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The Puzzle of the Harmonious Stock Prices

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Abstract

Stock prices in the US, Canada, Ireland, Denmark and virtually all other developed economies move quite independently of each other. But in emerging markets, like China, Turkey, and Peru, stocks tend to rise and fall en masse. This fact does not appear to be due to the fundamental values of emerging economy stocks moving together, for stock return co-movement is not explained by any or all of a long list of economy and market characteristics (such as size, diversification, and the like) that should capture fundamentals co-movement. Nor is it explained by direct measures of fundamentals co-movement, such as earnings co-movement across firms. Rather, economies that better protect private property rights have stock prices that move more independently. Moreover, among economies that protect general private property rights tolerably well, stocks move more independently where the law better protects shareholders' property rights in their investments. Finally, economies with less synchronous stock prices appear to allocate capital more efficiently.

"The social object of skilled investment should be to defeat the dark forces of time and ignorance which envelop our future"

John Maynard Keynes (1936, p. 155).

1. INTRODUCTION

The social purpose of a stock market is to process information about individual companies, which derives from the trades of informed investors. If they expect firm to do well, informed investors buy its stock, pushing the price up. If they expect a firm to do poorly, informed investors sell or short its stock, pushing the price down.

How a firm's stock price moves has direct implications for its governance.

A falling share price causes a range of problems. Prospective lenders withhold capital. Shareholders pressure the board for better corporate governance. The board dismisses the chief executive officer (CEO) and demands new strategies. Where possible, raiders accumulate the heavily discounted stock to launch a takeover. All of these effects induce the firm to review its investment plans and, in many cases, to change them. In short, a falling share price triggers a variety of mechanisms that bring about corporate governance changes.

A rising share price eases the minds of lenders, instills confidence in the CEO and her strategy, and rewards the CEO with stock options that increase in value. In short, a rising share price sends management a vote of confidence in its corporate governance.

In these ways, share price movements affect microeconomic decisions about capital allocation. When share price movements cause economically efficient capital allocation

(across firms and within them), the stock market is said to be *functionally efficient*.[1]

A peculiar pattern is evident across the stock markets of different countries. In emerging markets, such as China, all the stocks in the country tend to rise and fall together, like the voices of people in a chorus. But in developed countries, like the Canada, each stock seems to move on its own, like the voices of people talking in small groups in a crowded room.

Since the asset pricing models used by financial analysts measure the extent to which individual stocks track the market (one measure of comovement), this fact leads to the peculiar result that standard asset pricing models 'fit the data' quite well in emerging economies and very poorly in developed economies.

A range of explanations for this phenomenon come readily to mind. Firms in emerging economies might tend to cluster in a few industries; emerging economies might be small, and deeply affected by a few key firms; emerging economies might be prone to macroeconomic shocks; and so on. While these sorts of explanations clearly have some merit, they do not explain the data well. Thus, large or diversified emerging economies do not have more independent stock prices than small or undiversified emerging economies. Moreover, firm fundamentals, such as earnings ratios, are only slightly more synchronous in emerging economies than in developed ones, and the difference is too slight to explain the large differences in stock price synchronicity.

However, stock price synchronicity is highly correlated with measures of private property rights protection. Economies with less corruption have more independent stock prices. Economies that are passably free of corruption exhibit more independent stock price movements if they afford investors stronger property rights over their investments.

[1] Tobin (1982).

Perhaps stock markets are bereft of informed investors where rampant official corruption and rapacious corporate insiders make the informed estimation of share prices prohibitively difficult.

In economies where investors analyze individual companies and assess the quality of their governance, firm-specific stock price movements fine tune capital allocation. In economies where investors do not perform this information gathering and processing task, stock prices move together because of either economy-wide fundamentals or investor sentiment. In either case, the quality of capital allocation is compromised.

Consistent with this, economies with more independent stock prices show clear signs of better microeconomic capital allocation decisions. That is, more independent stock price movements may be an indicator of a more functionally efficient stock market.

Much of what follows is a non-technical synopsis of Morck *et al.* (2000). To avoid repetition, we present results from that study without citing it each time. Findings of other studies are, of course, cited whenever used.

2. HARMONY AND CACOPHONY IN STOCK PRICE MOVEMENTS

This section describes some simple ways of measuring the extent to which a country's stocks move independently, as opposed to synchronously. It then compares these measures across countries, showing that stocks in emerging markets move far more synchronously than those in developed economy stock markets.

a. Comovement

Figure 1 ranks the world's stock markets by the fraction of stock prices moving in the same direction in a typical week in 1995, defined as the number of stocks moving with the majority divided by the number of stocks that move. We drop stocks that do not

move from the total as these may reflect an absence of trading activity rather than a genuinely unchanged price.

[Figure 1 about here]

In Poland, just over eighty percent of the stocks move either up or down together during a typical week. Stocks in China, Taiwan, Malaysia, Turkey, Columbia, Mexico, and Peru are almost as concordant – with seventy to eighty percent of stocks moving in the same direction in a typical week.

Contrast this with the discordance of the United States, where a mere fifty eight percent of stocks move in the same direction in a typical week. The stock returns of other rich country markets like Canada, France, Germany, Portugal, Denmark, Australia, the United Kingdom, New Zealand, and the Netherlands, are nearly as dissonant.

The United States is a much more developed economy now than it was in the 1930s, when it possessed many of the characteristics we now associate with third world countries. Figure 2 looks at the behavior of US stock prices over the past decades, and shows that, in the 1930s, US stock returns were highly synchronous, rising and falling together - just as stocks do now in emerging markets.

[Figure 2 about here]

To sum up, stock prices in highly developed economies seem to move largely independently of each other. Stock prices in less developed economies seem to move up and down together.

b. Asset Pricing Models

An alternative way of gauging stock price synchronicity is afforded by the *market model*, in which firm *i*'s stock percentage price change, or return r_{it}, is regressed on a broad market average return, r_{mt}. In an open-economy setting, it also makes sense to include the US market return, $r_{US,t}$, as a proxy for the world market return in each country's regressions (except those for US stocks, of course).

Thus, we estimate

$$r_{it} = \alpha_i + \beta_i r_{mt} + \beta_{US} r_{US,t} + \varepsilon_{it} \qquad (1)$$

Using a worldwide index instead of a US index and including it in the regressions for US stocks does not materially change any of the results. We use biweekly returns to mitigate problems with thinly traded stocks.

The R^2 statistic of a regression of this form measures the proportion of the variation in an individual stock's return, r_{it}, that is market-related – that is, in synch with either the local index, r_{mt}, or the US index, $r_{us,t}$. We take the average R^2 of such regressions for all the stocks in a country's market, and denote this $\overline{R}^2$. The value of $\overline{R}^2$ falls between zero and 100%, with a higher value indicating a greater tendency in the typical stock to move with the market – that is, a higher value indicates more synchronous stock prices.

Figure 3 shows $\overline{R}^2$ estimates for each country. The countries line up in roughly the same order as in Figure 1. Highly developed economies have very low $\overline{R}^2$s, while less developed economies exhibit very high $\overline{R}^2$s. Since $\overline{R}^2$ is also a measure of statistical 'fit', Figure 3 shows that the market model 'fits the data' quite well in emerging markets, but quite badly in developed economy stock markets.

[Figure 3 about here]

Figure 4 shows $\overline{R}^2$s for US stocks, estimated using monthly returns over a succession of non-overlapping five-year periods from the 1920s to the present. In these regressions, the market return is the value-weighted total return produced by the Center for Research in Securities Prices (CRSP) at the University of Chicago. Paralleling Figure 2, the estimated $\overline{R}^2$s are very high in early decades and fall steadily over time to their current very low levels. The market model 'fit the data' well earlier in the twentieth century, but by the century's close fit very poorly.

[Figure 4 about here]

Figure 5 partitions countries into four quartiles, and displays the average synchronicity measures of each group of companies, from the poorest twenty five percent to the richest twenty five percent. Both synchronicity measures are clearly higher in lower income countries. Intriguingly, there is little difference between the lowest and second lowest twenty quartiles; and between the highest and second highest quartiles. That is, while rich and poor country stock returns clearly differ, there is little difference between those of different rich countries or between those of different poor countries. We will revisit this point later.

[Figure 5 and table 1 about here]

Table 1 lists all our countries, first by per capita GDP, then by fraction of stocks moving in the same direction, and finally by market model R^2. Standard statistical tests show all these rankings to be highly correlated with each other.

3. SYNCHRONOUS FUNDAMENTALS

The most straightforward explanations of why the stocks of rich countries move more independently is that the fundamental values of companies in rich countries move more independently. However, evidence for this hypothesis turns out to be so difficult to find that we are forced to think of other explanations.

To investigate this hypothesis, we take two parallel approaches. One is to think of various country characteristics that might be related to fundamentals synchronicity. The other is to estimate fundamentals comovement directly.

[Table 2 about here]

As we presented our results to various conferences and university seminars, we received a steady stream of ideas about why fundamentals would be more synchronous in some countries than others, and what variables we might use to test these ideas. Some of these are listed in Table 2, along with our direct measure of fundamentals synchronicity – earnings comovement.

The data consistently fail to cooperate. First, only a few of the suggested variables have detectable statistical correlations with our synchronicity measures. These correlations are always much weaker than the highly significant negative correlations between our synchronicity measures and per capita GDP. Second, in most cases, the

actual relationship between the suggested proxy for fundamentals synchronicity and stock returns synchronicity is not what the story supporting it would suggest. Thus, the idea that larger stock markets might attract more diverse companies is undermined by the simple fact that rich country markets with only a few dozen listings exhibit low synchronicity, while poor country markets an order of magnitude larger exhibit high synchronicity. Third, even when we control for all of these variables at once in a multiple regression framework, synchronicity remains highly significantly negatively correlated with per capita GDP.

Table 2 actually contains only a partial list. The list of suggestions we received is too long to deal with here. For a complete description, see Morck et al. (2000). We deleted countries with banking crises, too much political instability, or too much political stability. We deleted countries in certain geographical areas, such as Latin America. We redid the analysis using returns for 1993 and 1994 (and later for other years) instead of 1995. None of these procedures noticeably reduced the correlation between synchronicity and per capita GDP.

Okham's razor tells us that the simplest explanation is usually the best one, and the stories needed to extend Table 2 become increasingly convoluted. The absence of evidence is not evidence of absence - a theory cannot be proven false by lack of evidence. However, it seems sensible at this point to consider a different perspective.

4. THE STOCK MARKET AS AN INFORMATION PROCESSOR

Financial economists often find it useful to divide the variation in stock returns into a market-related component and a firm-specific component. This provides a useful

framework in which to consider this comovement puzzle, and also lets us cast it in more familiar terms.

The *market-related component* of stock return variation consists of movements that are common across most stocks in the market. If an anti-business government were elected, the prices of virtually all stocks might fall *en masse*. If the central bank lowers interest rates, stimulating the economy, the prices of virtually all stocks might rise as one. These are examples of market-related returns variation.

The *firm-specific component* of stock return variation consists of stock price movements that are unique to a particular firm. If a firm is hit with a product liability lawsuit, its share price might fall – but little or nothing might happen to the stock prices of most other companies across the economy. If a firm's CEO pulls off a brilliant restructuring miracle, her firm's share price might rise – but, again, little or nothing might happen to most other firms' share prices. These are examples of firm-specific returns variation.

In his Presidential Address to the American Finance Association, Richard Roll struggles to explain the low R^2 statistics of standard asset pricing models for US stocks.[2] He notes that they seem due to a great deal of firm-specific variation in US stock returns. Moreover, while he finds market-related price movements to be associated with major news announcements, firm-specific price movements are seldom connected with news stories. From this, he argues that firm-specific returns variation is a result of the trades of informed investors pushing stock prices up and down. These investors must thus be gathering and processing information about firms and taking positions based on these analyses.

If this gathering and processing of firm-specific information is more complete in developed economy stock markets than in emerging markets, an absence of firm-specific price movements in the latter would result. But why might this activity be less vigorous in emerging markets?

a. Official Corruption and the Predictability of Fundamental Values

Arbitrageurs make money by predicting how firm's stock prices will move in response to changes in other prices, wages, laws, technology, consumer tastes, and a host of other factors. Arbitrageurs who buy underpriced stocks make money as other investors realize the price is low and buy, pushing the price up. Arbitrageurs who short overpriced stocks likewise make money as the price subsequently falls.

This sort of arbitrage is a risky business. The arbitrageur can never be completely sure the stock is indeed overvalued or undervalued. Moreover, even if it is initially undervalued, something might happen to lower its fundamental value before other investors have time to push its price up. The information gathering and processing that underlies risk arbitrage of this sort is inherently a matter of comparing probabilities.

In many countries, governments and courts are mercantilist devices for diverting wealth to an entrenched elite. Politicians can "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, repudiation of commitments, and nationalization.

In such economies, fundamental values, obscured by shifting property rights associated with political changes, may be both hard to estimate and less useful to

[2] Roll (1989).

arbitrageurs. Rather, asset values are predominantly affected by political connections and events. For example, Fisman (1999) estimates that as much as 25% of the market values of many Indonesian firms is related to political connections, and that stock prices there swung on rumors about President Suharto's declining health. In such economies, political events, or even political rumors alone, could cause large market-related stock price swings and generate high synchronicity.

Moreover, informed arbitrage is doubly risky where corruption is pervasive. Even if an arbitrageur predicts correctly that a firm will do well next quarter, this need not translate into a higher share price if corrupt officials or rapacious insiders confiscate the profits. Weak property rights make corporate fundamentals doubly unpredictable and so expose the arbitrageur to substantial extra risk. Consequently, arbitrage on stocks in such economies is relatively unattractive. This might explain an absence of firm-specific price movements over a given observation period if Roll's (1989) contention that firm-specific price movements are mainly due to informed arbitrage is valid.

b. Noise Traders in Emerging Markets

Recent work in finance argues that share prices do not always reflect the trading of informed investors. Rather, share prices can be driven by the irrational exuberance (or irrational despondence) of so-called *noise traders*. [3] Although efforts to bring noise traders into the mainstream of finance theory are still in their infancy, two features do stand out.

First, the most basic noise trader models show that noise traders become more able to affect prices if informed traders are fewer. This means that, if informed traders are scarce

in emerging markets, noise traders are more likely to move share prices there.

Second, noise traders are irrelevant if their trades cancel each other out. Only when noise traders as a whole are either irrationally optimistic or irrationally pessimistic can their trades move the market. This means that *noise traders are likely to make their presence known by inducing market-related fluctuations unconnected to fundamentals*. Recall that we were unable to link the large market-related movements in share prices in emerging markets to economy-wide movements in fundamentals, or to other factors that might affect fundamentals co-movement – like economy diversification or macroeconomic instability. This is consistent with these market-related movements being due to waves of noise trader exuberance and melancholy.

c. The Selective Confiscation of Firm-specific Cash Flows

Many economies that protect property rights in general fail to provide strong property rights for shareholders in disputes with corporate insiders.[4] In such economies, the confiscation of corporate cash flows by insiders is legal, so as this does not obviously violate general property rights protection mechanisms such as contract, tort, or criminal laws. Shareholders probably have a hard time proving that these more general laws were violated in economies lacking the shareholder rights laws that force meaningful disclosure and that motivate whistle blowers. Consequently, an absence of shareholder rights laws may induce corporate insiders to confiscate shareholder wealth in a variety of ways.

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[3] Shleifer and Summers (1990), Shiller (2001)
[4] La Porta et al. (1997).

If insiders confiscate abnormally high cash flows that simultaneously accrue to all the firms in the economy, this confiscation is apparent – unless the insiders of all other firms do likewise. However, if insiders confiscate abnormally high cash flows that accrue only to their specific firm, investors may never know what happened and no coordination problem arises. Consequently, insiders are most likely to confiscate abnormally high firm-specific cash flows.

Given this, it makes little sense for arbitrageurs to expend resources predicting those cash flows. Also, market-related fluctuations tend to be associated with high profile public news announcements in the US, whereas firm-specific fluctuations are not.[5] This means market-related news might affect all stock prices simultaneously without any effort by arbitrageurs. Also, this publicity again makes market-related abnormal cash flows harder to appropriate.

d. Firm-specific and Market-related Stock Return Variation

To see whether these sorts of stories might be valid, we must revisit the market model (equation 1) approach to measuring synchronicity. This approach is useful because it lets us divide stock return movements into parts. Figure 6 illustrates this division into a constant component, a varying firm-specific component, and a varying market-related component that moves with the domestic and global markets.

[Figure 6 about here]

For simplicity, call the variance of the firm-specific component σ_{ε}^2 and that of the market-related component σ_m^2.

It can be shown that the $\overline{R}^2$ statistics shown in Figures 3 and 4 are ratios of the average market-related variance of a country's stock returns divided by the sum of the average market-related and firm-specific variances. That is,

$$\overline{R}^2 = \frac{\overline{\sigma}_m^2}{\overline{\sigma}_m^2 + \overline{\sigma}_\varepsilon^2} \tag{2}$$

where $\overline{\sigma}_\varepsilon^2$ is the average firm-specific variance across all stocks in the country, weighted by the number of observations for each stock, and $\overline{\sigma}_m^2$ is an analogous weighted average of market-related variance.

By thinking about the $\overline{R}^2$ measure of synchronicity in this way, we can attribute a high degree of synchronicity in stock returns either to a great deal of comovement (a high $\overline{\sigma}_m^2$) or to a dearth of independent movement (a low $\overline{\sigma}_\varepsilon^2$), or to both.

Figure 7 shows this breakdown for US stocks from 1926 to the present. Market-related variation fell sharply as the US pulled out of the Great Depression and moved into the prosperity of the 1950s. But since the 1960s, the primary reason for the decreasing synchronicity of US stocks has been s steady increase in firm-specific variation.

[Figure 7 about here]

Figure 8 plots this decomposition of stock returns against per capita GDP in 1995 for the countries listed in Table 1. There are substantial differences in the magnitude of firm specific variation within both emerging markets and developed economy markets. The greater synchronicity in emerging markets is due to generally higher level of market-related variation.

[5] Roll (1989).

[Figure 8 about here]

e. General Private Property Rights Protection and Stock Returns Synchronicity

To measure the strength of the private property rights protection each country affords, we use a *good government index* assembled by Morck et al. (2000). This index takes high values for countries where corruption is relatively rare and low values for countries where corruption is endemic. It equally weights three indexes from La Porta et al. (1998), which measure (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.

[Figure 9 about here]

Figure 9 groups the countries whose $\overline{R}^2$s we measure above into four quartiles according to the extent of official corruption in each, as measured by the good government index. Stock prices move roughly equally independently in countries in both of the top two quartiles, and move in synch to roughly the same extent in countries in the two most corrupt quartiles.

Figure 9 is startlingly similar to Figure 5, which showed a similar pattern of roughly similarly independent share price movements in the richest (highest per capita GDP) two quartiles of countries, and roughly similarly synchronous share price movements in the poorest two quartiles of countries.

Least squares regressions let us see which variable, per capita GDP or the good government index, better explains synchronicity. Whether synchronicity is measured by

the fraction of stocks moving together, by $\overline{R}^2$, or by a variety of other measures, the good government index swamps per capita GDP in explaining synchronicity. Adding the variables in Table 2 also does not alter this. The good government index remains highly correlated with all our synchronicity measures to the virtual exclusion of all our other variables.

This is probably because the good government index turns out to have similarly high values for developed countries and similarly low values for emerging economies – just like our synchronicity measures. One explanation of this is that a certain minimal level of private property rights protection is necessary to induce informed trading and to curtail the effects of noise trading. Achieving this threshold level of good government triggers a discrete change to a more firm-specific information-laden stock market.

Figure 9 also shows that stocks in 'good government' countries have markedly less market-related variation. This difference turns out not to be explained by differences in fundamentals synchronicity (the factors in Table 2). This, in turn, suggests an alternative explanation: stock markets in 'bad government' countries are more affected by noise traders than are markets in 'good government' countries.

f. Shareholder Rights Laws and Stock Return Synchronicity

Some countries that have generally well developed legal systems and that do not suffer from pervasive official corruption nonetheless provide public shareholders with little legal recourse against corporate insiders. The presence or absence of such laws probably means little in highly corrupt countries, for the confiscation of corporate cash flows by officials or insiders can occur regardless. But their presence or absence in 'good

government' countries might be quite important to arbitrageurs. Some countries that are relatively free of official corruption, nonetheless fail to provide shareholders with strong legal protection against arrogation by corporate insiders. We argued above that this makes it likely that insiders abrogate abnormally high firm-specific cash flows, and that this also leaves arbitrageurs less able to predict firm-specific movements in share prices.

To assess the degree to which each country protects public shareholders from corporate insiders, we employ a *shareholder rights index* constructed by La Porta *et al.* (1998, Table 2, p. 1130). This index ranges from zero to five, with a higher score indicating stronger property rights protection for public shareholders.

[Figure 10 about here]

Figure 10 graphs firm-specific and market-related returns variation against the strength of shareholder protection a country provides, first for 'bad government' countries (those with a good government index below the median) and 'good government' countries (with good government indexes above the median). In bad government countries, no relationship is apparent. But in 'good government' countries, the magnitude of firm-specific returns variation increases in step with the strength of shareholder protection.

This is consistent with stronger property rights protection for shareholders inducing more extensive informed arbitrage based on investors digging up and applying proprietary firm-specific information.

4. DOES IT MATTER?

The extent to which stock prices accurately reflect up-to-date information about individual companies is important primarily if stock prices affect real capital allocation decisions (and other decisions). Since share prices affect the terms on which individual firms can obtain capital and also trigger various corporate governance mechanisms that influence corporate decisions, it is plausible that real capital allocation decision might indeed be affected.

Figure 11 plots total factor productivity growth, which can be interpreted as a measure of the quality of economic decisions in each country, against stock return synchronicity. Countries with more synchronous stock returns exhibit slower total factor productivity growth.[6] This remains true even when initial per capita GDP, level of education, and the like are taken into account.[7]

[Figure 11 about here]

Figure 12 addresses the quality of capital budgeting more directly. It plots a capital allocation quality index developed by Wurgler (2000) against synchronicity. Wurgler's index measures the tendency of capital to flow disproportionately to sectors with higher value-added investment opportunities. Figure 12 shows that capital flows more stalwartly towards higher value added uses in economies where stock move more independently.[8]

[Figure 12 about here]

[6] We are grateful to Rafael la Porta for providing us with his total factor productivity estimates.
[7] See Durnev et al. (2002) for details.

These findings are consistent with the view that microeconomic capital allocation is more efficient in economies with more independently moving stock prices.

6. CONCLUSIONS

In the introductory quote, Keynes (1936) writes that well-informed investors fulfill an important social purpose, namely " to defeat the dark forces of time and ignorance which envelop our future." Arbitrageurs, who gather and processes information in order to buy up underpriced stocks and sell or short overpriced ones, uncover the future. They turn data into valuable information, and their trading ultimately reveals that information to the rest of us.

Stock prices in developed economy stock markets move independently, as though informed investors are frequently reassessing the prospects of each firm in the light of new information. But in emerging markets, the prices of all stocks tend to rise and fall en masse, as if driven only by information about the whole country's economy - or by waves of optimistic and pessimistic sentiment of noise traders.

The primary determinant of how independently a country's stock prices move is not the size of its market, the diversification of its economy, the stability of its macroeconomic policy, or indeed any of a large set of factors plausibly related to the asynchronicity of firm-level fundamentals. Rather, stock price move more independently in countries that provide their citizens with stronger private property rights. A lack of property rights protection might make informed arbitrage more difficult, and thus discourage investors from fulfilling their social mission as ordained by Keynes.

Further, countries that provide a certain acceptable level of general property rights

[8] This result was originally noted by Wurgler (2000).

protection have more independently moving stock prices if they also have stronger shareholder property rights protection. In a continuation of this line of work, Bushman et al. (2001) show that our measure of stock return synchronicity is lower in economies where government control of the media is less extensive and where freedom of the press is better protected.

All of these results are consistent with asynchronicity in stock returns measuring the activity of informed arbitrageurs who gather and process proprietary firm-specific information to identify mispriced stocks. They are also consistent with the view that stronger property rights protection for shareholders induces more extensive informed arbitrage based on investors. Finally, they are consistent with the view that stock markets in which prices move relatively independently are more efficient in the sense that they induce better quality microeconomic capital allocation decisions, which allows faster productivity growth.

Tobin (1982) argues that standard definitions of market stock efficiency should be augmented by what he calls *functional efficiency*. Three standard definitions of stock market efficiency are in common use. The *strong form of the efficient markets hypothesis* states that stock prices adjust to their full information values so fast that no information can be used to earn trading profits in excess of a normal portfolio return. The *weak form of the efficient markets hypothesis* states that prices adjust so that no information about current and past prices and volumes can be used to earn such profits. Finally, the *semi-strong form of the efficient markets hypothesis* states that stock prices adjust so quickly that no publicly available information can be used to earn trading profits in excess of a normal portfolio return. To these, Tobin would add the *functional form of the efficient*

markets hypothesis, which states that stock prices adjust so as to induce an economically efficient microeconomic allocation of capital.

The standard definitions of market efficiency are clearly of importance to portfolio managers and to arbitrageurs themselves. However, the functional form is of the most general concern, for it addresses a central issue in economic growth - how well is capital allocated? One consistent interpretation of our findings is that stock markets in which prices move more independently are more functionally efficient. Thus, the R^2 statistics of standard asset pricing models, which are inadvertent measures of the extent to which stock prices move in synch, are arguably inversely related to the functional efficiency of the stock market. Note that this in no way invalidates these models, nor the theory underlying them. Our results merely indicate that low R^2s for these models are indicative of a well-functioning stock market, and should not be viewed as a problem.

While we believe this interpretation of our results to be the most likely, we recognize that it remains speculative. We wholeheartedly invite other explanations of our findings.

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Figure 1. Comovement in Various Stock Markets in 1995
The fraction of stocks moving together in an average week of 1995 in various stock markets, estimated using weekly returns provided by DataStream.

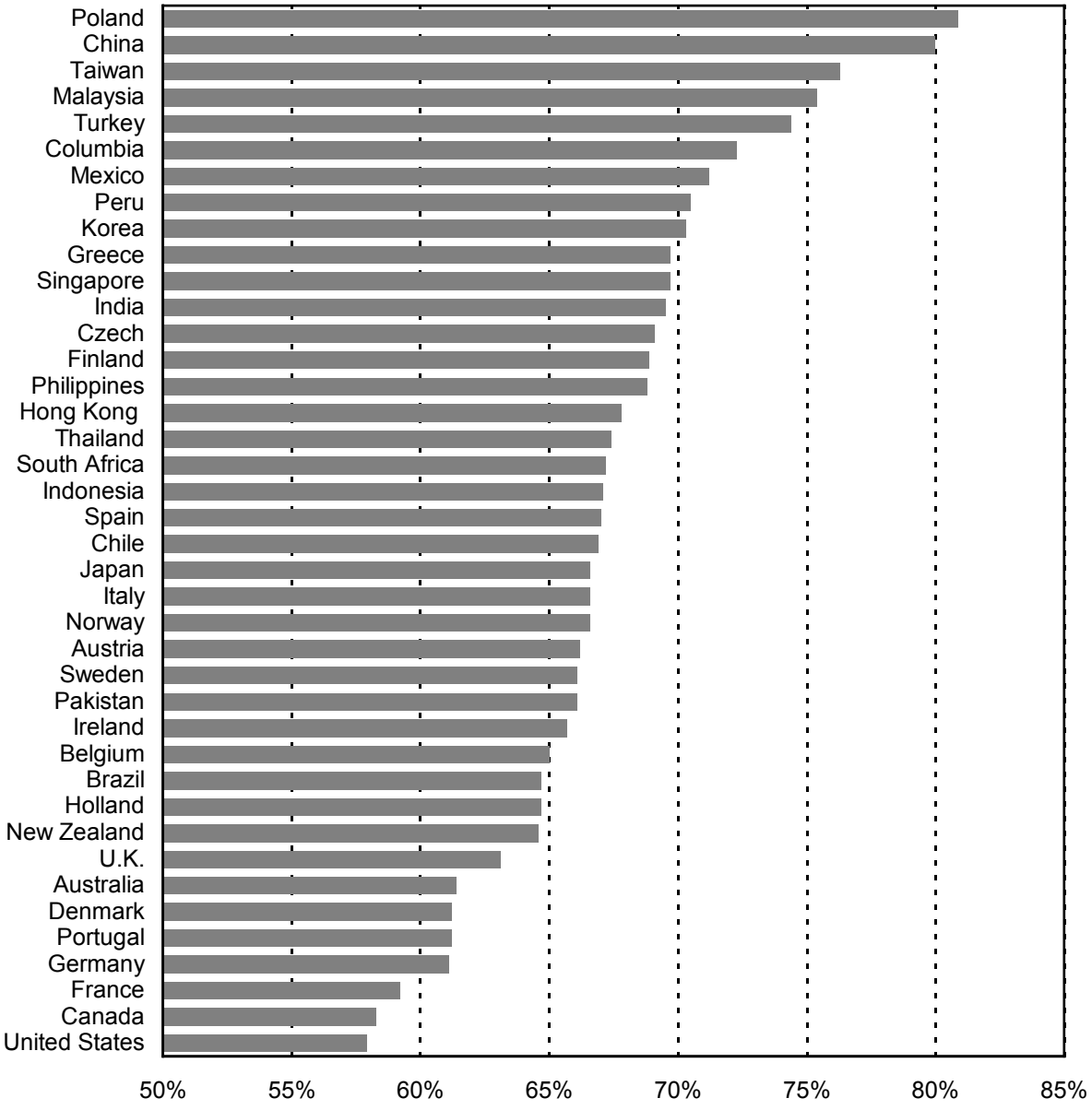


Figure 2. Comovement in US Stocks from 1926 to 2000

The Fraction of Stocks Moving Together in an Average Month of Each Year from 1926 to 1995 in the United States, Estimated Using 400 Randomly Chosen Stocks For Each Year and Estimated Using All Available Stock Returns

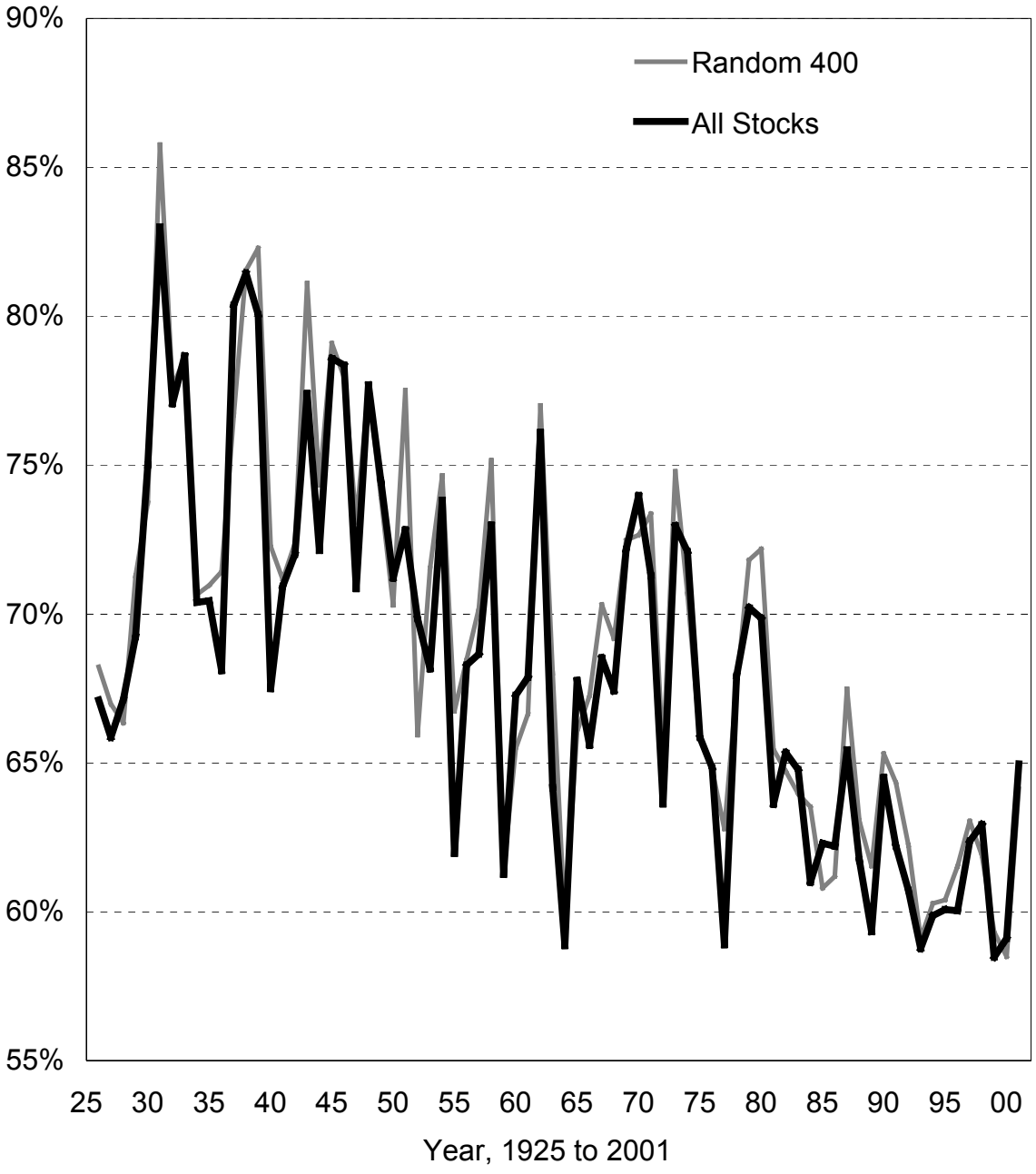


Figure 3. The Average Market Model R^2 for Stocks in Various Countries in 1995
The market model is estimated by regressing biweekly total returns on local and US market total returns, provided by DataStream.

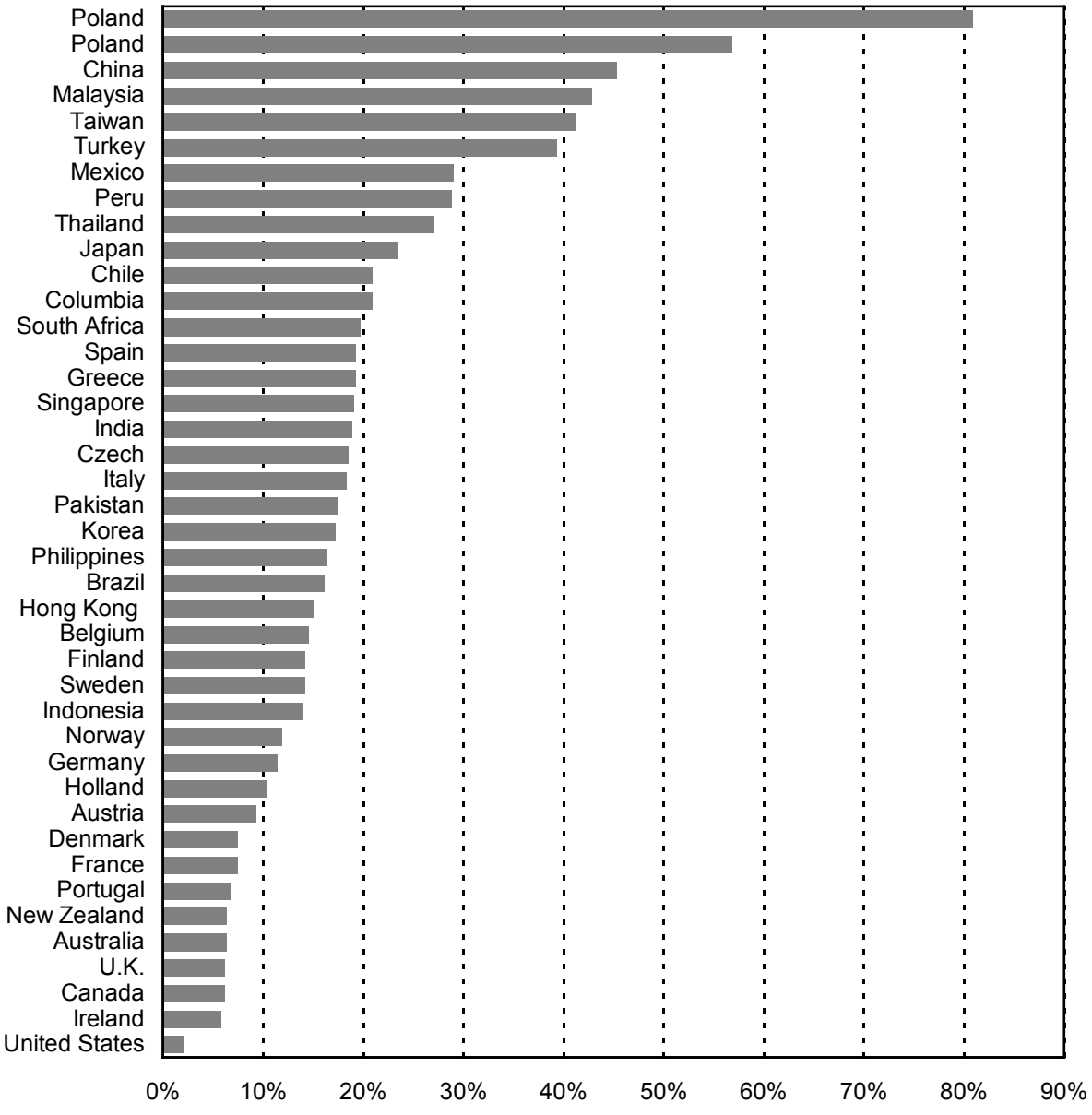


Figure 4. The Average Market Model R^2 for U.S. Stock From 1926 to 2000
The market model is estimated by regressing monthly total returns on monthly value-weighted market returns, provided by the Center for Research in Securities Prices (CRSP) at the University of Chicago, for non-overlapping five-year intervals.

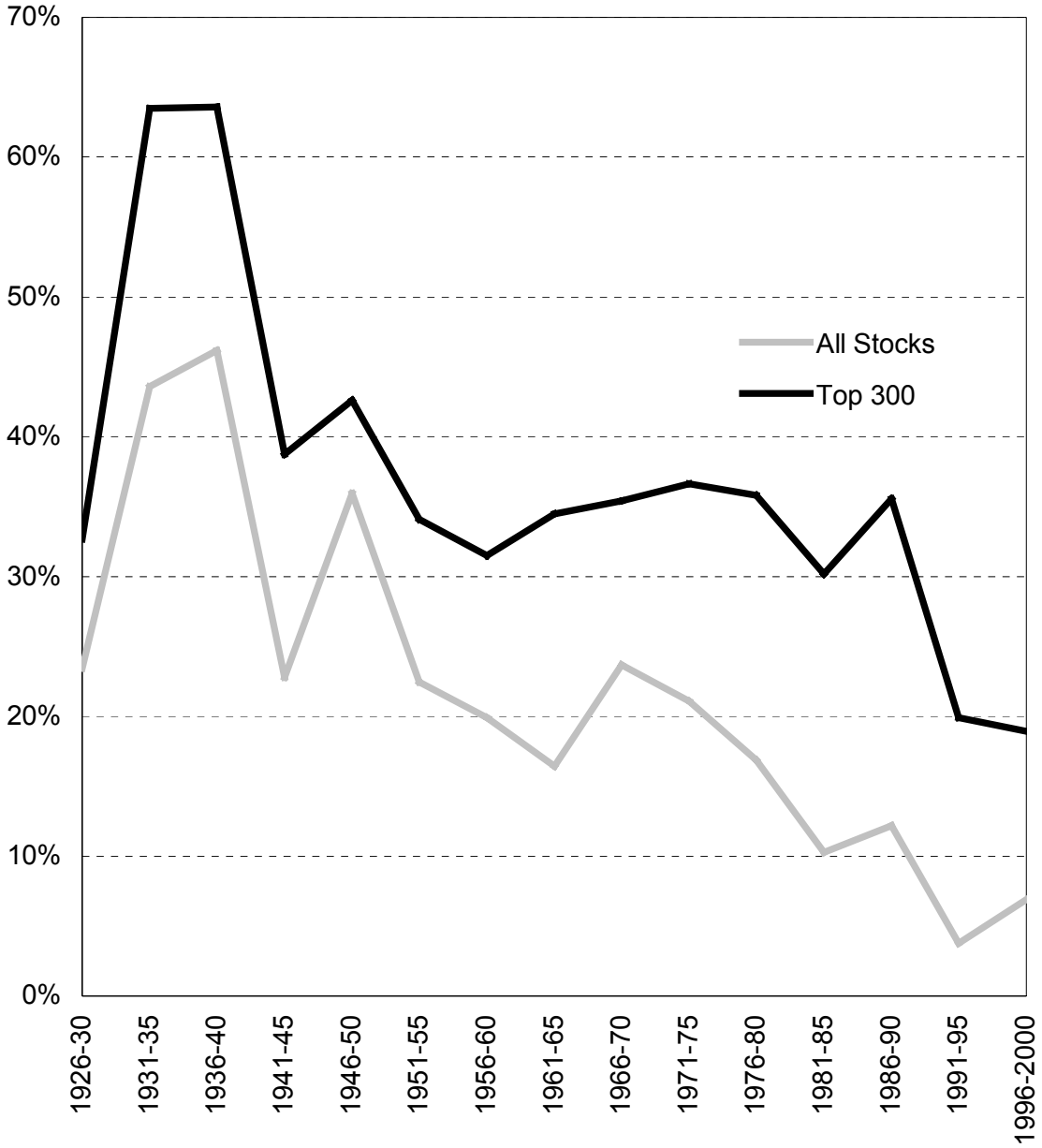


Figure 5. Stock Return Synchronicity and Per Capita Gross Domestic Product
Countries are divided into four quartiles according to per capita GDP in 1995. The stock returns synchronicity in each country is measured by the average fraction of stocks moving in the same direction in a typical week of 1995 and the average Market Model R^2 for 1995, estimated from equation (2) in the text.

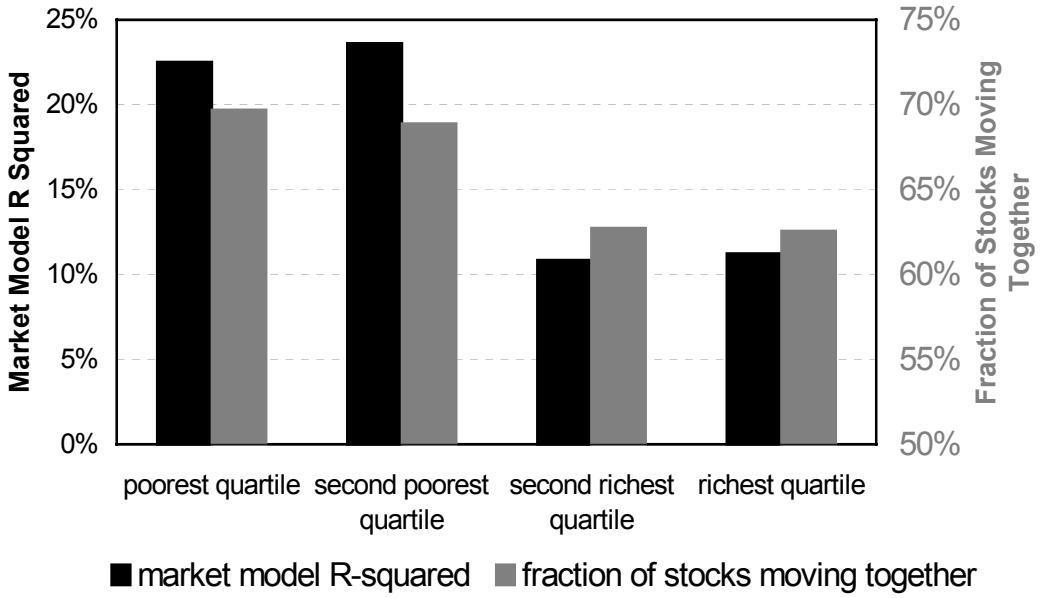


Figure 6. Market-Related and Firm-Specific Returns Variation

The market model allows the variation in an individual stock's return to be divided into two component, a market-related, or market-related, component, σ_m^2, and a firm-specific component, σ_ε^2

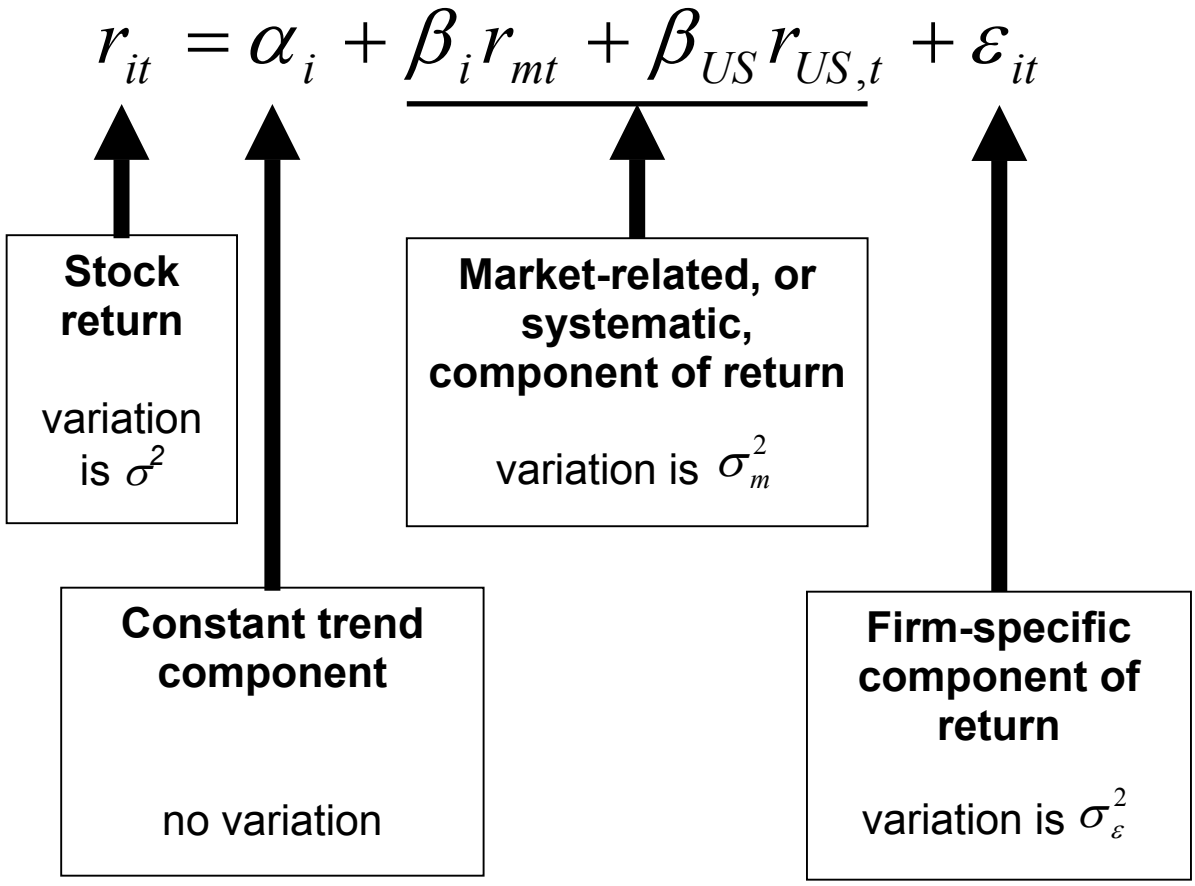


Figure 7. Average Monthly Firm-specific and Market-related Variation in US Stocks, 1925 to 1995.
Estimated by using the market model for each stock, containing a value-weighted market return provided by the Center for Research in Securities Prices (CRSP) at the University of Chicago, to break the variance of each stock return into firm-specific and market-related components, as in Figure 6. Variances are annualized for ease of interpretation.

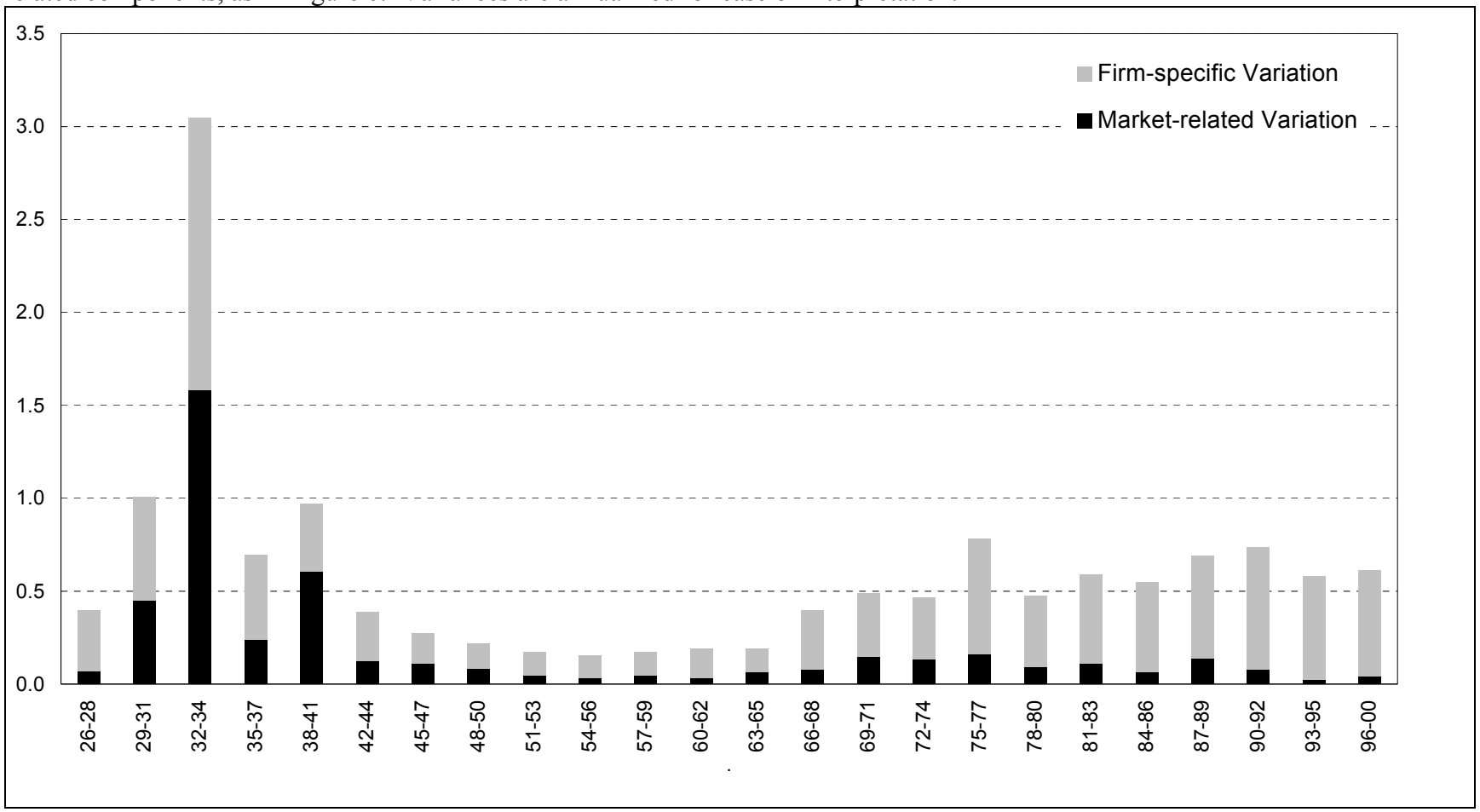


Figure 8. Average Monthly Firm-specific and Market-related Variation in the Average Stock in 1995 Plotted Against Per Capita Gross Domestic Product
A market model is estimated for each stock, using value-weighted domestic and US market returns provided by DataStream, to break the variance of each stock return into firm-specific and market-related components, as in Figure 6. These are then averaged for each country. Countries are ordered by declining *per capita* GDP.

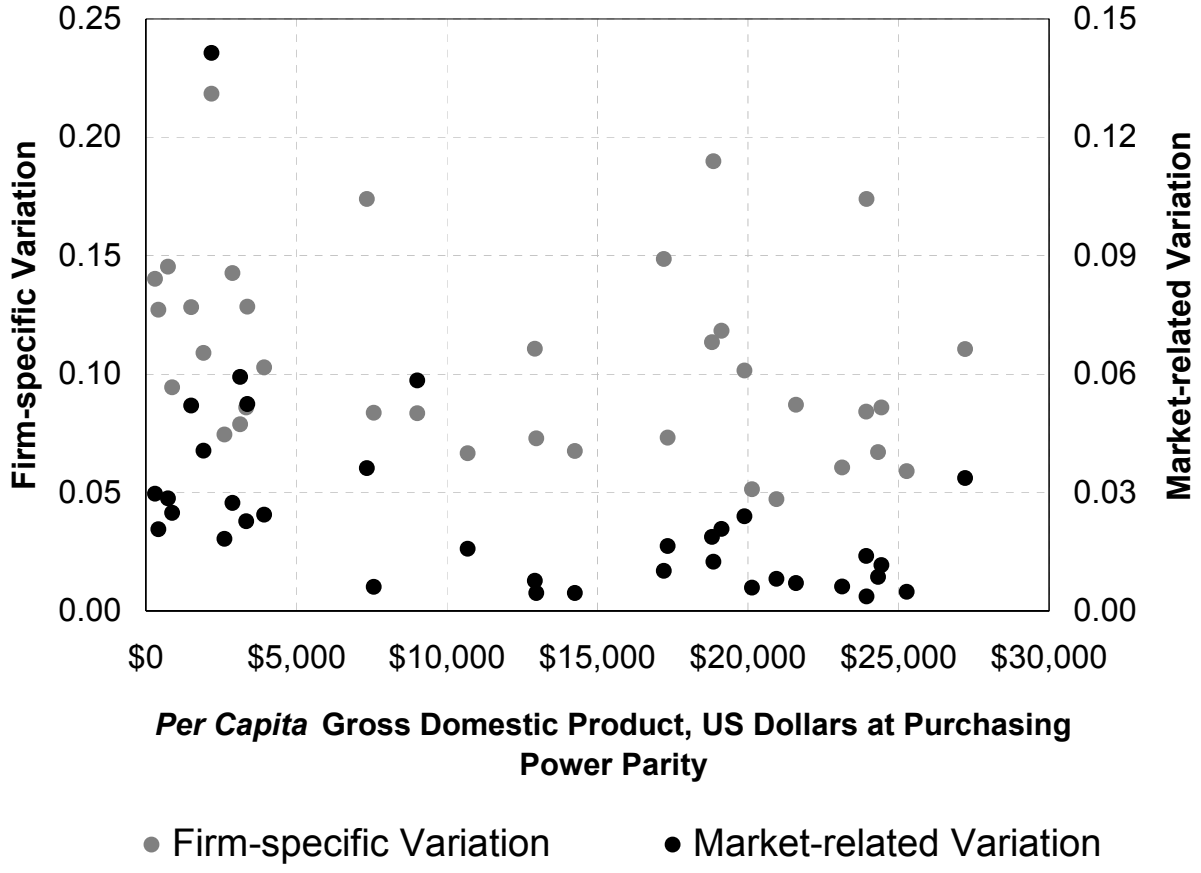


Figure 9. Stock Return Comovement, Variance Breakdown, and the Quality of Government

Countries are divided into four quartiles ranging from the most corrupt (first quartile) to the least corrupt (fourth quartile). Official corruption is measured using the 'Good Government Index' from Morck et al. (2000). A market model is estimated for each stock, using value-weighted domestic and US market returns provided by DataStream, to obtain the R2 and to break the variance of each stock return into firm-specific and market-related components. These are then averaged for each country.

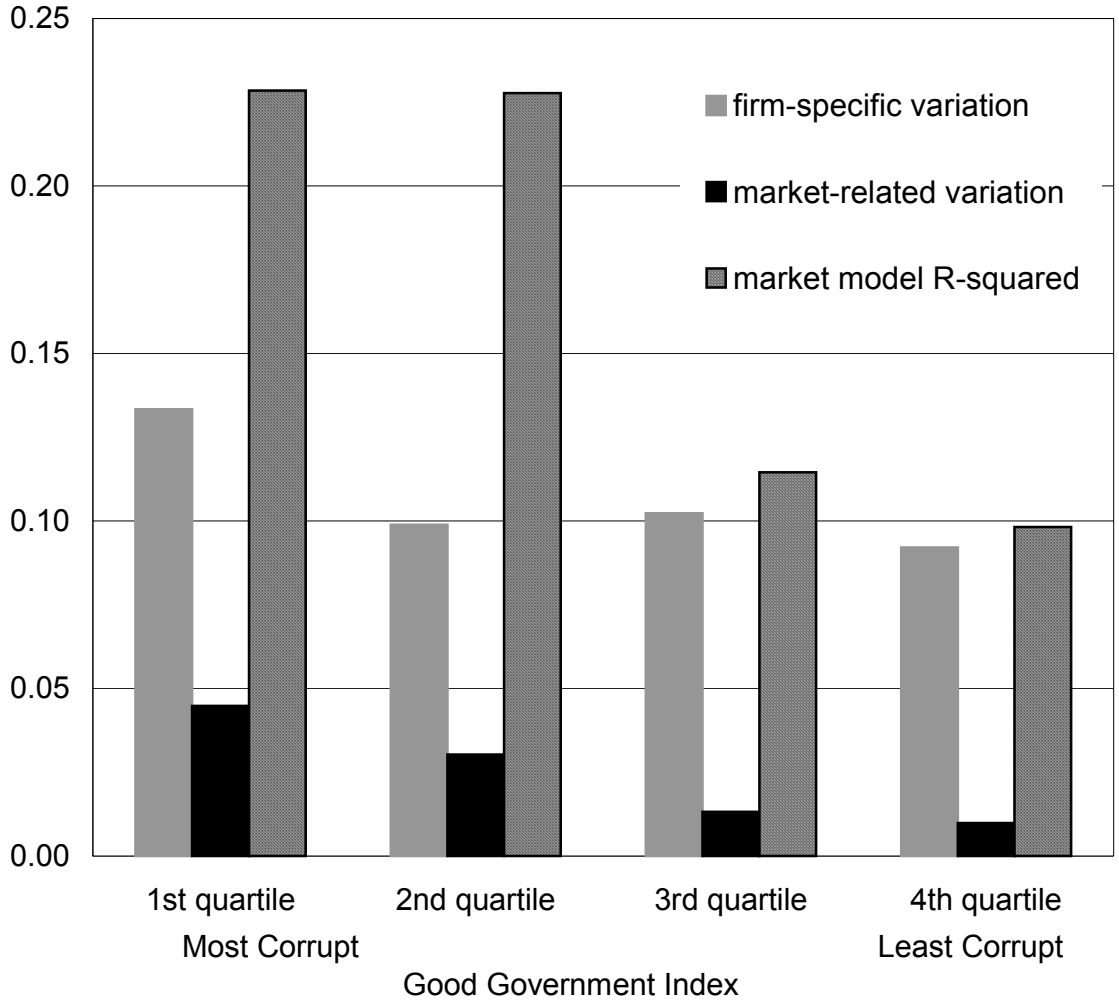


Figure 10. The Magnitudes of Firm-specific and Market-related, or Systematic, Stock Return Variation and Shareholder Rights Laws

Countries are divided into "bad government" countries (those having 'Good Government Indexes' below the median value) and "good government" countries (those having 'Good Government Indexes' above the median value). The 'Good Government Indexes' measures the general absence of corruption, and is taken from Morck *et al.* (2000). The number of shareholder rights laws is taken from La Porta *et al.* (1998). A market model is estimated for each stock, using value-weighted domestic and US market returns provided by DataStream, to obtain the R2 and to break the variance of each stock return into firm-specific and market-related components. These are then averaged for each country.

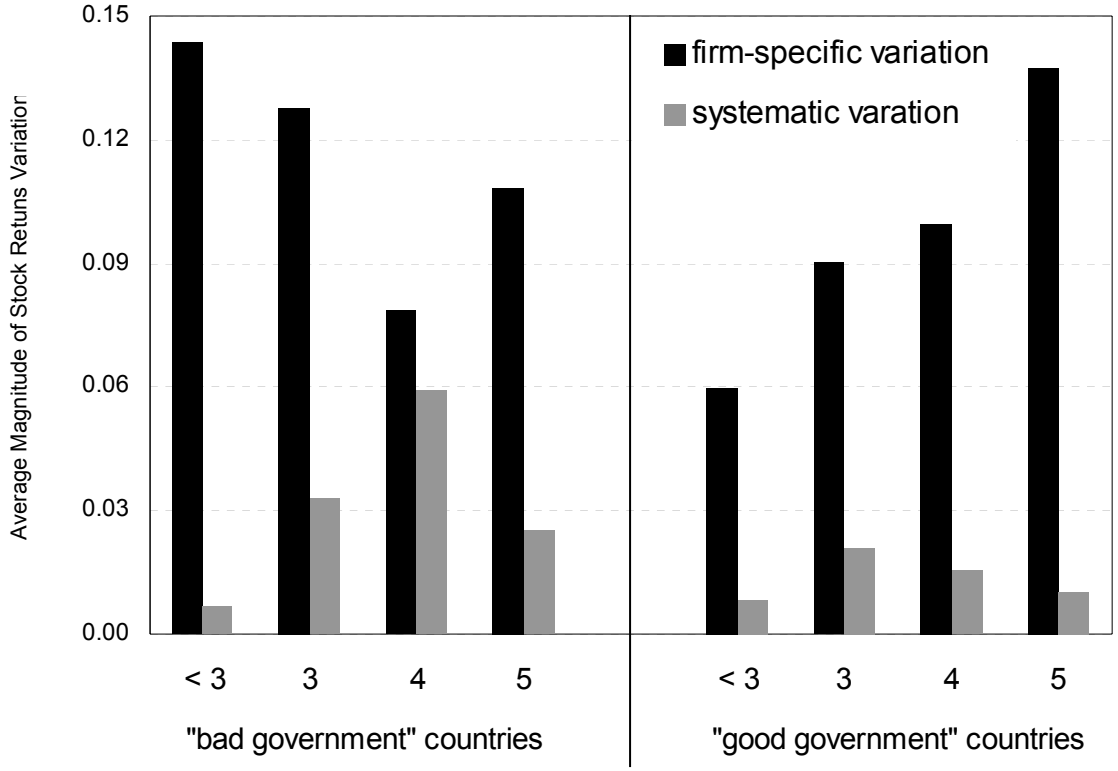


Figure 11. Productivity Growth and Stock Price Synchronicity
Synchronicity is the market model R^2, the average fraction of 1995 biweekly firm-level return variation explained by local and U.S. value-weighted market indexes. Stock and market returns are from DataStream. Total factor productivity is for 1986 to 1999 and is taken from La Porta et al. (1998). The correlation between the two is statistically highly significant, and is represented by the gray line.

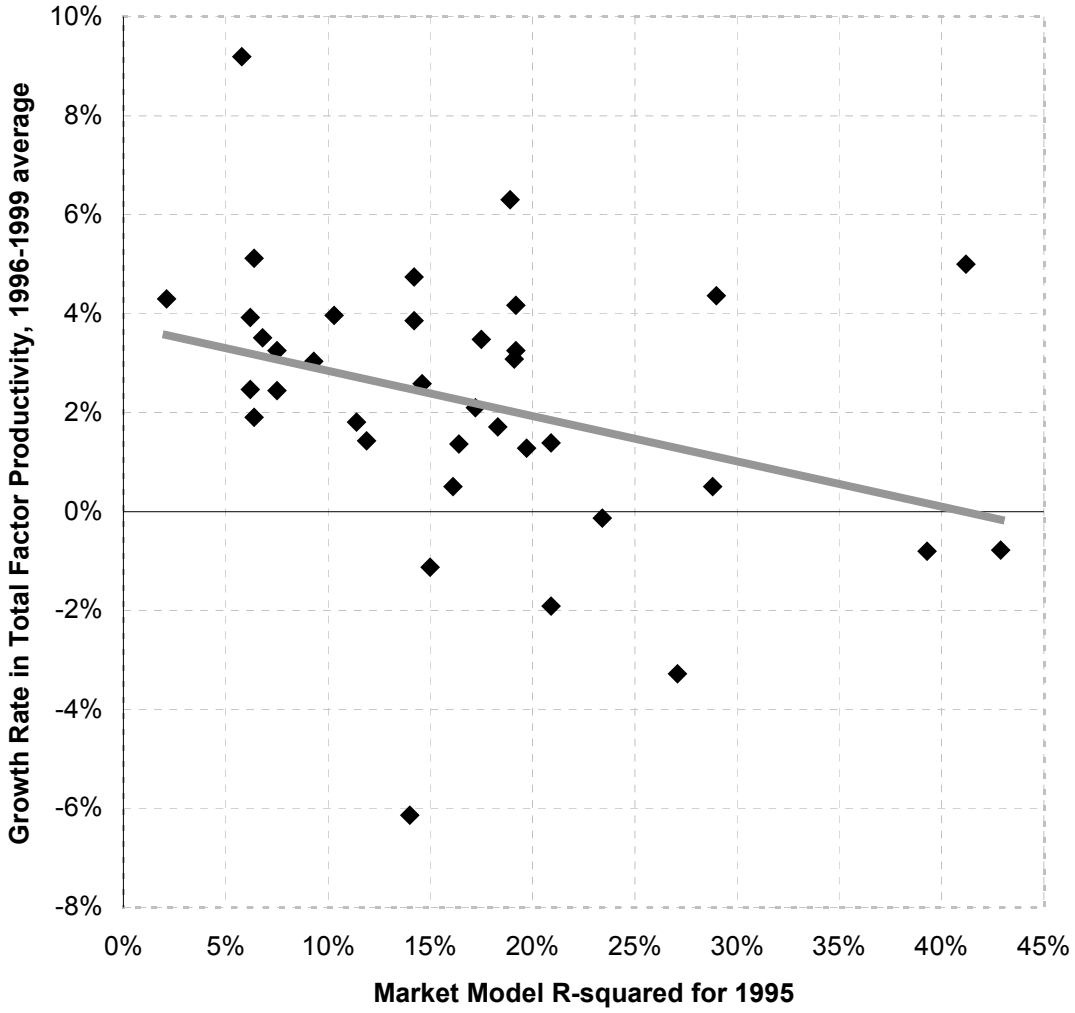
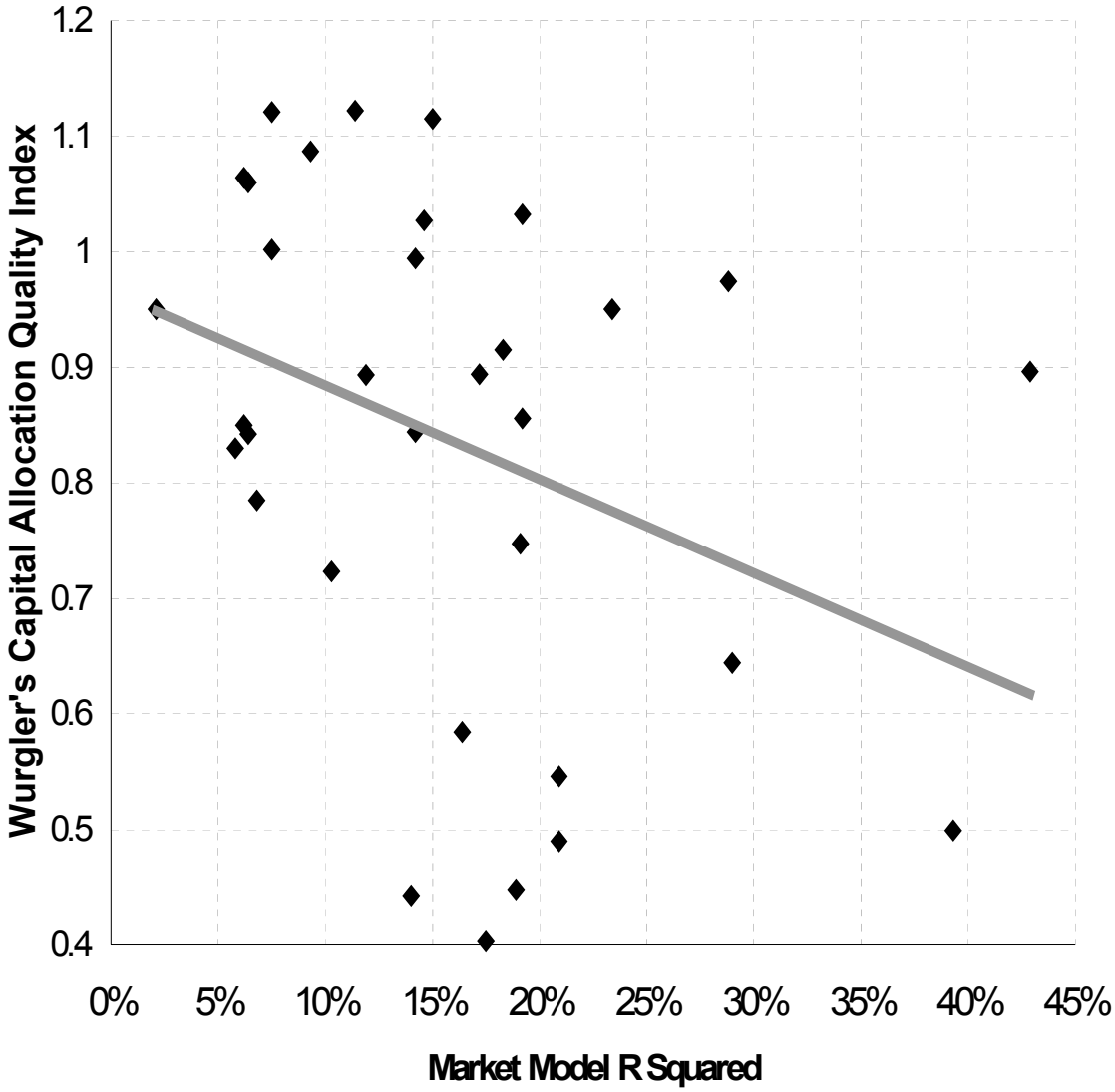


Figure 12. Capital Allocation Quality and Stock Price Synchronicity
Synchronicity is the market model R^2, the average fraction of 1995 biweekly firm-level return variation explained by local and U.S. value-weighted market indexes. Stock and market returns are from DataStream. Capital budgeting quality is a measure of the tendency of capital to flow where its value-added is higher, as estimated by Wurgler (2000). The correlation between the two is statistically highly significant, and is represented by the gray line.



This graph includes Australia, Austria, Belgium, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Greece, Holland, Hong Kong, India, Indonesia, Ireland, Italy, Japan, Korea, Malaysia, Mexico, New Zealand, Norway, Pakistan, Peru, Philippines, Portugal, Singapore, Spain, Sweden, Turkey, United Kingdom, and United States. Fewer countries are included because Wurgler's capital allocation quality is not available for all the countries in Table 1.

Table 1: Synchronicity Measures and Per Capita Gross Domestic Product
Countries sorted in the left, center and right panels by *per capita* GDP, the fraction of stocks moving together each week, and average market model R^2, respectively. Returns are trimmed at ±25%.

country	*number of listed stocks*	*1995 log per capita US$ GDP*	*country*	*fraction moving together*	*country*	R^2	*firm-specific variation*	*market-related variation*
Japan	2276	10.41	United States	57.9	United States	.021	.174	.004
Denmark	264	10.21	Canada	58.3	Ireland	.058	.073	.005
Norway	138	10.14	France	59.2	Canada	.062	.190	.013
Germany	1232	10.10	Germany	61.1	U.K.	.062	.068	.005
United States	7241	10.10	Portugal	61.2	Australia	.064	.149	.010
Austria	139	10.08	Australia	61.4	New Zealand	.064	.111	.008
Sweden	264	10.08	U.K.	63.1	Portugal	.068	.084	.006
France	982	10.05	Denmark	63.1	France	.075	.087	.007
Belgium	283	9.98	New Zealand	64.6	Denmark	.075	.059	.005
Holland	100	9.95	Brazil	64.7	Austria	.093	.061	.006
Singapore	381	9.91	Holland	64.7	Holland	.103	.051	.006
Hong Kong	502	9.90	Belgium	65.0	Germany	.114	.067	.009
Canada	815	9.86	Ireland	65.7	Norway	.119	.086	.012
Finland	104	9.84	Pakistan	66.1	Indonesia	.140	.127	.021
Italy	312	9.84	Sweden	66.1	Sweden	.142	.084	.014
Australia	654	9.76	Austria	66.2	Finland	.142	.113	.019
U.K.	1628	9.75	Italy	66.6	Belgium	.146	.047	.008
Ireland	70	9.56	Norway	66.6	Hong Kong	.150	.118	.021
New Zealand	137	9.47	Japan	66.6	Brazil	.161	.143	.027
Spain	144	9.47	Chile	66.9	Philippines	.164	.145	.029
Taiwan	353	9.28	Spain	67.0	Korea	.172	.174	.036
Portugal	90	9.11	Indonesia	67.1	Pakistan	.175	.140	.030
Korea	461	8.93	South Africa	67.2	Italy	.183	.073	.016
Greece	248	8.90	Thailand	67.4	Czech	.185	.125	.028
Mexico	187	8.28	Hong Kong	67.8	India	.189	.132	.031
Chile	190	8.12	Philippines	68.8	Singapore	.191	.102	.024
Malaysia	362	8.11	Finland	68.9	Greece	.192	.103	.024
Brazil	398	8.05	Czech	69.1	Spain	.192	.067	.016
Czech	87	8.03	India	69.5	South Africa	.197	.074	.018
South Africa	93	7.96	Singapore	69.7	Columbia	.209	.095	.025
Turkey	188	7.87	Greece	69.7	Chile	.209	.086	.023
Poland	45	7.75	Korea	70.3	Japan	.234	.111	.034
Thailand	368	7.69	Peru	70.5	Thailand	.271	.109	.041
Peru	81	7.56	Mexico	71.2	Peru	.288	.128	.052
Columbia	48	7.32	Columbia	72.3	Mexico	.290	.129	.052
Philippines	171	6.78	Turkey	74.4	Turkey	.393	.218	.141
Indonesia	218	6.60	Malaysia	75.4	Taiwan	.412	.084	.058
China	323	6.12	Taiwan	76.3	Malaysia	.429	.079	.059
Pakistan	120	6.05	China	80.0	China	.453	.079	.066
India	467	5.71	Poland	82.9	Poland	.569	.118	.156

Due to rounding errors, R^2 does not exactly match market-related variation over the sum of market-related and firm-specific variation.

Table 2. Some Possible Explanations for More Stock Price Comovment in Emerging Economies

This is a subset of a much longer list investigated by Morck et al. (2000). A variable "explains higher emerging market synchronicity" if including it a regression explaining synchronicity makes per capita GDP insignificant. See Morck *et al*. (2000) for details.

Proxy for fundamentals synchronicity	Supporting Story	Problems with Supporting Story	Does it explain higher emerging market synchronicity?
Number of listings	*Stock markets with many listed securities attract a more diverse range of companies.*	*Ireland and Denmark have substantially fewer listed stocks than many emerging markets; yet display synchronicity comparable to the U.S. market*	*No.*
Country size	*Natural disasters and other Acts of God affect most firms in smaller countries, but not in larger countries*	*The U.S. and Ireland have similarly low synchronicity. China and Poland exhibit similar high synchronicity*	*No.*
Country diversification	*Poor countries depend on only a few industries, so their listed stocks naturally move together*	*Many small rich countries are even more specialized than many poor countries*	*No.*
Dominant firms	*Poor country economies may be highly dependent on a small number of key firms, whose fortunes affect those of most other firms*	*This is also true of Holland (Phillips) and Finland (Nokia), yet stocks in these countries move quite independently*	*No.*
Dependence on natural resources	*Poor countries depend on natural resource extraction and are buffeted by commodity price fluctuations*	*Poor countries with resource dependent economies and other poor countries have roughly equally synchronous stock returns*	*No.*
Corporate groups	*Companies in poor economies are organized into corporate groups via pyramids or cross holdings*	*This is also true of many rich countries, such as Sweden, yet their move quite independently*	*No.*
Macroeconomic instability	*Poor countries have less stable macroeconomic policies and this causes synchronous fluctuations in stocks*	*Poor countries with more stable inflation, money supply growth, etc. do not exhibit less returns synchronicity*	*No.*
General instability	*Poor countries are prone to economic crises of various sorts, and these induce synchronicity in their stocks*	*Poor countries with more stable economic growth rates do not exhibit less returns synchronicity*	*No.*
Earnings comovement	*General*	*Estimated with error*	*No.*
All of the above	*General*		*No.*