)
Firm Herfindahl index	.375	.133	1.09	1.77	-2.23	-2.59	1.20	.054
	(.85)	(.95)	(.63)	(.40)	(.49)	(.42)	(.75)	(.99)
Joint Significance F test for the structural variables	1.96	1.715	2.10	2.05	1.76	1.38	1.34	1.05
	(.13)	(.17)	(.10)	(.12)	(.16)	(.26)	(.28)	(.40)
F statistics for the regression	3.96	3.65	4.14	4.57	3.33	3.08	2.53	3.60
	(.00)	(.01)	(.00)	(.00)	(.01)	(.02)	(.04)	(.01)
Marginal percent variations explained by the institutional variable	.0744	.0541	.009	.113	.101	.082	.0072	.176
Sample size	37	37	34	34	37	37	34	34
R^2	.489	.469	.527	.632	.446	.426	.406	.574

Numbers in the parentheses are the p-values for two-tailed significance tests. Intercept terms (not shown) are included in all regressions. In 5.1, 5.2, 5.5 and 5.6 we drop China, the Czech Republic, and Poland because of missing "good government index" and "anti-director rights Index". Regressions 5.3, 5.4, 5.7, and 5.8 exclude also Indonesia, Ireland, and Pakistan because of missing "accounting standards index".

Table 6: OLS regressions of stock price synchronicity variables, Ψ_j and Υ_j, on the log of *per capita* GDP, institutional variables and structural variables, including the earnings co-movement index. A control for market size, log(number of stocks), is included in all regressions.

Dependent Variable	Ψ is a logistic transformation of the average fraction of stocks moving together				Υ is a logistic transformation of the R_j^2 s of regressions of stock returns on market indices			
	(6.1)	(6.2)	(6.3)	(6.4)	(6.1)	(6.2)	(6.3)	(6.4)
log(GDP per capita)	.130 (.91)[a]	-2.18 (.01)	-2.26 (.04)	.097 (.93)	1.31 (.47)	-2.29 (.08)	-2.05 (.22)	1.10 (.56)
Logarithm of Number of Stocks Listed	-.196 (.10)	-.203 (.18)	-.211 (.15)	-.151 (.24)	-.358 (.07)	-.324 (.18)	-.405 (.09)	-.274 (.22)
Institutional Variables								
Good Government Index	-.0959 (.02)	-	-	-.141 (.00)	-.153 (.02)	-	-	-.192 (.02)
Anti-director Rights Index	-	-.022 (.84)	-	.039 (.42)	-	-.127 (.46)	-	-.0294 (.85)
Accounting Standards Index	-	-	.0013 (.93)	.0226 (.09)	-	-	-.007 (.74)	.0247 (.27)
Joint significance F-test for the institutional variables	7.07 (.02)	.044 (.84)	.009 (.92)	3.89 (.03)	6.90 (.02)	.570 (.46)	.118 (.73)	2.65 (.09)
Structural Variables								
Logarithm of Geographical Size	-1.98 (.01)	-1.74 (.05)	-1.83 (.04)	-2.70 (.00)	-1.93 (.08)	-1.28 (.34)	-1.47 (.28)	-2.49 (.07)
Variance in GDP growth	-217 (.49)	-284 (.49)	-245 (.52)	-63.8 (.85)	-48.2 (.92)	-297 (.65)	-124 (.84)	4.59 (.99)
Industry Herfindahl index	-4.96 (.03)	-4.13 (.12)	-4.04 (.21)	-2.32 (.39)	-6.82 (.06)	-5.15 (.22)	-6.65 (.20)	-3.58 (.44)
Firm Herfindahl index	1.83 (.41)	1.49 (.57)	1.40 (.61)	.485 (.83)	1.58 (.66)	1.08 (.79)	1.51 (.73)	.100 (.98)
Earning comovement index	.122 (.80)	.300 (.66)	.373 (.52)	.111 (.84)	.696 (.38)	.676 (.53)	1.11 (.24)	.47 (.62)
Joint Significance T-test for the structural variables	2.94 (.05)	1.41 (.27)	1.73 (.19)	3.26 (.04)	1.81 (.17)	.608 (.70)	1.19 (.36)	1.09 (.41)
F statistics for the regression	4.62 (.00)	2.60 (.05)	2.59 (.05)	4.50 (.01)	3.54 (.02)	2.01 (.11)	1.02 (.13)	2.85 (.04)
Marginal percent variations explained by the institutional variable	.134	.0012	.0003	.198	.156	.018	.0038	.187
Sample size	25	25	25	25	25	25	25	25
R^2	.698	.566	.565	.763	.639	.502	.488	.637

Numbers in the parentheses are the p-values for two-tailed significance tests. Intercept terms (not shown) are included in all regressions. We drop China, the Czech Republic, and Poland because of missing good government indexand anti-director rights indices. We also drop Columbia, Hong Kong, Indonesia, Ireland, Malaysia, New Zealand, Pakistan, Peru, the Philippines, Singapore, South Africa, and Thailand because Datastream does not provide a long enough time series for us to calculate their countries earning co-movement indices.

Table 7: Correlation coefficients of logs of unexplained, σ_e^2, and explained, σ_m^2, stock return variation with institutional and structural variables.

	$\log(\sigma_{e2})$	$\log(\sigma_{m2})$
Stock Price Co-movement measures		
Ψ is a logistic transformation of the average fraction of stocks moving together	.115	.829
	(.50)	(.00)
Υ is a logistic transformation of the R^2 of a regression of stock returns on the market	.073	.857
	(.67)	(.00)
Institutional Variables		
logarithm of per capita GDP	-.406	-.572
	(.01)	(.00)
anti-director rights index	.329	-.166
	(.05)	(.33)
good government index	-.477	-.664
	(.00)	(.00)
high accounting standards index	-.034	-.218
	(.85)	(.22)

	$\log(\sigma_{e2})$	$\log(\sigma_{m2})$
Structural Variables		
log of number of stocks listed	.200	-.183
	(.23)	(.28)
geographical size	.453	.102
	(.00)	(.55)
variance of GDP growth	-.190	.007
	(.26)	(.97)
industry Herfendahl Index	-.204	-.117
	(.23)	(.49)
firm Herfendahl Index	-.159	-.177
	(.35)	(.29)
earnings co-movement index	.183	.248
	(.39)	(.24)

Numbers in parentheses are probability levels. Sample is 37 countries, except for accounting standards index which covers 34 countries and the earnings co-movement variable which covers only 25 countries.

Table 8. OLS regressions of stock price variance components $log(\sigma_m^2)$ and $log(\sigma_e^2)$ on log(per capita GDP), institutional variables and structural variables. A control for market size, log(number of stocks), is included in all regressions.

Dependent Variable	$\log(\sigma_e^2)$ *is the average unexplained variance across regressions of stock returns on the market*		$\log(\sigma_m^2)$ *is the average explained variance across regressions of stock returns on the market*	
	8.1	8.2	8.3	8.4
log(per capita GDP)	*.794*	*.745*	*1.15*	*1.85*
	(.40)	*(.46)*	*(.551)*	*(.41)*
log of number of stocks listed	*.107*	*.014*	*-.133*	*-.261*
	(.24)	*(.90)*	*(.47)*	*(.31)*
Institutional variables				
Good Government Index	**-.070**	**-.078**	**-.187**	**-.27**
	(.02)	**(.06)**	**(.00)**	**(.01)**
Anti-director Rights Index	***.086*** [a]	***.113*** [a]	-.117	.082
	(.15)	***(.19)***	(.33)	(.66)
Accounting Standards Index	.0054	.006	.019	.031
	(.53)	(.59)	(.28)	(.24)
Structural Variables				
Logarithm of Geographical Size	***.471***	**1.28**	-.475	-1.21
	(.15)	**(.08)**	(.47)	(.43)
Variance in GDP growth	8.94	43.2	-312	49.7
	(.98)	(.89)	(.60)	(.94)
Industry Herfindahl index	.717	.404	-3.35	-3.16
	(.74)	(.87)	(.44)	(.56)
Firm Herfindahl index	.076	-.680	.112	-.60
	(.97)	(.74)	(.98)	(.89)
Earning co-movement index	-	.250	-	.729
		(.62)		(.52)
Joint Significance F test for the regression	**2.53**	**3.08**	**3.90**	**2.80**
	(.03)	**(.03)**	**(.00)**	**(.04)**
degree of freedom	34	25	34	25
R^2	.49	.687	.594	.666

a. Significant at 10% in a one-tail t-test.

We drop China, the Czech Republic, Indonesia, Ireland, Pakistan, and Poland because of missing institutional variables. Regressions 8.2 and 8.4 also exclude Columbia, Hong Kong, Malaysia, New Zealand, Peru, the Philippines, Singapore, South Africa, and Thailand because Datastream does not provide a long enough time series for us to calculate their earning co-movement indices.

Figure 1: The Fraction of Stocks Moving Up in Price in Each Week of 1995

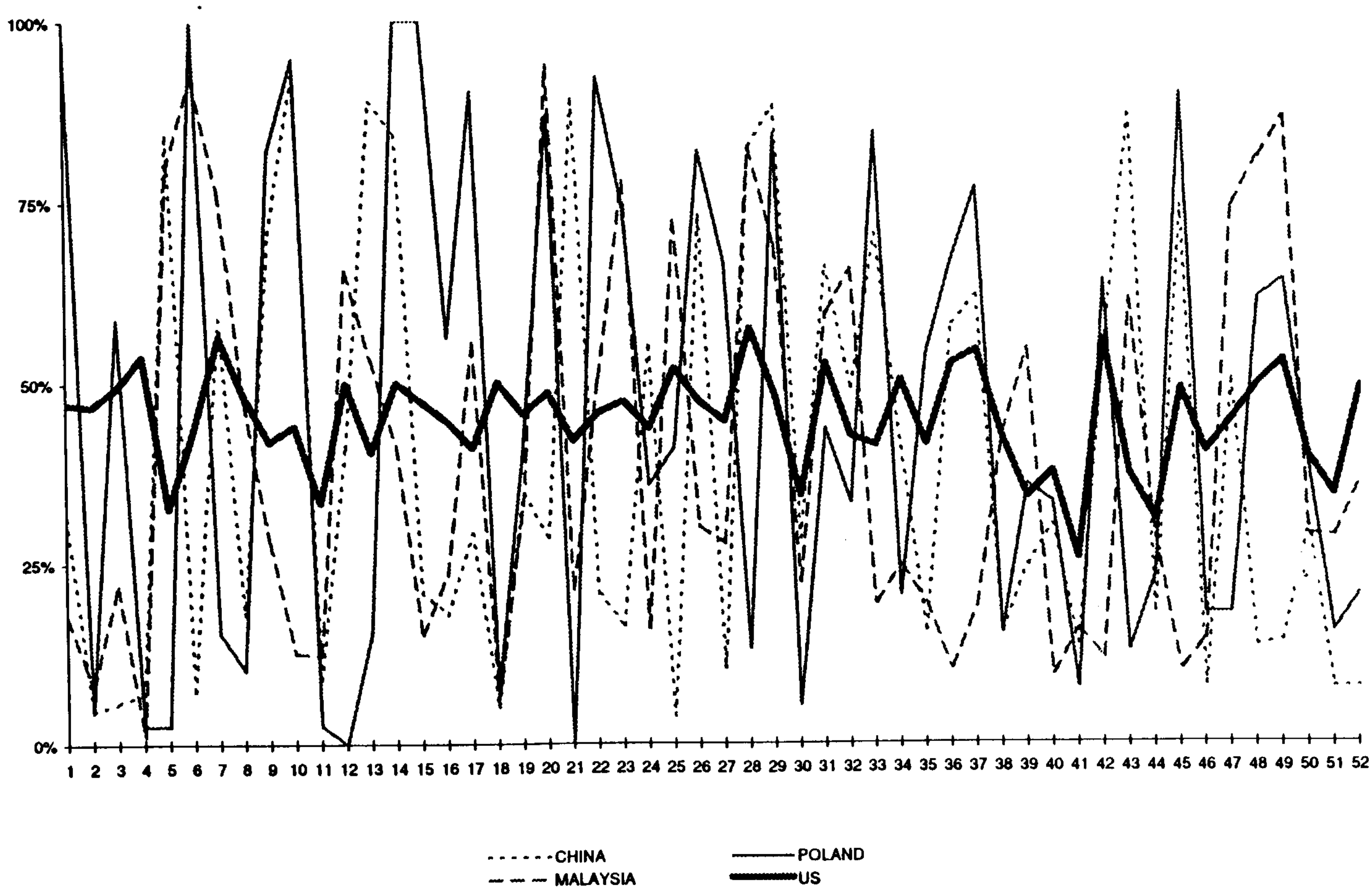


Figure 2: The fraction of US Stock Prices Moving Together from 1926 to 1995

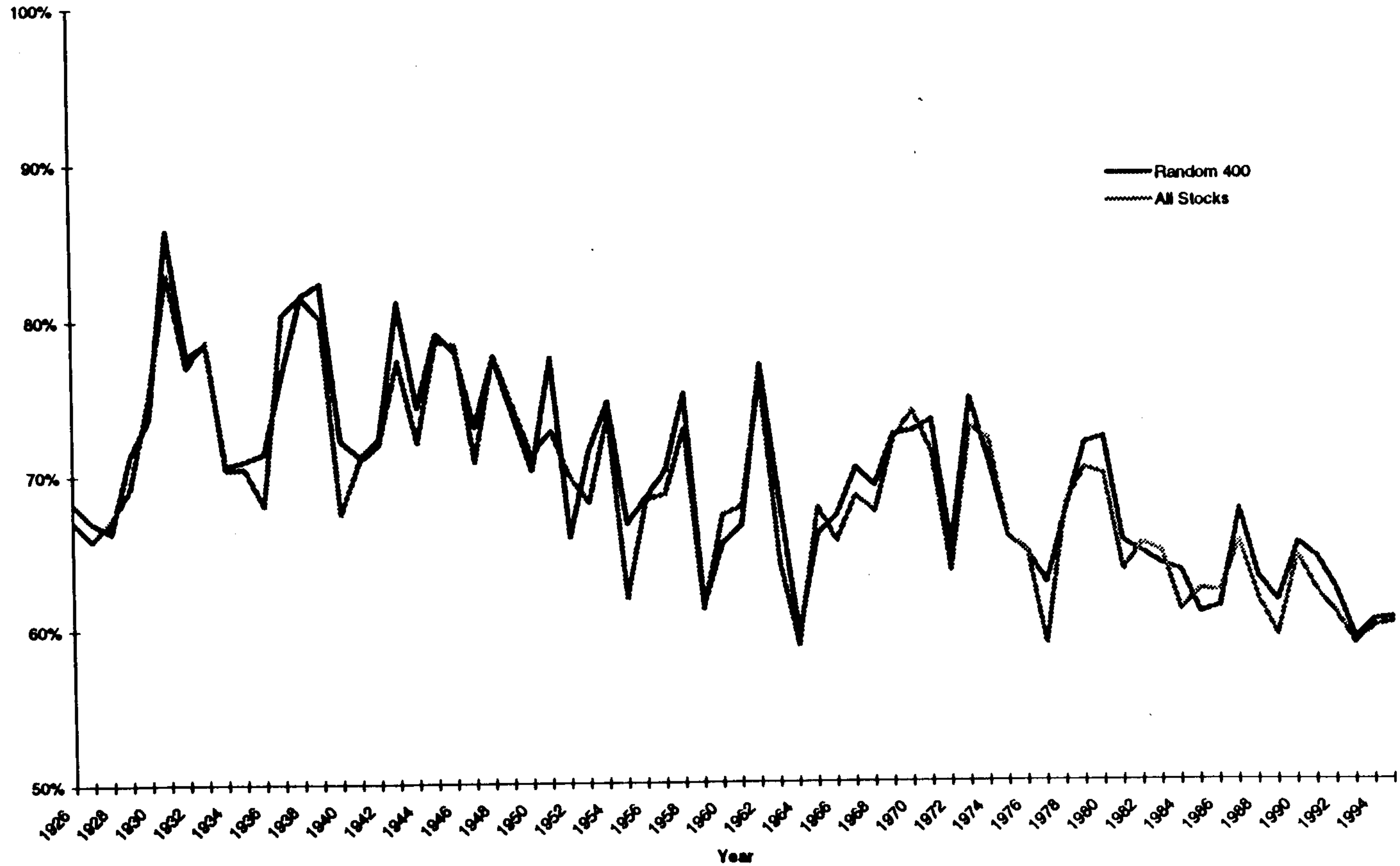


Figure 3: Average R2 Across Stocks Based on Monthly Returns from 1926 to 1995

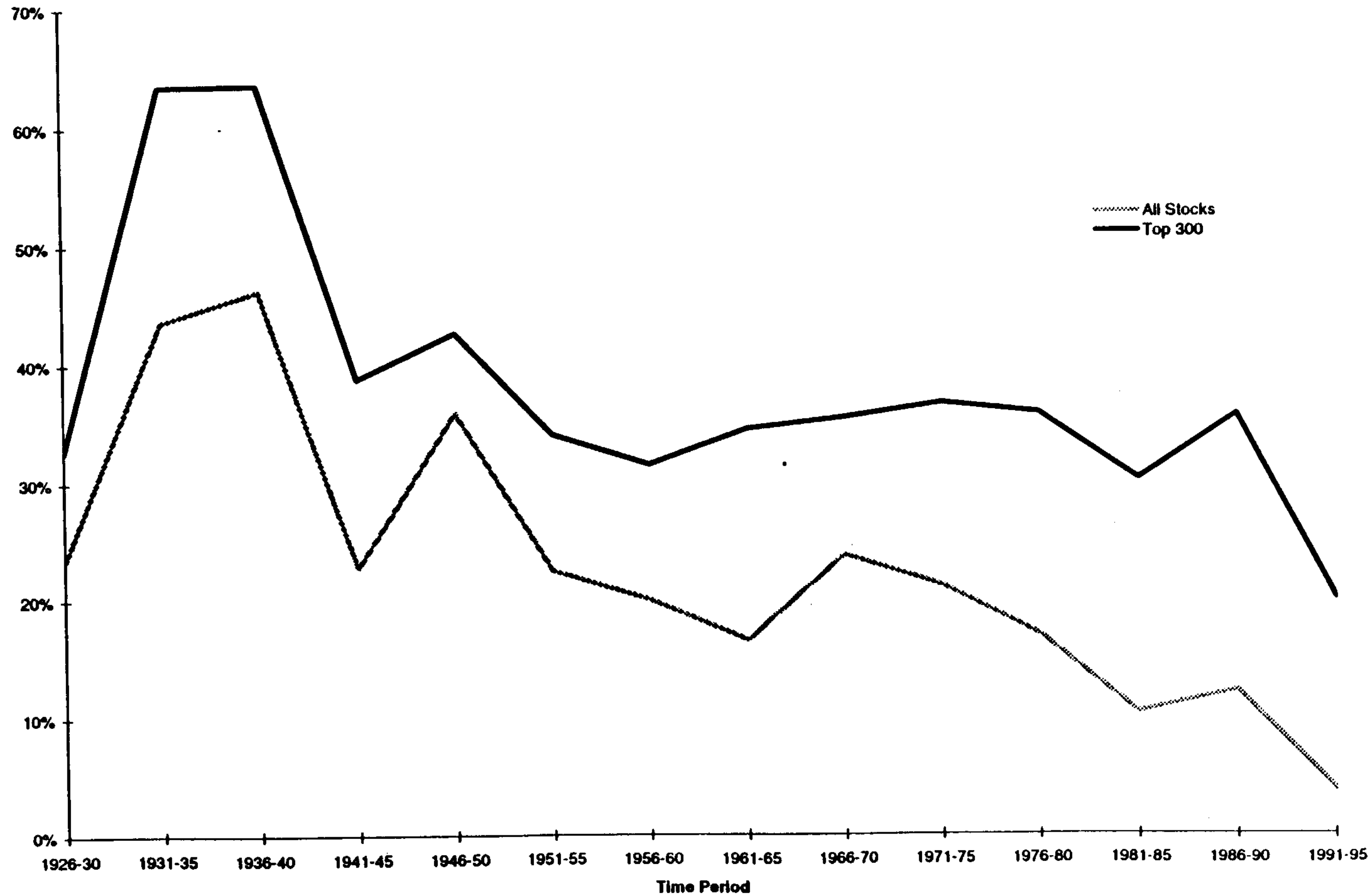


Figure 4. Stock return synchronicity in various countries: The fraction of stock returns moving in the same direction each week in Panel 4a; and the R^2 of a regression of bi-weekly stock returns on market indexes in Panel 4b. Each observation is for one country.

Figure 4a

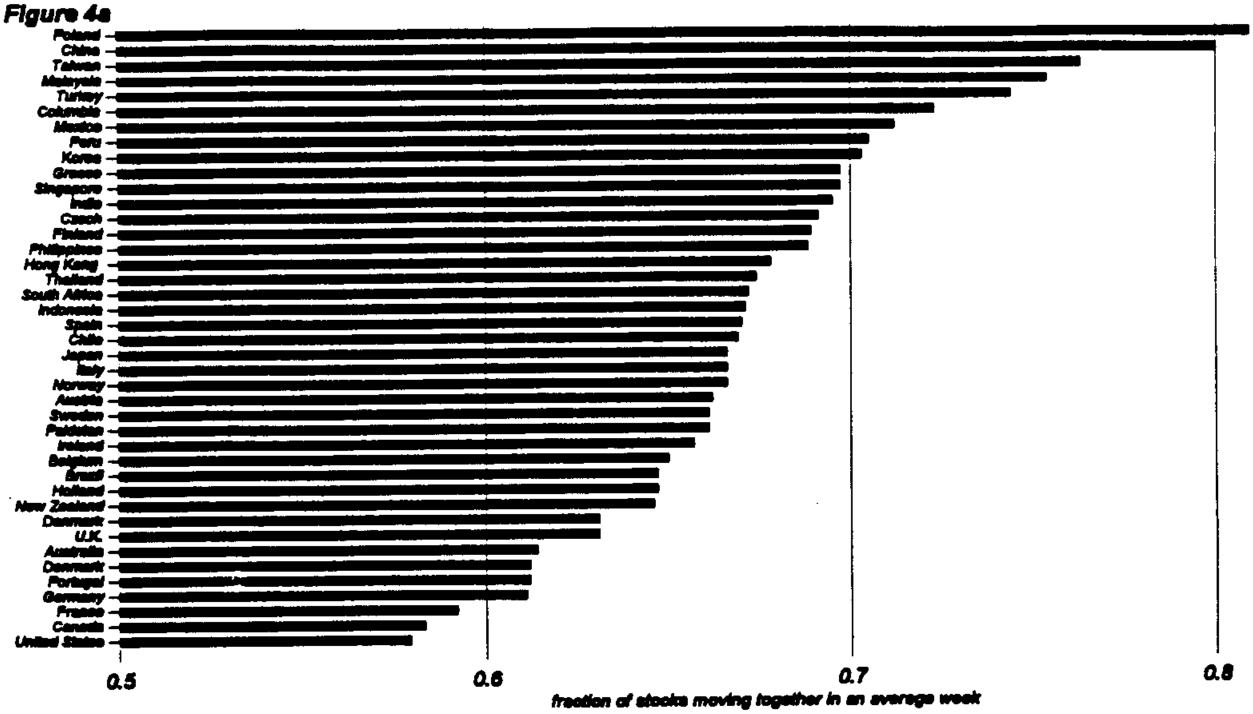


Figure 4b

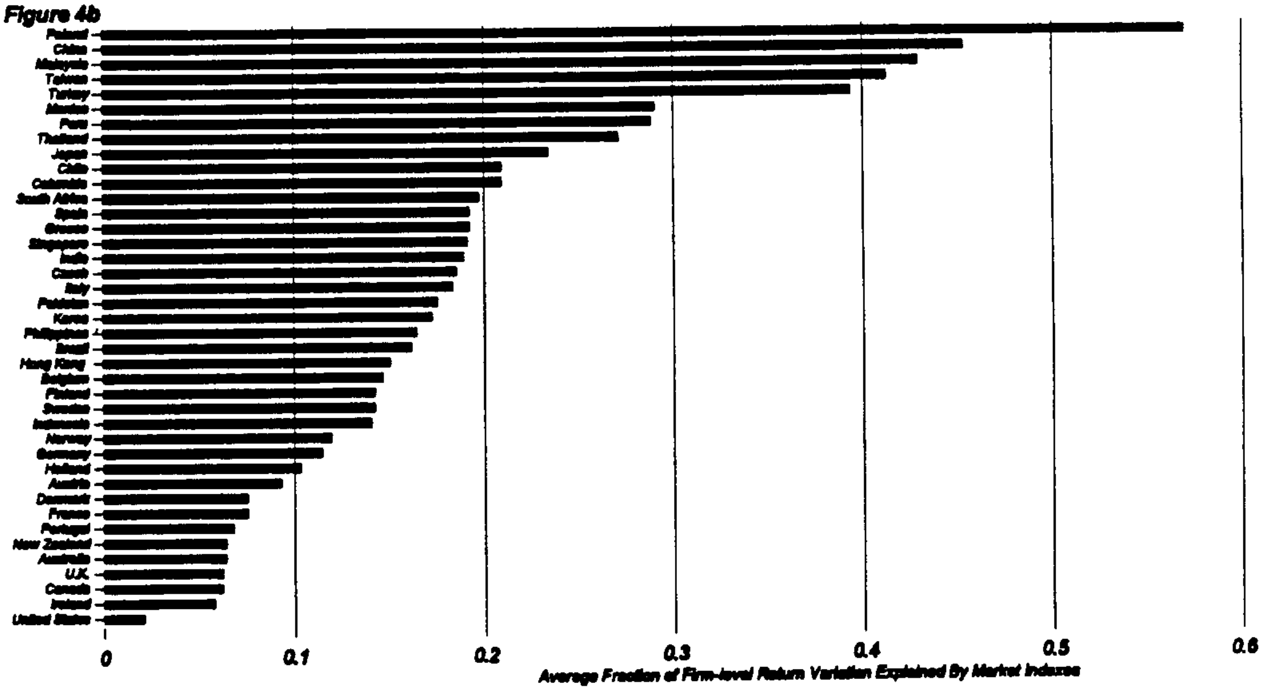


Figure 5. Logarithm of *per capita* GDP plotted against measures of stock return synchronicity: the fraction of stock returns moving in the same direction each week in panel 5a; and the R^2 of a regression of bi-weekly stock returns on market indexes in panel 5b. Each observation is for one country.

Figure 5a: Fraction of Stock Moving Together vs. Per Capita GDP

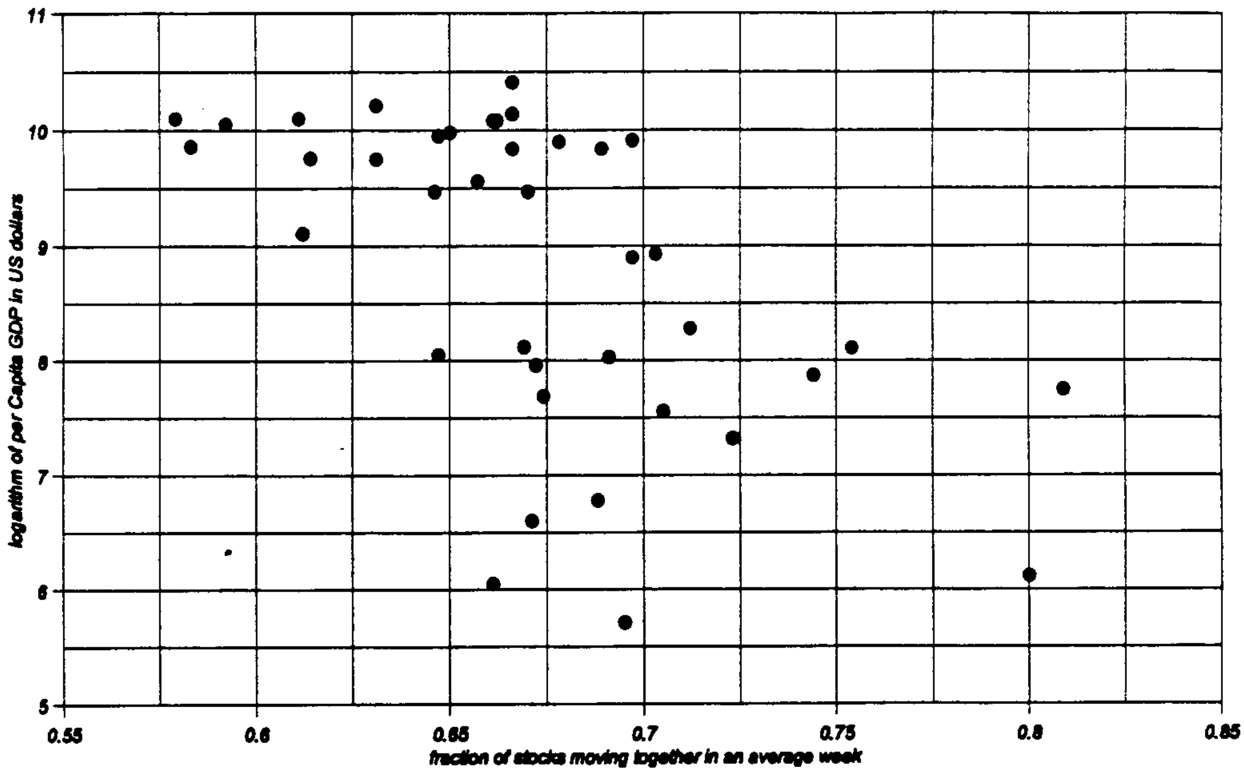


Figure 5b: The Importance of Market Returns vs. Per Capita GDP

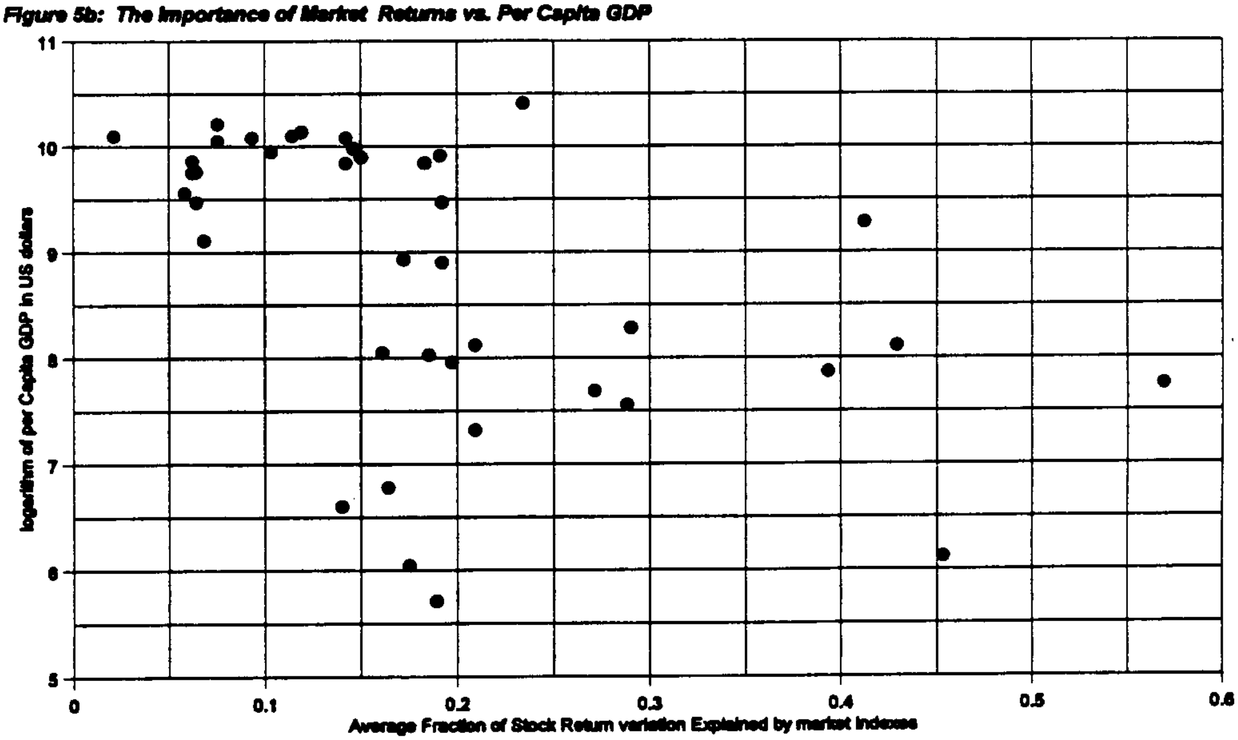


Figure 6: Variations Unexplained (SSE) and Explained (SSR) by Market Returns in the US

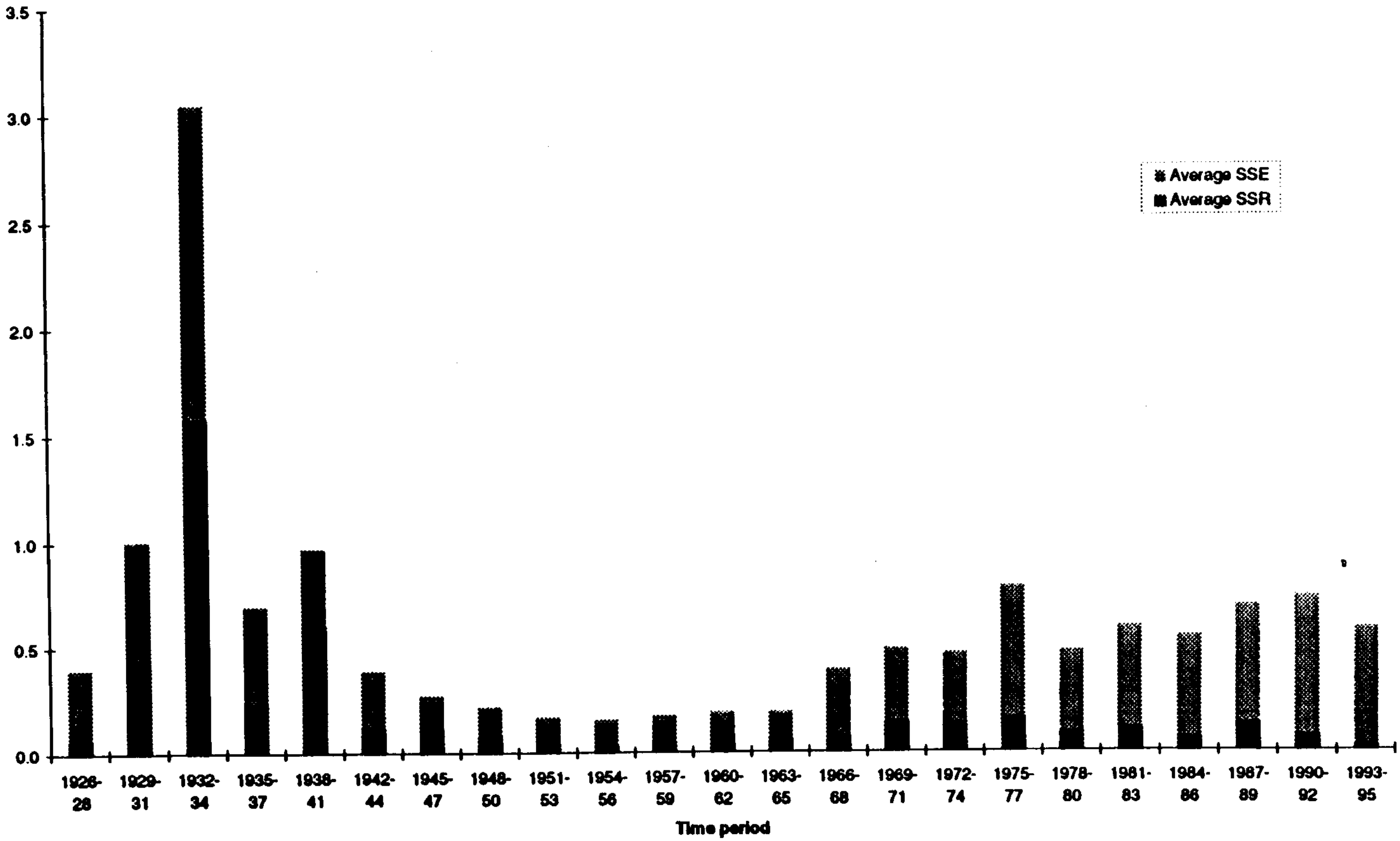
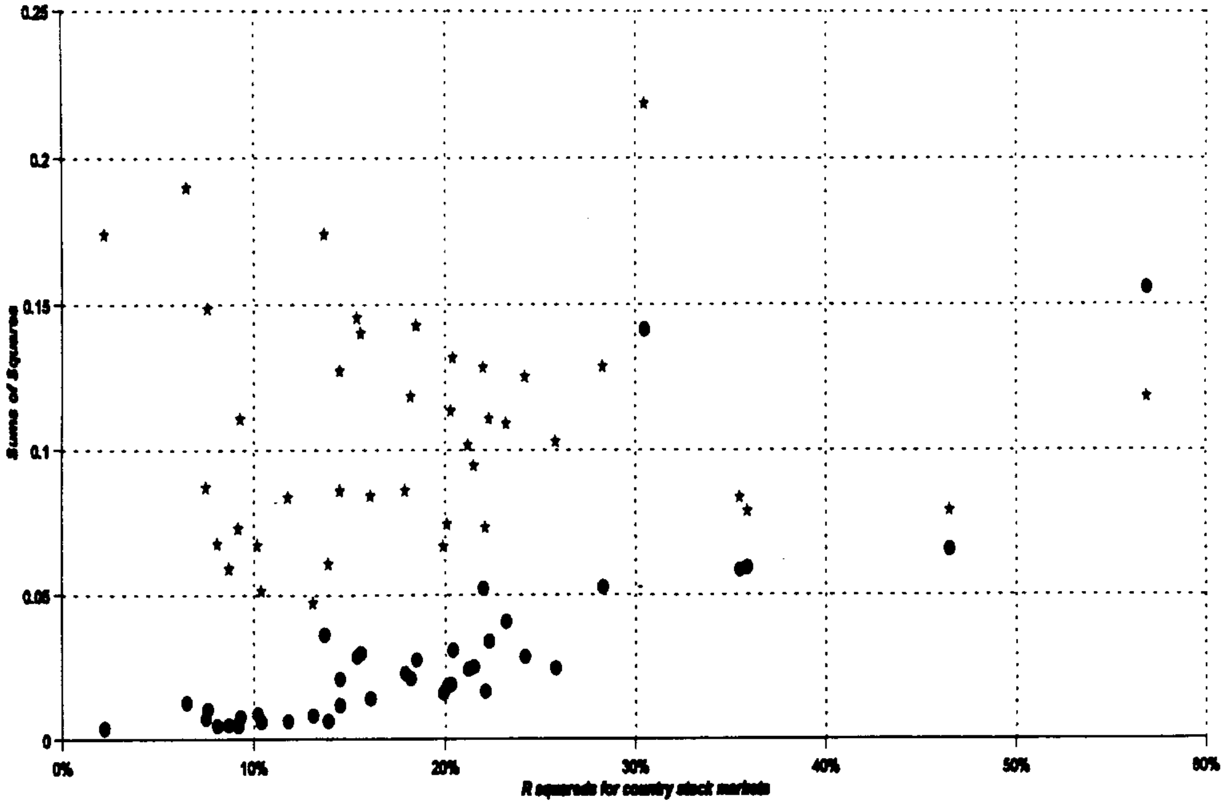


Figure 7. Explained Variation (σ_m^2) and unexplained variation (σ_ϵ^2) versus R^2s for regressions of stock returns on market indices. Each observation is for one country.



Notes

1. At present we only have a long panel of returns for the US. We are beginning our exploration of other advanced economies' historical patterns.

2. We calculate $f_{jt} = \dfrac{\max[n_{jt}^{up},\ n_{jt}^{down}]}{n_{jt}^{up} + n_{jt}^{down}}$ where n_{jt}^{up} is the number of stocks in country j whose prices rise in week t and n_{jt}^{down} is the number of stocks whose prices fall. For each country j we calculate $f_{US} - f_j$. The variance of the estimate is approximately $f_{US}(1 - f_{US})/n_{US} + f_j(1 - f_j)/n_j$, assuming that f_{US} and f_j are uncorrelated. By the Central Limit Theorem, the statistic $\dfrac{(f_{US} - f_j)}{\sqrt{f_{US}(1 - f_{US})/n_{US} + f_j(1 - f_j)/n_j}}$ is approximately normal for sample sizes n_{US} and n_j sufficiently large.

3. The numbers are $f_{jt} = \dfrac{\max[n_{jt}^{up},\ n_{jt}^{down}]}{n_{jt}^{up} + n_{jt}^{down}}$ where n_{jt}^{up} is the number of stocks in country j whose prices rise in week t and n_{jt}^{down} is the number of stocks whose prices fall. The calculation is for all weeks in 1995.

4. The f_{jt} is based on 1995 data. Our GDP *per capita* variable is averaged over 1992 to 1994 to mitigate any transitory noise. Using a three year average of f_{jt} gives similar results to those shown.

5. Regression 3 is similar to classical asset pricing equations. We do not pursue this approach to regression 3 because we view the present paper as an application of Grossman's (1976) approach to information capitalization, not as a refinement or critique of any asset pricing model.

6. We include only stocks which are actively traded at least 30 out of 52 weeks. We need to have sufficient observations to reliably assess the market returns' explanatory power on each stock. Thus, we are losing information on newly traded stocks which have been traded for roughly less than five months in a year and stocks which are about to be delisted. When trading of a stock is suspended, the returns data during the suspension period are coded as missing and excluded from our regressions.

7. Roll (1992) finds that high industry or high firm concentration, as captured by such Herfindahl indices, partly explains the high volatility of some stock market indices.

8. Our firm-level earnings data contain instances of isolated one time spikes. These generally reflect extraordinary items in the earnings calculation, and so are statistical noise for our purposes. To mitigate these error in variables problems, we exclude $ROA_{i,j}$ in period t if $|ROA_{i,j,t} - ROA_{i,j,t-1}|$ and $|ROA_{i,j,t} - ROA_{i,j,t+1}|$ are both greater than 0.75 and

opposite in sign.

9. The countries included are Australia, Austria, Belgium, Brazil, Chile, Denmark, Finland, France, Germany, Greece, Holland, India, Italy, Japan, Korea, Mexico, Norway, Portugal, Spain, Sweden, Taiwan, Turkey, UK and US. Three countries, Austria, Chile and Taiwan, have extraordinarily low *earnings co-movement measures*. For these countries the number of firms for which *Datastream* has accounting data is very small (e.g. Taiwan has only 5 firm observations). Our results are not affected by whether or not we include these observations in our analyses.

10. Note that our sample does not include very poor very small countries as these generally have no stock markets. We thus are not disproving the idea that dependence on undiversified raw materials production might cause economy-wide fluctuations in these countries.

11. The impact of macroeconomic information on firm prices varies according to industry and firm specific characteristics, however. For instances, the opening up of trade conceivably increases the stock prices of firms in exporting sector and does the opposite to firms in import substitute sectors. The more investors know about firm specific characteristics, the more the impact varies across firms.